Baltimore County
Department of Public Works and Transportation

STANDARD SPECIFICATIONS FOR CONSTRUCTION AND MATERIALS

September, 2023

BALTIMORE COUNTY
DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

STANDARD SPECIFICATIONS FOR CONSTRUCTION AND MATERIALS

D'ANDREA WALKER
DIRECTOR

(This page intentionally left blank)

FOREWORD

The Baltimore County Department of Public Works and Transportation's Specifications Committee wishes to thank everyone who participated in the development of this document.

(This page intentionally left blank)

TABLE OF CONTENTS

PART I
GENERAL CONDITIONS
&
TERMS AND CONDITIONS

GENERAL PROVISIONS

GP - SECTION 1 DEFINITIONS AND TERMS

GP - SECTION 2 BIDDING REQUIREMENTS AND CONDITIONS

GP - SECTION 3 AWARD AND EXECUTION OF CONTRACT

GP - SECTION 4 SCOPE OF WORK

GP - SECTION 5 CONTROL OF THE WORK

GP - SECTION 6 CONTROL OF MATERIAL

GP - SECTION 7 LEGAL RELATIONS AND RESPONSIBILITY TO PUBLIC

GP-SECTION 8 PROSECUTION AND PROGRESS

GP-SECTION 9 PAYMENT

GP-SECTION 10 PRIVATE CONTRACTS

TERMS AND CONDITIONS

TC - SECTION 1 LANGUAGE AND METRIC SYSTEM

TC - SECTION 2 BIDDING REQUIREMENTS AND CONDITIONS

TC - SECTION 3 SCOPE OF WORK

TC - SECTION 4 CONTROL OF WORK

TC - SECTION 5 LEGAL RELATIONS AND PROGRESS

TC - SECTION 6 RESTRICTIONS AND PERMITS

TC - SECTION 7 PAYMENT

PART II
TECHNICAL REQUIREMENTS

CATEGORY 400 - STRUCTURES

CATEGORY 500 - PAVING

CATEGORY 600 - SHOULDERS

CATEGORY 700 - LANDSCAPING

GENERAL PROVISIONS

GP - SECTION 1
DEFINITIONS AND TERMS

GP-1.01 GENERAL

This volume is based on the Maryland Department of Transportation, State Highway Administration Standard Specifications for Construction and Materials dated July 2008, as amended in this volume. It has been prepared as the Manual of Standard Specifications under the authority of Section 32-4-404 of the Baltimore County Code, 2015, as amended from time to time.

Baltimore County has adopted a set of Standard Detail Drawings as its Manual of Standard Details that is published separately under the authority of Section 32-4-404 of the Baltimore County Code, 2015, as amended from time to time.

GP-1.02 ORGANIZATIONAL STRUCTURE

Reference to Specifications or procedures beginning with the letters M, R, or T shall be understood to be AASHTO.

Reference to Specifications or procedures beginning with the letters A, B, C, D, E, F, G, ES or P shall be understood to be ASTM.

GP-1.03 LANGUAGE

It shall be understood that when all such expressions such as “directed, specified, authorized, permitted, approval, acceptable or satisfactory” are used they are implicitly followed by the words “by the Engineer” or “to the Engineer”.

GP-1.04 ABBREVIATIONS

Wherever in these General Provisions or in other Contract Documents the following abbreviations are used, the meaning shall be as follows:

AAN	American Association of Nurserymen
AAPA	American Association of Port Authorities
AAR	Association of American Railroads
AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
AIA	American Institute of Architects

AIEE	American Institute of Electrical Engineers
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
ANSI	American National Standards Institute
ARA	American Railway Association
AREA	American Railway Engineering Association
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigeration and Air-Conditioning Engineers
ASLA	American Society of Landscape Architects
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
ATA	American Transit Association
AWWA	American Water Works Association
AWS	American Welding Society
AWPA	American Wood Preservers Association
AWG	American Wire Gauge
AGC	Associated General Contractors of America
bccmp	bituminous-coated corrugated metal pipe
bccmpa	bituminous-coated corrugated metal pipe arch
B&S	Brown & Sharpe Wire Gauge
BOCA	Building Officials Code Administrators International
cip	cast iron pipe
cipx	cast iron soil pipe, extra strength
cmp	corrugated metal pipe
CPVC	Chlorinated Poly Vinyl Chloride
CSPA	Clay Sewer Pipe Association
COMAR	Code of Maryland Regulations
CRSI	Concrete Reinforcing Steel Institute
dip	ductile iron pipe
DIPRA	Ductile Iron Pipe Research Association
EEI	Edison Electric Institute
EIA	Electronic Industries Association
EPA	Environmental Protection Agency
FAA	Federal Aviation Administration, U.S. Department of Transportation
FCC	Federal Communications Commission
FHWA	Federal Highway Administration, U.S. Department of Transportation
FRA	Federal Railway Administration, U.S. Department of Transportation
FSS	Federal Specifications and Standards, General Services Administration
FTA	Federal Transit Administration
IBC	International Building Code
IEEE	Institute of Electrical and Electronic Engineers
IES	Illuminating Engineers Society
IMSA	International Municipal Signal Association
IPCEA	Insulated Power Cable Engineers Association
IRT	Institute for Rapid Transit
MBE	Minority Business Enterprise

MBMA	Metal Building Manufacturers Association
MDOT	Maryland Department of Transportation
MSMT	Maryland Standard Method of Tests (as developed by the State Highway Administration)
MSSESC	Maryland Standards and Specifications for Erosion and Sediment Control
MUTCD	Manual on Uniform Traffic Control Devices
MdMUTCD	Maryland Manual on Uniform Traffic Control Devices
MdSHA	Maryland State Highway Administration
NBFU	National Board of Fire Underwriters
NBS	National Bureau of Standards
NCHRP	National Cooperative Highway Research Program
NEC	National Electric Code
NESC	National Electric Safety Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NIST	National Institute of Standards and Technology
OSHA	Occupational Safety and Health Administration
PCA	Portland Cement Association
pccp	prestressed concrete cylinder pipe
PCI	Precast Concrete Institute
PVC	Poly Vinyl Chloride
QPL	Qualified Products List
rccp	reinforced concrete culvert pipe
rcsp	reinforced concrete sewer pipe
RLMI	Reflector and Lamp Manufacturers' Institute
RMA	Rubber Manufacturers Association
SAE	Society of Automotive Engineers
SAWP	Society of American Wood Preservers
SHA	State Highway Administration
SSPC	Steel Structures Painting Council
ucpx	unglazed clay pipe, extra strength
UL or **ULI**	Underwriters Laboratories, Incorporated
UMTA	Urban Mass Transportation Administration, U.S. Department of Transportation
USSG	United States Standard Gauge
USSWG	United States Steel Wire Gauge
WBE	Women's Business Enterprise

GP-1.05 DEFINITIONS

Wherever in these General Provisions or in other Contract Documents the following terms are used, the meaning shall be as follows:

Additional Work - Work not required or provided for in the original Contract.

Administration - Baltimore County, Maryland, a body corporate and politic.

Administrator - The Director of the Department.

Advertisement - The public announcement, as required by law, inviting any and all prequalified contractors to submit a Bid for Work to be performed or provided.

Agreement - The written agreement executed between the County and the successful Bidder covering the performance of the Work by which the Contractor is bound to perform the Work and by which the County is obligated to compensate the Contractor therefor at a mutually established and accepted rate or price. The Agreement shall include all the documents listed under "Contract Documents", as well as any written Contract Modification that is required to complete the Construction and completion of the Work in an acceptable manner, including any authorized extension thereof, all of which constitute one instrument and agreement. The Agreement shall be executed by the Contractor and the County as indicated by the signature of the Contractor's duly and legally authorized representative and the County Executive or his/her legally authorized designee, with evidence thereof of review for legal sufficiency by the County's Office of Law.

Alley - An established passageway for vehicles and pedestrians affording a secondary means of access in the rear to properties abutting on a street or Highway.

Approved Source of Supply - Listing prepared by the Department on a periodic basis and available on the Department's website.

Architect and/or Design Engineer - The Maryland licensed and registered architect and/or design engineer under separate contract with the County to prepare the Plans and Contract Documents.

As-Built Drawings - A complete set of as-built record Contract Drawings, sealed and signed by a Maryland-licensed Engineer or Surveyor (as designated in Section 300 of the Standard Specifications), that are based on the marked-up prints or red-lined drawings received from the applicable contractor, the shop drawings, any addenda, any change orders, any requests for information, and any other data utilized by the Contractor so as to provide a complete and accurate as-built record. The as-built drawings need to reflect the changes made in the field during the construction process, of any materials, quantities, grades, horizontal and/or vertical alignments from the approved advertised contract design drawings. The as-built drawings are to be an accurate representation of the final location/condition of the project.

Award - The decision and notice given by the County of the acceptance of a Bid or Proposal. The successful Bidder understands and expects the County to substantially, materially and justifiably rely upon its Bid from the date of Award pending execution of the Agreement.

Baltimore County - Baltimore County, Maryland, a body corporate and politic.

Base Course - The one or more layers of specified material and thickness placed on a Subbase or a Subgrade to support a Surface Course.

Bid - A written submission including, but not limited to, price, terms of sale, and description of work technical expertise, work experience, and any other information requested in the Bid Package, offered by a Bidder to the County in response to the County's Bid Package or request for Proposal.

Bid Bond - The security required and described in the Bid Package and Section GP-2.07 to be included in the Proposal and furnished by the Bidder as a guaranty of good faith to enter into a Contract with the County if the Work is awarded to the Bidder.

Bid Form - The approved form included in the Bid Package and/or Proposal Form, on which the Administration requires the Bid to be set forth and submitted.

Bid Item - An item of Work specifically described and for which a price, either unit or lump sum, is required. It includes the performance of all Work described herein or described in any Supplemental Specifications or Special Provisions.

Bid Package – Includes, but is not limited to, the Standard Specifications and any Contract Document included and/or incorporated by reference therein, used by the County for soliciting and procuring Bids by competitive sealed Bid and/or requests for Proposals and/or small procurement procedures including, but not limited to, requests for quotations, requests for Bids, etc.

Bidder - A Person formally submitting a Bid for the Work, acting directly or through a duly and legally authorized representative.

Bridge - A structure including supports erected over a depression or an obstruction, such as water, Highway, or railway, and having a track or passageway for carrying traffic or other moving loads, and having an opening measured along the center of the Road of more than 20 feet between undercopings of abutments or spring lines of arches, or extreme ends of openings for multiple boxes; it may also include multiple pipes, where the clear distance between openings is less than half of the smaller contiguous opening. For lengths, all dimensions shall be parallel to the center line of the Road. The dimensions of handrails will not be taken into account in measuring bridge lengths. Any Bridge or Highway grade separation structure includes the connecting Highways, Substructure, Superstructure, Road approaches, entrance plazas, interchanges, overpasses, underpasses, and other Structures which the Administration may deem necessary together with all property rights, Easements, franchises, and interests acquired by the Administration for the Construction and operation of the Bridge.

Business - A corporation, partnership, individual, sole proprietorship, joint venture, or any other legal entity through which commercial activity is conducted.

Business Day - Every day shown on the calendar except Saturdays, Sundays and Holidays.

Calendar Date – The specific calendar date by which Contractor must achieve Full and Final Completion of the Work and all requirements under the Contract.

Calendar Day - Every day shown on the calendar, Saturdays, Sundays and Holidays included.

Certification - A document which states that the Material and/or Work complies with the applicable specifications and includes the actual test results to confirm the statement. The contents of the Certification shall be on the contractor's/vendor's/manufacturer's letterhead or approved document and shall be duly signed by a legally and duly authorized officer. Certifications for metal products, when required, shall include a statement that the metal product was melted and manufactured in the United States.

Change Order - A written order amending the Contract and signed by the responsible Engineer, authorizing and requiring changes to the original Contract, with or without the consent of the Contractor. Each Change Order shall be executed by the Contractor and the County as indicated by the signature of the Contractor's duly and legally authorized representative and the County Executive or his/her legally authorized designee, with evidence thereof of review for legal sufficiency by the County's Office of Law.

Completion Date - The number of Working Days, Calendar Days, or Calendar Date shown in the Contract indicating the time allowed for the Full and Final Completion of the Work contemplated in the Contract.

Construction – To build, alter, Repair, improve and/or demolish any structure, building, or other improvement to real property and/or fixtures.

Construction Strip - An area contiguous to a permanent fee area or Easement, temporarily acquired for the use of the Contractor during the execution of the Work. This area exists only when shown on the Plans.

Contingent Item - Any Bid Item listed in the Contract Documents and included in the Bid for the purpose of obtaining a Contract price. Such Bid Item(s) constitutes tender of an exercisable option to and for the benefit of the County to incorporate such Bid Item(s) into the Work in accordance with the stated Bid prices.

Contract - The written agreement executed between the County and the successful Bidder covering the performance of the Work by which the Contractor is bound to perform the Work and by which the County is obligated to compensate the Contractor therefor at a mutually established and accepted rate or price. The Contract shall include all the documents listed under "Contract Documents", as well as any written Contract Modification that is required to complete the Construction and completion of the Work in an acceptable manner, including any authorized extension thereof, all of which constitute one instrument and agreement. The Contract shall be executed by the Contractor and the County as indicated by the signature of the Contractor's duly and legally authorized representative and the County Executive or his/her legally authorized designee, with evidence thereof of review for legal sufficiency by the County's Office of Law.

Contract Bond – Means Bid Bond, Payment Bond, Performance Bond and/or Proposal Guaranty, as applicable.

Contract Documents - The Contract executed between the Administration and the successful Bidder, covering the performance of the Work by which the Contractor is bound to perform the Work, and by which the Administration is obligated to compensate Contractor therefor at the mutually established and accepted rate or price. The Contract Documents shall include, but not be limited to, the Bid Package (which includes, but is not limited to, the instructions to bidders document, the information for bidders document and the specifications), Extra Work Order, Proposal Form, Proposal, Contract Bond, General Provisions, Contract Drawings, Special Provisions, Technical Provisions, all Plans and Notices to Proceed, also any Change Order, Contract Modification and Supplemental Agreement that are required to complete the Work in an acceptable manner, including County-authorized extensions of time for completion thereof, the Award, and the Agreement.

Contract Drawings - The official drawings issued by the Administration as part of the Contract Documents, including those incorporated in the Contract Documents by reference.

Contract Item or Pay Item - An item of Work specifically described and for which a price, either unit or lump sum, was provided in the form of a County-approved Bid Item and incorporated into the Contract, unless expressly stated to the contrary by the County. It includes the performance of all Work described therein.

Contract Modification - Any written change to the Contract including, but not limited to, delivery point, date of delivery, Contract period, price, quantity, or other provision of any original and/or existing Contract, whether accomplished in accordance with a Contract provision, or by mutual written action of legally and duly authorized representatives of the parties to the Contract including, but not limited to, any Change Order, Extra Work Order, Supplemental Agreement, and/or other form of Contract Modification. Each Contract Modification shall be executed by the Contractor and the County as indicated by the signature of the Contractor's duly and legally authorized representative and the County Executive or his/her legally authorized designee, with evidence thereof of review for legal sufficiency by the County's Office of Law.

Contract Number - The eight-place combination of numerals and letters by which all Contracts are identified:

9 6 0 0 0 X X 0

The first two digits indicate the year. The next three digits indicate the sequential numbering; the first Contract of each year is numbered 001, the second Contract 002 etc., regardless of the division of the Contract.

The three-space alpha-numeric combination (X X 0 above) indicates the general nature of the Work and the division of the Contract for accounting purposes. The two letters (X X) indicate the general nature of the Work. The last digit indicates the numerical division of the Contract. A zero as the last digit indicates that the Contract will be accounted as a whole.

GENERAL NATURE OF THE WORK

First X	**Second X**
B – Bridge	D – Development (Public)
C – Culvert	F – Fire Station
D – Storm Drain	L - Library
G – Grading or miscellaneous	
P – Public Building	O – Operating Building
R – Road **(except when used with RA, indicates Right-of-Way Improvement)**	P – Police Station X – Capital Improvement S – Development **(Private other than UA or RA)**
S – Sewer	A – Agreement **(for Private UA and RA)**
W – Water	
U – Utility	

Contract Time - The number of Working Days, Calendar Days, or a Calendar Date specified in the Contract Documents indicating the time period allowed for the Full and Final Completion of the Contract Work.

Contractor - The party of the second part to the Contract; the Person undertaking the execution of the Work under the terms of the Contract and acting directly or through his, their, or its agents or employees. If the party of the second part is comprised of one or more Persons, each shall be jointly and severally responsible for the performance of the entire Contract and jointly and severally liable to the County.

Controlling Operation - An operation that at the particular time under consideration has a controlling effect on the progress of the project as a whole.

County – Baltimore County, Maryland, a body corporate and politic.

County Roads - Any public Road in the County, excluding State Roads, fee title to which, or Easement for the use of which, is vested in the County by grant of condemnation, dedication, conveyance or by operation of law.

Culvert - Any structure not classified as a Bridge that provides an opening under any Roadway.

Day - Calendar Day unless otherwise designated.

Department - The Department of Public Works and Transportation of Baltimore County, unless another County department or office is expressly identified and designated by the County.

Domestic Manufacture - When referring to metallic items such as structural steel, pipe, reinforcement, bridge rails, etc., the term Domestic Manufacture means those metal products that have been melted and manufactured within the United States.

Drainage Ditch - In general, any open water course other than gutters, constructed as indicated in the Contract Documents.

Easement - A grant of a) an interest in property and b) a right of use of property of an owner for a certain purpose at the will of the grantee.

Engineer – Unless an official is expressly identified in writing by the County or expressly stated in the Contract Documents, Engineer means any one of the following:

Director of the Department, or his authorized delegated representative,
Deputy Director of the Department (if applicable),
Chief, Division of Construction Contracts Administration of the Department, or
Chief, Bureau of Engineering & Construction of the Department.

Any delegation of the Engineer's authority must be authorized in writing by any one of the above listed officials or expressly stated in the Contract, and such delegation of authority will pertain only to the specific Contract and/or Contracts as expressly stated in the authorization.

If the Engineer's authority is delegated as specified above to another County department or office, "Department" shall mean the County department or office delegated such authority, and any references to a director, deputy director, chief, division, or bureau shall mean the corresponding official, employee, division, bureau or office of the County department delegated such authority, as applicable and appropriate; provided that, any references to "Department" rules, lists, or published and/or adopted materials shall continue to refer to the County Department of Public Works and Transportation.

Equipment - All machinery, tools, and apparatus necessary for the proper Construction and acceptable completion of the Work, together with the necessary supplies for upkeep and maintenance.

Extra Work - Work that was not required or provided for in the original Contract.

Extra Work Order - A written document amending the Contract by adding, deleting, or modifying the Contract to include price, time and/or Extra Work and/or conditions not previously addressed within the Contract. Each Extra Work Order shall be executed by the Contractor and the County as indicated by the signature of the Contractor's duly and legally authorized representative and the County Executive or his/her legally authorized designee, with evidence thereof of review for legal sufficiency by the County's Office of Law.

Federal Agencies - Reference to any federal agency or official shall be deemed made to any agency or official succeeding in conformance with law or regulations to the powers, duties, jurisdictions, and authority of the agency or official mentioned.

Final Acceptance for Maintenance - The date upon which all the Work is sufficiently complete in accordance with the Contract so that the County can occupy and utilize the Work for the purposes for which it was intended, and more specifically, the date that the Engineer makes

written acceptance of all Work under the Contract for the purpose of the County assuming maintenance responsibilities for all Work, as further described in Section GP-5.13(b) of the Standard Specifications. Final Acceptance for Maintenance will also be considered Substantial Completion for purposes of the Contract and the Work.

Fixed-Price Items - Unit prices established and prescribed by the County to compensate for the cost of Work and Materials that may or may not be necessary for the proper completion of the Contract, and the quantities of which are not amenable to the reliable quantitative estimate prior to Construction. Fixed-Price Items are shown on the Proposal sheets with the estimated quantities, fixed price, and estimated total cost imprinted prior to issuance of the Contract Documents to Bidders.

Full and Final Completion - The date upon which the County acknowledges in writing that the Contractor fully and finally completed all aspects of the Contract and the Contract Work, and met all terms, conditions and obligations of the Contract, as further described in Section GP-8.11 of the Standard Specifications.

General Provisions or GP - Contract provisions published as part of, or provided as a supplement to these Standard Specifications intended for general application and repetitive use.

Highway or Road - Includes rights-of-way, surfaces, Subgrades, Shoulders, Median dividers, drainage facilities and Structures, Road cuts, Road fills, traffic barriers, Bridges, Highway grade elimination Structures, tunnels, overpasses, underpasses, interchanges, entrance plazas, approaches and other Structures forming an integral part of a street, Road, or Highway; including bicycle and walking paths and related storm water management facilities and Structures. In addition, the terms include any other property acquired for the Construction, operation, or use of the Highway.

Highways Standards - Official MdSHA Book of Standards for Highway and Incidental Structures edited by the MdSHA with the latest incorporated revisions issued on or before the date of Advertisement of the Contract. These Highway Standards are used where County projects are constructed within MdSHA rights-of-way, or as directed by these Specifications or by the Engineer.

Holidays – Holidays only occur on:

January 1	New Year's Day
3rd Monday in January	Martin Luther King's Birthday
3rd Monday in February	President's Day
4th Monday in May	Memorial Day
July 4	Independence Day
1st Monday in September	Labor Day
2nd Monday in October	Columbus Day
November 11	Veteran's Day
4th Thursday in November	Thanksgiving Day
December 25	Christmas Day

All days of general and congressional elections (not primary elections) throughout the State.

If a Holiday falls on a Sunday, the following Monday shall be deemed and treated as a Holiday.

If a Holiday falls on a Saturday, the Friday immediately preceding shall be deemed and treated as a Holiday.

Informal Contract - A Private Contract not exceeding twenty-five thousand dollars ($25,000), subject to the approval of the County's Department of Permits, Approvals and Inspections, bid on a lump sum basis, and not requiring a Contractor Performance Bond or Payment Bond. Informal Contracts may be used for commercial water meters and detector checks two (2) inches and smaller, fire hydrants, sanitary connections, residential water and sewer house connections for four (4) lots or less, and small road and drain projects not exceeding the twenty-five thousand dollars ($25,000).

Inspector - The authorized representative of the Engineer assigned to make detailed inspection of any or all portions of the Work.

Interim Supplemental Specifications or ISS – Those items required by the Department and the County for all County contracts, which shall be included as part of the Contract Documents and incorporated into the Contract, but which are not formally published in the Standard Specifications. The ISS control over the Standard Specifications but do not control over the Special Provisions.

Laboratory - The testing Laboratory of the State Highway Administration (or other administrations) or any other testing Laboratory designated by the Engineer.

Landscaping (Highway) or Roadside Development - Work for the preservation of natural and landscaped areas and the rehabilitation and protection against erosion of all areas disturbed by Construction through turf establishment and the placing of other ground covers, suitable planting, and other improvements to increase the effectiveness and enhance the appearance of the Highway.

Major Contract Items - The original Contract Items of greatest cost, excluding Contingent Items, (computed from the original price and estimated quantity or lump sum price) plus such other Contract Items next in sequence of lower cost (computed in like manner) as are necessary to show a total cost of original prices and quantities of not less than sixty percent (60%) of the original total cost of the Work, Bid and/or Proposal.

Median - The portion of a divided Highway separating the Traveled Ways for traffic in opposite directions.

Materials - Any substances and/or goods specified for use in the Construction of the Work and its appurtenances.

Minor Contract Items - All Contract Items other than the Major Contract Items and Contingent Items.

Minor Structure - Any structure not classified as a building, Bridge or Culvert. Minor Structures include, but are not limited to, catch basins, fences, inlets, manholes, retaining walls, steps and other miscellaneous items.

Notice to Proceed - A Written Notice to the Contractor of the date on or before which Contractor shall begin the prosecution of the Work to be done under the Contract.

Partial Acceptance for Maintenance - The date upon which the Engineer makes written acceptance of a unit or portion of the Work under the Contract and the County assumes maintenance responsibilities for only that unit or portion of Contract Work, as further described in Section GP-5.13(a) of the Standard Specifications.

Pavement Structure - The surface, base, or Subbase Course placed in layers on a Subgrade to support and distribute the traffic load to the Roadbed.

Pay Item - An item of Work specifically described and for which a price, either unit or lump sum, was provided in the form of a County-approved Bid Item. It includes the performance of all Work described therein.

Payment Bond - A County-approved form of security furnished and executed by the Contractor and Contractor's Surety as a guaranty of good faith to pay promptly, or cause to be paid promptly, in full, such sums as may be due for Material and/or labor supplied or performed, and/or services rendered by third parties in the prosecution of the Work under the Contract. This Payment Bond is in addition to the Performance Bond.

Performance Bond - The County-approved form of security, furnished and executed by the Contractor and Contractor's Surety, guaranteeing Full and Final Completion of the Work in complete compliance with and in accordance with the Contract and all Contract Documents. This Performance Bond is in addition to the Payment Bond.

Person - A corporation, partnership, individual, sole proprietorship, joint venture, or any other legal entity through which commercial activity is conducted.

Plans - The official drawings issued by the Administration as part of the Contract Documents, including, but not limited to, those incorporated in the Contract Documents by reference.

Private Contract - A private contract for Highway, storm drain, water main, utilities, roads, and sanitary sewer Construction let by applicants or Persons, by procedures pursuant to Public Works Agreements with County at no cost to County. The developer, in such a Private Contract, obtains the bid privately using contract forms provided by the Department's Division of Construction Contracts Administration. Private Contracts bearing the letters "UA" or "RA" within their Contract Numbers are governed and initiated by the Baltimore County Department of Permits, Approvals and Inspections Policy for the Construction of Improvements Under

Private Contracts, pursuant to Baltimore County Code Section 32-4-301, as amended, and shall be referred to as UA and/or RA, as applicable, in these Standard Specifications.

Procurement Agency - Baltimore County, Maryland, a body corporate and politic.

Profile Grade - The trace of a vertical plane intersecting the top surface of the proposed wearing surface usually along the longitudinal center line of the Road. Profile Grade means either elevation or gradient of the vertical plane.

Proposal – A written submission including, but not limited to, price, terms of sale, and description of work technical expertise, work experience, and any other information requested in the Bid Package, offered by a Bidder to the County in response to the County's Bid Package or request for Proposal.

Proposal Affidavit – An affidavit form (included in the Solicitation for Bid) to be a certified form executed by a legally authorized representative of the Bidder and required to accompany a Bid.

Proposal Form - Includes, but is not limited to, the Standard Specifications and any Contract Document included and/or incorporated by reference therein, used by the County for soliciting and procuring Bids by competitive sealed Bid and/or requests for Proposals and/or small procurement procedures including, but not limited to, requests for quotations, requests for Bids, etc.

Proposal Guaranty - The security required and described in the Bid Package and Section GP-2.07 to be included in the Proposal and furnished by the Bidder as a guaranty of good faith to enter into a Contract with the County if the Work is Awarded to said Bidder.

Questionnaire - The approved form or forms upon which the Contractor shall furnish the information as to its ability to perform the Work, its experience in similar Work, the Equipment to be used, and its financial condition as related to its ability to finance the Work.

RA - A private contract for Highway, storm drain, water main, and sanitary sewer Construction is let by land developers, by procedures pursuant to Public Works Agreements with Baltimore County, Maryland. The developer, in such a Contract, obtains the Bid privately using Contract forms provided by the Division of Construction Contracts Administration. Private Contracts bearing the letters "RA" within their Contract Numbers are governed by the Baltimore County Department of Permits, Approvals and Inspections Policy for the Construction of Improvements Under Private Contracts pursuant to Baltimore County Code Section 32-4-301, as amended, and shall be referred to as RA and/or UA Contracts or RA and/or UA in these Standard Specifications.

Ramp - A connecting Road between two intersecting Highways at a Highway separation.

Regional Engineer - Unless an official is expressly identified in writing by the County or expressly stated in the Contract Documents, Regional Engineer means any one of the following:

Director of the Department, or his authorized delegated representative,
Deputy Director of the Department (if applicable),
Chief, Division of Construction Contracts Administration of the Department, or
Chief, Bureau of Engineering & Construction of the Department.

Any delegation of the Regional Engineer's authority must be authorized in writing by any one of the above listed officials or expressly stated in the Contract, and such delegation of authority will pertain only to the specific Contract and/or Contracts as expressly stated in the authorization.

If the Regional Engineer's authority is delegated as specified above to another County department or office, "Department" shall mean the County department or office delegated such authority, and any references to a director, deputy director, chief, division, or bureau shall mean the corresponding official, employee, division, bureau or office of the County department delegated such authority, as applicable and appropriate; provided that, any references to "Department" rules, lists, or published and/or adopted materials shall continue to refer to the County Department of Public Works and Transportation.

Repair - To restore after injury, deterioration, or wear; to mend, to renovate, by such means as appropriate, and to supply such Materials and labor as necessary to render the item to be repaired sound, solid, true, plumb, square, even, smooth, and fully serviceable. Upon completion of such repair it must be, unless otherwise stated, rendered to such condition as to present a first-class finished work, or in instances where the repaired item serves as a base for additional finish, the repaired work must be such as to permit a first-class finish, to be applied without extra cost to the County. When the word "Repair" is used in connection with machinery or mechanical Equipment, it shall mean, in addition to the above, rendering the Equipment completely serviceable and efficient, ready for the normal use for which it was originally intended.

Responsible Bidder - A Person who is a Prequalified Contractor, as further described in these Standard Specifications and pursuant to the County's Rules for Prequalification of Contractors, as described in Section GP-2.00 of these Standard Specifications, and who has the capability in all respects to perform fully the Contract requirements and to perform all mandatory and essential requirements of the Bid, and the integrity and reliability that shall assure good faith performance.

Responsive Bid - A Bid submitted in response to a Bid Package that conforms in all material respects to all requirements contained in the Bid Package, including, but not limited to, all mandatory and essential requirements of the Bid.

Responsive Bidder - A Responsible Bidder whose Bid conforms in all material respects to the Bid Package, including, but not limited to, all mandatory and essential requirements of the Bid.

Right-of-Way - The area that has been acquired and reserved by the County for use in constructing the proposed improvement and appurtenances thereto. The area may be held by the

County for use in constructing the proposed improvements and appurtenances thereto. The area may be held by the County in fee simple or as an Easement -- perpetual or temporary, recorded or unrecorded.

Roadbed - The graded portion of a Highway within the top and side Slopes prepared as a foundation and/or the top surface of a Road upon which the Pavement Structure, Shoulders, and curbs are constructed.

Road, Roadway or Highway - The words Road, Roadway and Highway include rights-of-way, surfaces, Subgrades, Shoulders, Median dividers, drainage facilities and Structures, Roadway cuts, Roadway fills, traffic barriers, Bridges, Highway grade elimination Structures, tunnels, overpasses, underpasses, interchanges, entrance plazas, approaches, and other Structures forming an integral part of a street, Road, Roadway, or Highway; including bicycle and walking paths and related storm water management facilities and Structures. Any other property acquired for the Construction, operation, or use of the Highway.

Roadside - A general term denoting the area adjoining the outer edge of the Roadbed within the Right-of-Way. Extensive areas between the Road of a divided Highway may also be considered Roadside.

Roadside Development - Work for the preservation of natural and landscaped areas and the rehabilitation and protection against erosion of all areas disturbed by Construction through turf establishment and the placing of other ground covers, suitable planting, and other improvements to increase the effectiveness and enhance the appearance of the Highway.

Seal Coat - An application of asphalt material followed by an application of cover coat aggregate.

Shoulder - The portion of the Roadbed contiguous with the Traveled Way for accommodation of stopped vehicles, for emergency use, and for lateral support of base and Surface Courses.

Sidewalk - The portion of the Road constructed for use by pedestrians.

Slopes - The inclined graded areas beyond the Shoulder, extending from the Shoulders to the natural, undisturbed surface of the ground.

Special Provisions or SP - Specifications for a specific item or condition or requirement peculiar to the Work and not otherwise thoroughly or satisfactorily detailed elsewhere in the Contract Documents. If a Special Provision or SP is in conflict with any portion of the Contract Documents, the Special Provisions shall always control and prevail. Specifically, the Special Provisions control over the Standard Specifications and the Interim Supplemental Specifications.

Standard Details / Standard Detail Drawings / Baltimore County Standard Details for Construction - The Baltimore County, Maryland Department of Public Works and Transportation Standard Details for Construction published by the Administration for general application and repetitive usage, as may be supplemented, revised and superseded by the

Contract Documents, which include detail drawings showing standard methods of Construction for water mains, sanitary sewers, storm drains, roads and streets.

Standard Specifications - The Baltimore County Department of Public Works and Transportation Standard Specifications for Construction and Materials published by the Administration for general application and repetitive use, as may be supplemented, revised and superseded by the Contract Documents.

State - The State of Maryland.

State Agency - A State agency or official thereof, including any agency or official succeeding to their powers, duties, jurisdictions and authority in accordance with law.

State Highway System - The system of Roads owned, operated, or maintained by the State of Maryland.

State Road - Any public Road included in the Maryland State Highway System.

Structure(s) - Bridges, culverts, catch basins, drop inlets, retaining walls, cribbing, manholes, end walls, buildings, sewers, service pipes, underdrains, foundation drains, steps, fences, and other features that may be encountered in the Work and not otherwise classified.

Subbase - The layers of specified or selected material of designed thickness placed on a Subgrade to support a Base Course or Surface Course.

Subcontract - Any agreement entered into by the Contractor with a Subcontractor for a portion of the Construction or any other part of the Work in connection with, and under the terms of, the Contract.

Subcontractor - Any Person undertaking a portion of the Construction or any other part of the Work under the terms of the Contract, by virtue of an agreement with the Contractor. Subcontractor does not include an employee with an employment contract, or an employee organization with a collective bargaining agreement. It includes one who furnished Material worked to a special design according to the Plans and Specifications for the Work. It excludes one who merely furnished Material not so worked.

Subgrade (Highways) - The top surface of a Roadbed upon which the Pavement Structure, Shoulders, and curbs are constructed.

Subgrade (Pipes) - The soil foundation layer upon which a pipe, cradle, or encasement is placed such that the prescribed invert elevation of the pipe will be achieved.

Subgrade (Structures) - The soil foundation layer upon which the structural foundation is built to achieve prescribed elevations of subsequent structural elements or controls.

Substantial Completion / substantial completion - The date upon which all the Work is sufficiently complete in accordance with the Contract so that the County can occupy and utilize the Work for the purposes for which it was intended, and more specifically, the date that the Engineer makes written acceptance of all Work under the Contract for the purpose of the County assuming maintenance responsibilities for all Work, as further described in Section GP-5.13(b) of the Standard Specifications. Substantial Completion will also be considered Final Acceptance for Maintenance for purposes of the Contract and the Work.

Substructure - All of that part of the Structure below bottoms of bearings of simple and continuous spans, skewbacks of arches and tops of footings of rigid frames, together with the back walls and wing walls.

Superintendent - The executive representative of the Contractor duly authorized by the Contractor, in accordance with Contractor's organizational documents and requirements to receive and execute instructions from the Engineer, and who shall supervise and direct the Construction and the Work.

Superstructure - All of that part of the Structure above bottoms of bearings of simple and continuous spans, skewbacks of arches and tops of footings of rigid frames, except as noted above for Substructure.

Supplemental Agreement - Any written Contract Modification or Change Order evidencing, among other things, the terms, conditions, costs and time, mutually agreeable to the Contractor and the County as indicated by the signature of the Contractor's duly and legally authorized representative and the County Executive or his/her legally authorized designee, with evidence of review for legal sufficiency by the County's Office of Law.

Surety - The Person providing any or all of the Contract Bonds for the Contractor, for the Bid and the Full and Final Completion of the Contract and/or for the payment for all of the Work in connection with the Contract.

Surface Course - One or more layers of a pavement designed to accommodate direct traffic loading.

Technical Provisions - The technical provisions included in the Proposal Form and/or Solicitation for Bid, which are a part of and incorporated into the Contract.

Third Tier Contracting - The process where the Contractor subcontracts a portion of the Contract to a Subcontractor who in turn subcontracts a portion of the Contract to a third party. This latter action is termed entering into a Third Tier Contract.

Traveled Way - The portion of the Roadway for the movement of vehicles, exclusive of Shoulders.

Trench - An excavation made for the purpose of installing or removing pipes, drains, catch basins, etc., which is later refilled.

UA - A private contract for Highway, storm drain, water main, and sanitary sewer Construction is let by land developers, by procedures pursuant to Public Works Agreements with Baltimore County. The developer, in such a Private Contract, obtains the bid privately using contract forms provided by the Department's Division of Construction Contracts Administration. Private Contracts bearing the letters "UA" within their Contract Numbers are governed by the Baltimore County Department of Permits, Approvals and Inspections Policy for the Construction of Improvements Under Private Contracts, pursuant to Baltimore County Code Section 32-4-301, as amended, and shall be referred to as UA and/or RA Contracts or UA and/or RA in these Standard Specifications.

Unclassified Excavation - Excavation not defined within Standard Specifications' classifications, including, but not limited to, rock, logs, stumps, water, debris. (Excavation of all utility Trenches to subgrade.)

Utility Agreements/Right-of-Way Agreements or UA/RA- These UA/RA are initiated in the County Department of Permits, Approvals and Inspections (PAI), or any successor County department, by the applicant, including, but not limited to developers, schools, or commercial property owners for the Construction and installation of improvements to utilities or roads at no cost to the County. PAI reviews and approves, if and as applicable, the cost estimates, Construction drawings, UA and/or RA, as applicable, and collects any security and fees.

Utility Companies – Entities or Persons which may have utility facilities in a proposed Work area (e.g. BG&E and Verizon, etc.)

Work – The Contractor's furnishing of all labor, Materials, Equipment, services, supplies, Construction, construction-related services and/or other incidentals necessary to successfully perform and complete the Contract and carry out of all the duties and obligations imposed by the Contract.

Working Day - A Calendar Day upon which, in the judgment of the Engineer, weather and soil conditions are such that the Contractor can advantageously Work more than half of his current normal force for more than five (5) consecutive hours on a Controlling Operation. Working Days will not be charged on Saturdays, Sundays, and Holidays unless the Contractor actually Works more than five (5) hours on a Controlling Operation.

Working Drawings - Stress sheets, shop drawings, fabrication details, erection Plans, Plans for false work, forms, centering, cribs, cofferdams and masonry layouts, bending and placing drawings, bar schedules for reinforcement steel, and any other supplementary Plans or similar data that the Contractor may be required to furnish.

Written Notice - Shall be deemed to have been duly served if delivered with signed receipt or if sent by certified registered mail with signed receipt to the last business address known to party who gives the notice.

GP - SECTION 2
BIDDING REQUIREMENTS AND CONDITIONS

GP-2.00 GENERAL

All terms that are capitalized in this GP - Section 2 shall be in accordance with the Department Rules for Prequalification of Contractors, adopted March 1, 2012. Only the Bid of a Contractor who holds a valid Certificate ten (10) Days prior to the date of Bid Opening will be considered. A Prequalified Contractor is one whose rating and classification have been determined by the Prequalification Committee and ratified by the Director of the Department.

All applicants for prequalification must comply with all Procedures for Prequalification as described in Article II of the Rules for Prequalification of Contractors.

All information must be filed with the Department in sufficient time for action to be completed ten (10) Days before the date of Bid opening.

A prospective Bidder, when prequalifying, shall state in the Application the extent and type of work it considers it is qualified to handle at one time and shall show the exact type of work it has performed during the preceding five (5) years. The information and all other information required by Procedures for Prequalification, as described in Article II of the Rules for Prequalification of Contractors, shall be the basis for a determination of the Bidder's financial rating and work classifications. Following the evaluation, the Contractor may receive a Certificate of Prequalification from the Director of the Department of Public Works and Transportation.

A Prequalification Certificate, subject to the following provision, is valid through the expiration date stated on the Certificate. The County reserves the right to re-evaluate a Prequalified Contractor. A Bidder who holds a Prequalification Certificate shall furnish additional information bearing on its qualification as may be required. The County reserves the right to reject unopened the Bid of any Bidder who fails to furnish promptly and properly all the information called for when so notified.

A Contractor, dissatisfied with its rating or classification or both, may request a reconsideration on the basis of additional or revised information submitted to the committee in writing and may request a meeting with the Prequalification Committee to support its resubmittal in accordance with the Rules for Prequalification.

EACH BIDDER AND/OR APPLICABLE SUBCONTRACTOR SHALL FURTHER QUALIFY AS OTHERWISE REQUIRED IN THE CONTRACT DOCUMENTS.

A prospective Bidder may submit a Bid if their Prequalification Certificate is valid in the category of work specified for that bid package. Materials, suppliers, and other interested parties may download the bid package and plans without prequalification.

GP-2.01 BID IRREVOCABLE

Unless otherwise provided in the Bid Package, Bid prices are irrevocable for ninety (90) Days following Bid opening.

GP-2.02 CONTENTS OF BID FORMS

All papers included in, bound thereto or attached to the Solicitation for Bid and/or the Proposal Form are necessary parts thereof and shall not be detached, separated or altered. The Plans, Standard Specifications, and all other Contract Documents are part of the Solicitation for Bid and/or the Proposal Form whether attached thereto or not.

GP-2.03 INTERPRETATION OF QUANTITIES IN BID SCHEDULE

Where designated as estimated quantities, the quantities in the prepared Solicitation for Bid are approximate only. Payment to the Contractor will be made only for the actual quantities of Work performed or Materials furnished in accordance with the Contract and as provided in Section GP-4.04, Variations in Estimated Quantities.

GP-2.04 SITE INVESTIGATION

The Contractor acknowledges that it has investigated and satisfied itself as to the conditions affecting the Work, including but not restricted to those bearing upon transportation, disposal, handling and storage of Materials, availability of labor, water, electric power, Roads and uncertainties of weather, river stages, tides or similar physical conditions at the site, and the Contractor has further confirmed conditions of the ground, and the character of Equipment and facilities needed preliminary to and during prosecution of the Work. The Contractor further acknowledges that it has satisfied itself as to the character, quality and quantity of surface and subsurface Materials or obstacles to be encountered insofar as this information is reasonably ascertainable from an inspection of the site, including all exploratory Work done by the County, as well as from information presented by the drawings and Standard Specifications made a part of this Contract. Any failure by the Contractor to acquaint itself with the available information will not relieve Contractor from responsibility for estimating properly the difficulty or cost of successfully performing the Work. The County assumes no responsibility or liability of any kind, nature or amount for any conclusions or interpretations made by the Contractor on the basis of the information made available by the County.

Notwithstanding anything to the contrary in the Standard Specifications or the Contract Documents, including, but not limited to, Section GP-4.05, any and all subsurface soil/test borings, sample borings, boring logs, test pits, and/or related documents, reports or materials (collectively, the "Boring Materials") provided by the County, or its engineer, architect, or consultant, to any Bidders or the Contractor are for the convenience of the Bidders and/or the

Contractor. THE COUNTY NEITHER EXPRESSLY NOR IMPLIEDLY WARRANTS OR GUARANTEES THAT THE ACTUAL SITE CONDITIONS ENCOUNTERED UNDER THIS CONTRACT WILL BE THE SAME OR SIMILAR TO THOSE SITE CONDITIONS INDICATED BY ANY BORING MATERIALS.

THE CONTRACTOR HAS THE EXPRESS DUTY AND RESPONSIBILITY TO EXAMINE AND SATISFY ITSELF AS TO THE PHYSICAL CONDITIONS OF THE CONTRACT SITE, including, but not limited to, conformation and condition of the ground, character, quantity, and quality of subsurface materials which may be encountered, surface and subsurface conditions including the presence of rock or groundwater, and all other physical conditions of the Contract site which may affect the Contractor's performance and/or costs and expenses under the Contract. THE CONTRACTOR SHALL NOT RELY ON THE COUNTY AND/OR ANY BORING MATERIALS TO FULFILL THIS EXPRESS DUTY AND RESPONSIBILITY UNDER THE CONTRACT.

NO ADDITIONAL COMPENSATION OF ANY KIND, INCLUDING, BUT NOT LIMITED TO, ADJUSTMENT OF COST OR SCHEDULING, WILL BE CONSIDERED BY THE COUNTY FOR THE CONTRACTOR'S FAILURE TO PROPERLY EXAMINE AND SATISFY ITSELF AS TO THE PHYSICAL CONDITIONS OF THE CONTRACT SITE. NOR WILL SUCH FAILURE BY THE CONTRACTOR RELIEVE THE CONTRACTOR OF ITS OBLIGATIONS, RESPONSIBILITIES, AND LIABILITIES TO ACHIEVE FULL AND FINAL COMPLETION OF THE CONTRACT TO THE COUNTY'S SATISFACTION.

GP-2.05 TAXES - RESPONSIBILITY FOR PAYMENT, EXEMPTIONS, FORMS TO FILE, ETC.

(a) The Contractor is responsible for, and by submitting a Bid agrees to pay, all retail sales, income, real estate, sales and use, transportation and special taxes applicable to and assessable against any Materials, Equipment, processes and operations incident to or involved in the Construction and/or Work. The Contractor is responsible for ascertaining and acquainting itself with such taxes and making all necessary arrangements to pay same.

(b) The County's Director, Office of Budget and Finance, may not authorize payment to a Contractor who has submitted an invoice if that Contractor is indebted by virtue of unpaid taxes or other obligations when in an amount of fifty dollars ($50) or more to the State of Maryland or any County department or agency or affiliated entity. In this regard, Contractors shall indicate their federal tax identification or social security number as required by the Rules for Prequalification of Contractors.

(c) If taxes or other obligations are owed to the State of Maryland or any County department or agency or affiliated entity, payment shall be deferred, and the Contractor shall be promptly notified. Subsequent release of the deferred payment shall be made promptly when the taxes or other obligations are satisfactorily resolved with no late fee and/or interest of any kind thereon.

(d) The County hereby reserves the right to withhold final payments under this Contract until the Contractor and/or any Subcontractors and/or Third Tier Contracting parties performing any duties under this Contract have paid all taxes or other obligations due the State or the County or any County affiliated entity.

GP-2.06 PREPARATION OF BID

(a) The Bidder shall submit the Bid upon the blank forms furnished by the Administration. The Bidder shall specify a price in U.S. dollars and cents for each Bid Item given, and shall show the products of the respective unit prices and quantities written in figures in the column provided for that purpose, together with the total amount of the Bid obtained by adding the amounts of the several items.

(b) The Bid Form(s), including the fully and properly executed MBE/WBE forms, shall be filled out legibly in ink or typed. The Bid shall be signed by the Contractor's duly and legally authorized representative or officer, if and as applicable, of the Bidder, and attested by the Contractor's appropriate officer, if and as applicable. There must be on file with the County a copy of the current organizational documents and/or resolution, duly certified by the corporate secretary, if applicable, showing the authority, of the Person so signing on behalf of the Contractor. In lieu thereof, the Contractor may file such evidence with the Administration, duly certified by the corporate secretary, if applicable, together with a list of the names of the Contractor's officers having legal and authority to execute Contract Documents on behalf of and legally bind the Contractor, duly certified, if applicable, which listing shall remain in full force and effect, and shall be materially relied upon by the Administration, until the Director of the Department receives Written Notice to the contrary. In any case, where a Bid is signed by an attorney in fact, the same must be accompanied by a copy of the appointing document, duly certified as described above. All Bids shall be signed in ink. All erasures and/or alterations shall be initialed by the signer in ink.

(c) If the Bid Package requires the Bidder to furnish samples or descriptive literature, it shall be submitted with the Bid, unless the Bid Package provides otherwise.

(d) Bidders must specifically identify any portions of their Proposals deemed to contain confidential, proprietary information or trade secrets. Such designations will not necessarily be conclusive and Bidders may be required to justify why such material should not, upon request, be disclosed by the County under the Maryland Public Information Act, Title 4, of the General Provisional Article of the Annotated Code of Maryland, as amended.

(e) Bid Items for which quantities are identified in the "Summary of Quantity" sheet of the Plans, in the column headed "Contingent" or listed in the "Bid Form" are established for the purpose of obtaining Bids on one or more Bid Items that may be incorporated into the Work.

The Engineer shall have sole discretion in determining whether and to what extent such Bid Items will be incorporated into the Work. The Engineer may order incorporation of such Bid Items at any location within the Contract and at anytime during the Work. These Bid Items may not be located on the Plans. The estimated quantities set out in the Bid Package for such Bid Items are presented solely for the purpose of obtaining a representative Bid price. The actual quantities employed may be only a fraction of, or many times the estimated quantity. Neither party shall make claims for additional compensation because of any increase, decrease or elimination of such Bid Items.

The Contractor is required to pay tax, as applicable, on Materials and supplies that will be incorporated into the Work. The Contractor must pay tax, as applicable, on all Equipment that is purchased and pertains to the Work

GP-2.07 PROPOSAL GUARANTY/BID SECURITY

No Proposal will be considered unless accompanied by a guaranty of the amount specified in the Proposal in the form of either a certified check, bank cashier's check or a Bid Bond on the form provided therein or an exact facsimile thereof. The Bid Bond must be executed by a Surety that is, as of the date of the Bid: (a) licensed in the State of Maryland, (b) rated "B" or better by the A.M. Best Company, (c) on federally funded projects, authorized by the underwriting limitation contained in the U.S. Department of the Treasury Circular 570, as amended, to guaranty the amount of the Bid, and (d) in good standing as determined by the County's Engineer. The Bid Bond must guaranty payment to the County of liquidated damages as follows: (a) if only one Bid is received, the guaranteed payment shall be five (5%) percent of the Bidder's Bid amount; (b) if two or more Bids are received, the guaranteed payment shall be the difference between the Bidder's Bid amount and the next lowest Bid amount, subject to the limitation that the guaranteed payment not be greater than five (5%) percent of the Bidder's Bid amount. This Bid Bond is required in case the successful Bidder, after issuance of notice of Award, fails to comply, timely and completely, with each of the requirements set forth under Section GP-3.04.

GP-2.08 DELIVERY OF BIDS

Each Bid must be submitted in a sealed envelope plainly marked to indicate its contents. When sent by mail, the sealed Bid must be addressed to the Administration at the address and in care of the official in whose office the Bids are to be received. All Bids shall be filed prior to the time and at the place specified in the Bid Package. Bids received after the time for opening of Bids will be treated in accordance with the provisions of Section GP-2.12.

GP-2.09 COMMUNICATIONS AND INTERPRETATIONS - PRIOR TO BID OPENING

Any information regarding the requirements or the interpretation of any provision of the General Provisions, Special Provisions, Standard Specifications, Interim Supplemental Specifications or any part of the Bid Package, Bid and/or Bid Form shall be requested, in writing, from the Engineer, and delivered no later than five (5) Days prior to the scheduled date of Bid opening. Responses to questions or inquiries having any material effect on the Bids shall be made by written addenda, or by written notice sent to all purchasers of Contract Documents. **THE CONTRACTOR SHALL NOT MAKE VERBAL INQUIRIES TO THE COUNTY, AS VERBAL INQUIRIES MAY NOT BE ACKNOWLEDGED AND SHALL NOT BE BINDING UPON THE COUNTY IN ANY MANNER OR EXTENT**.

Any and all verbal interpretations and/or oral pre-Bid statements made by the Engineer, County employees or their respective representatives and/or agents shall not be binding in any manner or extent upon the County.

Pre-Bid conferences may be conducted by the Department of Public Works and Transportation or the applicable County agency or department. If they are to be conducted, notice of the same will be contained in the Bid Package. Any minutes of Pre-Bid conferences are provided as a courtesy to the Bidders and ANY MINUTES PROVIDED ARE NOT BINDING UPON THE COUNTY IN ANY MANNER OR EXTENT.

GP-2.10 AMENDMENTS TO SOLICITATIONS FOR BIDS

(a) **Form.** Pre-Bid amendments shall be identified as addenda and shall require that the Bidder acknowledge receipt of all addenda issued. The addenda shall reference the portion of the proposed Solicitation for Bid and/or Proposal Form it amends. Any addenda shall be issued by the County and shall be posted on the County's website prior to bid opening date.

(b) **Timeliness.** Addenda shall be distributed to allow Bidders a reasonable time to consider them in preparing their Bids. The Bid receipt date shall be changed in the addenda only if the distribution of the addenda, in the sole determination of the Administration, does not permit timely preparation and distribution thereof. If the Administration deems that there is adequate time for consideration of the addenda, the addenda may be silent as to the Bid receipt date.

(c) **Bidder's Responsibility.** It is the Bidder's responsibility to frequently check for addenda, download, print and include signed copies of all addenda along with the Bid.

GP-2.11 PRE-OPENING MODIFICATION OR WITHDRAWAL OF BIDS

(a) **Procedure.** Bids may be modified or withdrawn by Written Notice executed by a duly and legally authorized representative of the Bidder, received in the office designated in the Bid Package before the time and date set for Bid opening.

(b) Disposition of Bid Security. If a Bid is withdrawn in accordance with this Section GP-2.11, the Bid Bond, if any, shall be returned to the Bidder.

GP-2.12 LATE BIDS, LATE WITHDRAWALS, AND LATE MODIFICATION

(a) Policy. Any Bid is late if not received at the place designated in the Solicitation for Bid and/or Proposal Form at or prior to the time and date set for receipt of Bids. Any request for withdrawal or request for modification received at the place designated in the Solicitation for Bid and/or Proposal Form after the time and date set for receipt of Bids is late.

(b) Treatment. A late Bid, late request for modification, or late request for withdrawal shall not be considered. Late Bids will be returned to the Bidder unopened.

GP-2.13 OPENING AND RECORDING OF BIDS

(a) Bids, and modifications pursuant to Section GP-2.11, shall be opened publicly, at the time, date, and place designated in the Bid Package. The name of each Bidder, the Bid price, and such other information as is deemed appropriate by the County shall be read aloud or otherwise made available to the public. This information also shall be recorded at the time of Bid opening. The Bids shall be tabulated or a Bid abstract made. If the Bidder designates in writing trade secrets or other proprietary data to be confidential, in accordance with applicable State law, regulations, and/or these Standard Specifications including, but not limited to, Section GP-2.06, material so designated in writing by the Bidder shall accompany the Bid but Bidder shall make such readily separable from the Bid in order to facilitate public inspection of the nonconfidential portion of the Bid. After Contract Award, prices, makes, and model or catalog numbers of the items offered, deliveries, and terms of payment shall be available for public inspection at a reasonable time regardless of any designation to the contrary at the time of Bid opening.

(b) The Engineer shall examine the Bids to determine the validity of any requests for nondisclosure of trade secrets and other proprietary data identified in writing by the Bidder. Confidential, proprietary information, and trade secrets furnished by a Bidder may be disclosed to State and/or other County department, or agencies if there is a need for the information and may not be disclosed outside of the County except as provided by the Maryland Public Information Act or other applicable laws and/or regulations.

GP-2.14 MISTAKES IN BIDS

(a) Mistakes Discovered Before Opening. A Bidder may correct mistakes discovered before the time and date set for Bid opening by withdrawing or correcting the Bid as provided in Section GP-2.11.

(b) **Mistakes Discovered After Opening But Prior To Award.** If the Director of the Department knows or has reason to conclude that a mistake may have been made, the Bidder may be required to confirm the Bid. Situations in which confirmation may be requested include obvious, apparent errors on the face of the Bid or a Bid unreasonably lower than the other Bids submitted. If the Bidder alleges mistake, the Bid may only be corrected or withdrawn upon the written approval of the County's Director, Office of Budget and Finance, as follows:

(1) If the mistake and intended correction are clearly evident on the face of the Bid document, the Bid shall be corrected to the intended correct Bid and may not be withdrawn. Examples of mistakes that may be clearly evident on the face of the Bid document are typographical errors, errors in extending unit prices, transposition errors, and arithmetical errors.

(2) Subject to the written approval of the County's Director, Office of Budget and Finance, a Bidder may be permitted to withdraw a low Bid if:

(a) A mistake is clearly evident on the face of the Bid document but the intended correct Bid is not similarly clearly evident; or

(b) The Bidder submits proof of evidentiary value that clearly and convincingly demonstrates that a mistake was made.

(c) **Mistakes Discovered After Award.** Mistakes may not be corrected after Award of the Contract unless and only when the County's Director, Office of Budget and Finance, determines that it would be unconscionable not to allow the mistake to be corrected. Changes in price are not permitted, except as allowed in the County's sole discretion. Corrections, if permitted, shall be submitted to and approved by the County's Director, Office of Budget and Finance before being incorporated into the Contract.

GP-2.15 MINOR IRREGULARITIES

Minor irregularities in Bids, as defined below, may be waived if the County's Director, Office of Budget and Finance, determines, in his sole discretion, that it shall be in the County's best interest. The County's Director, Office of Budget and Finance, may either give a Bidder an opportunity to cure any minor irregularity in its Bid, or waive the minor irregularity where it is to the County's advantage to do so.

When at any public opening of Bids, a Bid appears to be irregular, as herein specified, this apparent fact may be announced when read. Said Bid shall be read as other Bids and then referred to the Director of the Department for consideration and appropriate action thereon in accordance with these General Provisions, laws and regulations, as applicable.

A minor irregularity is one that is merely a matter of form and not of substance, or pertains to some immaterial or inconsequential defect or variation of a Bid or Proposal from the exact

requirement of the Bid Package and/or Proposal Form, the correction or waiver of which would not be prejudicial to other Bidders. The defect or variation in the Bid or Proposal is immaterial and inconsequential when its significance as to price, quantity, quality, or delivery is trivial or negligible when contrasted with the total cost or scope of the Bid Package and the labor, Materials, Equipment, services and supplies being procured, and when the intent and meaning of the entire Bid or Proposal is clear.

GP-2.16 CANCELLATION OF SOLICITATIONS FOR BIDS

(a) Before opening of the Bids, a Solicitation for Bid may be canceled, in whole or in part, when the County determines this action is fiscally advantageous or otherwise in its best interest.

(b) When a Solicitation for Bid is canceled before Bid opening, the Bids shall be returned to the Bidders submitting them and notice of cancellation shall be included and no party or Person including, but not limited to, the County shall have any liability or obligation of any amount, kind, or nature to another or any other in connection therewith.

GP-2.17 REJECTION OF INDIVIDUAL BIDS OR PROPOSALS

(a) Any Bid may be rejected, in whole or in part, when it is in the best interest of the County to do so.

(b) Reasons for rejection of a Bid may include but are not limited to:

(1) It is not a Responsive Bid.

(2) Unreasonable price.

(3) The Bidder submitting the Bid is determined to be nonresponsible. A determination of nonresponsibility may be made for, but is not limited to, any of the following reasons:

(a) Bidder debarred or ineligible and period of debarment or ineligibility not expired.

(b) The unit prices contained in a Bid are unbalanced.

(c) Evidence of collusion among Bidders.

(d) Inadequate quantity and/or quality of experience, plant, equipment, financing, manpower or other resources required to perform the Contract.

(e) Bidder's workload that, in the judgment of the Administration, might hinder or prevent the prompt completion of the subject Work if Awarded.

(f) Default by the Bidder on other contracts.

(g) Failure to pay or satisfactorily settle all reasonable and just bills due for labor and material on prior or current contracts.

(h) The same Person has an interest in more than one Bid on a Contract exclusive of being named by another Bidder as a Subcontractor.

(i) Failure to perform satisfactorily on other contracts awarded, and the conditions leading to unsatisfactory performance remain unresolved.

(j) Any other reason affecting the Bidder's ability to perform, or a record of business integrity.

(k) Bidder not otherwise qualified and eligible to receive an Award under applicable laws and regulations.

(4) The Bidder fails to supply information to the Engineer promptly, after notification from the Engineer that such information is required in connection with a determination to be made pursuant to this Section GP-2.17.

GP-2.18 REJECTION OF ALL BIDS, IN WHOLE OR IN PART

(a) After opening of Bids or Proposals but before Award, all Bids or Proposals may be rejected, in whole or in part, when the Engineer, with the approval of the using-County department or agency head, or his/her designee, determines such rejection is fiscally advantageous or otherwise in the County's best interest.

(b) If and as applicable, notice of rejection of all Bids shall be sent to all Bidders that submitted Bids, and Bids which have been opened shall be retained by the Department's Division of Construction Contracts Administration.

GP-2.19 BID EVALUATION AND AWARD

(a) **General.** The Contract is to be Awarded to a Responsible Bidder who is also a Responsive Bidder and whose Bid meets the requirements and evaluation criteria set forth in the Bid Package, and is either the lowest Bid price or lowest evaluated Bid price, in the County's sole discretion.

(b) **Determination of Lowest Bidder.** Bids shall be evaluated to determine which Bidder offers the lowest cost to the County in accordance with the evaluation criteria set forth in the Bid Package.

Except as otherwise provided under Section GP-2.14, Mistakes in Bids:

(1) The unit price will govern in the event of a discrepancy between the unit price and the extended price (product of unit price multiplied by the quantity).

(2) The sum of the extended prices will govern in the event of a discrepancy between the total lump sum and the extended prices.

(3) The written words for the lump sum will govern in the event of a discrepancy between the lump sum prices written in words and the lump sum prices written in figures.

(4) If a unit price was omitted, the unit price will be determined by dividing the extended price by the quantity.

The Administration reserves the right to make the Award by Bid Item, or groups of Bid Items, rather than total Bid if it is in the best interest of the County to do so, unless the Bidder expressly stated in its Bid that a particular or progressive Award was not acceptable to the Bidder.

(c) **Award.** Upon determination of the Responsible Bidder who is also a Responsive Bidder, and whose Bid meets the requirements and evaluation criteria of the Bid Package and is the lowest Bidder in accordance with these Standard Specifications and the Bid Package, the Contract may be Awarded to that Bidder. In accordance with these Standard Specifications and the Bid Package, a Contract may be Awarded to a Bidder offering a higher quality item than that designated in the Bid Package if that Bidder is a Responsible Bidder with the lowest Responsive Bid whose Bid meets the requirements and evaluation criteria of the Bid Package.

GP-2.20 TIE BIDS

(a) **Definition.** Tie Bids are Responsive Bids from Responsible Bidders that are identical in price, terms and conditions and which meet all the requirements and evaluation criteria set forth in the Bid Package.

(b) **Award.** If two or more Bidders shall be tied for the lowest Bid, quality and service being equal, the Contract shall be Awarded to the Bidder qualified as a minority, as defined in the State procurement regulations. If both Bidders are qualified minorities, as defined in the State procurement regulations, the Contract shall be Awarded to the minority that is a local Bidder. Please see Baltimore County Code, 2015, as amended, Article 10, Title 2,

for more information and the governing statute regarding minority Bidders and local Bidders.

GP-2.21 – RESERVED

GP-2.22 MULTIPLE OR ALTERNATE BIDS

Unless multiple or alternate Bids are requested in the Bid Package, such multiple or alternate Bids may not be accepted. However, if a Bidder clearly indicates a base Bid, it shall be considered for Award as though it were the only Bid submitted by the Bidder.

GP-2.23 BID PROTESTS

(a) Bidder Protest of Award or Alleged Improprieties. The Bidder must file a written Bid protest of Award pursuant to this Section GP-2.23 of the Standard Specifications. The Bid protest of Award must be in writing and filed with the Engineer. Oral objections, whether or not acted on, are not protests.

(1) Time for Filing. A Bid protest of Award shall be filed not sooner than the date of Award and not later than three (3) Business Days after the date of Award. A protest based on alleged improprieties in the Bid Package which are apparent before the Bid opening or the closing date for receipt of Bids shall be filed not later than five (5) Business Days before the Bid opening date.

(2) Content of Written Protest. The written protest must state: the name and address of the Bidder; the Bid or Contract Number; the reasons for protest; and any supporting exhibits, evidence or documents to support the protest.

(b) Bidder Protest of Bid Rejection. The Bidder must file a written Bid protest of Bid rejection with the Engineer not later than three (3) Business Days from the date of the Bid rejection. Oral objections, whether or not acted on, are not protests. The written Bid protest must comply with Section GP-2.23(a)(2).

(c) Department Response to Bidder Protest. The Department's Chief of the Division of Construction Contracts Administration, or other designated County official, will review the Bidder's protest, as filed pursuant to Section GP-2.23(a) or (b), and respond to the Bidder in writing within ten (10) Working Days of receipt of protest.

(d) Bidder Appeal. The Bidder may appeal the decision by the Department's Chief of the Division of Construction Contracts Administration, or other designated County official, (a) to the County's Director of the Office of Budget and Finance for all MBE/WBE-related protests or (b) to the Director, or other designated County director, for all other protests.

The Bidder must file a written appeal with the relevant director not later than three (3) Business Days from the date of the Department response in Section GP-2.23(c). Oral objections, whether or not acted on, are not appeals. The appeal must comply with Section GP-2.23(a)(1) and (2), but may include any additional documentation as deemed necessary and appropriate by the Bidder.

(e) **Director Response to Bidder Appeal.** The relevant County director, as appropriate and applicable, will review the Bidder's appeal under Section GP-2.23(d) and respond to the Bidder in writing within fifteen (15) Working Days of receipt of appeal.

(f) **Second Bidder Appeal.** The Bidder may appeal the decision by the relevant County director, as appropriate and applicable, to the County Administrative Officer (CAO).

The Bidder must file a written appeal with the CAO not later than three (3) Business Days from the date of the director response in Section GP-2.23(e). Oral objections, whether or not acted on, are not appeals. The appeal must comply with Section GP-2.23(a)(1) and(2), but may include any additional documentation as deemed necessary and appropriate by the Bidder.

(g) CAO Response to Bidder Appeal. The CAO, or his/her duly authorized designee, will review the Bidder's appeal under Section GP-2.23(f) and respond to the Bidder in writing within twenty (20) Working Days of receipt of appeal. The CAO's, or his/her duly authorized designee's, written decision is final and binding on all involved parties.

GP - SECTION 3
AWARD AND EXECUTION OF CONTRACT

GP-3.01 AWARD OF CONTRACT (SEE SECTION GP-2.19)

Notice of Award shall be faxed, where available, at the number provided with the Bid and/or mailed, by first class mail, to the successful Bidder at the address submitted with the Bid. In addition, the Department's Division of Construction Contracts Administration shall maintain for public inspection a record of the date of the notice of Award for each Contract, if Awarded and as applicable.

(a) The notice of Award, if it be Awarded, shall be within ninety (90) Calendar Days (or as otherwise specified in the Contract) after the opening of the Bid, and will be to the Responsible Bidder with the lowest Responsive Bid whose Bid complies with all the requirements prescribed in these Standard Specifications and the Solicitation for Bid. The successful Bidder will be notified by letter, as stated above, to the address shown on its Bid, that its Bid has been accepted and that it has been Awarded the right to execute the Contract Documents with the County. The notice of Award shall be deemed to have been received three (3) Calendar Days after the date on the notice of Award. The

successful Bidder will also be deemed to be on notice of the information contained in the public record log referred to above.

(b) If a Contract is jointly Bid by more than one Person, all Persons will be, upon Award, notified and shall execute the Control thereafter and will be held jointly and severally responsible for the performance and Full and Final Completion of the entire Contract.

(c) The right is reserved to cancel and rescind any notice of Award at any time before the County fully executes the Contract Documents. Upon the County's cancellation and rescission of the notice of Award the County shall not be liable or obligated in any kind, nature or amount to any Person.

GP-3.02 RETURN OF PROPOSAL GUARANTY

If a Bid is withdrawn by Written Notice received in the office designated in the Bid Package before the time and date set for Bid opening, the Proposal Guaranty will be returned if requested. Each Proposal Guaranty submitted, other than the three low Bidders, will be considered released immediately following opening and review of the Bids. The Proposal Guaranty of the 2nd and 3rd low Bidders will be returned upon request only, following execution of the Contract with the lowest Bidder, and the Proposal Guaranty of the lowest Bidder (i.e., the Contractor) can only be released upon execution of the Contract and submittal of the Performance Bond and the Payment Bond by the Contractor, as required by Section GP-3.03.

GP-3.03 PERFORMANCE BOND AND PAYMENT BOND REQUIREMENTS

(a) Acceptable security in the County-required forms for the Performance Bond and a Payment Bond are included in the Bid Package.

(b) A Performance Bond and a Payment Bond must be provided by Contractor from a Surety acceptable to the County who is (1) licensed in the State of Maryland, (2) rated "B" or better by the A.M. Best Company, (3) on federal funded projects, authorized by the underwriting limitation contained in the U.S. Department of Treasury Circular 570, as amended, to guaranty the amount of the Bid, and (4) in good standing as determined by the County's Engineer at the time of the underwriting and provision of the Payment Bond and Performance Bond.

A Payment Bond and Performance Bond are required for every and each Contract in excess of twenty-five thousand dollars ($25,000). Each Payment Bond and each Performance Bond shall be in the amount equal to at least one hundred (100%) percent of the Contract price. The fully executed Payment Bond and fully executed Performance Bond shall be delivered by the Bidder to the Department's Division of Construction Contracts Administration no later than the time the Contract is to be executed by the Contractor. If the Bidder fails to deliver the required Payment Bond and the required Performance Bond in a timely manner, the Bid shall be rejected, the Proposal Guaranty

shall be enforced, and Award of the Contract may be made to the Responsible Bidder with the next lowest Responsive Bid in accordance with the Solicitation for Bid and these Standard Specifications.

All Bond premiums shall be paid by the Contractor. At the direction of the Department, the Contractor may be required to increase the Payment Bond and Performance Bond with such increase to be paid for by the County in the amount of the documented actual cost to the Contractor.

GP-3.04 EXECUTION OF CONTRACT/SUBMISSION OF REQUIRED DOCUMENTS AND MBE/WBE FORMS

(a) Not later than ten (10) Business Days after the date of the notice of Award, the successful Bidder shall have obtained and returned the Contract Documents to the County and two (2) sets of cross sections, including, but not limited to:

(1) the fully and properly executed Contract Proposal Form,

(2) the fully and properly executed Payment Bond and Performance Bond, if required under Section GP-3.03,

(3) the fully and properly completed evidence of insurance required pursuant to Section GP-7.14 of these Standard Specifications and the Bid Package, and

(4) the Proposal Affidavit.

The documents referred to in Sections GP-3.04 (a) (1), (2), (3), and (4) are to be delivered to the Department's Division of Construction Contracts Administration unless expressly specified otherwise by the Engineer or in the Contract Documents.

(b) The Department's Division of Construction Contracts Administration shall record in the public record log, referred to in Section GP-3.01, the date it received from the successful Bidder each of the properly completed Contract Documents required in Sections GP-3.04 (a) (1), (2), (3), and (4) above, and the date it received notification from the County that the successful Bidder's MBE/WBE forms required by the County have been approved. The successful Bidder is deemed to be on notice of such information so recorded.

(c) In the event the County fails to fully execute the Contract Documents within thirty (30) Business Days after the date all of the required documents in this section have been received by the Department, the successful Bidder will have, as its sole remedy, the option to declare the Contract terminated or to agree to an extension of the time for the County to execute the Contract. Should Bidder declare the Contract terminated, in no event shall County be liable or obligated for any losses, costs, expenses or damages in any amount, nature, or kind incurred by any Person including, but not limited to, the Bidder. If the successful Bidder, however, shall fail within thirty-five (35) Business Days of the aforementioned date to deliver Written Notice to the Department's Division of Construction Contracts Administration that it elects to rescind its Bid and have the

Contract terminated, the time period for the County to execute the Contract shall automatically be extended for an additional fifteen (15) Business Days.

(d) All Contract Documents remain the property of the County and must not be used on other work but shall be returned to the County upon request by Engineer.

GP-3.05 FAILURE TO EXECUTE CONTRACT

Failure to deliver to the County the required items listed in Section GP-3.04 within the time specified therein shall be just cause for the annulment and rescission of the notice of Award and the Contractor's and Surety's forfeiture of the Proposal Guaranty to the County, not as a penalty, but in liquidation of damages sustained. Notice of Award may then be made to the Responsible Bidder with the next lowest Responsive Bid, or, at the County's option, the Work may be re-advertised.

GP - SECTION 4
SCOPE OF WORK

GP-4.01 INTENT OF CONTRACT

(a) The Contractor shall (within specified tolerances) perform all Work in accordance with the Contract Documents including, but not limited to, the lines, grades, typical cross sections, dimensions, and other data shown on the Plans or as modified by Contract Modification including the furnishing of all Materials, implements, machinery, Equipment, tools, supplies, transportation, labor, and all other things necessary to the satisfactory prosecution and completion of the Work in full compliance with the Contract Documents.

(b) The Contract Documents are intended to be complementary, and to describe the Construction and completion of the Work. Anything mentioned in the Contract Documents and not shown on the Contract Drawings, or shown on the Contract Drawing, and not elsewhere mentioned in the Contract Documents shall be of like effect as if it is shown or mentioned in both.

(c) Omissions from the Contract Documents including, but not limited to, Contract Drawings or the misdescription of details of Work which are manifestly necessary to carry out the intent of the Contract Documents and/or Contract Drawings or which are customarily performed shall not relieve the Contractor from performing such omitted or misdescribed details of Work, but they shall be performed as if fully and correctly set forth and described in the Contract Drawings and Contract Documents. The Engineer shall consider modifications of the Bid and/or postponement of Bid opening as may best serve all interested parties where Written Notice of apparent omissions is received by the

Engineer five (5) Business Days before the hour prescribed for Bid opening. This is not to be construed as a limitation on the Engineer. If justified and deemed appropriate by the County, the Engineer may issue a Contract Modification or, if after execution of the Contract, prepare a Supplemental Agreement(s) for Extra Work that was not anticipated and/or shown on the Contract Drawings or described in the Contract Documents.

(d) It is assumed that the Contractor has obtained clarification of all questions that may have arisen as to intent of the Contract Documents, or assumed, there is no actual or problematic conflict between two or more items in the Contract Documents as required in "instructions to bidders." Should the Contractor have failed to obtain such clarification as required by the "instructions to bidders," then the Engineer may direct the Work to proceed by any method indicated, specified or required by the Contract Documents in the interest of maintaining the best Construction practice. Such direction by the Engineer shall not constitute a claim for Extra Work by the Contractor or result in a Contract Modification.

(e) Work described in words that have a well-known technical or trade meaning shall be held to refer to such recognized standard use.

(f) The Contractor shall keep in the office on the Work site a complete set of all Contract Drawings, Standard Specifications, shop drawings, schedules, etc., in good order and available to the Engineer and representatives of the County.

GP-4.02 CONTRACT DOCUMENTS

The Contract Documents are essential parts of the Contract, and a requirement occurring in one is as binding as though occurring in all. They are intended to be complementary and to describe and provide for a complete Work. In the event of any discrepancy between the drawing and figures written thereon, the figures, unless obviously incorrect, will govern over scaled dimensions. In the event of any discrepancy between the Plans and the Standard Specifications, the Plans will govern. If there is a discrepancy between the Standard Specifications and Interim Supplemental Specification, the Interim Supplemental Specifications will govern. Special Provisions will govern over Standard Specifications, Interim Supplemental Specification and Plans.

Special Provisions govern over all other Contract Documents unless expressly stated to the contrary in the Contract Documents.

GP-4.03 ENTIRE CONTRACT

The Contract represents the entire and integrated agreement between the parties thereto and supersedes all prior negotiations, representations or agreements, either written or oral.

GP-4.04 VARIATIONS IN ESTIMATED QUANTITIES

(a) Where the quantity of a Major Contract Item in this Contract is an estimated quantity and where the actual quantity of such Pay Item varies more than twenty-five (25%) percent above or below the estimated quantity stated in this Contract, an equitable adjustment in the Contract price shall be made upon demand of either party. The equitable adjustment shall be based upon any increase or decrease in costs due solely to the variation above one hundred twenty-five (125%) percent or below seventy-five (75%) percent of the estimated quantity. If the quantity variation is such as to cause an increase in the time necessary for completion, the Engineer shall, upon receipt of a written request for an extension of time within ten (10) Days from the beginning of the delay, or within a further period of time which may be granted by the Engineer before the date of final settlement of the Contract, ascertain the facts and make the adjustment for extending the Completion Date as in Engineer's judgment the findings justify.

(b) Should any Contract Items contained in the Bid Package be found unnecessary for the proper completion of the Work, the Engineer may, upon written order to the Contractor, eliminate such Contract Items from the Contract and no allowance will be made for Contract Items so eliminated in making final payment to the Contractor except for Material costs documented incurred prior to notification of the elimination of the Contract Items and for which there is no other possible or reasonable use.

GP-4.05 DIFFERING SITE CONDITIONS

(a) Pursuant to and incorporated in Section GP-2.04, the Contractor is solely responsible for ascertaining soil conditions impacting any and all portions of the Work and soils testing shall be performed by an independent testing firm at Contractor's sole cost and expense. Unless waived in writing by the Engineer, the independent testing shall be performed by a Professional Engineer licensed by the State of Maryland. The Contractor shall promptly, and before such conditions are disturbed, notify the Engineer in writing of:

(1) Subsurface or latent physical conditions at the site differing materially from those indicated in this Contract; or

(2) Unknown physical conditions at the site of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in Work of the character provided for in this Contract. The Engineer shall promptly investigate the conditions, and if he finds, in his sole discretion, that such conditions do materially so differ and cause an increase or decrease in the Contractor's cost of, or the time required for, performance of any part of the Work under this Contract, whether or not changed as a result of such conditions, an equitable adjustment shall be made and the Contract modified in writing accordingly.

(b) No claim of the Contractor under this General Provision shall be allowed unless the Contractor has given the notice required in (a) above; provided however, the time prescribed therefor may be extended by the County, in its sole discretion.

(c) No claim by the Contractor for an equitable adjustment under this General Provision shall be allowed if asserted after final payment under this Contract.

GP-4.06 CHANGES

(a) The Engineer may unilaterally, at any time, and without notice to the Surety, if any, by a Change Order, make any change in the Work within the general scope of the Contract, including but not limited to changes:

(1) In the Contract Documents (including, but not limited to, Contract Drawings and designs);

(2) In the method or manner of performance of the Work;

(3) In the County-furnished facilities, Equipment, Materials, services, or Work site; or

(4) Directing acceleration in the performance of the Work.

If the Contractor intends to assert an equitable adjustment claim under this Section GP-4.06(a) for changes made by the Engineer, it shall, within thirty (30) Days after receipt of a written Change Order submit to the Engineer a Written Notice setting forth the general nature and monetary extent of such claim for equitable adjustment and the Contractor's position relative to Contract Time, unless the Contract Time was already extended by the County.

(b) The Contractor may request a Change Order by providing the Engineer with Written Notice stating the date, circumstances, and the source of any written or oral order from the County causing the change in Work. Except for claims based on defective Contract Documents, no claim for any change under this Section GP-4.06(b) shall be allowed for any costs incurred more than twenty (20) Days before the Contractor gives Written Notice as required. Further, in the case of defective Contract Documents in the Bid Package for which the County is responsible, the equitable adjustment shall include any increased costs reasonably incurred by the Contractor in attempting to comply with such defective Contract Documents in the Bid Package.

If the Contractor intends to assert an equitable adjustment claim under this Section GP-4.06(b) for changes it requested, it shall, within thirty (30) Days after the furnishing of Written Notice submit to the Engineer a written statement setting forth the general nature and monetary extent of such claim and the Contractor's position relative to Contract Time, unless the Contract Time was already extended by the County. This statement of

claim for equitable adjustment may be included in the Written Notice submitted pursuant to this Section GP-4.06(b).

The Engineer will consider the Written Notice provided, and all facts at hand or that can be readily obtained, without unduly delaying the Work, and:

(1) Where the Engineer finds the change presented by the Contractor would cause a difference in Contract cost or Contract Time, he/she will consider alternatives to minimize impacts in the Contract cost or Contract Time in the mutual interest of both parties and commit his final decision to writing in a Change Order; or

(2) Where the Engineer does not find in favor of the change presented by the Contractor, he shall commit his instructions to writing and direct the Contractor's and the Engineer's staff to proceed as if a force account, as further described in Section GP-9.02, were ordered to provide a record for later re-evaluation as to merits of the change and any adjustments that may be needed.

Both parties are duty-bound to minimize the accumulation of expenses during the time the Engineer requires to complete the evaluation required in this Section GP-4.06(b). Delay costs and time, to the extent judged reasonable and unavoidable, are to be considered in the Engineer's Change Order, if any.

(c) No order, statement, or conduct of the Engineer shall be treated as a change under this General Provision or entitle the Contractor to an equitable adjustment unless made in a properly authorized and executed Change Order or Contract Modification.

(d) Each Contract Modification or Change Order that affects Contract price, whether an increase or a decrease, shall be subject to the prior written approval of the Engineer and other appropriate authorities and to prior Certification of the County's Office of Budget and Finance of fund availability and the effect of the Contract Modification or Change Order on the Contract budget or the total Contract cost. If, according to the Certification of the County's Office of Budget and Finance, the Contract Modification or Change Order will cause an increase in Contract cost that will exceed budgeted and available funds, the Contract Modification or Change Order may not be made unless sufficient additional funds are made available or the scope of the Contract is adjusted to permit its completion within the Contract budget.

(e) No claim by the Contractor for an equitable adjustment hereunder shall be allowed if asserted after final payment is made pursuant to Section GP-9.04 and this Contract.

(f) No claim for Extra Work by the Contractor will be granted which includes cost of delays or Work stoppage due to strikes, lockouts, fire, avoidable casualties or damage or delay in transportation for which the County or its agents are not responsible.

GP-4.07 NEGOTIATED PAYMENT PROVISION

(a) The County, without invalidating the Contract, may order changes in the Work by altering, adding to or deducting from the Work, the Contract amount being adjusted accordingly in a Change Order. Extension of time made, or if necessary thereby, shall be adjusted at and documented in a Change Order.

(b) The Engineer shall have the authority to make minor changes in the Work not involving extra cost and not inconsistent with the purpose of the Contract and/or Work. Otherwise, except in an emergency endangering life or property, no Extra Work or change shall be made unless a written order from the Department signed by the Director has been received by the Contractor. No claim for addition to the Contract sum shall be valid unless so ordered in writing by the Director.

(c) The value of any such Extra Work or change under this Section GP-4.07 shall be determined in one or more of the following ways as determined by the Department:

(1) By Estimate and Acceptance of a Lump Sum

(a) The Contractor shall furnish a breakdown of the estimated Construction cost. The breakdown shall be of sufficient detail to describe the Extra Work and related costs for labor, Material, overhead and profit.

(b) Overhead and Profit

1. Extra Work by Subcontractor:

   Subcontractor will be allowed 10% overhead and 10% profit added to the direct labor and Material costs. The Contractor will be allowed to increase the Subcontractors total lump sum by 10% to cover its administration.

2. Extra Work by Contractor:

   The Contractor will be allowed 10% overhead and 10% profit added to the labor and Material costs.

(c) The Contractor will be allowed 1% for Contract Bond added to the labor and Material costs, as applicable.

(d) The allowed overhead will include all supervision; no additional allowance will be made for it.

(2) By Unit Prices Named in the Contract or Subsequently Agreed Upon

Such unit prices are to include all supervision, overhead, taxes, insurance and profit.

(3) By Cost and a Fixed Fee

Added to the cost is a fixed fee portion that is to include supervision, overhead, insurance and profit.

(4) By Force Account (Labor and Material Cost plus)

See Section GP-9.02 entitled "Force Account Work".

Should none of the methods stated in Sections GP-4.07(c)(1), (2), or (3) be applicable, the Contractor shall, providing the Contractor receives an order as defined in Section GP-4.07(b) of this General Provision, proceed with the Work in accordance with Section GP-9.02 entitled "Force Account Work". The Contractor and Engineer shall keep accurate costs, in such form as the Engineer may direct, for presentation, together with vouchers, to the Department for determination of the value of the Extra Work included in each Change Order. Pending determination of the final value and the execution of the Change Order, the Engineer may include payments for Materials and labor, as stated in General Provision - Section 9, "Payment", in monthly vouchers.

GP-4.08 UNAUTHORIZED WORK

Work done contrary to or regardless of the instructions of the Engineer, Work done beyond the lines and grades shown on the Contract Drawings, or as given, or any Extra Work done without written authority of the Engineer is unauthorized and at the sole cost and expense of the Contractor and will not be measured or paid for. Work so done may be ordered removed and/or replaced at the Contractor's sole cost and expense.

GP-4.09 FINAL CLEAN UP

Upon Final Acceptance for Maintenance of the Work specified in the Contract and before final payment will be made, the Construction area and all other adjoining areas occupied by the Contractor during the Construction of said Contract, other than those owned by the Contractor, shall be cleaned of all surplus and discarded Materials, spilled Materials, excess Materials left deposited on the permanent Work as a result of the Contractor's operations, falsework, and rubbish and temporary Structures and buildings, that were placed thereon by the Contractor. The adjoining areas mentioned above, outside the normal pay limits for seeding, will be reshaped, seeded and mulched, or otherwise restored as directed by the Engineer at the Contractor's expense.

GP-4.10 WARRANTY OF CONSTRUCTION

(a) In addition to any other warranties at law and specified in the Special Provisions of the Contract, the Contractor warrants for two (2) years after the date of Final Acceptance for Maintenance by the County, that Work performed under this Contract shall conform to the Contract requirements and is free of any defect of Equipment, Material or design furnished, or workmanship performed by the Contractor or any of the Contractor's Subcontractors or suppliers at any tier. Under this warranty, the Contractor at its own and sole cost and expense shall make any Repairs or replacements which, in the judgment of the Engineer, may become necessary during this warranty period on account of any failures or defects. In addition, the Contractor shall remedy at its own and sole cost and expense any damage to County-owned or controlled real or personal property, when that damage is the result of the Contractor's failure to conform to Contract requirements or any such defect of Equipment, Material, workmanship, or design. The Contractor shall also promptly restore any Work damaged in fulfilling the terms of this General Provision. The Contractor's warranty with respect to Work Repaired or replaced hereunder will run for two (2) years from the date of the County's acceptance of such Repair or replacement; provided that the terms and conditions of all warranties in place following the Final Acceptance for Maintenance shall continue to remain in full force and effect.

(b) The County shall notify the Contractor in writing within a reasonable time after the discovery of any failure, defect, or damage.

(c) Should the Contractor fail to remedy any failure, defect, or damage described in (a) above within a reasonable time after receipt of notice thereof, or in the case of an emergency, the County shall have the right to replace, Repair, or otherwise remedy such failure, defect, or damage at the Contractor's sole cost and expense. To insure the County against the nonpayment of any such costs, on the date of Final Acceptance for Maintenance, the County will either require the retainage of five percent (5%) of the total value of the Contract or require the Contractor to submit a value equivalent maintenance bond. Said maintenance bond shall be in a form and with a Surety approved by the County, binding the Contractor as principal, and the Surety, to promptly and properly replace any improper Work or Materials that may become apparent within the two (2) year warranty period following the date of Final Acceptance for Maintenance. In lieu of a bond, other forms of security such as irrevocable letters of credit, or a bank cashier's or treasurer's check may be accepted. Upon acceptance and approval by the County of such a bond or other security, the sum retained by the County will be released pursuant to GP-Section 9.

(d) In addition to the other rights and remedies provided by this General Provision, all Subcontractors', manufacturers', and suppliers' warranties expressed or implied, respecting any Work and/or Materials shall, at the direction of the County, be enforced by the Contractor for the benefit of the County. In such case if the Contractor's warranty under (a) above has expired, any suit directed by the County to enforce a Subcontractor's, manufacturer's or supplier's warranty shall be at the expense of the County. The Contractor shall obtain any warranties that the Subcontractors, manufacturers, or suppliers would give in normal commercial practice.

(e) If directed by the Engineer, the Contractor shall require any such warranties under this Section GP-4.10 to be executed in writing to the County.

(f) Notwithstanding any other provision of this General Provision, unless such a defect is caused by the negligence of the Contractor or its Subcontractors or suppliers at any tier, the Contractor shall not be liable for the Repair or any defects of material or design furnished by the County nor for the Repair of any damage which results from any such defect in County furnished Material or design.

(g) The warranty specified herein shall not limit the County's rights under Section GP-5.13 "Acceptance for Maintenance", or any other rights available to County under the Contract, at law, and/or in equity.

GP - SECTION 5
CONTROL OF THE WORK

GP-5.01 AUTHORITY OF THE ENGINEER

(a) The Engineer shall decide: all questions which may arise as to the quality and acceptability of Materials furnished and Work performed and as to the rate of progress of said Work; all questions which may arise as to the interpretation of any or all Plans and Contract Documents; and all questions as to the acceptable fulfillment of the Contract on the part of the Contractor.

(b) The Engineer shall determine the amount and quantity of Work performed and Materials which are to be paid for under the Contract.

(c) The Engineer shall have the authority to suspend the Work wholly or in part due to the failure of the Contractor to carry out any provisions of the Contract.

GP-5.02 CONFORMITY WITH CONTRACT REQUIREMENTS

All Work performed and all Materials furnished shall be in conformity with the Contract requirements.

In the event the Engineer finds the Materials or the finished product in which the Materials are used or the Work performed are not in reasonably close conformity with the Contract requirements and have resulted in an inferior or unsatisfactory product, the Work or Materials shall be removed and replaced or otherwise corrected by and at the expense of the Contractor.

In the event the Engineer finds the Materials or the finished product in which the Materials are used are not in conformity with the Contract requirements but that acceptable Work has been

produced, he shall then make a determination if the Work shall be accepted in the Engineer's sole discretion. In this event, the Engineer will document the basis of acceptance by a Change Order that will, if applicable, provide for an appropriate adjustment in the Contract price. Any action taken pursuant to this General Provision shall not result in an increase of the Contract price.

GP-5.03 DISCREPANCIES IN THE CONTRACT DOCUMENTS

In the event the Contractor discovers any discrepancies in the Contract Documents, the Contractor shall immediately notify the Engineer in writing. The Engineer will then make such corrections and interpretations as may be deemed necessary for fulfilling the intent of the Contract.

GP-5.04 COOPERATION BY CONTRACTOR

The Contractor will keep available on the Work site at all times one complete set of Contract Documents.

The Contractor shall give the Work the constant attention necessary to facilitate the timely progress thereof, and shall cooperate with the Engineer and the Engineer's Inspector at all times and in every way possible.

The Contractor shall assign to the Contract as his agent, a competent Superintendent capable of communicating in English and capable of reading and thoroughly understanding the Contract Documents and thoroughly experienced in the type of Work being performed, who shall receive instructions from the Engineer or his authorized representatives. The Superintendent shall have full authority to execute the order or directions of the Engineer without delay, and to promptly supply such Materials, Equipment, tools, labor and incidentals as may be required. Such superintendence shall be furnished irrespective of the amount of Work sublet. Said Superintendent shall be on the Work site at all times when the Work is in progress.

The Contractor shall so schedule the Work as to ensure efficient and uninterrupted progress and to hold to an absolute minimum the cutting and patching of new Work. All cutting, patching and digging necessary to the execution of the Work is included in the Contract.

The Contractor shall so schedule (to include Subcontracts) the Construction performed by each group or trade that each installation or portion of the Construction shall member with and join with all other Work as required for a complete installation, all according to accepted good Construction practice.

The Contractor shall be responsible for the coordination of the Work of all Subcontractors.

GP-5.05 COOPERATION WITH UTILITIES

It is understood and agreed that the Contractor has considered in its Bid all of the permanent and temporary utility appurtenances in their present or relocated positions and that no additional compensation will be allowed for delays, inconvenience, or damage sustained by the Contractor due to any interference from the said utility appurtenances or the operation of moving them.

The Contractor shall have responsibility for notifying all affected Utility Companies before performing any Work on their utilities and shall cooperate with them. All damage to utility facilities caused by the Contractor's operations shall be the sole financial and legal obligations, liability and responsibility of the Contractor.

MISS UTILITY: Sections 12-101, *et seq*., of the Public Utility Companies Article of the Maryland Annotated Code, as amended from time to time, establish requirements regarding protection of existing underground utilities from excavation and demolition activities.

The Contractor shall notify Utility Companies and their public agencies at least forty-eight (48) hours but not more than ten (10) Days before digging. Locate requests may be processed through Ticket Check by calling this special toll-free number: 1-866-821-4226, where the caller will be prompted through the steps to retrieve ticket status, using a 10 digit Contractor's number. Contact the MISS UTILITY help desk at 410-712-0056, x4040 or check the www.missutility.net/maryland web site for more information on how to use the Ticket Check system.

One call to 1-800-257-7777 or use of Ticket Check will reach most companies and organizations that have underground facilities in the County. A list of member utilities belonging to MISS UTILITY is on the MISS UTILITY website at www.missutility.net/maryland. Other utilities, which are non-participants in MISS UTILITY, may also be encountered. It is the Contractor's responsibility to identify all utilities, to inform the proper authorities of Work near the utility line, and to exercise caution at all times in regard to them.

The UTILITY SERVICE PROTECTION CENTER (MISS UTILITY: (800 257-7777) may also be called between 7:00 a.m. and 5:00 p.m., Monday through Friday, excluding Holidays. Emergencies will be processed promptly on a 24-hour basis.

FIRE HYDRANTS: The Contractor shall notify the County Fire Department's Fire Dispatch Liaison Officer (410 887-4592) prior to starting any Work involving the removal or relocation of existing fire hydrants.

SANITARY SEWERS: To protect against accidental clogging, existing sanitary sewer channels shall be covered within manholes, as directed by the Engineer, prior to any grubbing or grading operations. This will not be a separate Pay Item, but shall be included in the cost of other Pay Items.

ADDITIONAL COSTS: The cost of charges for marking the locations for water and sewer utilities by the organizations which are part of the MISS UTILITY program shall be included as an incidental cost in the Contractor's Bid.

Water mains, gas mains, storm drains, sanitary sewers, and other utilities are shown on the Plans, in accordance with the best information available to the County, for the convenience of the Contractor. THE COUNTY ASSUMES NO RESPONSIBILITY FOR ACCURACY OR COMPLETENESS OF THE INFORMATION SHOWN ON THE PLANS AND THE CONTRACTOR SHALL BE FULLY AND SOLELY RESPONSIBLE FOR VERIFYING THE LOCATION OF ALL UTILITIES. Existing mains and services shall be carefully protected and any damage to them caused by the Work and/or the Contractor shall be immediately Repaired to the satisfaction of the Engineer by the Contractor at its own expense, using Materials of the quality and kinds damaged.

GP-5.06 COOPERATION BETWEEN CONTRACTORS

(a) Each and every contractor under contract with the County, with regard to any adjoining or overlapping Work or work of or with another under contract with the County, shall cooperate with each other as necessary. Such cooperation shall include:

(1) Arrangement and conduct of Work and/or work; and

(2) Storage and disposal of Materials, etc., by each in such manner as to not unnecessarily interfere with or hinder the progress of the Work and/or work being performed by other contractors. Contiguous Work shall be joined in an acceptable manner.

(b) The Administration and Department shall have the right, at any time, to contract for and perform other Work and/or work on, near, over or under the Work covered by this Contract. In addition, other Work and/or work may be performed under the jurisdiction of another public body, public entity, the County agency or entity, County affiliate or any public educational or college entity. In such cases, when a dispute arises among one or more contractors, the Engineer will decide which department, body, or entity has jurisdiction over said dispute. The Contractor shall cooperate fully with such other contractors and carefully fit Contractor's own Work to such other work as may be directed by the Engineer.

(c) The Contractor agrees that in the event of dispute as to cooperation the Engineer will act as referee. The Contractor waives its rights and remedies to make a claim or take any other action of any kind against the Administration for any inconvenience, delay or loss experienced by Contractor because of the presence and operations of other contractors.

(d) The County reserves the right to let other contracts in connection with paving and utilities adjoining this Work. The Contractor shall afford other contractors reasonable

opportunity for the introduction and storage of their materials and the execution of their work, and shall properly connect and coordinate its Work with theirs.

If any part of the Contractor's Work depends for proper execution or results upon the work of any other contractor, the Contractor shall inspect and promptly report to the Engineer any defects in such work that render it unsuitable for such proper execution and results. Failure to inspect and report shall constitute an acceptance of the other contractor's work as fit and proper for the reception of the Work. The Contractor shall take all reasonable precautions during construction to prevent damages to previously installed work. The Contractor shall monitor the previously installed area/work while performing its assigned Work, and shall advise the Engineer immediately if defects in that previously installed work become apparent.

To ensure the proper execution of Contractor's subsequent Work, the Contractor shall verify Work already in place and shall at once report to the Engineer any discrepancy between the executed Work and the Contract Drawings.

GP-5.07 AUTHORITY AND DUTIES OF INSPECTORS

The Inspector shall be authorized to inspect all Work done and all Material furnished. Such inspection may extend to all or any part of the Work and to the preparation, fabrication or manufacture of the Materials to be used. The Inspector is not authorized to revoke, alter or waive any requirements of the Contract, nor is he authorized to approve or accept any portion of the Work. The Inspector is authorized to call the attention of the Contractor to any failure of the Work or Materials to conform to the Contract. The Inspector shall have the authority to reject Materials or suspend the Work until any questions at issue can be referred to and decided by the Engineer. The Inspector shall perform his duties at such times and in such manner as will not unnecessarily impede progress on the Contract.

The Inspector shall in no case act as foreman or perform any other duties for the Contractor, nor interfere with the management of the Work by the Contractor. Any advice, instruction, direction or other order which the Inspector may give the Contractor shall not be construed as binding the Engineer in any way, or releasing the Contractor from fulfilling all of the terms of the Contract.

Where there is disagreement between the Contractor, the Superintendent, or any other contractor and the Inspector, such as refusal by the Contractor to use properly approved Material, performing Work not in compliance with Plans and Contract Documents, and/or refusing to suspend Work until problems at issue can be referred to and decided by the Engineer, the Inspector will immediately direct the Engineer's attention to the issues of disagreement. If the Contractor still refuses to make corrections and/or comply or suspend Work, as applicable, the Engineer may prepare and deliver in writing to the Contractor, by mail or otherwise, a written order suspending the Work and explaining the reason for such shutdown. As soon as the Inspector is advised of the delivery of the shutdown order, the Inspector shall immediately leave the site of the Work and any Work performed during the Inspector's absence will not be accepted

or paid for and may, in the sole discretion of the Engineer be required to be removed and disposed of at the Contractor's sole cost and expense.

GP-5.08 INSPECTION OF WORK

All Materials and each part or detail of the Work shall be subject at all times to inspection by the Engineer and/or the Inspector, and the Contractor will be held strictly to the Materials, workmanship, and the diligent execution of the Contract. Such inspection may include mill, plant or shop inspection, and any Material furnished under the Contract is subject to such inspection. The Engineer and/or Inspector shall be allowed access to all parts of the Work and shall be furnished with such information and assistance by the Contractor as is required to make a complete and detailed inspection of all parts of the Work.

If the Engineer requests it, the Contractor, at any time before Partial Acceptance for Maintenance and/or Final Acceptance for Maintenance of any Work, shall remove or uncover such portions of the finished Work as may be directed. After examination, the Contractor shall restore said portions of the Work to the standards required by the Contract. Should the Work thus exposed or examined prove acceptable, adjustments in Contract Time and price will be made pursuant to Section GP-4.06 for the uncovering or removing, and the replacing of the covering or making good of the parts removed. Should the Work so exposed or examined prove unacceptable, the uncovering, or removing and replacing, shall be at the Contractor's sole cost or expense.

When the United States Government, the State, another local government or municipality, or any railroad, corporation or other Person is to pay a portion of the cost of the Work covered by this Contract, their respective representatives shall have the right to inspect and approve the Work.

If the Contract Documents, the Engineer's instructions, laws, regulations, executive orders, ordinances, or any public authority require any Work to be specially tested or approved, the Contractor shall give the Engineer timely notice of its readiness for inspection, and if the inspection is by another authority, the date fixed for such inspection. Inspections by the Engineer shall be made promptly, and where practicable, at the source of supply. Any Work covered without approval of the Engineer must, if required, be uncovered for examination at the Contractor's sole cost and expense.

If initial tests and/or inspections show substandard products, Materials, workmanship, etc. and the Contractor elects, with the Engineer's approval, to perform additional tests and/or inspections to prove the acceptability of the substandard products, Materials, workmanship etc., the Contractor shall perform same at Contractor's sole cost and expense.

GP-5.09 REMOVAL OF DEFECTIVE WORK

All Work and Materials which do not conform to the requirements of the Contract will be considered unacceptable, unless otherwise determined acceptable under the provisions in Section GP-5.02.

Any defective Work, whether the result of poor workmanship, use of defective Materials, damage through carelessness or any other cause, found to exist shall be removed and replaced by Work and Materials which shall conform to the Contract Documents or shall be remedied otherwise in an acceptable manner authorized by the Engineer.

Upon failure on the part of the Contractor to comply promptly with any order of the Engineer made pursuant to these General Provisions, the Engineer shall have authority to cause defective Work to be remedied or removed and replaced and unauthorized Work to be removed and to deduct the costs from any monies due or to become due the Contractor under this Contract.

GP-5.10 LOAD RESTRICTIONS

(a) The Contractor shall comply with all applicable State and local laws, regulations and requirements pertaining to speed, size and weight of motor vehicles.

(b) The Administration may indicate in the Contract any load restrictions on any Road or Structure within the vicinity of the Work site.

(c) The Contractor shall take into account any and all posted Bridges, the crossing of which might be contemplated by the Work of the Contract. No loads in excess of posted limits will be allowed in the prosecution of the Work on any Contract, unless the required permits are obtained from the appropriate State and local governmental agencies.

(d) The Contractor shall consider possible detrimental effects of operating heavy paving and grading Equipment contiguous to retaining walls, pipe Culverts, arches, forms for concrete Work as well as any Construction existing prior to this Contract.

(e) The Engineer shall have the right to limit passage of heavy Equipment (plus loads) when such passage or usage is causing apparent or visible damage to embankments, paving, Structures or any other property.

(f) Within Baltimore City limits, and within the limits of the Baltimore City-maintained watershed properties, the Department of Transportation of the City of Baltimore has jurisdiction for oversize and overweight vehicle movements. Permits are obtainable from the Baltimore City Department of Transportation.

GP-5.11 MAINTENANCE OF WORK DURING CONSTRUCTION

(a) The Contractor shall maintain the Work during Construction and until Final Acceptance for Maintenance by the County. This maintenance shall constitute continuous and effective Work prosecuted as required with adequate Equipment and forces to the end that all parts of the Work be kept in satisfactory condition at all times.

The Contractor shall at all times keep the Work site free from accumulations of waste Material or rubbish caused by its employees, Subcontractors, or Work, and at the Final Acceptance for Maintenance of the Work, shall remove all rubbish, waste, Contractor's tools, scaffolding and surplus Material from and about the Work site. In case of dispute, the County may remove the waste and rubbish and charge the cost to the Contractor as the Engineer shall determine to be just, in his sole discretion.

All debris shall be kept sprinkled to reduce dust and shall be promptly removed from any Structure, and no combustible Materials shall be stored against perimeter walls of any Work.

The Contractor shall clean entirely any Structure as it is completed, wash all windows, scrub all floors at least once, and leave all floors free from spots and blemishes. The interior of any Structure and the entire Work site shall be left "broom clean," or its equivalent.

(b) Particular attention shall be given to drainage, both permanent and temporary. The Contractor shall use all reasonable precautionary measures to avoid damage or loss that might result from accumulations and concentrations of drainage water, and material carried by such water and such drainage shall be diverted or removed when necessary to prevent damage to excavation, embankments, surfacing, Structures or any other property. Suitable measures shall be taken by the Contractor to prevent the erosion of soil in all Construction areas where the existing ground cover has been removed and/or disturbed.

The Contractor shall remove all water, including rain water, encountered during the entire progress of the Work, using pumps, drains or other methods approved by the Engineer. Excavations and the Work site shall be kept free from water until all backfilling is completed. The water shall be discharged to catch basins, or other drainage points as directed by the Engineer.

(c) All cost of maintenance Work during Construction and before Final Acceptance for Maintenance by the County shall be included in the Bid and the Contractor will not be paid an additional amount for such Work, except as otherwise provided in the Contract Documents.

(d) In the event that the Contractor's Work is ordered to shut down for failure to comply with any provision of the Contract, the Contractor shall maintain the entire Work site as provided herein, and provide such ingress and egress for local residents or tenants adjacent to the Work site, for tenants of the Work site, and for the general public as may be necessary during the period of suspended Work or until the Contract has been declared in default.

(e) On Contracts where traffic flow is maintained, the Contractor shall be responsible for Repair of all traffic damages to the Work, either partially or totally completed, until Final Acceptance for Maintenance of the Work is achieved. Responsible, as used here, shall

mean the responsibility for restoration and the cost thereof unless otherwise expressly provided for in the Special Provisions.

GP-5.12 FAILURE TO MAINTAIN ENTIRE PROJECT

Failure on the part of the Contractor, at any time, to respond to the provisions of Section GP-5.11 will result in the Engineer's immediately notifying the Contractor to comply with the required maintenance provisions. In the event the Contractor fails to proceed with corrections to unsatisfactory maintenance so as to conform to the provisions of Section GP-5.11 within four (4) hours after receipt of such notice, the Engineer may notify the Contractor to suspend all other Work on the Contract until the unsatisfactory maintenance is corrected. In the event that the Contractor has failed to commence with adequate corrective measures within four (4) hours after receipt of such notice the Engineer may immediately proceed with adequate forces and Equipment to maintain the Contract Work and the entire cost of this maintenance will be deducted from any monies due or to become due to the Contractor from the County. The Contractor is and remains responsible for any injury or damage that may result from lack of maintenance of any refilled excavation at any time until Final Acceptance for Maintenance by the County. The Engineer may suspend Work as further described in Section GP-8.07.

GP-5.13 ACCEPTANCE FOR MAINTENANCE

(a) **Partial Acceptance for Maintenance.** If at any time during the performance of the Work the Contractor substantially completes a unit or portion of the Work, the Contractor may request the Engineer to make final inspection of that unit or portion. If the Engineer determines upon inspection that the unit has been satisfactorily completed in compliance with the Contract, the Engineer may make a written Partial Acceptance for Maintenance of that unit or portion of Work, and the Contractor may be relieved of further maintenance responsibility for that unit or portion of Work. Generally, Partial Acceptance for Maintenance will only be considered when the Administration feels that such action is in the public interest. Such Partial Acceptance for Maintenance of any unit or portion of Work shall in no way void or alter any of the terms of the Contract.

(b) **Final Acceptance for Maintenance.** Upon due notice from the Contractor of presumptive completion of the Contract Work, the Engineer shall make a Construction inspection and if at such inspection all Construction and Contract Work provided for and contemplated by the Contract is found completed, such inspection shall constitute the final inspection and the Engineer shall make the Final Acceptance for Maintenance of the Work as of that date, and the Contractor shall be notified of such Final Acceptance for Maintenance in writing. After Final Acceptance for Maintenance, the Administration will assume responsibility for maintenance except where otherwise provided by the Contract.

(c) If, however, at any Construction inspection any Contract Work, in whole or in part, is found unsatisfactory, the Engineer shall give the Contractor the necessary instructions as

to the Contract Work required for Final Acceptance for Maintenance by the County. The Contractor forthwith shall comply with and execute such instructions. Upon completion of such Contract Work, another inspection shall be made which shall constitute the final inspection if the said Contract Work is completed satisfactorily. In such event, the Engineer shall make the Final Acceptance for Maintenance and the Contractor shall be notified as aforesaid. After Final Acceptance for Maintenance, the Administration will assume responsibility for maintenance except where otherwise provided by the Contract.

(d) Unless otherwise provided in this Contract, Partial Acceptance for Maintenance and/or Final Acceptance for Maintenance by the County shall be made as promptly as practicable after completion and inspection of all Work required by this Contract, or that portion of the Work that the Engineer determines can be accepted separately. Partial Acceptance for Maintenance and/or Final Acceptance for Maintenance shall be final and conclusive except as regards latent defects, fraud, and such gross mistakes as may amount to fraud or the County's rights under any warranty or guarantee or any claims or counter claims reserved by the County.

(e) No claim for Extra Work will be granted which includes cost of delays or Work stoppage due to strikes, lockouts, fire, avoidable casualties or damage or delay in transportation for which the County or officials, employees, or its agents are not responsible.

GP-5.14 CLAIMS

Unless a shorter period is prescribed by law or elsewhere in this Contract:

(a) The Contractor shall file a Written Notice of claim for extension of time, equitable adjustment, extra compensation, damages, or any other matter (whether under or relating to this Contract) with the Engineer within ninety (90) Days after the basis for the claim is known or should have been known, whichever is earlier.

(b) Contemporaneously with or within ninety (90) Days of the filing of a notice of a claim, but no later than the date that final payment for the Pay Item and/or portion of the Work for which the claim is made, a Contractor shall submit the claim to the appropriate Engineer. The claim shall be in writing and shall contain:

(1) An explanation of the claim, including reference to all Contract provisions upon which it is based;

(2) The amount of the claim;

(3) The facts upon which the claim is based;

(4) All pertinent data and correspondence that the Contractor relies upon to substantiate the claim;

(5) A Certification by a legally authorized representative of the Contractor or Subcontractor, as applicable, that, to the best of the Person's knowledge and belief, the claim is made in good faith, supporting data are accurate and complete, and the amount requested accurately reflects the Contract adjustment for which the Person believes the Administration is liable; and

(6) Itemized supporting data for the elements of cost the Contractor claims to have incurred or which the Contractor will incur. This data shall be in sufficient detail to permit analysis by the Administration of Material, labor, Equipment, Subcontract and overhead costs as well as profit and shall include all Work covered by the claim, whether deleted, added, or changed. Subcontractors' costs shall be supported by similar detailed data.

(c) A notice of claim or a claim that is not filed within the prescribed time shall be dismissed.

GP-5.15 DISPUTES

(a) Except as otherwise may be provided by applicable law or regulation, all disputes arising under or as a result of a breach of this Contract that are not disposed of by mutual agreement shall be resolved in accordance with this General Provision.

(b) As used herein, "claim" means a written demand or assertion by one of the parties seeking, as a legal right, the payment of money, adjustment or interpretation of Contract terms, or other relief, arising under or relating to this Contract.

A voucher, invoice, or request for payment that is not in dispute when submitted is not a claim under this General Provision. However, if the submission subsequently is not acted upon in a reasonable time, or is disputed either as to liability or amount, it may be converted to a claim for the purpose of this General Provision.

(c) When a claim cannot be resolved by mutual agreement, the Contractor shall submit a written request for decision to the Department's Chief of the Division of Construction Contracts Administration, or other designated County official, for his decision in consultation with the County Office of Law. The Contractor's written request shall set forth all the facts surrounding the controversy, including, but not limited to, those items listed in Section GP-5.14(b). Any claim by the County shall be decided in like manner.

(d) The Contractor, at the discretion of the Engineer, may be afforded an opportunity to be heard and to offer evidence in support of his claim. Pending resolution of a claim, the Contractor shall proceed diligently with the performance of the Contract.

(e) The Department's Chief of the Division of Construction Contracts Administration, or other designated County official, shall decide any and all claims. The decision by the Department's Chief of the Division of Construction Contracts Administration, or other designated County official, shall be issued within ninety (90) Days on matters of less than

fifty thousand dollars ($50,000) and within one hundred eighty (180) Days on matters of fifty thousand dollars ($50,000) or more. The written decision of the Department's Chief of the Division of Construction Contracts Administration, or other designated County official, shall be final and binding unless appealed in writing to the Director of the Department within thirty (30) Days of the Chief's, or other designated County official's, written opinion to the parties. If the Chief's, or other designated County official's, decision is timely appealed in writing to the Director of the Department, the Director of the Department, serving as referee, will review the written appeal submitted to assure all reasonable attempts were made to resolve the appeal.

(f) The Director shall issue his/her decision in writing within ninety (90) Days. The Director's decision shall be final and conclusive unless a written appeal is mailed or otherwise filed with the County Administrative Officer within thirty (30) Days of the Director's written decision.

(g) When the County Administrative Officer is satisfied all efforts at the Department level were made to resolve the dispute, a claim shall be resolved as follows:

(1) Subject to, and without in any way enlarging or limiting the other provisions of the Contract, the parties to any Agreement which adopts or incorporates by reference these Standard Specifications, appoint the County Administrative Officer as an administrative hearing officer pursuant to Article 25A, "Chartered Counties of Maryland", of the Annotated Code of Maryland.

(2) The parties further grant the County Administrative Officer the right to delegate this responsibility and authority in writing to a County official who is a registered Professional Engineer, independent of the Department of Public Works and Transportation's Division of Construction Contracts Administration, or to any other County official.

(3) For disputes involving ten thousand dollars ($10,000) or more the decision of the administrative hearing officer shall be final and binding on both parties, subject only to such appeals on the record as provided by Article 25A. For disputes involving less than ten thousand dollars ($10,000), the decision of the administrative hearing officer shall be final and binding on both parties.

GP - SECTION 6
CONTROL OF MATERIAL

GP-6.01 GENERAL

All Materials shall meet all quality requirements of the Contract. In order to expedite the inspection and testing of the Materials, the Contractor shall notify the Engineer in writing of the sources from which the Contractor proposes to obtain all Materials requiring approval, testing,

inspection, or Certification prior to incorporation into the Work as soon as possible after receipt of notification of Award of the Contract.

To expedite the approval of this notice a list of Approved Sources of Supply is available through the Department's Division of Construction Contracts Administration. If all Materials are to be supplied from the sources on the Approved Sources of Supply list, no written notification to that effect is required unless specifically requested by the Engineer or required by the Contract. If other sources are to be used, they shall be submitted for approval to the Engineer. It shall be the Contractor's responsibility to insure that all Materials are supplied from approved sources. Once the source of concrete or bituminous concrete for exposed final surfaces has been selected, that source is to provide Material for all Construction of continuous surfaces on all of the Contract Work. Submittal of all sources of supply will still be required for contracts involving State or federal funding. The Engineer will inform the Contractor as to source acceptability as soon as possible.

GP-6.02 STORAGE AND HANDLING OF MATERIALS

Materials shall be stored so as to assure the preservation of their quality and acceptability for the Work. Stored Materials shall, at the discretion of the Engineer, be again inspected prior to their use in any Work even if approved before storage. Stored Materials shall be located so as to facilitate their prompt inspection. Approved portions of the Right-of-Way or Work site may be used for storage purposes and for the placing of the Contractor's plant and Equipment; such storage areas must be restored to their original condition by the Contractor prior to Final Acceptance for Maintenance of the Work at Contractor's sole cost and expense. Any additional space required must be provided by the Contractor at Contractor's sole cost and expense.

Materials shall be handled in such a manner as to preserve their quality and acceptability for the Work.

GP-6.03 UNACCEPTABLE MATERIALS

(a) Materials represented by samples taken and tested in accordance with the County-specified tests and failing to meet required values shall be considered to be defective regardless of prior tests or approvals.

(b) Unless otherwise allowed by the Engineer as set forth below, defective Materials shall be removed from the Work site and any tags, stamps or other markings implying conformance with Contract Work removed for those Materials and returned to the Engineer or obliterated if located on the Materials.

(c) Where defects can be corrected, the Contractor may propose such corrective action as the Contractor deems appropriate to the Engineer. The Engineer may approve the corrective action but in so doing does not assume responsibility for the success thereof. Retests will

be made to determine the acceptability of the Material after corrective measures have been taken by the Contractor.

(d) The cost of replacing, correcting and/or removal of defective Material will be the sole responsibility of the Contractor.

(e) The cost of Repairing or replacing Materials damaged by the installation, correction and/or removal of defective Materials will be the sole responsibility of the Contractor.

GP-6.04 ADMINISTRATION FURNISHED MATERIAL

The Contractor shall furnish all Materials required for Full and Final Completion of the Work, except those specified to be furnished by the Administration. Materials furnished by the Administration will be delivered or made available to the Contractor at the point or points specified in the Special Provisions. The cost of handling and placing all Materials, after they are delivered to the Contractor, shall be considered as included in the Contract price for the Contract Item in connection with which they are used.

The Contractor shall be held responsible for all Material delivered to Contractor, and deductions will be made from any monies due or to become due to the Contractor to make good any shortages and deficiencies, from any cause whatsoever, and for any damage which may occur after such delivery, and for any demurrage charges.

In cases where Materials are supplied by the Administration and incorporated in the Contract Work by the Contractor, Materials inspection and acceptance will not be prerequisite for Final Acceptance for Maintenance as the Work pertains to these Contract Items.

GP-6.05 MATERIALS

Materials include all manufactured products and all processed and unprocessed natural substances required for the Full and Final Completion of the Contract. The Contractor in accepting the Contract is assumed to be thoroughly familiar with the Materials required and their limitations as to use and requirements for connections, setting, maintenance and operation.

When stipulated in the Contract Documents, materials testing shall be performed by a County/Engineer – approved independent testing firm and paid for by the Contractor. Certified copies of all test reports shall be submitted to the County/Engineer for approval. Otherwise, materials testing and sampling will be performed by Baltimore County's Division of Construction Contracts Administration.

Whenever an article, Material or Equipment is specified and a fastening, furring, connection (including utility connections), bed or accessory is normally considered essential to its installation in good quality Construction, such shall be included as if fully specified. Nothing in the Contract shall be interpreted as authorizing any Work in any manner contrary to applicable law, codes or regulations. (See Section GP-7.01).

(a) Approval

All Materials are subject to the Engineer's and the Architect's and/or Design Engineer's approval as to conformity with the Contract Documents, quality, design, color, etc. No Work for which approval is necessary shall be contracted for, or used, until written approval is given by the Engineer and the Architect and/or Design Engineer. Approval of a Subcontractor, as such, does not constitute approval of a Material which is other than that included in the Contract Documents.

(b) New Materials

Unless otherwise specified, all Materials shall be new.

(c) Quality

Unless otherwise specified, all Material shall be of the best quality of the respective kinds.

(d) Samples

The Contractor shall furnish for approval all samples of the Materials as directed. The Work shall be the same as the approved samples.

(e) Painting and Color

The Architect and/or Design Engineer and the Contractor shall jointly prepare the paint and color schedules. The Architect and/or Design Engineer shall direct the exact color, texture and finish.

(f) Proof of Quality

The Contractor shall, if required, furnish satisfactory evidence as to the kind and quality of Materials either before or after installation. The Contractor shall pay for any tests as may be deemed necessary in relation to "Substitutions" as specified in Section GP-6.05(i).

(g) Contractor's Option

When several products or manufacturers are named in the Contract Documents for the same purpose or use, then the Contractor shall select any of those so named. However, all of the units of a thing required for a Contract must be the same in material and manufacture.

(h) "Or Equal", "Equal", "Approved Equal"

The above terms are used as synonyms throughout the Contract Documents. They are implied in reference to all named manufacturers. Only Materials that, in the opinion of the Engineer, are fully equal in all details of Construction, methods of assembly, finish and design quality will be considered. (See Sections GP-6.05(a), (c), (e) and (i) of this General Provision).

(i) Substitutions

Should the Contractor desire to substitute another Material for one or more specified by name, the Contractor shall apply, in writing, for such permission from the Engineer and state the credit or Extra Work involved by the use of such Material. The Engineer will not consider the substitution of any Material different in type or Construction methods unless such substitution effects a benefit to the County. (See (a) and (d) of this General Provision.)

The Contractor shall not submit for approval Materials other than those specified, unless the Contractor concurrently submits a written statement explaining why such a substitution of Materials is proposed. Approval of a "substitute" material by the Architect and/or Design Engineer when the Contractor has not designated such Material as a "substitute," shall not be binding on the County nor release the Contractor from any obligations of the Contract, unless the Engineer and the Architect and/or Design Engineer approves such "substitutions" in writing.

(j) Storage

The Contractor shall confine apparatus and storage of Materials to the "off-Road" area delineated as the "limit of contract" or "limit of disturbance", as applicable. The Contractor shall not load or permit any part of any Structure to be loaded with a weight that will endanger the safety of any Structure or any part thereof.

GP-6.06 SALVAGE MATERIALS

For Contract Work that involves the renovation, repair, and/or improvement of an existing Structure, the County has the right to claim as salvage any equipment and/or materials removed under the Work of the Contract. Should such right of salvage be exercised by the County, through verbal notification to the Contractor, the Contractor shall be responsible for the removal, protection, and transport, intact, of all salvaged equipment and/or materials to one or more government locations as directed by the Engineer. The Contractor shall provide the County with five (5) days advance notice prior to delivery of any salvage item to the designated government location. Until such time that items claimed as salvage by the County are provided to the County, the Contractor shall move and neatly store said items in a dry, secure location at the Contract Work site approved by the Engineer. Any and all costs associated with salvage materials, including, but not limited to, removal, protection, transportation and storage, shall be included by the Contractor in its Bid and Bid Package, and there will be no additional payment of any kind by the County for salvage operations or salvage materials.

GP - SECTION 7
LEGAL RELATIONS AND RESPONSIBILITY TO PUBLIC

GP-7.01 COMPLIANCE WITH LAWS

The Contractor hereby represents and warrants that:

(a) It is qualified to do business in the State of Maryland and that it will take such action as, from time to time hereafter, may be necessary to remain so qualified;

(b) It is not in arrears with respect to the payment of any monies due and owing the State or the County, or any department or unit thereof, including, but not limited to the payment of taxes and employee benefits, and that it shall not become so in arrears during the term of this Contract;

(c) It shall comply with all federal, State and local laws, regulations, codes, executive orders, and ordinances applicable to its activities and obligations under this Contract; and

(d) All requirements set forth in federal assistance instruments applicable to this Contract shall be satisfied. The Contractor understands and agrees that it is possible federal and/or State funds may be used in connection with the Contract. Accordingly, prior to commencing any and all Work under the Contract, the Contractor shall ascertain and verify if federal and/or State funds are to be used by the County. It is the Contractor's obligation to ascertain if the County will use any federal and/or State funds in connection with the Contract or any portion thereof. Further, it is the obligation of the Contractor and the Contractor understands and agrees that should any federal and/or State funds be used by the County in connection with the Contract, the Contractor shall adhere to and comply with all applicable federal and/or State laws, regulations, circulars, executive orders, procedures and guidelines, as and if applicable, as amended from time to time, at no additional cost or expense to the County.

GP-7.02 PERMITS AND LICENSES

(a) The Contractor shall procure at Contractor's sole cost and own expense such permits, licenses, insurances and governmental approval as may be necessary in order to comply with federal, State and local laws, ordinances, codes, executive orders and regulations in performance of the Contract. The Contractor shall further give any notices necessary and incidental to the due and lawful prosecution of the Contract.

(b) The cost incurred in compliance with all permits shall be incidental to and included in the Bid. Any required permits, licenses and governmental approvals desired by the Contractor for temporary Structures such as docks, piers, anchorages, etc. must be applied for and obtained by the Contractor at Contractor's sole cost and expense.

(c) Fire hydrant permits must be obtained if water is required from a hydrant. No water is to be drawn from a public fire hydrant except through a meter. Applications shall be made through the County Department of Permits, Approvals and Inspections (PAI), or any successor County department. All costs are considered incidental to the Bid, with the following exceptions:

The Department will issue a meter for fire hydrant utilization for performance of the Contract. At the request of the Contractor within five (5) Days of charging the lines the Engineer will issue the meter application to the Contractor without cost and there will be no charge for Contractor's water use recorded on the meter provided. Failure to return the meter in good condition, or utilization of the meter provided for any other purpose, will be grounds for assessment of replacement costs thereof and/or liquidated damages.

(d) A backflow valve must be used in drawing water from the metropolitan system for charging and testing new utilities.

(e) This Section GP-7.02 (e) (1) through (7) below only applies, in its entirety, to building Contracts (vertical construction), exclusive of Baltimore County-owned: wastewater pumping stations and treatment facilities, potable water pumping stations and disinfection facilities, and potable water storage facilities.

(1) **BUILDING PERMIT** – The County will obtain the building permit at no cost to the Contractor.

(2) **PERMANENT WATER AND/OR SEWER SERVICE** – The County will apply for the permanent water and/or sewer service and pay all related charges; i.e., water meter, water systems connection charge, water distribution charge and sewer systems connection charge. Total installation of the permanent water and/or sewer service is part of this Contract. Water and/or sewer service shall be installed by a County prequalified utility contractor.

(3) **PLUMBING PERMIT** – The Contractor shall apply for the plumbing permit; however, the County will pay all related charges and fees.

(4) **PERMANENT ELECTRIC SERVICE** – The Contractor shall apply for and pay for the electrical permit. The County shall obtain permanent gas and electric service from the applicable Utility Companies for the Work site at no cost to the Contractor.

The Contractor shall coordinate the installation of permanent gas and electric service with the applicable Utility Companies. Both the gas and electric services shall be activated at the same time under one account number showing the County as owner. The Contractor shall be responsible for payment of consumption charges for the use of gas and electric energy obtained through the permanent gas and/or electric service until Final Acceptance for Maintenance of the Contract Work or until agreed upon by the County in direct coordination with the Department's Building Services Division. Charges from the Utility Companies for removal of existing electric service will be paid by the County.

(5) **PERMANENT TELEPHONE SERVICE** – The County shall pay for the permanent telephone service and systems to and in any Contract building. The Contractor is responsible for supplying and installing all conduit, cables and junction boxes as shown on the Contract Drawings or as described in the Contract Documents.

(6) **CABLE** – The County shall pay for any permanent cable television service into any Contract building. The Contractor is responsible for supplying and installing the remaining Work as shown on the Contract Drawings or as described in the Contract Documents.

(7) **TEMPORARY SERVICES** – All temporary services, such as water, electric, telephone, etc., shall be the Contractor's entire responsibility.

The Contractor shall arrange for and pay for the installation of temporary connection to the County's water mains, including all incidental fees and expenses for water supply during Construction of the Contract Work, and shall pay for all water used. Wasting of County water will not be permitted.

The Contractor shall arrange for and pay for temporary electric light and power service required during Construction of the Contract Work, and shall pay for all electricity used. Gasoline or other torches for lighting will not be permitted.

The Contractor shall provide and pay for any other temporary services that may be required for the Full and Final Completion of the Contract Work.

The Contractor shall provide, at Contractor's sole cost and expense, all cold weather protection, temporary heat and fuel as necessary to carry on the Work expeditiously during inclement weather, to protect Work and Materials against injury from dampness and cold, to dry out the building, and to provide suitable Working conditions. Refer to other portions of these Standard Specifications and/or the Contract Documents for temperatures required for Work under the various trades.

The methods of heating and type of fuel and Equipment used shall be subject to approval by Engineer.

With special permission, obtained from the Engineer in writing, a permanent heating system may be used to dry out any Contract building and provide suitable working conditions in all or various parts thereof as soon as practicable. If used, the Contractor shall be responsible for use of the permanent heating system for the purpose described and all costs of fuel, attendance, etc. in connection therewith shall be borne by the Contractor. Such use shall not relieve the Contractor of its responsibility to turn over the permanent heating system to County on the date of Final Acceptance for Maintenance in perfect condition,

including the removal of all dust of Construction from air handling units, etc., the replacing of all filters, etc., nor shall it shorten the stipulated guarantee period which will commence upon the date of Final Acceptance for Maintenance by the County of the Work.

(f) **MISCELLANEOUS PERMITS (All Contracts)** - The Contractor shall procure any and all necessary permits not previously mentioned and pay any and all related charges and fees required and incidental to the due and lawful prosecution of the Work.

(g) The Contractor shall give all notices and comply with all State and federal laws, ordinances, rules and regulations bearing on the conduct of the Work as drawn and/or as specified.

GP-7.03 INTELLECTUAL PROPERTY AND PATENTED DEVICES, MATERIALS, AND PROCESSES

If the Contractor is required or desires to use any intellectual property right, design, device, propriety information, material, or process covered by letters of patent or copyright or any other intellectual property right, the Contractor shall provide for such use by suitable legal agreement with the patentee, license holder, or owner and a copy of such agreement shall be filed with the Administration. The Contractor and the Surety shall indemnify, protect and save harmless (and defend upon request) the County and its officials, employees, agents and any affected third party, or political subdivision from any and all claims, suits, demands, liabilities, actions, costs, and/or judgments including, but not limited to, attorneys fees, by reason of the use of any such patented design, proprietary information, device, trade secret, patent right or intellectual property right or design, device, material, or process, or any trademark or copyright.

GP-7.04 FEDERAL OR STATE PARTICIPATION

When the United States Government and/or the State pays all or any portion of the cost of a project, the Work shall be subject to the inspection of the appropriate federal or State agency. Such inspection shall in no sense make the federal or State government a party to this Contract, and will not interfere in any way with the rights of either party hereinunder.

GP-7.05 CONSTRUCTION SAFETY AND HEALTH STANDARDS

(a) It is a condition of this Contract, and shall be made a condition of each Subcontract entered into pursuant to this Contract, that the Contractor and any Subcontractor shall not require any laborer or mechanic employed in performance of the Contract to work in surroundings or under working conditions which are unsanitary, hazardous, or dangerous to his health or safety, as determined under Construction safety and health laws, standards and regulations (Title 29, Code of Federal Regulations, Part 1926, formerly Part 1518, as revised from time to time) promulgated by the United States Secretary of Labor, in accordance with Section 107 of the Contract Work Hours and Safety Standard Act, (83 Stat. 96) and under any Construction safety and health standards and regulations

promulgated by the Commissioner of Labor and Industry in accordance with the Maryland Occupational Safety and Health Act and/or the Maryland General Assembly (as the same may be amended from time to time).

The Contractor and each Subcontractor shall permit inspection without delay and at any reasonable time on any premises where the Work is being performed by a federal or State inspector authorized to investigate compliance with the above mentioned federal and State statutes and regulations.

The Contractor further agrees to correct any violations found to exist during such inspection within a reasonable time after the issuance of any citation, unless the Contractor contests the validity thereof through the appropriate administrative and judicial process.

(b) The Contractor shall be responsible for gas detection in and ventilation of confined spaces.

When procedures require workers to enter confined spaces such as steel or concrete box section type Superstructures, the Contractor shall be cognizant of the potential health hazards, particularly when the interior is closed off at both ends.

It shall be the Contractor's responsibility to adhere to all applicable MOSHA regulations. The Contractor shall have available approved detecting devices and shall conduct tests for oxygen content and presence of gases, such as combustible gas, carbon dioxide, methane, carbon monoxide, and hydrogen sulfide whenever any fabrication, erection or inspection operations are to be performed within the confined spaces. The Contractor shall apply mechanical ventilation continuously to the confined space during occupancy to maintain the proper oxygen content. The Contractor shall conduct air tests periodically during the occupancy.

(c) The Contractor shall arrange for the erection and maintenance of temporary toilets equipped with running water and a drain connection for use of the Contractor's employees, Subcontractors, and/or agents, and County employees. These conveniences shall be erected and kept clean, neat and in good sanitary condition, as required by applicable law and/or regulation, until ordered removed by the Engineer.

In lieu of temporary toilets, the Contractor may install a portable chemical toilet at a location as approved by the Engineer.

The permanent plumbing fixtures to be constructed under the Contract shall not be used by any Person, under any circumstances, before Final Acceptance for Maintenance of the Contract by the County.

(d) The Contractor shall erect and properly maintain at all times as required by the conditions and progress of the Work, all necessary safeguards for the protection of workers and the public and shall post danger signs warning against the hazards created by such features of

Construction as protruding nails, hod hoists, well holes, elevator hatchways, scaffolding, window openings, stairways and falling material.

In an emergency affecting the safety of life, or of the Work, or of the adjoining property, the Contractor, without special instruction or authorization is hereby permitted to act, at the Contractor's discretion, to prevent such threatened loss or injury, and the Contractor shall so act, without appeal, if so instructed or authorized by the Engineer. Any compensation claimed by the Contractor on account of emergency Work shall be determined as outlined in Section GP-4.07.

GP-7.06 PUBLIC CONVENIENCE AND SAFETY

The Contractor at all times shall conduct the Work in such a manner as to ensure the least practicable obstruction to all forms of traffic. The convenience of the general public, tenants, and of the residents along and/or adjacent to the Work site shall be provided for as follows and as further directed by the Engineer:

(a) Equipment and/or Materials stored upon or about the Work site shall be placed so as to cause a minimum of obstruction to the public.

(b) Sprinkling shall be performed at the direction of the Engineer.

(c) The Contractor shall, unless otherwise specified, provide and maintain in passable condition such temporary access, Roads and Bridges as may be necessary to accommodate traffic diverted from the Work site under Construction, or using the project under Construction and shall provide and maintain in a safe condition temporary approaches to and crossings of the Work site.

(d) Existing facilities planned to be removed, but which might be of service to the public during Construction are not to be disturbed until other and adequate provisions are made.

(e) Existing mailboxes shall be maintained or reset in positions accessible to the public and to mail deliveries during Construction and subsequent to Construction in their final locations in a satisfactory condition.

(f) On facilities occupied by railroad or light rail stations, temporary platforms for the entrance and exit of passengers and/or freight to and from the railway cars shall be provided and maintained in an approved manner by the Contractor and the applicable railroad/agency.

(g) Fire hydrants on or adjacent to the Contract Work site shall be kept accessible to fire apparatus at all times, and no material or obstruction shall be placed within fifteen (15) feet of any such hydrant. Work closed down for the winter or at any other times shall be left entirely accessible at all points to fire apparatus.

(h) All footways, gutters, storm drainage and portions of the Contract Work site adjoining the Work under Construction shall not be obstructed more than is absolutely necessary. The Engineer, in cooperation with the Sediment Control Inspector, shall specify that drainage inlets in sumps where there is potential for localized flooding shall have flow restrictions removed in the event of a predicted significant rainfall event.

GP-7.07 DETOURS

Detours may be indicated in the Contract Documents, or at the Contractor's request traffic may be detoured over County-approved routes along existing Roads, as determined acceptable by the Department's Bureau of Traffic Engineering and Transportation Planning. Detours over existing Roads will be designated, marked and maintained by the Contractor.

GP-7.08 BARRICADES AND WARNING SIGNS

The Contractor shall provide, erect and maintain all necessary barricades, suitable and sufficient lights, danger signals, signs and other traffic control devices, and shall take all necessary precautions for the protection of the Work and safety of the public. All Highways and other County facilities closed to vehicular traffic shall be protected by effective barricades, and obstructions shall be illuminated during hours of darkness with electric lights. The Contractor shall erect warning signs in advance of any place on the Work site where operations may interfere with the use of the facility by vehicular traffic, and at all other points where the new Work crosses or coincides with an existing Roadway or traffic lane(s). Such warning signs shall be constructed and erected in accordance with the MUTCD for Street and Highways, or as directed by the Engineer.

The Contractor shall furnish, erect and maintain warning and direction signs in the number required by the Engineer and at locations designated by the Engineer throughout the limits of the Contract Work site.

For street and Highway type traffic, the signs shall conform in every respect to the requirements of the MUTCD for Streets and Highways. Signs must be freshly painted and adequately reflectorized before being placed on any Contract Work site. No Work may be performed or begun unless an adequate number of signs of the proper category are in place.

In cases where the Contractor's sequence of operations results in grade differentials that would be hazardous to vehicular traffic the Contractor shall, at the direction of the Engineer, provide suitable substantial traffic barriers to the extent determined by the Engineer.

GP-7.09 FLAGGING OF MOTOR VEHICLE TRAFFIC

For all Construction Contracts requiring the flagging of motor vehicles licensed for operation on the Highways of the State, said flagging shall be conducted as specified in the MUTCD for Streets and Highways.

GP-7.10 MAINTENANCE OF TRAFFIC

Unless otherwise noted in the Special Provisions, it shall be the Contractor's responsibility to maintain pedestrian and vehicular traffic safely, adequately and continuously on all portions of existing facilities affected by the Contractor's Work. In addition to existing facilities undergoing improvement, this also applies to crossroads, approaches, crossovers and entrances affected or made necessary by the Contractor's Work.

GP-7.11 PRESERVATION AND RESTORATION OF PROPERTY OUTSIDE OF RIGHT-OF-WAY

(a) The Contractor shall not enter upon public or private property (outside of the Right-of-Way or Contract Work area as shown on the Contract Drawings) for any purpose without obtaining prior written permission from any applicable property owners. The Contractor shall be responsible for the preservation of all public and private property, trees, property pipes, monuments, signs and markers and fences thereon, and shall use every precaution necessary to prevent damage or injury thereto. The Contractor shall take suitable precaution to prevent damage to underground or overhead public utility structures. The Contractor shall carefully protect all survey land monuments and property marks located on the Contract Drawings or found in the Work site from disturbance. No alteration or damage thereto shall occur until survey references are established by a licensed surveyor at Contractor's sole cost and expense. If any land monuments and/or property marks are damaged or disturbed, they shall be reset by a licensed surveyor at the Contractor's sole cost and expense.

(b) The Contractor shall be responsible for all damage or injury to property of any character during the prosecution of the Work, resulting from any act, omission, neglect or misconduct in the Contractor's manner or method of executing said Work, or at any time due to defective Work or Materials, and said responsibility shall not be released until Final Acceptance for Maintenance of the Work is achieved. When or where any direct or indirect damage or injury is done to public or private property by or on account of any act, omission, neglect or misconduct in the execution of the Work or in consequence of the nonexecution thereof on the part of the Contractor, the Contractor shall restore, at the Contractor's sole cost and expense, such property to a condition similar to, or equal to, that existing before such damage or injury, in an acceptable manner to the County and/or applicable property owner. In case of the failure on the part of the Contractor to restore such property or make good such damage or injury, the Engineer may, upon forty-eight (48) hours notice to the Contractor, proceed to Repair, rebuild or otherwise restore such property as may be deemed necessary, and the cost and expense thereof will be deducted from any monies due or which may become due the Contractor under this Contract. If

the property damage results in a public safety issue, in the sole discretion of the County, the Contractor shall restore immediately or the County shall do so at Contractor's sole cost and expense.

(c) The Contractor should be aware of the potential of cultural resources on the Contract Work site. During the Construction phase, whenever anything that might appear to be a cultural resource of an historical, archeological, or paleontological nature is encountered, such an object shall not be disturbed. Work shall be stopped and rescheduled in a way that shall avoid not only the objects encountered but also the area of discovery and the Engineer shall be notified in writing at once. The Engineer will arrange for the evaluation of the situation by the appropriate authorities and for the ultimate disposition of the matter, taking the evaluation of the situation by the appropriate authorities into consideration.

(d) All trees along the way of access and all trees surrounding any Contract building which are liable to injury by the moving, storing and working up of Materials shall be boxed. No permanent tree shall be used for attachment of any ropes or derricks. Every public way, catch basin, conduit, tree, fence or things injured in carrying out this Contract, shall be replaced and put in good condition by the Contractor at no cost or expense to the County, unless the same shall be permanently done away with by written order of the Engineer.

GP-7.12 LAND, AIR, AND WATER POLLUTION

(a) The Contractor shall incorporate all permanent erosion control features into the Work at the earliest practicable time as required by the Contract Documents. Temporary pollution control measures will be used to correct conditions that develop during Construction that were not foreseen during design; that are needed prior to installation of permanent pollution control features; or that are needed temporarily to control erosion that develops during normal Construction practices, but are not associated with permanent control features on the Contract.

(b) The Contractor's attention is directed to the fact that temporary pollution control may include control measures outside the Right-of-Way or Contract Work site where such Work is necessary as a direct result of Contract-required Construction. The Engineer shall be kept advised of all such off-site control measures taken by the Contractor. This shall not relieve the Contractor of the basic responsibilities for such Work.

(c) In case of failure on the part of the Contractor to control erosion, pollution or siltation, the Engineer reserves the right to employ outside assistance or to use County forces to provide the necessary corrective measures. All costs and expenses incurred by the Engineer in the performance of such duties for the Contractor shall be withheld from monies due or becoming due to the Contractor.

(d) The Contractor and the Contractor's suppliers must submit evidence to the Administration that the governing federal, State and local air pollution laws, regulations and criteria will be met. This evidence and related documents will be retained by the Administration for on-site evaluation.

GP-7.13 RESPONSIBILITY FOR DAMAGE CLAIMS

(a) The Contractor shall indemnify and save harmless the County and all of its officials, agents, employees and representatives from all suits, actions, or claims of any character, including, but not limited to, all the costs of defense, brought on account of any injuries or damages sustained by any person or property in consequence of any neglect in safeguarding the Work, and/or through the use of unacceptable Materials in the Construction of the Contract Work, and/or on account of any act or omission by the said Contractor in the performance of the Contract, and/or as a result of faulty, inadequate or improper temporary drainage during Construction, and/or on account of the use, misuse, storage or handling of explosives, and/or on account of any claims or amounts recovered for any infringement of intellectual property, patent, trade secret, proprietary information, trademark, or copyright, and/or from any claims or amounts arising or recovered under the workers' compensation laws, and/or any other State or local law, executive order, charter, bylaw, code, ordinance, regulation, order or decree whether caused by or resulting from the act, omission, neglect, or misconduct of the Contractor, or its employees, agents, or Subcontractors, at any tier. The Contractor shall be responsible for any and all damage or injury to property of any character during the prosecution of the Work resulting from any act, omission, neglect or misconduct, in the manner or method of executing said Work satisfactorily or due to the nonexecution of said Work or at any time due to defective Work or Materials and said responsibility shall continue until Full and Final Completion of the Contract. The obligation of the Contractor to the County and all of its officials, agents, employees and representatives to indemnify, defend, and save harmless shall not apply if resulting from the sole negligence of the County.

(b) The Contractor shall conduct its operations upon the right-of-way of any applicable railroad company fully within the rules, regulations and requirements of the railroad company including, but not limited to, any additional flagging, insurance, inspection, and/or permit requirements. The Contractor shall be responsible for acquainting itself with such requirements as the railroad company may demand.

(c) The Contractor shall be held solely responsible for any accidents that may happen to the railroad company as a result of its operations.

(d) In accordance with Section GP-7.15, the Contractor shall not be held responsible for any claims arising from accidents incurred because of any traffic or general use permitted during the time the Construction Work site or any section thereof is open to traffic except from accidents which are attributable to the Contractor's, or the Contractor's employee's, Subcontractor's or agent's, acts or omissions or negligence.

GP-7.14 LIABILITY INSURANCE

Prior to the start of the Work on the Contract, or prior to the execution of the Contract if permitted by the County, the Contractor shall submit to the Department's Division of Construction Contracts Administration, an evidence of insurance certificate indicating that the following insurance is carried:

"Comprehensive general public liability and property damage insurance" in the amounts of at least five hundred thousand dollars ($500,000) for the death of or injury to any person, each occurrence. Such insurance shall protect the Contractor from claims which may arise out of, or result from, the Contractor's operations under the Contract, whether such operations be by the Contractor, any Subcontractor, or anyone directly or indirectly employed by the Contractor or Subcontractor, or anyone for those acts any of the above may be liable. Minimum coverages to be included: "independent contractor's coverage"; "completed operations and products liability coverage"; and "contractual liability coverage". "Damages not to be excluded insurance" shall contain no exclusions applying to operations by the Contractor or any Subcontractor in the performance of the Contract pertaining to: (1) collapse of, or structural injury to, any Contract building or Structure; (2) damage to underground property; or (3) damage arising out of blasting or explosion and, where applicable, (4) removal of asbestos/lead or debris and building products containing asbestos/lead, transportation and disposal of asbestos/lead and contaminated materials.

"Automobile liability insurance" shall include "bodily injury liability" and "property damage liability" for a combined single limit of five hundred thousand dollars ($500,000) any one accident. Such insurance shall provide coverage for all Contractor owned, non-owned and hired automobiles.

"Workers' compensation and employers' liability insurance" must contain statutory coverage in accordance with Maryland statutory limits, including "employers' liability insurance" with limits of at least for "bodily injury by accident" – two hundred fifty thousand dollars ($250,000) each accident; "bodily injury by disease" – two hundred fifty thousand dollars ($250,000) each employee; and "bodily injury by disease" – five hundred thousand dollars ($500,000) policy limit.

Any policy exclusions must be shown on the face of the evidence of insurance.

When specified in the Contract Documents, the Contractor shall carry the type and amounts of insurance in addition to any other forms of insurance or bonds required under the terms of the Contract and the Contract Documents.

The cost of the insurance will be incidental to the Contract lump sum price for mobilization, or if that is not identified, to the other Contract Items specified in the Contract Documents.

Contractor shall procure **"railroad public liability and property damage insurance"** and this insurance shall be provided by the Contractor as specified in Section TC-6.03.

The Contractor and its insurer shall immediately notify in writing the Department's Division of Construction Contracts Administration in the event that the Contractor's insurance coverage lapses for any reason.

Unless previously waived in writing by the Engineer, the Contractor shall, at the Contractor's sole expense and cost, insure the Work and keep it insured at all times during the Contract term and period of Construction, and until Final Acceptance for Maintenance of all Contract Work by the County, against loss or damage covered by an "all risk" builders risk type of policy. The amount of insurance shall be the one hundred percent (100%) estimated replacement cost of the Work.

The policies shall name the County and the Contractor as certificate holder and shall name the County as an additional insured in accordance with the requirements of the Contract Documents, as their interest may appear, and the policies shall be left in the possession of the Engineer, prior to the start of Construction.

GP-7.15 USE AND POSSESSION PRIOR TO FULL AND FINAL COMPLETION

(a) The Administration shall have the right to take possession of or use any completed or partially completed part of the Work. Such possession of or use shall not be deemed Partial Acceptance for Maintenance and/or Final Acceptance for Maintenance of any Work not completed in accordance with the Contract. While the Administration is in such possession, the Contractor shall be relieved of the responsibility for loss or damage to that portion of the Work in possession of the Administration, other than that resulting from the Contractor's fault, omission, act, or negligence. If such prior possession or use by the Administration delays the progress of the Work or causes additional expense to the Contractor, the Contractor shall provide the Administration with immediate Written Notice thereof to allow possible equitable adjustment in the Contract price or the time of completion. If necessary, an equitable adjustment will be made and the Contract shall be modified pursuant to a Contact Modification accordingly.

(b) Under this Section GP-7.15, only upon the prior written authorization of the Engineer may the Contractor be relieved of maintenance during the time the County has taken possession. Any portion of the Work that may be disturbed or damaged shall be restored at respective Contract prices for Contract Items involved, or on the basis of a predetermined arrangement entered into by the Contractor and Engineer before the performance of the restoration Work.

GP-7.16 CONTRACTOR'S RESPONSIBILITY FOR WORK

(a) Except as herein elsewhere provided, until Final Acceptance for Maintenance of the Work by the Administration, the Contractor shall have the charge and care thereof and shall take every reasonable precaution against injury or damage to any part thereof by the

action of the elements, or from any other cause, whether rising from the execution or from the nonexecution of the Work. The Contractor, except as herein elsewhere provided, shall rebuild, Repair, restore, and make good all injuries or damages to any portion of the Work occasioned by any of the above causes before the Final Acceptance for Maintenance and shall bear the expense thereof. Material lost or Structures damaged as a result of faulty temporary drainage during Construction or the action of the elements shall be replaced or Repaired by the Contractor at no cost, expense, or delay to the Administration. The Contractor shall make good or replace at the Contractor's cost and expense, and as otherwise required, any Administration-furnished Material which may be broken, lost through fire, theft, or otherwise damaged, or in any way made useless for the purpose and use intended subsequent to delivery to the Contractor by the Administration and prior to Final Acceptance for Maintenance of the Work by the County even though such breakage, damage, loss or uselessness may result from causes beyond the control of the Contractor.

(b) In case of suspension of Work for any cause whatever, the Contractor shall be responsible for the Contract Work and Work site and shall take such precautions as may be necessary to prevent damage to the Work and the Work site, provide for normal drainage, and shall erect any necessary temporary Structures, signs, or other facilities at the Contractor's cost and expense. During such period of suspension of Work, the Contractor shall properly and continuously maintain in an acceptable growing condition all living material in newly established plantings, seedings, and soddings furnished under this Contract, and shall take adequate precautions to protect new growth and other important vegetative growth against injury.

GP-7.17 CONTRACTOR'S RESPONSIBILITY FOR UTILITY PROPERTY AND SERVICES

At points where the Contractor's operations are adjacent to properties of railway, telegraph, telephone, power companies, and/or Utility Companies or are adjacent to other property, damage to which might result in expense, loss or inconvenience, Work shall not be commenced until all arrangements necessary for the protection thereof have been made between the Contractor and the property owner and/or affected Person.

The Contractor shall cooperate with the owners of any underground or overhead utility lines in their removal and rearrangement operations in order that these operations may progress in a reasonable manner, that duplication or rearrangement Work may be reduced to a minimum and that services rendered by those parties will not be unnecessarily interrupted.

In the event of interruption to utility services as a result of accidental breakage or as a result of being exposed or unsupported, the Contractor shall promptly notify the proper authority and shall cooperate with the said authority in the restoration of service. No Work shall be undertaken around fire hydrants until provisions for continued service have been approved by the local fire authority.

GP-7.18 PERSONAL LIABILITY OF PUBLIC OFFICIALS

In carrying out any of the provisions of the Contract, or in exercising any power or authority granted to them by or within the scope of the Contract, there shall be no liability upon the Administrator, Engineer or other County officials, employees, agents and/or authorized representatives, either personally or as officials, employees, or agents of the County, it being understood that in all such matters they act solely as agents and representatives of the County.

In addition, the Engineer and all of Engineer's representatives shall be held harmless, free of liability and duress, in the exercise of their duties and obligations as Inspector, administrator, witness, referee, mediator, and arbiter by both parties in their mutual best interest.

GP-7.19 NO WAIVER OF LEGAL RIGHTS

The Administration shall not be precluded or estopped by any measurement, estimate, or Certificate made either before or after the Partial Acceptance for Maintenance and/or Final Acceptance for Maintenance of any Work and payment therefore by the County, from showing the true amount and character of the Work performed and Materials furnished by the Contractor, nor from showing that any such measurement, estimate or Certificate is untrue or is incorrectly made, nor from showing that the Work or Materials do not in fact conform to the Contract. The Administration shall not be precluded or estopped, notwithstanding any such measurement, estimate or Certificate and payment in accordance therewith, from recovering from the Contractor or its Sureties, or both, such damage as it may sustain by reason of Contractor's failure to comply with the terms of the Contract. Neither the acceptance by the Administration, or any representative of the Administration, nor any payment for or acceptance of the whole or any part of the Work, nor any extension of time, nor any possession taken by the Administration, shall operate as a waiver of any portion of the Contract or of any power herein reserved, or of any right to damages.

No failure or delay by the County to insist upon the strict performance of any term, condition or covenant within the Contract, or to exercise any right, power, or remedy consequent upon a breach thereof, shall constitute a waiver of any such term, condition, or covenant or of any such breach, or preclude the County from exercising any such right, power, or remedy at any later time or times. Further, the express written waiver of any breach of the Contract shall not be a waiver of any other or subsequent breach of the Contract.

GP-7.20 NONDISCRIMINATION IN EMPLOYMENT

(a) The Contractor shall agree to the following conditions during the performance of its Contract with the County:

(1) To comply with all applicable federal, State, and County laws, regulations, codes, circulars, and executive orders;

(2) Not to discriminate in any manner against an employee or applicant for employment because of race, color, religion, creed, age, sex, marital status, national origin, ancestry, or physical or mental handicap unrelated in nature and extent so as reasonably to preclude the performance of such employment;

(3) To include a provision similar to that contained in Section GP-7.20 (a)(2), above, in any Subcontract except a Subcontract for standard commercial supplies or raw Materials;

(4) To post and to cause Subcontractors to post in conspicuous places available to employees and applicants for employment, notices setting forth the substance of this Section GP-7.20;

(5) In all solicitations or advertisements for employees placed by or on behalf of the Contractor, to state that all qualified applicants will receive consideration for employment without regard to sex, race, creed, color or national origin;

(6) If requested by the County to furnish a compliance report concerning its employment practices and policies in order for the County to ascertain compliance with the provisions of this Contract concerning nondiscrimination in employment; and

(7) To include the provisions outlined in this Section GP-7.20 pertaining to nondiscrimination in employment in every Subcontract or purchase order it uses in order to carry out the terms and conditions of the Contract so that such nondiscrimination in employment provisions are binding on each Subcontractor or vendor.

(b) In the event of the Contractor's noncompliance with the nondiscrimination provisions of this Section GP-7.20 and/or the Contract, the County shall impose such sanctions as it may determine to be appropriate, including but not limited to:

(1) Withholding of payment to the Contractor under the Contract until the Contractor complies; and/or

(2) Cancellation, termination or suspension of the Contract in whole or in part.

(c) Contractors providing Materials, Equipment, supplies, or services to the County under this Contract herewith assure the County that they are conforming to the provisions of the Civil Rights Act of 1964 and Section 202 of the Executive Order 11246 of the President of the United States of America as amended by Executive Order 11375, as applicable and as may be amended from time to time.

GP-7.21 SANCTIONS UPON IMPROPER ACTS – RESERVED.

GP-7.22 NONHIRING OF EMPLOYEES

No official or employee of the County or any unit, department or agency of the County, whose duties as such official or employee include matters relating to or affecting the subject matter of this Contract, shall, while so appointed and/or employed, and during the pendency and/or term of the Contract, become or be an officer or employee of the Contractor.

GP-7.23 CHOICE OF LAW

The Parties hereby agree that:

(a) This Contract was made and entered into in Maryland, and under the laws, regulations, codes, and executive orders of the County and the State, as applicable.

(b) The laws, regulations, codes and executive orders of the County and the State shall govern the resolution of any issue arising in connection with this Contract including, but not limited to, all questions concerning the validity of this Contract; the capacity of the parties to enter therein; any modification or amendment thereto; and the rights and obligations of the parties hereunder.

GP-7.24 CONTINGENT FEE PROHIBITION

(a) The Contractor warrants that it has not employed or retained any Person, partnership, corporation, or other entity, other than a bona fide employee or agent working for the Contractor, to solicit or secure this Contract, and that it has not paid or agreed to pay any Person, partnership, corporation, or other entity, other than a bona fide employee or agent, any fee or any other consideration contingent on the making of this Contract.

(b) For a breach or violation of this warranty, the Administration shall have the right to terminate this Contract without liability, or, in its discretion, to deduct from the Contract price or consideration, or otherwise recover, the full amount of such fee, commission, percentage, brokerage fee, gift or contingent fee.

GP-7.25 MULTI-YEAR CONTRACTS CONTINGENT UPON APPROPRIATIONS – RESERVED

GP-7.26 COST AND PRICE CERTIFICATION – RESERVED

GP-7.27 CORPORATE REGISTRATION AND TAX PAYMENT CERTIFICATION – RESERVED

GP-7.28 BUY AMERICAN STEEL ACT

The Provisions of COMAR 21.11.02 pertaining to implementation of the "Buy American Steel" Act (Subtitle 3 of Title 17 of the State Finance and Procurement Article of the Annotated Code of Maryland), as amended from time to time, are incorporated in this Contract by reference.

GP-7.29 MINORITY BUSINESS ENTERPRISE AND WOMEN BUSINESS ENTERPRISE

It is the policy of the County that MBE and WBE, as defined by the most recent County Executive Order, and as further described in the Contract Documents, shall have the maximum opportunity to participate in the performance of capital improvement contracts financed by County capital funds and/or County operating funds in accordance with the most recent County Executive Order. The Contractor shall comply with all MBE/WBE requirements as set forth in the Contract Documents.

GP-7.30 PREVAILING WAGE CONTRACTS FOR PUBLIC WORKS

(a) The Provisions of Subtitle 2 of Title 17 of the State Finance and Procurement Article of the Annotated Code of Maryland, as amended, and COMAR 21.11.11, as amended, pertaining to the Prevailing Wage for Public Works are incorporated in construction contracts of five hundred thousand dollars ($500,000) or more by reference, if and as applicable.

(b) When all or a portion of the cost of a contract is funded by the U.S. Government, and the cost of the contract exceeds two thousand dollars ($2,000), among other legal requirements, the minimum wage rates and benefits paid to workmen under the contract shall be those prevailing in the locality, as predetermined by the Secretary of Labor pursuant to the Davis-Bacon Act (40 USC 276a to a-7), as amended from time to time, and regulations (29 CFR, Part 5) promulgated thereunder, as amended from time to time. Davis-Bacon rates applicable to this Contract, if any, may be specified elsewhere in the Contract Documents.

GP-7.31 SMALL BUSINESS PROCUREMENTS – RESERVED

GP-7.32 FINANCIAL DISCLOSURE – RESERVED

GP-7.33 POLITICAL CONTRIBUTION DISCLOSURE

The Contractor affirms that it is aware of, and will comply with, the provisions of Sections 14-101 through 14-108 of the Election Law Article of the Annotated Code of Maryland, as amended from time to time, which requires every Person who makes, during any 12-month period, one or more contracts, with one or more State governmental entities involving cumulative consideration, of at least two hundred thousand dollars ($200,000.00), to file with the State Board of Elections certain specified information to include disclosure of attributable political contributions in excess of five hundred dollars ($500.00), during defined reporting periods.

GP-7.34 CONFLICT OF INTEREST LAW

It is unlawful for any County official, employee, or agent to participate personally in his/her official capacity through decision, approval, disapproval, recommendation, advice, or investigation in any contract or other matter in which he or she, his or her spouse, or his or her dependent child has a financial interest or to which any firm, corporation, association, or other organization in which he or she has a financial interest or in which he or she is serving as an officer, director, trustee, partner, or employee is a party, or to which any person with whom he or she is negotiating or has any arrangement concerning prospective employment, is a party, unless such official, employee, or agent has previously complied with the provisions of Article 7 of the Baltimore County Code, 2015, as amended.

GP-7.35 PRE-EXISTING REGULATIONS – RESERVED

GP-7.36 RETENTION OF RECORDS

(a) Except as otherwise expressly stated in this General Provision and the Contract Documents, the Contractor shall retain and maintain all records and documents including, but not limited to, cost or pricing data, relating to this Contract for three (3) years after final payment by the County under the Contract or any applicable statute of limitations, whichever is longer, and shall make them available for inspection and audit by authorized representatives of the County, including the Engineer or his designee at all reasonable times. Should the Contract involve use of State or federal funds, the Contractor shall retain and maintain, all records and documents including, but not limited to, cost or pricing data, relating to this Contract for not less than ten (10) years after final payment by the County under the Contract or any applicable statute of limitations, whichever is longer.

(b) The Contractor shall include the provisions of Section GP-7.36(a) in every Subcontract.

GP-7.37 RESPONSIBILITY FOR RIGHT-OF-WAY

(a) The Right-of-Way (or Work site) as shown on the Contract Drawings has been, or will be, secured by the County.

(b) The Contractor shall not move any Equipment or Material in or on the Right-of-Way until authorized to do so by the Engineer. The Contractor shall confine its operations strictly within the limits of the Rights-of-Way shown in the Contract Documents unless the Contractor obtains the prior written permission of any applicable property owner of such additional lands as Contractor proposes to occupy. A copy of the written permission will be furnished to the Engineer before Contractor enters said property.

(c) Unless otherwise provided in the Contract Documents, trees with a butt diameter in excess of three inches (3"), measured three feet (3') above the ground, shall not be felled or damaged by the Contractor in a Right-of-Way identified as a Construction Strip. Should the Contractor obtain written permission of any applicable property owner to fell a tree or trees with a diameter greater than three inches (3") from a Construction Strip, Contractor shall provide a copy of the written permission to the Engineer before Contractor enters said property and/or fells such tree(s).

(d) Unless otherwise provided in the Contract Documents, all trees may be felled with the permission of the Engineer in those Rights-of-Way identified as a Highway Right-of-Way or a slope, utility or drainage Easement.

(e) Unless otherwise provided in the Contract Documents, the Contractor is to preserve and protect, remove and replace, or restore fences, mail boxes, Sidewalks, driveways, shrubs, perennial plants, or other private improvements in Rights-of-Way identified as Construction Strips or Easements of any kind.

(f) The Contractor shall not enter upon public or private property (outside of the Right-of-Way or Contract Work area as shown on the Contractor Drawing) for any purpose without obtaining prior written permission from any applicable property owners and shall be responsible for the preservation of all public and private property, trees, property pipes, monuments, signs and markers and fences thereon, and shall use every precaution necessary to prevent damage or injury thereto. The Contractor shall take suitable precaution to prevent damage to underground or overhead public and private utility structures. The Contractor shall carefully protect from disturbance all survey land monuments and property marks located on the Contract Drawings or found in, on, or at the Work site. No alteration or damage thereto shall occur until survey references are established by a licensed surveyor at Contractor's sole cost and expense. If any land monuments and/or property marks are damaged or disturbed, they shall be reset by a licensed surveyor at the Contractor's sole cost and expense.

(g) Upon Final Acceptance for Maintenance of the Work by the County, the Contractor shall restore the Rights-of-Way provided to a condition equivalent to that originally encountered, unless improved by the Work completed or as specified by the Contract. Property used by the Contractor under letter of permission or property that has been damaged shall be restored pursuant to Section GP-7.11 and the applicable letter of

permission or to the satisfaction of the property owner without any cost or expense to the County.

(h) No arrangements will be made by the County for rights-of-way or rights of access beyond those shown in the Contract Documents. Any and all expense or costs relative to additional rights-of-way, rights of ingress and egress, or any other supplemental property rights beyond those described in the Contract Documents are considered to have been accounted for in the Bid.

GP-SECTION 8
PROSECUTION AND PROGRESS

GP-8.01 SUBCONTRACTING

(a) **Utilities and/or Highways Contracts.** Except as may be provided elsewhere in the Contract, the Contractor to whom a utilities and/or Highways Contract is Awarded shall perform with its own organization and with the assistance of workmen under the Contractor's immediate supervision, Work of a value of not less than fifty percent (50%) of the total Bid value of the Contract. The Director may permit the Contractor to sublet or Subcontract Work in excess of the fifty percent (50%) limitation where it is determined by the Engineer that the best interest of the County will be promoted thereby. The execution of Work by a subsidiary of the Contractor is not considered to be Work performed by the Contractor under this Section GP-8.01(a). The Contractor shall not assign any monies due or to become due to the Contractor hereunder, without the previous written consent of the County.

The Engineer's consent to Subcontract shall not be construed to relieve the Contractor or its Surety of any responsibility for the fulfillment of all the requirements of the Contract.

Unless required by the County pursuant to Section GP-8.01(e) or unless specified in the Contract Documents, Subcontractors undertaking a portion of Work under a utilities or Highways Contract in accordance with Section GP-8.01(a) (less than fifty percent (50%) of the Bid value) do not require Department approval.

When required, the Contractor shall give assurance that the minimum wage for labor, as specified in the Contract Documents, shall apply to labor performed on all Work sublet, subcontracted, assigned or otherwise disposed of in any way under a utilities or Highway Contract.

(b) **Buildings Contracts.** Except as may be provided elsewhere in the Contract, the contractor to whom a buildings Contract is Awarded shall perform with its own organization, and with the assistance of workmen under the Contractor's immediate supervision and with Materials directly purchased and paid for by the Contractor, Work of a value of not less than ten percent (10%) of the total Bid value of the Contract. Costs

for insurance, overhead, and supervisions may not be claimed as a portion of the ten percent (10%) or more of the Work. The execution of Work by a subsidiary of the Contractor is not considered to be Work performed by the Contractor under this Section GP-8.01(b). The Contractor shall not assign any monies due or to become due to the Contractor hereunder, without the previous written consent of the County.

The Engineer's consent to Subcontract shall not be construed to relieve the Contractor or its Surety of any responsibility for the fulfillment of all the requirements of the Contract.

Unless required by the County pursuant to Section GP-8.01(e) or unless specified in the Contract Documents, Subcontractors undertaking a portion of Work under a building Contract in accordance with Section GP-8.01(b) (less than ten percent (10%) of the Bid value) do not require Department approval.

When required, the Contractor shall give assurance that the minimum wage for labor, as specified in the Contract Documents, shall apply to labor performed on all Work sublet, subcontracted, assigned or otherwise disposed of in any way under a building Contract.

(c) **All Contracts.** The Contractor shall not assign any of its obligations, responsibilities, or liabilities under any portion of the Contract except with the express prior written consent of the Engineer. Any assignment of any of the Contractor's obligations responsibilities, or liabilities under any part of the Contract without the express prior written consent of the Engineer shall be null and void. Along with any applicable legal documentation to be signed by all applicable parties, any approved assignee must provide the County with (1) an executed Contract specifying the Contract Items and dollar volume of the Work to be performed by the assignee, (2) a Payment Bond and a Performance Bond as required pursuant to Section GP-3.03, and (3) a certificate of insurance as required pursuant to Section GP-7.14.

(d) **All Contracts.** For **purposes of documentation and the County's file**, the Contractor shall provide the County with Written Notice of all Subcontractors' names, and the amount or percent of the Bid value of the Contract and/or the Contract to be performed by each named Subcontractor, at or before time of Notice to Proceed.

(e) **All Contracts.** At any time after the County's issuance of the Bid Package, the County expressly reserves the right, for **purposes of County approval and/or rejection**, to require the Contractor to provide the County with Written Notice of all Subcontractors' names, and the amount or percent of the Contract to be performed by each named Subcontractor, and the names for such material men, suppliers, and others as the Engineer may direct, within ten (10) Business Days upon request by the County therefore. The Engineer shall review the Contractor's Written Notice under this Section GP-8.01(e) in a timely manner and inform the Contractor in writing of those Subcontractors approved by the Engineer for use on the Contract. If any Subcontractor is rejected in writing by the Engineer, such Subcontractor shall not work on the Contract Work. Prior to any Engineer approval, the Engineer may request the Contractor and any Subcontractor to meet additional criteria as specified by the Engineer in writing or in a Contract Modification.

If the County requests Written Notice under this Section GP-8.01(e), the Contractor shall employ only those Subcontractors as may be approved in writing by the Engineer. No substitutions or further Subcontracting shall be employed by the Contractor without prior written approval from the Engineer. Approved Subcontractors shall not Subcontract principal or important parts of their Work, as determined in the County's sole discretion, without the Engineer's prior written approval.

The Engineer's approval of a Subcontractor under this Section GP-8.01(e) is only for Work to be prosecuted under the Contract and said approval is not applicable to any other contract with the County.

The Engineer reserves the express right to revoke approval of any Subcontractor for that Subcontractor's breach of any Contract provision, including, but not limited to, Section GP-8.06.

The Contractor agrees to be fully responsible to the County for the acts and omissions of its employees, Subcontractors and, of Persons either directly or indirectly employed by Contractor, and their respective employees and agents. The Contractor shall not assign this responsibility to any Person, except as provided in Section GP-8.01(c).

The Contractor shall incorporate by reference or otherwise include these General Provisions in every Subcontract issued pursuant to or under this Contract, and shall require that the same reference or inclusion be contained in every Subcontract entered into by any of its Subcontractors, at any tier.

(f) **All Contracts.** The Contractor agrees to bind every Subcontractor and every Subcontractor agrees to be bound by the terms of the Contract, the Standard Specifications, the Standard Details, the Special Provisions, the Contract Drawings and the Contract Documents, as far as applicable, to the Work.

The Subcontractor agrees to be bound to the Contractor by the terms of the Contract, the Standard Specifications, the Standard Details, the Special Provisions, the Contract Drawings and the Contract Documents and to assume towards the Contractor all obligations and responsibilities that the Contractor, by those documents, assumes towards the County.

The Contractor agrees to be bound to the Subcontractor by all the obligations the County assumes to the Contractor under the Contracts, the Standard Specifications, the Standard Details, the Special Provisions, the Contract Drawings, and the Contract Documents and by all the provisions thereof affording remedies and redress to the Contractor from the County.

(g) **All Contracts.** The Contractor shall pay its Subcontractors:

(1) Upon receipt of payment, as described in Section GP-9.03, the amount allowed to the Contractor on account of that Subcontractor's Work, to the extent of that Subcontractor's interest herein.

(2) Upon the receipt of payment, if issued otherwise than as described in Section GP-9.03, so that at all times the total payments shall be as large in proportion to the value of the Work done by the Contractor as the total amount certified to the Contractor is to the value of the Work done by that Subcontractor.

(3) To such extent as may be provided by the Contract Documents or any related Subcontracting documents, if either of these provides for earlier or larger payments than described in Sections GP-8.01(g)(1) and (2).

(4) On demand for that Subcontractor's Work or Materials as far as executed and fixed in place, less the retained percentage, at the time the payment is requested, even though the Engineer fails to approve it for any cause not the fault of that Subcontractor.

(5) To give that Subcontractor an opportunity to be present and to submit evidence in any manner involving that Subcontractor's rights under the Contract.

The Contractor and the Subcontractor agree that nothing in this Section GP-8.01(g) shall create any obligation on the part of the County to pay any Subcontractor or to see to the payment of any sums to any Subcontractor. County has no obligation or liability of any kind, nature or amount to any Subcontractor. Nothing contained in the Contract, or any related Subcontracting documents, shall create any contractual relationship between any Subcontractor, materialman, supplier, and/or other party and the County.

GP-8.02 NOTICE TO PROCEED

(a) Unless otherwise stated in the Contract Documents, upon execution of the Contract and within ninety (90) Calendar Days from the date of Award, the Department's Division of Construction Contracts Administration will issue to the Contractor a "Notice to Proceed" and this notice will stipulate when the Contractor is expected to begin Work. The specified Contract Time shall begin on the date stipulated in the Notice to Proceed or, if an earlier start is authorized in the Notice to Proceed, on the Day Work (other than the erection of the inspection office, Construction stakeouts and mobilization) actually starts. Work done prior to receipt of the Notice to Proceed is unauthorized and will not be measured or paid for.

(b) If the County is unable to issue the Notice to Proceed within ninety (90) Calendar Days from the Award of the Contract, and the County has not yet executed the Contract, the Contractor may request that the County rescind the Notice to Proceed, it being mutually understood that in such instance and upon such rescission, the County shall have no further obligation or liability to Contractor of any nature, kind or amount. If the County

is unable to issue the Notice to Proceed within ninety (90) Calendar Days from the Award of the Contract, and the Contract was executed by the Contractor and the County, the Contractor may request that the County rescind the Contract, it being mutually understood that in such instance and upon such rescission, the County's obligations and liabilities shall be limited to the net documented cost of Materials actually fabricated and/or delivered to the Work site of the Contract preauthorized in writing by the Engineer. The County's remedies shall be in accordance with the Contract Documents, at law and/or in equity.

(c) The County has no obligation or duty to remit payment for any Materials prior to the County's execution of the Contract. Any Material paid for by the County after a notice of Award will become the property of the County.

(d) **Emergency Roster.** Each successful Contractor must furnish the Engineer with the names, addresses and telephone numbers of at least two (2) members of the Contractor's organization who may be contacted in an emergency.

GP-8.03 PROSECUTION OF THE WORK/DETERMINATION & EXTENSION OF CONTRACT TIME

(a) The Contractor shall begin Work promptly within the time specified by the Engineer in the Notice to Proceed and shall notify the Engineer at least forty-eight (48) hours before starting Work. The Contractor shall complete the Work and achieve Full and Final Completion within the number of Working Days, Calendar Days or Calendar Date, as specified in the Contract.

The Engineer will make available to the Contractor each week a record showing the number of Days charged to the Contract for the preceding week. The Contractor will be allowed one week in which to protest and thirty (30) Days in which to file a written statement, setting forth in what respects time charges are incorrect.

(b) If Full and Final Completion of the Contract, including all extensions and increases authorized under Section GP-4.04 and changes specified in the General Provisions and Interim Supplemental Specifications, requires the performance of Work in greater quantities than specified in the Contract, as determined by the Engineer, the Contract Time allowed for Contract performance may be adjusted based on the quantities, cost and the nature of the Work involved.

(c) The Contractor, under certain conditions, may be granted permission or ordered to suspend operations as defined in Section GP-8.07 "Suspension of Work". On a Working Day Contract, if the Contractor elects and is permitted by the Engineer to do any Work during a suspension period, the Working Days charged shall be based on the "daily value" of the Contract, which shall be calculated as the Bid price of the Contract divided by the number of Working Days allowed by the Contract Time. At the end of each month during any suspension period, the amount of money earned for that month will be divided

by the "daily value" (as defined above) to determine the number of Working Days to be charged for that month (number of Working Days to be rounded down). However, the resultant number of Working Days to be charged for any particular month will never exceed the number of Calendar Days for that month, excluding Saturdays, Sundays or Holidays on which no Work was performed by the Contractor on a Pay Item and/or a Controlling Operation.

Time used in performing Work of an emergency nature ordered by the Engineer for the convenience of the traveling public or for the production or delivery of Materials for storage, if performed during the period of suspension, will not be charged against the Contract Time.

(d) Following the date on which Partial Acceptance for Maintenance has been achieved for all Work, except those landscaping Contract Items on which Work is restricted to specified seasons and when inspection and Final Acceptance for Maintenance is being deferred pending completion of those landscaping Contract Items because such Work is currently out of season, and for no other reason, no time will be charged against the Contractor until such time as it is again permissible to proceed with such landscaping Work. However, time will be charged during any extensions of the specified season documented by the County and which may be granted the Contractor.

(e) **Prosecution of the Work shall not be discontinued without the prior written approval of the Engineer.** After the Work has started, the Contractor shall prosecute the Work continuously within the Contract Time without stoppage until Final Acceptance for Maintenance of all Contract Work is achieved **and** the Contractor achieves Full and Final Completion.

(f) Should the prosecution of the Work for any reason be discontinued without the prior written approval of the Engineer, the Contractor shall immediately notify the Engineer in writing of Contractor's intention to stop and the County may exercise any and all rights pursuant to the Contract, at law and/or equity.

GP-8.04 PROGRESS SCHEDULE REQUIREMENTS

(a) General.

(1) Scheduling of Construction is the responsibility of the Contractor. The Contractor must take all reasonable action to avoid or to mitigate the effects of delays including, but not limited to, rescheduling or resequencing the Work, accepting other work, and reassigning personnel. When the Contractor is responsible for any delays, the County may order the Contractor to accelerate Construction, work overtime, add additional shifts or manpower, work on weekends, or to do anything else reasonably necessary to achieve Full and Final Completion of the Work within the Contract Time, at no additional cost to the County.

(2) The Contractor shall submit to the County for review and approval a baseline schedule, monthly progress schedules, and any required recovery schedules as outlined in this Section GP-8.04.

(3) Failure of the Contractor to comply with the requirements of this Section GP-8.04 shall be grounds for determination by the County that the Contractor is not prosecuting the Work with due diligence as to ensure Full and Final Completion of the Work within the Contract Time specified in the Contract Documents or as agreed upon with the County after execution of the Contract. Based on this determination, the County may terminate the Contractor's right to proceed with the Work, or any separable part thereof, in accordance with Section GP-8.08 of these Standard Specifications.

(4) The Contractor does not have the unilateral right to complete the Work late and to then pay liquidated or other damages as a proposed remedy to this lateness.

(b) Baseline Schedule.

(1) Within thirty (30) Days after the Award of the Contract, the Contractor shall submit to the Department a detailed baseline schedule indicating the time allocated by the Contractor for performance of each portion of the Work. The baseline schedule shall show commencement of Work from the date the Notice to Proceed is issued. The baseline schedule shall show Full and Final Completion of the Work within the Contract Time as specified in the Contract or as mutually agreed upon with the County in writing pursuant to a Contract Modification after execution of the Contract.

(2) The submitted baseline schedule shall be properly and reasonably sequenced to show the order of performing the various tasks of Work. The baseline schedule shall clearly identify the sequencing restraints and the critical activities necessary to complete the Work and achieve Full and Final Completion of the Work within the Contract Time, and shall list proposed Work Days, Holidays and any special non-Work Days.

(3) The submitted baseline schedule shall list the dollar value for each Contract Item and shall show the Contractor's labor requirements for achieving each Contract Item. The baseline schedule shall also include a list of submittals related to Material and Equipment fabrication orders, permits, Easements and any other Work tasks requiring submittals. Each necessary submittal shall be shown on the baseline schedule as a separate Work activity with necessary dates of submittal, anticipated review and response time, anticipated dates of re-submittal if necessary, and anticipated dates for final review and approval.

(4) Within fourteen (14) Calendar Days after the Engineer reviews and rejects or conditionally approves the submitted baseline schedule, the Contractor shall make all necessary corrections and resubmit the corrected baseline schedule. The

County may decline to issue a Notice to Proceed until the Contractor submits the required baseline schedule in form and content acceptable to the County in the County's sole discretion.

(c) Monthly Progress Schedules.

(1) Within thirty (30) Days after the County issues Notice to Proceed, and on a monthly basis thereafter, the Contractor shall submit a monthly progress schedule accurately updated to reflect Contract Work performed to date since the previously submitted monthly progress schedule including, but not limited to, actual commencement dates of listed Work activities, actual Work activities completed to date, and any sequence changes made or planned for the order of Work activities and their effect on the critical path for Full and Final Completion of the Contract. The sequencing changes shall show extension of times granted in a Contract Modification by the County and any delays or early completion of Work activities.

(2) The Contractor shall, and it is the Contractor's obligation to, meet with the Engineer, or his designee, at least once a month to discuss in detail the Contractor's updating of the monthly progress schedule and the necessity for revision or correction in the monthly progress schedule.

(3) Within ten (10) Calendar Days after the County reviews and rejects or conditionally approves the submitted monthly progress schedule, the Contractor shall make all necessary corrections and resubmit the corrected monthly progress schedule in form and content acceptable to the County in the County's sole discretion.

(4) The Contractor shall submit the required monthly progress schedule whether or not the Contractor submits an application for payment each month. The County may decline to process any pending payment requests under the Contract unless and until the Contractor submits the required monthly progress schedule in form and content acceptable to the County, in the County's sole discretion, and the Engineer approves such schedule in writing.

(d) Recovery Schedules.

(1) At all times during the Contract term, within ten (10) Calendar Days after the Contractor falls behind a baseline schedule or a monthly progress schedule, or is alleged by the County to be behind a baseline schedule or a monthly progress schedule, the Contractor shall furnish to the County, at no additional cost, a recovery schedule. The recovery schedule shall show how the Contractor will finish the Contract Work and achieve Full and Final Completion by the Contract Date.

(2) The recovery schedule shall include all of the information required under Section GP-8.04(c).

(e) Logical Sequencing and Layout of the Submitted Schedules (CPM Schedules).

(1) Unless the Contract Documents expressly permit the Contractor to use a type of schedule other than a Critical Path Method (CPM) schedule, the submitted baseline schedule, the monthly progress schedules, and any required recovery schedules shall all be CPM schedules.

(2) CPM schedules are required to assure and to monitor the Contractor's adequate planning and execution of the Work and to assist in the County's evaluation of the Contractor's progress of the Work and the impact on the Completion Date.

(3) The submitted CPM schedules shall clearly designate the dates of Final Acceptance for Maintenance and Full and Final Completion of the Contract Work. **THE CONTRACTOR'S ACHIEVEMENT OF FINAL ACCEPTANCE FOR MAINTENANCE DOES NOT RELIEVE THE CONTRACTOR OF ANY OBLIGATION OR RESPONSIBILITY TO ACHIEVE FULL AND FINAL COMPLETION OF ALL CONTRACT WORK BY THE COMPLETION DATE.**

(4) As part of the CPM schedule format, the Contractor shall include logic or network diagrams showing the order and interdependence of activities and the sequence in which Work is to be accomplished as planned by the Contractor. These diagrams must show how the start of a given activity is dependent on preceding activities and how its completion restricts the start of the following activities.

(5) At a minimum, the following information shall be furnished for each Work activity in any and all schedules provided under this Section GP-8.04:

- **i.** Activity number
- **ii.** Description of activity
- **iii.** Activity numbers for any predecessor and successor activities
- **iv.** Relationships with preceding activities
- **v.** Activity duration in calendar days
- **vi.** Percent of activity completed
- **vii.** Early start date (by Calendar Date)
- **viii.** Early finish date (by Calendar Date)
- **ix.** Actual start date (by Calendar Date)
- **x.** Actual finish date (by Calendar Date)
- **xi.** Float or slack (by Calendar Date)

(6) The Contractor's monthly progress schedules and any required recovery schedules shall show the activities or portion of the activities completed during the reporting period and their total dollar value as basis for the Contractor's

periodic request for payment. For each activity, the update shall state the percentage of Work actually completed and the progress along the critical path in terms of Days ahead or behind the allowable dates.

(7) The Contractor's monthly progress schedules and any required recovery schedules shall include a comments section summarizing the updated analysis for the Contract Work as a whole, describing any and all problems with Work activities, and explaining proposed corrective actions.

(8) Approved Change Orders shall be reflected as new activities or as change in logic and/or time framing of existing activities. Approved Change Orders shall be shown on the Contractor's applicable updated schedule that immediately follows the Contractor's receipt of a Change Order approval from the County.

(9) The Contractor shall hold bi-weekly progress meetings, or more frequently if required by Engineer, at the Work site, at a time suitable to the Engineer, at which the progress of the Work shall be reported upon in detail with reference to all applicable schedules. Each interested Subcontractor shall be required to have present a competent representative to report the condition of the Subcontractor's portion of the Work and to receive instructions. Minutes of these progress meetings shall be taken by the Contractor who shall type them for distribution to members of the meeting, the Department's Division of Construction Contracts Administration, the Department's Bureau of Engineering and Construction, and other interested persons. These minutes shall be received by all parties prior to the next scheduled progress meeting and will be revised by the Contractor if not accurately describing events to date.

ANY AND ALL MINUTES FROM ANY PROGRESS MEETING ARE FOR INFORMATIONAL PURPOSES ONLY. THESE MINUTES ARE NOT INCORPORATED INTO THE CONTRACT DOCUMENTS AND ARE NOT LEGALLY BINDING UPON THE DEPARTMENT OR THE COUNTY.

(f) Form of Schedule Submittal.

All schedules including, but not limited to, the baseline schedule, the monthly progress schedules, and any required recovery schedules shall be submitted by the Contractor to the County in three (3) paper copies and one (1) copy on CD.

GP-8.05 LIMITATIONS OF OPERATION

The Contractor shall conduct the Work at all times in such a manner and in such sequence as will assure the least interference with the public.

Except as otherwise stated in the Contract Documents, no Work shall be done on Saturdays, Sundays, or Holidays without the prior written approval of the Engineer. Except for

emergencies, approval to Work on Saturdays, Sundays and Holidays shall be obtained forty-eight (48) hours in advance.

GP-8.06 CHARACTER OF WORKMEN, METHODS, AND EQUIPMENT

(a) The Contractor shall employ sufficient labor and Equipment for prosecuting the several and all classes of Work to achieve Full and Final Completion in the manner and time required by the Contract.

Workmen must have sufficient skill and experience to properly perform the Work assigned to them. All workmen engaged in special Work or skilled Work shall have sufficient experience in such Work and in the operation of the Equipment required to perform the Work properly and satisfactorily.

(b) Any person employed by the Contractor or by any Subcontractor who, in the opinion of the Engineer, does not perform his Work in a proper manner or is intemperate or disorderly shall, at the written request of the Engineer, be removed forthwith by the Contractor or Subcontractor employing such person, and shall not be employed again in any portion of the Work without the prior written approval of the Engineer.

Should the Contractor fail to remove such person or persons as required in this Section GP-8.06(b), or fail to furnish suitable and sufficient personnel for the proper prosecution of the Work, the Engineer may withhold estimates and/or monies which are or may become due on the Contract until a satisfactory understanding and resolution is reached in the County's sole discretion.

(c) Only persons thoroughly trained and skilled in the task assigned to them may be employed on any portion of the Work, or they shall be removed by the Contractor.

When County, State or federal laws require that certain persons (such as, by way of example, electricians, plumbers, etc.) be licensed, then all such persons employed on the Work shall be so licensed.

(d) The Contractor shall confine the operations of Contractor's employees and agents to the limits as provided by law, regulations, executive orders, ordinance, permits or directions of the Department. Generally, the "off-Road" area will be the same as the "limit of Contract" line.

(e) All workmanship shall be of good quality. Whenever the method or manner of the Work or manner of procedure is not specifically stated or shown in the Contract Documents, then it is intended and understood that the best standard practice shall be adhered to by the Contractor. Recommendations of the manufacturers of approved Materials shall be considered as a part of and incorporated into the Standard Specifications and all Materials shall be applied, installed, connected, erected, used, cleaned and conditioned as so called

for thereby. This, however, does not remove any requirement in Contract to add to the manufacturer's recommendations.

All Materials shall be accurately assembled, set, etc., and when so required in good Construction, shall be true to line, even, square, plumb, level and regularly spaced, coursed, etc. Under no circumstances, either in new or old Work, shall any Material be applied over another which has not been thoroughly cleaned, sanded or otherwise treated so as not to impair the finish, adhesion, or efficiency of the next applied item.

(f) Equipment to be used on the Work shall meet the requirements of the Work and produce a satisfactory quality of Work in accordance with the Contract. The Engineer may order the removal and require replacement of any unsatisfactory Equipment at the Engineer's sole discretion. When the methods and Equipment to be used by the Contractor in accomplishing the Construction are not prescribed in the Contract, the Contractor is free to use any methods or Equipment that Contractor demonstrates in advance to the satisfaction and written approval of the Engineer will accomplish the Contract Work in conformity with the requirements of the Contract.

When the Contract specifies that the Construction be performed by the use of certain methods and Equipment, such methods and Equipment shall be used unless others are pre-authorized by the Engineer in writing. If the Contractor desires to use a method or type of Equipment other than those specified in the Contract, the Contractor shall request authority from the Engineer to do so. The request shall be in writing and shall include a full description of the methods and Equipment proposed for use and an explanation of the reasons for Contractor desiring to make the change. If written pre-approval of the Engineer is given, it will be on the condition that the Contractor will be fully responsible for producing Construction Work in conformity with Contract requirements. If, after trial use of the substituted methods or Equipment, the Engineer determines that the Work produced does not meet Contract requirements, the Contractor shall promptly discontinue the use of the substituted method or Equipment and shall complete the remaining Construction with the specified methods and Equipment in accordance with the Contract. The Contractor shall remove the deficient Work and replace it with Work of specified quality, or take such other corrective action as the Engineer may direct. Any Change Order issued, if any, in accordance with this Section GP-8.06(f) shall not result in an increase in Contract price or Contract Time.

(g) All methods, procedures and results are subject to the Engineer's approval as to the finished result to be obtained. However, this is not to be interpreted as placing upon the Engineer any responsibility for the Work management that is solely the responsibility of the Contractor.

The Contractor shall at all times enforce strict discipline and good order among Contractor's employees and agents. The Contractor shall neither employ any unfit person nor shall the Contractor permit an unfit person to remain on the Work site. The Contractor shall enforce all instructions relative to use of water, heat, power, smoking, and shall control any use of fires, as required by law, regulation, and the Contract and by

the Department. Employees and agents of the Contractor shall not loiter on, near or about the Work site before or after work.

GP-8.07 SUSPENSION OF WORK

(a) The Engineer may unilaterally order the Contractor in writing to suspend the Work, wholly or in part, for such period or periods as Engineer may deem necessary, in the Engineer's sole discretion, for reasons including, but not limited to, unsuitable weather or such other conditions as are considered unfavorable for the proper prosecution of the Work, or for such time as is necessary because the Contractor has failed to carry out orders given or to perform any and all provisions of the Contract. If it should become necessary to stop Work for an indefinite period, the Contractor shall store all Materials in such manner that they will not obstruct or impede the traveling public unnecessarily or become damaged in any way, and the Contractor shall take every precaution to prevent damage or deterioration of the Work performed, provide suitable drainage by opening ditches, Shoulder drains, etc., and erect temporary Structures where necessary.

(b) If the performance of all or any part of the Work is for an unreasonable period of time, suspended, delayed, or interrupted by an act of the Engineer in the administration of this Contract, or by Engineer's failure to act within the time specified in this Contract (or if no time is specified, within a reasonable time), an adjustment shall be made for any increase in the cost of performance of this Contract (excluding profit) necessarily caused by an unreasonable suspension, delay, or interruption and a Contract Modification executed accordingly. However, no adjustment shall be made under this Section GP-8.07 for any suspension, delay, or interruption of the Work to the extent that performance would have been so suspended, delayed or interrupted by any other cause, including, but not limited to, the fault or negligence of the Contractor, including, but not limited to, Section GP-8.07(a) and (c), or for which an equitable adjustment is provided for or excluded under any other provisions of this Contract.

(c) The Engineer shall have the unilateral authority to suspend the Work, wholly or in part, due to the failure of the Contractor to correct conditions unsafe for the workers or the general public; for Contractor's failure to carry out the requirements of the Contract Documents; or as directed in conformance with the Contract Documents for conditions considered unsuitable for the prosecution of the Work.

(d) No claim under this General Provision shall be allowed:

(1) For any costs incurred more than twenty (20) Days before the Contractor shall have notified the Engineer in writing of the act or failure to act involved (but this requirement shall not apply as to a claim resulting from a suspension ordered by Engineer); and

(2) Unless the claim, in an amount stated, is asserted in writing as soon as practicable after the termination of a suspension, delay, or interruption, but not later than the date of final payment under the Contract.

(e) If the Contractor should neglect to prosecute the Work properly or fail to perform any provision of this Contract, the County after three (3) Days' Written Notice to the Contractor may, without prejudice to any other remedy, make good such deficiencies and/or perform the Contract or any portion thereof, as deemed applicable and appropriate by the County in its sole discretion, and may deduct the cost thereof from the payment then or thereafter due the Contractor.

GP-8.08 TERMINATION FOR DEFAULT - DAMAGES FOR DELAY - TIME EXTENSIONS

(a) If the Contractor refuses or fails to timely and properly prosecute the Work, in whole or in part, with such diligence as shall insure Full and Final Completion within the Contract Time, or breaches the terms of the Contract, termination for default, in whole or in part, shall be evidenced and the Department may, by Written Notice to the Contractor, terminate the Contract and the Contractor's right to proceed with the Work, in whole or in part, in accordance with this Section GP-8.08.

(b) The Department, upon proof that sufficient cause exists to satisfy such action, in the County's discretion, may without prejudice to any other right or remedy, terminate the Contract for default, in whole or in part. Termination for default, in whole or in part, shall be evidenced and documented by Written Notice by the County to the Contractor and said termination for default shall be effective on the date set forth in such Written Notice. Upon a termination for default the County may take over the Work and take possession of the Work and of all Materials, tools, Equipment and plant thereon and prosecute the same to completion, by contract, by whatever method may be deemed expedient, or otherwise, and may take possession of and utilize in completing the Work, the Materials, Equipment, and plant as may be on the site of the Work and necessary therefore. Whether or not the Contractor's right to proceed with the Work is terminated for default, the Contractor and its Sureties shall be liable for any damage to the County resulting from the Contractor's refusal or failure to achieve Full and Final Completion of the Work within the Contract Time and/or the Contractor's breach of the Contract Documents.

The County may appropriate or use any or all Materials and Equipment intended to be incorporated in the Contract as may be suitable and acceptable and may enter into an agreement for the completion of said Contract according to the terms and provisions thereof, or use such other methods as in the County's determination shall be required for the completion of said Contract in a manner acceptable to the County.

(c) Examples of sufficient cause to terminate for default include, but are not limited to, cases where the Contractor should:

(1) Be adjudged a bankrupt or make a general assignment for the benefit of creditors,

(2) Have a receiver appointed on account of insolvency,

(3) Fail to or refuse to supply properly skilled persons or proper Materials, Equipment except in cases for which extension of time is provided by the County,

(4) Fail to make payment to a Subcontractor, materialmen, supplier, and/or other persons.

(5) Fail to comply with any law, regulation, executive order, ordinance, or persistently disregarded the instructions of the Engineer, or

(6) Breach any material representation, warranty, covenant, condition, obligation, or provision of the Contract.

(d) If the County terminates for default of the Contract under this Section GP-8.08, the Contractor shall not be entitled to receive any further payment until the Contract Work is finished and, even then, only if the unpaid balance of the Contract price shall exceed the expenses of finishing the Work, including compensation for additional managerial and administrative services, shall such excess be paid to the Contractor. If such expenses shall exceed such unpaid balance, the Contractor shall pay the difference to the County. The expenses incurred by the County as herein provided, and the damage incurred by the County as herein provided, and the damage incurred through the Contractor's default, shall be itemized by the Engineer and a certified copy supplied to the Contractor.

(e) The Contractor's right to proceed may not be terminated for default and the Contractor shall not be charged with resulting damages if:

(1) The delay in the completion of the Work arises solely from unforeseeable causes beyond the control and without the act, omission, fault or negligence of the Contractor including, but not restricted to, acts of God, acts of the public enemy, acts of the County in either its sovereign or contractual capacity, acts of another contractor in the performance of a contract with the County, fires, floods, epidemics, quarantine, restrictions, strikes, freight embargoes, unusually severe weather, or delays of Subcontractors or supplies arising solely from unforeseeable causes beyond the control and without the act, omission, fault or negligence of either the Contractor and/or the Subcontractors, suppliers or materialmen; and

(2) The Contractor, within ten (10) Days from the beginning of any such delay (unless the Engineer grants a further period of time before the date of final payment under the Contract), notifies the Engineer in writing of the causes of delay. The Engineer shall ascertain the facts and the extent of the delay and extend the Contract Time for completing the Work when, in the Engineer's judgment, the findings of fact justify such an extension, and the Engineer's

findings of fact shall be final and conclusive on the parties, subject only to appeal as provided in the Section GP-5.15 "Disputes".

(f) If, after notice of termination for default of the Contract and the Contractor's right to proceed under these General Provisions, it is determined for any reason that the Contractor was not in default under the provisions of the Contract, or that the delay was excusable under the provisions of the Contract, the rights and obligations of the parties shall be the same as if the notice of termination had been issued pursuant to Section GP-8.10.

(g) The rights and remedies of the County provided in this Section GP-8.08 are in addition to any other rights and remedies provided by law, equity and/or under this Contract.

(h) As used in Section GP-8.08, the term Subcontractors, materialmen, or suppliers means Subcontractors, materialmen or suppliers at any tier.

GP-8.09 LIQUIDATED DAMAGES

TIME IS AN ESSENTIAL ELEMENT OF THE CONTRACT AND IT IS IMPORTANT THAT THE WORK BE VIGOROUSLY PROSECUTED UNTIL FULL AND FINAL COMPLETION OF THE CONTRACT.

FOR EACH DAY THAT FULL AND FINAL COMPLETION REMAINS UNACHIEVED BEYOND THE CONTRACT TIME, THE CONTRACTOR AND/OR ITS SURETY SHALL BE LIABLE FOR LIQUIDATED DAMAGES IN THE AMOUNT PROVIDED FOR IN THE CONTRACT.

(a) ALL ADDITIONAL COSTS AND CHARGES INCURRED BY THE COUNTY, INCLUDING, BUT NOT LIMITED TO, ANY AND ALL DAMAGE TO PERSONS OR PROPERTY, THE COST OF COMPLETING THE WORK UNDER THE CONTRACT, SHALL BE DEDUCTED FROM ANY MONIES DUE OR WHICH MAY BECOME DUE TO CONTRACTOR. IF THE EXPENSE SO INCURRED BY THE COUNTY IS LESS THAN THE SUM WHICH WOULD HAVE BEEN PAYABLE UNDER THE CONTRACT IF IT HAD BEEN COMPLETED BY SAID CONTRACTOR, THE SAID CONTRACTOR SHALL BE ENTITLED TO RECEIVE THE DIFFERENCE, AND IF SUCH EXPENSE EXCEEDS THE SUM WHICH WOULD HAVE BEEN PAYABLE UNDER THE CONTRACT, THE CONTRACTOR AND THE SURETY SHALL BE LIABLE AND SHALL PAY TO THE COUNTY THE AMOUNT OF SAID EXCESS.

(b) IF FIXED AND AGREED LIQUIDATED DAMAGES ARE PROVIDED IN THE CONTRACT AND IF THE COUNTY SO TERMINATES THE CONTRACT, AND ACCORDINGLY THE CONTRACTOR'S RIGHT TO PROCEED, THE RESULTING DAMAGE SHALL CONSIST OF SUCH LIQUIDATED DAMAGES FOR THE REASONABLE TIME REQUIRED FOR FULL AND FINAL COMPLETION OF THE

WORK TOGETHER WITH ANY INCREASED COSTS AND EXPENSES INCURRED BY THE COUNTY IN COMPLETING THE WORK.

(c) IF FIXED AND AGREED LIQUIDATED DAMAGES ARE PROVIDED IN THE CONTRACT AND IF THE COUNTY DOES NOT SO TERMINATE THE CONTRACTOR'S RIGHT TO PROCEED, THE RESULTING DAMAGE SHALL CONSIST OF THESE LIQUIDATED DAMAGES UNTIL FULL AND FINAL COMPLETION IS ACHIEVED.

(d) INTEREST SHALL ACCRUE UPON ALL DAMAGES, LIQUIDATED OR OTHERWISE, AT THE STATUTORY RATE OF INTEREST PROVIDED PURSUANT TO THE MARYLAND CONSTITUTION AND THE MARYLAND CODE, AS APPLICABLE AND AS AMENDED.

GP-8.10 TERMINATION FOR CONVENIENCE OF THE COUNTY

(a) The performance of Work under this Contract may be terminated for convenience by the County, in whole, or in part, whenever the Engineer shall determine that such termination for convenience is in the best interest of the County. Any such termination for convenience shall be effected by Engineer's delivery to the Contractor of a Written Notice of termination for convenience specifying the extent to which performance of Work under the Contract is terminated, and the date upon which such termination becomes effective.

(b) After receipt of notice of termination for convenience, and except as otherwise directed by the Engineer, the Contractor shall:

(1) Stop Work under the Contract on the date and to the extent specified in the Written Notice of termination for convenience;

(2) Place no further orders or Subcontracts for Materials, supplies, Equipment, services or facilities, except as may be necessary for completion of the portion of the Work under the Contract that is not terminated for convenience;

(3) Terminate all orders and Subcontracts to the extent that they relate to the performance of Work terminated by notice of termination for convenience;

(4) Assign to the County in the manner, at the times, and to the extent directed by the Engineer, all of the right, title, and interest of the Contractor under the orders and Subcontracts, in which case the County shall have the right, in its discretion, to settle or pay any or all claims arising out of such orders and Subcontracts, or assume said orders and subcontracts, or do otherwise, as deemed appropriate in the sole discretion of the County;

(5) Settle all outstanding liabilities and all claims arising out of the termination of orders and Subcontracts, with the approval or ratification of the Engineer, to the extent he may require, which approval or ratification shall be final for all the purposes of this Section GP-8.10;

(6) Transfer title and deliver to the County, in the manner, at the times and to the extent, if any, directed by the Engineer, (a) the fabricated or unfabricated parts, Work in process, completed Work, supplies, and other Material produced as a part of, or acquired in connection with the performance of the Work terminated for convenience by the Written Notice of termination for convenience, and (b) as applicable, the completed or partially completed Plans, Contract Drawings, As-Built Drawings, operation and maintenance manuals, warranty certificates, information, and other property which, if the Contract had been completed, would have been required to be furnished to the County;

(7) Use its best effort to sell, in the manner, at the times, to the extent, and at the price or prices directed or authorized by the Engineer, any property of the types referred to in (6) above; provided, however, that the Contractor (a) may not be required to extend credit to any purchaser, and (b) may acquire any such property under the conditions prescribed by and at a price or prices approved by the Engineer; and provided further that the proceeds of any such transfer or disposition shall be applied in reduction of any payments to be made by the County to the Contractor under this Contract or shall otherwise be credited to the price or cost of the Work covered by this Contract or paid in such other manner as the Engineer may direct;

(8) Complete performance of such part of the Work as may not have been terminated by the Written Notice of termination for convenience; and

(9) Take any action that may be necessary, or as the Engineer may direct, for the protection and preservation of the property related to this Contract which is in the possession of the Contractor and in which the County has or may acquire an interest. The Contractor shall submit to the Engineer a list, with Certification as to quantity and quality, of any or all items of inventory not previously disposed of, exclusive of items the disposition of which has been directed or authorized by the Engineer, and may request the County to remove such items or enter into a storage agreement covering them. Not later than fifteen (15) Days thereafter, the County shall accept title to such items and remove them or enter into a storage agreement covering the same; provided, that the list submitted shall be subject to verification by the Engineer upon removal of the items, or if the items are stored, within forty-five (45) Days from the date of submission of the list, and any necessary adjustment to correct the list as submitted shall be made prior to final settlement.

(c) After receipt of a Written Notice of termination for convenience, the Contractor shall submit to the Engineer his termination for convenience claim, in the written form and with Certification prescribed by the Engineer. This claim shall be submitted promptly in

accordance with Sections GP-5.14 and GP-5.15 of these Standard Specifications, unless an extension is granted in writing by the Engineer, upon timely request of the Contractor in writing.

(d) Subject to this Section GP-8.10 (c), the Contractor and the Engineer may agree upon the whole or any part of the amount or amounts to be paid to the Contractor by reason of the total or partial termination for convenience of Work pursuant to this Section GP-8.10, which amount or amounts may include a reasonable allowance for profit on Work done; provided, that such agreed amount or amounts, exclusive of settlement costs, shall not exceed the total Contract price as reduced by the amount of payments otherwise made and as further reduced by the Contract price of Work not terminated for convenience. If the parties so agree, the Contract shall be amended with a Contract Modification, and the Contractor shall be paid the amount specified therein.

(e) In the event of the failure of the Contractor and the Engineer to agree as provided in Section GP-8.10 (d), upon any amount to be paid to the Contractor by reason of the termination for convenience of Work pursuant to this General Provision, the Engineer shall pay to the Contractor the amounts determined by the Engineer as follows, but without duplication of any amounts agreed upon in accordance with Section GP-8.10 (d):

(1) For completed supplies or services accepted by the County (or sold or acquired as provided in Section GP-8.10 (b)(7) above) and for which payment has not theretofore been made, a sum equivalent to the aggregate price for the supplies or services computed in accordance with the price or prices specified in the Contract, appropriately adjusted for any saving of freight or other charges;

(2) The total of:

(a) The costs incurred in the performance of the Work terminated for convenience, including initial costs and preparatory expense allocable thereto, but exclusive of any costs attributable to supplies or services paid or to be paid for under Section GP-8.10 (e)(1) hereof; and

(b) The cost of settling and paying claims arising out of the termination of Work under Subcontracts or orders, as provided in Section GP-8.10 (b)(5) above, which are properly chargeable to the termination for convenience portion of the Contract (exclusive of amounts paid or payable on account of supplies or Materials delivered or services furnished by Subcontractors or vendors before the effective date of the Written Notice of termination for convenience, which amounts shall be included in the costs payable under Section GP-8.10 (e)(2)(a); and

(c) A sum, as profit on Section GP-8.10 (e)(2)(a), determined by the Engineer to be fair and reasonable; provided, however, that if it appears that the Contractor would have sustained a loss on the entire Contract had it been completed, no profit shall be included or allowed under this Section GP-

8.10 (e)(2)(c) and an appropriate adjustment shall be made reducing the amount of the settlement to reflect the indicated rate of loss; and

(d) The reasonable cost of settlement accounting, legal, clerical, and other expenses reasonably necessary for the preparation of settlement claims and supporting data with respect to the terminated portion of the Contract and for the termination and settlement of Subcontracts thereunder, together with reasonable storage, transportation, and other costs incurred in connection with the protection or disposition of property allocable to this Contract.

The total sum to be paid to the Contractor under this Section GP-8.10 (e) shall not exceed the total Contract price as reduced by the amount of payments otherwise made and as further reduced by any Contract price of Work not terminated for convenience. Except for normal spoilage, and except to the extent that the County shall have otherwise expressly assumed the risk of loss, there shall be excluded from the amounts payable to the Contractor as provided in Section GP-8.10 (e), the fair value, as determined by the Engineer, of property that is destroyed, lost, stolen, or damaged so as to become undeliverable to the County or to a buyer pursuant to Section GP-8.10 (b)(7).

(f) The Contractor shall have the right of appeal, under Section GP-5.15 "Disputes", from any determination made by the Engineer under this Section GP-8.10, except that if the Contractor has failed to timely submit its claim within the time provided in this Section GP-8.10, and has failed to request extension of such time, Contractor shall have no such right of appeal. In any case where the Engineer has made a determination of the amount due under this Section GP-8.10, the County shall pay to the Contractor the following:

(1) If there is no right of appeal hereunder and/or if no timely appeal has been taken, the amount so determined by the Engineer; or,

(2) If an appeal has been taken, the amount finally determined on such appeal.

(g) In arriving at the amount due the Contractor under this Section GP-8.10 there shall be deducted:

(1) All unliquidated advance or other payments or account theretofore made to the Contractor, applicable to the terminated for convenience portion of this Contract;

(2) Any claim which the County may have against the Contractor in connection with this Contract; and

(3) The agreed price for, or the proceeds of sale of, any Materials, supplies, or other things acquired by the Contractor or sold, pursuant to the provisions of this Section GP-8.10, and not otherwise recovered by or credited to the County.

(h) If the termination for convenience hereunder be partial, the Contractor may file with the Engineer a written claim for an equitable adjustment in accordance with Sections GP-5.14 and GP-5.15 of the price or prices specified in the Contract relating to the continued portion of the Contract (the portion not terminated by the Written Notice of termination for convenience), and such equitable adjustment as may be agreed upon shall be made in such price or prices in a Contract Modification.

(i) The County may, from time to time, under such terms and conditions as it may prescribe, make partial payments and payments on account against costs incurred by the Contractor in connection with the terminated for convenience portion of this Contract whenever, in the opinion of the Engineer, the aggregate of such payments shall be within the amount to which the Contractor shall be entitled hereunder. If the total of such payments is in excess of the amount finally agreed or determined to be due under this General Provision Section 8.10, such excess shall be payable by the Contractor to the County upon demand, together with interest at the legal rate as prescribed by State law for the period from the date such excess payment is received by the Contractor to the date on which the excess is repaid to the County.

(j) Unless otherwise provided for in this Contract, or by applicable statute, the Contractor shall, from the effective date of termination for convenience until the expiration of three (3) years after final settlement under this Contract, preserve and make available to the County at all reasonable times at the office of the Contractor but without direct charge to the County, all Contractor's books, records, documents and other evidence bearing on the costs and expenses of the Contractor under this Contract and relating to the Work terminated for convenience hereunder, or, to the extent approved by the Engineer, photographs, microphotographs, or other authentic reproductions thereof. If the Contract involves the use of federal or State funds, Contractor shall retain records and documentation as required by Section GP-7.36.

GP-8.11 SUCCESSFUL TERMINATION OF CONTRACTOR'S RESPONSIBILITY

Full and Final Completion is the date upon which the County acknowledges in writing that the Contractor fully and finally completed all aspects of the Contract and the Contract Work, and met all terms, conditions and obligations of the Contract, as further described herein. Full and Final Completion of a Contract includes Final Acceptance for Maintenance of all Contract Work; the authorization of final payment by the County; the Contractor's and its Surety's compliance with all obligations under the Contract; the submission of all Plans, Contract Drawings, As-Built Drawings (as described below), operation and maintenance manuals, and warranty certificates; the completion of all punch list Work; and final payment by the County to the Contractor.

The Contractor shall, as the Work progresses, neatly record on a set of final signed and sealed As-Built Drawings the Work as actually constructed by the Contractor and reflecting all Working Drawings including, but not limited to, any changes and all revisions to the Work made during the course of the Contract wherever it differs from the Contract Documents. Upon Final Acceptance for Maintenance of the Work, the Contractor shall turn over the As-Built Drawings

to the County. No Full and Final Completion of the Contract by the County may occur until these As-Built Drawings are submitted to and approved by the County.

GP-8.12 CONTRACTOR'S RESPONSIBILITY TO PROVIDE PROJECT DOCUMENTATION

For all Public Works' project identified in the Proposal as either Cost Group H, I, J, K, or L, the Contractor shall provide and maintain a secure, online system for exchanging, reviewing, and archiving construction project documentation including, but not limited to: shop drawing submittals, Requests for Information, Requests for Proposals, proposed change orders, meeting minutes, project schedule updates, punch list status updates, and test reports. The Contractor shall submit the proposed online project documentation system to the County for approval. The Contractor agrees to store and process the project documentation only in the continental United States. The Contractor shall store all of the project documentation in a physically and logically secure environment that protects it from unauthorized access, loss, alteration, disclosure, modification, theft, misuse, and destruction. The Contractor shall maintain an adequate level of data security controls to ensure compliance with the requirements of the Contract or any protective order, or confidentiality agreement signed by the Contractor. No Personal, Private or Confidential information can be stored on this site.

The online project documentation system shall be available to the Owner, Engineer, and their designees beginning three (3) weeks following Notice To Proceed and continuing uninterrupted until the time of Final Acceptance for Maintenance of the Work, and shall be updated by the Contractor on a weekly basis. Upon Final Acceptance for Maintenance of the Work, the Contractor shall return all project documentation, in a format acceptable to the County. No full and Final Completion of the Contract by the County shall be deemed to have occurred until the documentation and its contents are submitted and approved by the County.

Private contracts, UA and/or RA, are exempt from the requirements of this Section.

GP-SECTION 9
PAYMENT

GP-9.01 SCOPE OF PAYMENT

(a) Payments to the Contractor will be made for the actual quantities of Contract Items performed in accordance with the Plans and Contract Documents and if, upon completion of the Construction and the Work, these actual quantities show either an increase or decrease from the quantities given in any Contract schedule, the Contract unit prices will still prevail, except as provided in Section GP-4.04 "Variations in Estimated Quantities", or in a Contract Modification.

(b) Except as may otherwise be provided herein, the Contractor shall accept the compensation as provided by the Engineer under this GP-Section 9:

(1) In full payment for furnishing all Materials, lab, tools, and Equipment and any incidentals necessary to the completed Work and for performing all Work contemplated and embraced under the Contract;

(2) For all loss or damage arising from the nature of the Work, or from the action of the elements, or from any other unforeseen difficulties which may be encountered during the prosecution of the Work until Full and Final Completion of the Contract;

(3) For all risks of every description connected with the prosecution of the Work; and

(4) For all expenses incurred in consequence of suspension of the Work, if any, as herein authorized by the County.

(c) Where provisions in the Contract Documents relating to any unit price for a Contract Item require that the said unit price cover, and be considered, compensation for certain Work or Material essential to that Contract Item, this same Work or Material shall not also be measured or paid for under any other Contract Item which may appear elsewhere in the Contract Documents.

(d) The payment of any partial estimate or of any retained percentage by the County, in no way shall affect the obligation of the Contractor to Repair or renew any defective parts of the Construction and/or Work or to be responsible for all damages due to such defects.

(e) Payment to the Contractor under this section for Materials on hand in no way will be construed as acceptance by the Administration of title to the Material. Title shall remain with the Contractor until Final Acceptance for Maintenance of the Contract Work in accordance with Section GP-5.13.

The Contractor shall indicate its federal tax identification or social security number on the face of each invoice billed to the County.

(f) If the Contract is in excess of twenty-five thousand dollars ($25,000), the Contractor and any Subcontractor with a lower tier Subcontract, in accepting each Contract payment from the County is making a Certification and representing and warranting to the County, prior to receiving a progress or final payment under this Contract, that the Contractor or Subcontractor has made payment from proceeds of prior payments, and that the Contractor or Subcontractor will make timely payments, from the proceeds of the progress or final payment then due it, to its Subcontractors, materialmen, and suppliers in accordance with Contractor or Subcontractor contractual arrangements with them and pursuant to State Finance and Procurement Article of the Maryland Annotated Code, as amended. This Certification may be required by the Engineer even if the Contract is for twenty-five thousand dollars ($25,000) or less.

If the Contract is in excess of twenty-five thousand dollars ($25,000), the Contractor further represents and warrants that it shall also obtain from each Subcontractor a Certification that payment from proceeds of prior payments have been made to any lower tier Subcontractors and that timely payments will be made to the lower tier Subcontractors and suppliers in conformance with contractual arrangements with those lower tier Persons. This Certification is not required from Subcontractors who have no lower tier Subcontracts. These Certifications may be required by the Engineer for contract of twenty-five thousand dollars ($25,000) or less.

(g) For all Contract Items of Work, other than those to be paid by lump sum, after Final Acceptance for Maintenance of the Work and before final payment is made, the Engineer will make final measurements to determine the quantities of various Contract Items of Work performed as the basis for final settlement. The Contractor in case of unit price Contract Items will be paid for the actual amount of Work performed and for the actual amount of Materials in place, in conformance with the Contract Documents as shown by the final measurements made by the Engineer. All Work completed under the Contract will be measured by the Engineer in conformance with the standards of weights and measures recognized by the NBS and NIST.

The term lump sum when used as a Contact Item will mean complete payment for the unit of Work described and will be construed to include all necessary fittings and accessories for that Contract Item of Work.

(1) All longitudinal measurements for area will be made along the actual surface and not horizontally, and no deductions will be made for individual fixtures in the pavement having an area of nine (9) square feet or less. For all transverse measurements for area of Base Course and pavements, the dimensions to be used in calculating the pay area will be the neat dimensions shown on the Plans or as ordered in writing by the Engineer.

(2) Structure measurements will conform to the neat lines shown on the Plans or as ordered in writing by the Engineer, unless otherwise provided for elsewhere in the Contract Documents.

(3) Volumes of excavation, tamped fill and borrow pits will be calculated per cubic yard from the cross section and the use of average end area formulas. Volumes of other Work including, but not limited to, masonry and removal of masonry will be calculated by using arithmetical formulas. Where the volume is bounded by varying dimensions and there are no simple volumetric formulas applicable, frequent cross sections will be taken and the cubic yard volume computed from average end area formulas.

(4) Cement will be measured by weight.

(5) All items which are measured by the linear foot, including, but not limited to, pipe culverts, traffic barriers, underdrains, will be measured parallel to the base or

foundation upon which such Structures are placed unless otherwise specified in the Contract Documents.

(6) The term gauge when used in connection with the measurement of uncoated steel sheet and light plates shall mean the USSG, except that when reference is made to the measurements of galvanized or aluminum sheets used in the manufacture of corrugated metal pipe, metal plate pipe culverts and arches, and metal cribbing, the term gauge shall mean that specified in M 36, M 167, M 196 or M 197.

(7) When the term gauge refers to the measurement of wire, it shall mean the Washburn & Moen wire gauge as referenced in the New Departure Handbook. A tolerance of plus or minus 0.003 inch shall apply.

(8) The term ton shall mean the short ton consisting of two thousand (2,000) pounds avoirdupois. All Materials which are specified for measurement by the ton shall be weighed on accurate, approved scales conforming to the requirements of the NBS Handbook 44. A digital recorder and printout shall be required on all truck scales. The digital recorder shall produce a printed record of the gross, tare, net weights, the time, date, truck identification and Contract Number. Provisions shall be made so that the scales may not be manually manipulated during the printing process. The system shall be interlocked to allow printing only when the scale has come to rest.

(9) Except for computer operated scales, all weights shall be certified by a bonded weigh Person supplied by the Contractor, producer or supplier. The security bond shall be one hundred thousand dollars ($100,000.00).

(10) If the Material is shipped by rail, the car weight may be accepted but the payment will be limited to the actual weight of Material. Car weights will not be acceptable for Material to be passed through mixing plants.

(11) All Materials for which measurements are obtained by the cubic yard shall be hauled in approved vehicles and measured at the point of delivery. No allowance will be made for the settlement of Material in transit. Approved vehicles for this purpose shall be of any size or type acceptable to the Engineer, provided that the body is of such shape that the actual contents may be readily and accurately determined. Unless all approved vehicles are of uniform capacity, each approved vehicle must bear a plainly legible identification mark indicating the specific approved capacity. All vehicles shall be loaded to at least their water level capacity, and all loads shall be leveled when the vehicles arrive at the point of delivery.

(12) When requested by the Contractor and approved by the Engineer in writing, Material specified to be measured by the cubic yard may be weighed, and such weights will be converted to cubic yards for payment purposes. Factors for conversion from weight measurement to volume measurement will be determined

by a qualified laboratory and shall be agreed to by the Contractor before such method of measurement of pay quantities will be approved by the Engineer.

(13) Liquid asphalt Material delivered for the project will be measured by volume in each railroad tank car, tank truck, distributor tank or drums in which it is delivered. The measurements will be taken when the asphalt Material is of a uniform temperature and free from air bubbles, and the temperature of the Material will be recorded at that time by the Contractor.

The volumetric measurement of the asphalt material will be based upon a temperature of sixty degrees Fahrenheit (60° F). Only the quantity of asphalt Material actually placed in the Work and accepted will be considered in determining the amount due the Contractor.

Reference is hereby made to D 1250, Petroleum Measurement Tables.

(14) Timber will be measured by the thousand feet board measure (MBM) actually incorporated in the structure. Measurement will be based on nominal widths and thicknesses and the extreme length of each piece.

(15) Rental of Equipment will be measured in hours of actual Work time by the Contractor, moving-in and moving-out costs, if any, and necessary traveling time of the Equipment within the limits of the Contract, except when special conditions make some other method of measurement desirable as determined by the Engineer.

(h) Payment will not be allowed for stored Materials except in specific instances approved in writing by the Engineer involving specially manufactured Contract Items or Contract Items requiring a long lead time for delivery and as further described in Sections GP-9.01(i), (j) and (k). No payment for stored Material will be made if it is anticipated that the Material will be incorporated into the Work within thirty (30) Days of the delivery of said Material to the Contractor or Work site.

(i) When the Contractor requests payment allowance for stored Materials and the Engineer gives written approval of those Materials stored, the following terms and conditions shall apply:

(1) For Superstructure members delivered and stored on the Work site, an allowance of one hundred percent (100%) of the Material cost plus freight charges as invoiced may be made provided the cost does not exceed ninety percent (90%) of the Contract price of the applicable Contract Item. The allowance will be based upon validated invoices or bills for Material including freight charges, and a copy thereof shall be made a part of the documented records for the Contract.

(2) For reinforcement steel, piling, pipe, traffic barrier, signs and sign assemblies, and other nonperishable Material in storage on the Contract, but excluding aggregates,

cement, seed, plants, fertilizer or other perishable Contract Items, an allowance of one hundred percent (100%) of the invoiced cost of the Material plus freight charges to the Contractor may be made provided the cost does not exceed ninety percent (90%) of the Contract price of the applicable Contract Item. Such Material shall be delivered and stockpiled at the Contract Work site, and shall be tested by the Administration and found to conform with the Contract Documents or have been accepted under a County-approved Certification program prior to the allowance.

(3) No payment allowance will be made for fuels, form lumber, falsework, temporary Structures or other Materials of any kind which will not become an integral part of the finished Work.

(4) Only end product manufactured Material or fully fabricated products that are awaiting installation or incorporation into the finished Work are eligible for prepayment. Components, elements, or ingredients of a finished product are not eligible for prepayment or payment allowance.

(5) Stored Material for which a payment allowance is requested shall be stored in an approved manner in areas within the County where damage is not likely to occur. If any of the stored Materials are lost or become damaged in any manner, the Contractor shall be responsible for Repairing or replacing the damaged Materials. The value of the lost or damaged Material will be deducted from the Contractor's subsequent estimates until replacement has been accomplished. The request for payments allowances for any Materials stored on private property within the County shall be accompanied by a release from the applicable owner and/or tenant of such property agreeing to permit the removal of the Materials from the property without cost to the County.

When it is considered impractical to store Materials on the Work site, the Engineer may approve storage areas in the vicinity of the Work site which will be considered as the Work site for purposes of those stored Materials.

When storage of the Materials within the County is not practical, written approval shall be obtained from the Engineer for storage elsewhere. Storage of Materials outside the County will be subject to the conditions set forth in this Section GP-9.01 and limited to Materials exceeding twenty-five thousand dollars ($25,000), which are designed and fabricated exclusively for use on the Contract.

(6) Stored Material for which payment has been made, either wholly or partially by the County, shall not be removed from the approved location or Work site until such time that it is to be incorporated into the Work, unless authorized by the Engineer in writing.

(j) The following items shall accompany any written request by the Contractor for payment allowance for stored Materials:

(1) Consent of the Contractor's Surety specifying the Material type and the Contract Item(s) in which the Material is to be used.

(2) Validated invoices with the signature of an officer of the company supplying the Material showing actual cost.

(3) A notarized statement from the Contractor attesting that the invoices as submitted from the supplier do not include charges or fees for placing, handling, erecting or any other charges or markups other than the actual Material cost, sales tax(es), if applicable, and freight charges.

(4) Bills of lading showing delivery of the Material.

(5) The request for allowances for any Materials stored on property outside the County shall be accompanied by a release from the owner or tenant of such property agreeing to permit verification by the Department's Division of Construction Contracts Administration that the Material is stored at the approved location, and to permit the removal of the Materials from the property without cost to the County.

(6) Inspection test reports, Certifications and/or a written statement from the Department's Division of Construction Contracts Administration attesting to the inspection and approval of the Material.

Upon receipt of the above by the Engineer and verification by the Department's Division of Construction Contracts Administration that the Material is stored at the approved location, the Engineer will authorize payment.

The Contractor shall pay the Material supplier the amount shown on the invoice within seven (7) Calendar Days of receipt of payment from the Administration. Failure to make invoice payments as specified will be cause for the County to deduct the monies from future estimates to the Contractor.

Copies of all pertinent data relating to any stored Materials shall be made by the Contractor and distributed to the Department's Division of Construction Contracts Administration for retention as part of the documented records for the Contract.

(k) The Engineer may withhold, or on account of subsequently discovered evidence, nullify the whole or a part of any payment for stored Materials to such extent as may be necessary to protect the County from loss on account of:

(1) Defective Work not remedied.

(2) Claims filed, or reasonable evidence indicating probable filing of claims, by parties other than the Contractor.

(3) Failure of the Contractor to make payments properly to Subcontractors or for material or labor.

(4) A reasonable doubt that Full and Final Completion of the Contract can be achieved for the balance then unpaid.

(5) Damage to another contractor.

(6) Failure of the Contractor to submit data required within the time limits stated in the Contract Documents.

Upon removal of the Engineer's hold and resolution of all related issues, payment shall be made for any amounts withheld.

GP-9.02 FORCE ACCOUNT WORK

When the Contractor is required to perform Extra Work as a result of a Change Order or Contract Modification to the Contract for which there are no applicable unit prices in the Contract, the Engineer and the Contractor shall make every effort to come to an agreed price for the performance of such Extra Work. If an agreement cannot be reached by the parties prior to the time that Extra Work must commence, the Engineer may, in writing, order the Extra Work done on a force account basis by the Contractor, to be compensated in accordance with the following:

(a) **Labor.** For all labor and for foremen in direct charge of the specific operations of the Work, the Contractor shall receive the rate of wage agreed upon in writing by the County and the Contractor in either the Contract or a Contract Modification before the Contractor begins such Extra Work for each and every hour that said labor and foremen are actually engaged in such Extra Work, to which cost shall be added an amount equal to the percentage of the sum shown below. No additional allowance will be considered for Contract Bond, insurance, taxes or other fringe benefits, except as permitted in the County's discretion in a Written Notice or a Contract Modification. The number of laborers and foremen engaged in the Extra Work will be subject to regulation by the Engineer and shall not exceed the number the Engineer deems most practical and economical for the Extra Work. The Contractor shall submit certified payrolls in conformance with the Contract Documents and pursuant to Section GP-9.02(g) signed by a legally authorized officer of the Contractor. Superintendent's time will not be allowed.

Highway Contracts..... 65%
Utility Contracts..... 75%
Building Contracts 65%

(b) **Materials.** For Materials accepted by the Engineer and used for the Extra Work, the Contractor shall receive the actual cost of such Materials delivered to the Work site. This

cost includes transportation charges paid by Contractor (exclusive of machinery rentals as specified in Section GP-9.02(d)), to which cost shall be added an amount equal to twenty percent (20%) plus prevailing State sales tax.

To substantiate Materials and transportation cost, original receipted invoices shall be submitted to the County by the Contractor, as further specified in Section GP-9.02(g).

If the Materials used in the force account Extra Work are not specifically purchased for the Extra Work but are taken from the Contractor's stock, then in lieu of the original invoices, the statements shall contain or be accompanied by an affidavit and Certification from the Contractor that shall certify that the Materials were taken from the Contractor's stock, that the quantity claimed was actually used, and that the price and transportation cost of the Material as claimed represents the actual cost.

The Administration reserves the right to furnish Materials as it deems appropriate, and the Contractor shall have no claim for any costs, overhead, or profit on these Materials.

(c) Subcontractor's Works.

(1) When a Contract Item of Extra Work is performed on a force account basis by a Subcontractor who is approved for this Extra Work by the Engineer, as may be required under Section GP-8.01, an amount equal to ten percent (10%) of the total cost shall be added to the final payment under Section GP-9.04 for such force account Extra Work and such amount of compensation shall be full and final compensation to the Contractor for the administration of the Extra Work performed by the Subcontractor under the force account basis.

(2) This additional ten percent (10%) compensation to the Contractor for administration shall only be allowed if the Extra Work requires particular trades or specialty work for which the Contractor is not prequalified, and not for Extra Work assigned to a Subcontractor for the convenience of the Contractor.

(d) Equipment. For any machinery or special Equipment approved by the Engineer for use on Extra Work (expressly excepting all small tools), including fuel and lubricants, the Contractor shall receive the rental rates and operating costs agreed upon in writing by the County and the Contractor in either the Contract or a Contract Modification before such Extra Work is begun by the Contractor for the actual time such Equipment is authorized on the Extra Work.

(1) Rental rate shall be based on the weekly rate converted into hours. To compute hourly rate use forty (40) hours per week.

(2) The rental rates and operating costs, including fuel and lubricant but excluding operators, for Extra Work shall be the current rates from the "Rental Rate Blue Book for Construction Equipment," published by the Equipment Guide Book Company and/or the "Rental Rate Blue Book for Older Construction Equipment." Both rental rate and operating rate will be subject to area adjustment per the

"Rental Rate Blue Book for Construction Equipment." No other allowances or additions will be paid to the Contractor by the County.

(3) In the Engineer's discretion, rental rates will be applied to both idle time and actual operating time authorized by the Engineer, and operating rates will be applied to operating time only. Or, if the Engineer determines it to be in the County's best interest, standby rates shall apply when a piece of Equipment is required to remain on the Work site on standby status as authorized by the Engineer. For purposes of standby rates, when a unit of Equipment works for a portion of a day and is on standby for a portion, the total time allowed for rental rates shall not exceed eight (8) hours for that day and will be allowed for Working Days only. Standby rates shall be half of the normal hourly base rental rates without the operating expenses.

(4) Transportation costs of the Equipment directly attributable to force account Extra Work will be allowed. When it is necessary to obtain Equipment exclusively for force account Extra Work from sources beyond the Contract limits, the cost of transferring the Equipment to the Work site and return, including the use of any hauling unit, will only be allowed as an additional expense if the Contractor receives prior written approval from the Engineer.

(e) **Superintendence/Use of Small Tools.** No additional allowance shall be made for general superintendence, the use of small tools, or other costs for which no specific allowance is herein provided. For the purpose of definition under this Section GP-9.02, Equipment with a new cost of one thousand dollars ($1,000) or less will be considered small tools.

(f) **Compensation.** The compensation provided for in this Section GP-9.02 shall be received by the Contractor as full and final payment, including, but not limited to, overhead and profit, for Extra Work, Change Order Work, and/or Contract Modification Work done on a force account basis. The final force account payment request from the Contractor for any Extra Work will be subject to audit as specified in Section GP-7.36 "Retention of Records".

At the end of each applicable Day, the Contractor and the Engineer shall compare records of the cost of all Extra Work as ordered on a force account basis and mutually agree on a final record of the costs of Extra Work for that Day. This record must be signed by both the Engineer and the Contractor on a daily basis. Daily force account records for Extra Work performed and signed by a Subcontractor, must also be signed by the Contractor and the Engineer. Each party shall retain a copy of these records as substantiation of all labor, Equipment, and Materials used by the Contractor and any of its Subcontractors in the performance of the force account Extra Work.

(g) **Statements.** No payment will be made by the County for Extra Work performed on a force account basis until the Contractor furnishes the Engineer with duplicate itemized statements of the cost of such force account Extra Work detailed as to the following:

(1) Name, classification, date, daily hours, total hours, rate, and extension for such laborer, or foreman.

(2) Designation, dates, daily hours, total hours, rental rate, and extension for each unit of machinery and Equipment.

(3) Quantities of Materials, prices and extensions.

(4) Transportation of Materials.

(5) Payments of items under this Section GP-9.02(g)(1) shall be accomplished by copies of certified payrolls. Under this Section GP-9.02(g)(2), original receipted invoices for rentals must be provided. Sections GP-9.02(g)(3) and GP-9.02(g)(4) shall be accompanied by original receipted invoices for Materials used and related transportation charges. Any request for payment for force account Extra Work shall be submitted by the Contract in strict compliance with this Section GP-9.02.

GP-9.03 PROGRESS PAYMENTS

(a) Current Estimates.

(1) **Lump Sum Contracts.** If requested by the Administration, the Contractor shall furnish an acceptable breakdown of the lump sum Contract price showing the amount included therein for each Pay Item of the Work. Said breakdown shall be in such detail so as to provide a basis for estimating monthly progress payments in connection with the Contract.

(2) **Monthly Estimates.** Except as otherwise stated in the Contract, each month the Administration will pay the Contractor for the Contract Work satisfactorily performed during the preceding calendar month, including Extra Work less five percent (5%). The five percent (5%) of the total Contract value retained by the Administration will not be released until final payment pursuant to Section GP-9.04 (unless partially released in a semi-final payment in the County's sole discretion). Current estimates will be based upon the Engineer's estimate of quantity (including Materials and/or Equipment complete in place) satisfactorily performed. In the instance of lump sum Contract Items, the Engineer's estimate shall be the proper fraction of the lump sum Contract Items satisfactorily performed during the preceding month. All quantities, estimates and fractions will be reasonably accurate approximations and are subject to correction (a) in subsequent current estimates, (b) in any semi-final estimate and, (c) in final payment. Any and/or all partial payments or monthly payments may be withheld in the event current requirements of the Contract Documents have not been complied with by the Contractor. Should either the Engineer or the Contractor be of the opinion that any estimates, quantities and/or fractions (either as to an

individual current estimate or accumulations thereof) do not represent a reasonably accurate approximation of actual Work satisfactorily performed, then details questioned shall be reviewed by the Engineer and then any corrections adjusted by the Engineer for in the next current estimate.

Deferred Monthly Payment. Should the amount(s) due the Contractor for any one month be less than five hundred dollars ($500.00), payment will be deferred until such time as the amount(s) due the Contractor under subsequent estimates, combined with that month for which the amount(s) due was less than five hundred dollars ($500.00), shall equal five hundred dollars ($500.00) or more.

(b) Semi-Final Estimate Payments and Partial Semi-Final Estimate Payments.

(1) Semi-Final Estimate Payments. Upon Final Acceptance for Maintenance by the Administration of the Contract Work, pursuant to Section GP-5.13(b), the Administration, at the Contractor's request and with consent of the Contractor's Surety, will pay the Contractor, within forty-five (45) Calendar Days of said request, what is hereby known as a semi-final estimate payment. Such a semi-final estimate payment will be based upon (a) quantities the Administration has computed and set up as proposed final quantities and (b) a reasonably accurate estimate for those quantities for which the Administration has not yet completed computations. The quantities which the Administration sets forth as proposed final quantities shall be so designated. To arrive at the amount of semi-final estimate payment there shall be deducted from the apparent estimated value of the Contract (a) total of all amounts previously paid to the Contractor as current estimates and (b) sums deemed chargeable against the Contractor properly deductible, including liquidated damages, and as a retainage, an amount equal to two percent (2%) of the total Contract value or two thousand dollars ($2,000), whichever is greater.

(2) Partial Semi-Final Estimate Payments. In cases where there has been Partial Acceptance for Maintenance for a majority of the Contract Work as determined in the County's sole discretion and there are remaining only inconsequential or minor Contract Items such as painting, seeding, mulching, or planting to be completed and such Contract Items cannot be completed for an extended period of time because of seasonal or weather conditions, the Administration, within forty-five (45) Days from the most recent Partial Acceptance for Maintenance, upon request of the Contractor and with consent of Surety, shall pay to the Contractor, what is hereby known as a partial semi-final estimate payment. Such a partial semi-final estimate payment will be based upon (a) quantities the Administration has computed and set up as proposed final quantities and (b) a reasonably accurate estimate for those quantities for which the Administration has not yet completed computations. The quantities which the Administration sets forth as proposed final quantities shall be so designated. To arrive at the amount of the partial semi-final estimate payment, there shall be deducted from the apparent estimated value of the Contract (a) total of all amounts previously paid to the

Contractor as current estimates, and (b) sums deemed chargeable against the Contractor properly deductible, including liquidated damages, and as a retainage, a sum equal to two percent (2%) of the total value of the Contractor or two thousand dollars ($2,000), whichever is greater.

GP-9.04 FINAL ACCEPTANCE AND FINAL PAYMENT

(a) When the Contractor believes it has completed a Contract, and there has been a Final Acceptance for Maintenance in accordance with the provisions of Section GP-5.13(b), the Engineer will promptly proceed:

(1) To make any necessary final surveys;

(2) To complete any necessary computation of quantities; and

(3) To submit to the Contractor, within sixty (60) Calendar Days after Final Acceptance for Maintenance of the Work by the Engineer, for the Contractor's consideration, a written tabulation of the proposed final quantities. This written tabulation shall be accompanied by a written statement setting forth, as applicable: (a) the Additional Work performed under Change Orders and/or Contract Modifications; (b) the County-authorized extension of Contract Time; (c) the number of Days which have been charged against the Contractor as having been used to complete the Contract; and/or (d) any deductions, charges or liquidated damages which have been made or imposed against the Contractor by the County.

(b) The Contractor shall then have a period of twenty (20) Calendar Days, dating from the date upon which it received the written tabulation from the Engineer under Section GP-9.04(a), in which:

(1) To decide whether or not the Contractor will accept final payment based upon the Engineer's written tabulation; and

(2) To notify the Engineer, in writing, of the Contractor's decision. The Contractor may request an additional period up to ten (10) Calendar Days in which to notify the Engineer of its decision. In the event the Contractor notifies the Engineer that it protests final payment based on the Engineer's written tabulation, that notification shall outline the reason(s) for said protest.

(c) Upon receipt of a notification of acceptance as provided for in Section GP-9.04(b)(1) above (or in the event of no response), the County shall prepare the final estimate and final payment forms and submit the final payment check to the Contractor. Such action by the County shall be deemed to constitute final payment for all Work under the Contract.

(d) If, under the provisions of Section GP-9.04(b)(2) above, the Contractor notifies the Engineer of its protest and nonacceptance of the Engineer's written tabulation, the Engineer shall pay the Contractor a semi-final estimate, or an additional semi-final estimate in the event a semi-final estimate has already been paid, based upon the Engineer's written tabulation, with deductions for all prior payments. A retainage equal to one and one-half percent (1.5%) of the total value of the Contract shall be withheld by the Engineer. The acceptance of such semi-final estimate, or additional semi-final estimate, shall not be considered as a waiver on the part of the Contractor of its right to pursue its protest and press for Full and Final Completion and final payment.

(e) In the event the Contractor does not accept the Engineer's tabulation from Section GP-9.04(a) above and/or has outstanding a claim filed in accordance with Section GP-5.14, the Engineer and the Contractor shall confer at mutually convenient times and endeavor to reconcile all points of disagreement expeditiously. If such reconciliation is accomplished, the Engineer will promptly proceed with final payment on the reconciled basis and in accordance with the provisions of Section GP-9.04(c) above. If reconciliation is not accomplished within thirty (30) Days, the decision of the Engineer shall be submitted to the Director with a copy to the County Office of Law, Attention: County Attorney, as a dispute in accordance with Section GP-5.15 "Disputes". The Contractor's failure to timely comply with the provisions of Section GP-5.15 shall constitute a waiver by the Contractor of its right under Section GP-5.15, and final payment may be made by the County based on the Engineer's recommendation.

(f) All prior partial estimates and payments shall be subject to correction by the Engineer at the time of final payment and if the Contractor has been previously overpaid, as determined by the Engineer, the amount of such overpayment shall be set forth in the final payment forms and the Contractor hereby agrees that it will reimburse the Administration for such overpayment within six (6) months of receipt of such notice by the Engineer, and the Contractor's Surety will not be granted release from obligations under the terms of the Contract until reimbursement has been made in full by the Contractor. It is further agreed that the County can withhold any overpayment from any other accounts due and payable to the Contractor under any County contract.

(g) Payment for the full apparent value of the Contract thus determined shall become due and payable to the Contractor within ninety (90) Days after Full and Final Completion of the Contract, as provided in Section GP-8.11. Contractor's acceptance of final payment shall be considered a general release of any, all, and every claim and/or dispute against the County arising out of, or in any way connected with, this Contract and the Work.

(h) Neither Full and Final Completion nor final payment nor any provision in the Contract shall relieve the Contractor of responsibility for faulty Materials and workmanship. Unless otherwise specified, the Contractor shall remedy any defects and pay for any damage to other Work resulting therefrom that appears within the applicable warranty period. The County shall give notice of observed defects to the Contractor with reasonable promptness.

GP-9.05 LATE PAYMENTS – RESERVED

GP-9.06 INTEREST

Notwithstanding any other provision in the Contract, the Contractor hereby waives the right to predecisional interest. For purposes of this Section GP-9.06 and the Contract, "predecisional" means a decision by any Engineer or the County Administrative Officer, or his designee, or a decision by any Person including but not limited to an administrative hearing officer. The Contractor shall only be entitled to postdecisional interest, and for purposes of this Section GP-9.06 and the Contract, "postdecisional" interest shall only begin to accrue, after the exhaustion of all administrative remedies and the rendering of a judgment by a court of competent jurisdiction.

GP-SECTION 10
PRIVATE CONTRACTS

GP-10.01 PRIVATE CONTRACTS

(a) A Private Contract is used in land development projects when, with the permission of the Director of the County Department of Permits, Approvals and Inspections, the Construction Contract is let by a developer and processed through the County. The applicable developer shall obtain the Bid privately and the cost estimates will be processed using County contract forms provided by the Department's Division of Construction Contracts Administration or as approved by County for use with a UA and/or RA. No public funds may be used in a Private Contract. UA and RA are not governed by those provisions of these Standard Specifications which involve payment by developers to contractors.

(b) The following sections, as amended by the County, apply to Private Contracts:

107.01
107.03.02
107.04.02
204.03.07(b)
204.04
300.03.01(c)(2)
300.03.04(h)(4)
351.01
501.03.14
504.03.03 B
504.04

For Private Contracts, all references to the County (including Administration) in this Section GP-10.01 shall be construed to mean the developer as defined in the governing

UA and/or RA in the Standard Specifications and in all references to making payments under the contract.

(c) IN ALL OTHER PORTIONS OF THESE STANDARD SPECIFICATIONS, REFERENCES TO THE COUNTY SHALL REMAIN UNCHANGED, WHETHER THE CONTRACT IS PUBLIC OR PRIVATE.

(d) Private Contracts may include fixed price Contingent Items to provide for certain contingencies encountered during Highway and utility Construction. If included in the Bid, unit prices shall be those established by the County.

(1) Fixed Price Highway Contingent Items - Private Contract Only
See Section 109 of Category 100 "Preliminary".

(2) Fixed Price Utility Contingent Items - Private Contract Only
See Section 109 of Category 100 "Preliminary".

(3) Award and Execution of Contract - Private Contract Only [Section GP-3.03 Performance Bond and Payment Bond Requirements].

In Section GP-3.03(b) delete the words "twenty-five thousand dollars ($25,000)" and substitute "two thousand dollars ($2,000)".

(4) Unauthorized Work - Private Contracts Only, see Section GP-4.08, Unauthorized Work, and include the following paragraph:

Any Work performed in excess of one hundred ten (110%) percent of the Private Contract Bid, or one hundred ten (110%) percent of the Private Contract Bid plus any Contract Modifications, between the developer and the Contractor, shall be considered unauthorized Work and shall not be paid for. The Contractor is advised to bring to the attention of the developer and the County, in writing, any impending overrun of the one hundred ten (110%) percent upset limitation at least two (2) weeks before having to stop work due to this limitation.

(5) Interest - Private Contracts Only, see Section GP-9.06, Interest, and include the following paragraph:

Payment by the developer under Section GP-9.03(b)(1) "Semi- Final Estimate Payments" and Section GP-9.04 "Final Acceptance and Final Payment", shall be due on receipt of the monthly estimates, semi-final estimates, and final estimates prepared by the Department and submitted to both parties in the amount shown as payable on this estimate. Any monies not paid within fifteen (15) Days of the date of such estimates shall bear interest at the rate of eighteen percent (18%) per annum. Interest shall be computed and invoiced by the Contractor and shall not be subject to a review or approval by the Department. However, the Department will not consider the developer's Public Works Agreement obligations complete

as long as the Contractor reports an outstanding indebtedness under the Private Contract.

(6) Interim Acceptance - Development Bonds - Private Contract Only, see Section GP-9.03(b) and include the following paragraph:

When the Contractor postpones Road surfacing (during the course of completing a two-phased, 4-inch, paving section) its retainage shall be 2.0 percent after the bituminous Base Course has been accepted. Following a satisfactory re-inspection one (1) year after that acceptance, the retainage may be reduced to 0.0 percent.

GP 10.02 UTILITY/ROAD AGREEMENTS

These UA and/or RA are for projects wherein the applicant (developer, Persons, or property owners) constructs and installs improvements to utilities or Roads all at no cost to the County. The County Department of Permits, Approvals and Inspections (PAI), or any successor County department, in accordance with the applicable provisions of the County Code, as amended from time to time, and the PAI Construction Policy Manual, approves the cost estimates and Construction Drawings and collects, except for County departments and agencies, the security and all fees. An applicant must provide to PAI, in writing, the name, address and phone number of an authorized Work site representative. The applicant must use a County prequalified Contractor who provides a certificate of insurance and performs the work in accordance with the Department's Standard Specifications and Standard Details in effect on the date of the Notice to Proceed. It is the applicant's responsibility to schedule an on-site pre-Construction meeting with the Department, the Department of Environmental Protection and Sustainability, or any successor County department, and the County prequalified Contractor. No Construction is to be performed prior to receiving a written Notice to Proceed from the Department.

TERMS and CONDITIONS

TC - SECTION 1
LANGUAGE AND METRIC SYSTEM

TC-1.01 METRIC SYSTEM – RESERVED

TC-1.02 LANGUAGE – RESERVED

TC - SECTION 2
BIDDING REQUIREMENTS AND CONDITIONS

TC-2.01 PROJECT CLASSIFICATION

The Administration will estimate the cost of the Contract and classify it within one cost group and letter designation as follows:

COST GROUP ESTIMATE	COST GROUP LETTER CLASS
Up to $ 100 000	A
$ 100 001 to $ 500 000	B
$ 500 001 to $ 1 000000	C
$ 1 000 001 to $ 2 500 000	D
$ 2 500 001 to $ 5 000 000	E
$ 5 000 001 to $ 10 000 000	F
$ 10 000 001 to $ 15 000 000	G
$ 15 000 001 to $ 30 000 000	H
$ 30 000 001 to $ 50 000 000	I
$ 50 000 001 to $ 75 000 000	J
$ 75 000 001 to $ 100 000 000	K
Over $ 100 000 000	L

The letter designation will be published as part of the Bid Package.

TC-2.02 IN-STATE PREFERENCE – RESERVED

TC-2.03 VALUE ENGINEERING CHANGE PROPOSALS

The Contractor may submit to the Engineer, in writing, value engineering change proposals (VECP) for modifying the Contract Documents for the purpose of reducing the total cost of Construction without reducing design capacity or quality of the finished product. The Engineer

will then forward the VECP to the Department's Chief of the Bureau of Engineering and Construction with recommended action. The decision to accept or deny the VECP will be made by the Department's Chief of the Bureau of Engineering and Construction. The Department's Chief of the Bureau of Engineering and Construction will be the sole and final judge of the acceptability of a VECP. The County will not consider appeals once this final decision is made. If a VECP is accepted by the County, net savings resulting from that VECP will be equally divided by the County and the Contractor. The Contractor may elect to pursue one of the following options when submitting a VECP:

Option 1 Submit revised Plans, Contract Documents and estimate of savings to reflect the VECP; or

Option 2 Submit a written concept of the VECP for tentative approval and if accepted, submit the detailed Plans, Contract Documents, and estimate for final approval at a later date.

Each VECP shall result in a net savings to the Contract cost without impairing essential functions and characteristics of the Contract Items or of any other part of the Work, including but not limited to service life, reliability, economy of operation, ease of maintenance, desired aesthetics and safety.

As a minimum, the Contractor shall submit the following information before final approval of a VECP may be given:

(a) A statement that the revised Plans, Contract Documents, and estimate of savings are submitted as a VECP.

(b) A statement concerning the basis for the VECP and benefits to the County together with an itemization of the Contract Items and requirements affected by the VECP.

(c) A statement describing in detail any and all potential impacts to public convenience and/or safety.

(d) A detailed estimate of the cost under the existing Contract and under the VECP.

(e) Plans, Contract Documents and recommendations as to how the VECP changes shall be accomplished.

(f) A statement as to the time by which an Extra Work Order adopting the VECP must be issued so as to obtain the maximum cost effectiveness. Typically, the County will require at least four (4) weeks to review and approve a VECP.

(g) A revised Baseline schedule showing the impact of the VECP, and including in that revised Baseline schedule a four (4) week allowance for the County's review of such VECP.

(h) The Contractor's engineering cost for the VECP.

The County will process the VECP in the same manner as prescribed for any other Contract Modification which would necessitate issuance of an Extra Work Order. The County may accept in whole or in part any VECP by issuing an Extra Work Order which will identify the VECP on which it is based. The County will not be liable to the Contractor for failure to accept or act upon any VECP submitted pursuant to these requirements nor for any delays to the Work attributable to any VECP. Until a VECP is effected by a Contract Modification, the Contractor shall remain obligated to the terms and conditions of the existing Contract. If an executed Extra Work Order has not been issued by the date upon which the Contractor's VECP specifies that a decision thereon should be made, or any other date as the Contractor may subsequently have specified in writing, the VECP shall be deemed rejected. The Extra Work Order effecting the necessary Contract Modification will establish the net savings agreed upon, will provide for adjustment in the Contract prices and/or Contract Time and will indicate the net savings to be equally divided between the Contractor and the County. The Contractor's costs for preparation of the VECP and the County's costs to review and administer the VECP will be deducted from the gross savings. The County reserves the right to include in the Contract any conditions it deems appropriate for consideration, approval and implementation of the VECP. The Contractor's fifty (50%) percent share of the net savings shall constitute full compensation for effecting all changes pursuant to the Contract. Acceptance of the VECP and performance of the Work thereunder will not change the Contract Time, unless specifically provided for in the Contract Modification authorizing the VECP.

The County expressly reserves the right to adopt a VECP for general use in contracts administered by the County when it determines that the VECP is suitable for application to other contracts. VECPs identical or similar to previously submitted VECPs will be eligible for consideration and compensation under these provisions if such VECPs were not previously adopted for general application to other contracts administered by the County. When a VECP is adopted for general use, compensation pursuant to these requirements will be applied only to those contracts Awarded and for which the subject VECP has been submitted prior to the date of adoption of the specific VECP.

Proposed changes in the basic design of a Bridge or pavement type, or requiring modification to the Right-of-Way limits, will not normally be considered as an acceptable VECP. Quantity decreases or elimination of any Contract Items as a result of changing field conditions, errors, etc. will not be considered as an acceptable VECP. If a VECP is based upon or similar to a change in the Plans, Contract Documents or Special Provisions adopted by the County prior to submission of the VECP, the County will not accept the VECP.

These requirements apply to all VECPs initiated and developed by the Contractor and which are identified as such by the Contractor at the time of its submission to the Engineer; however, nothing herein shall be construed as requiring the Engineer to consider or approve a VECP submitted by the Contractor.

Subject to the provisions contained herein, the County or any other public agency shall have the right to use all or part of any accepted VECP on other contracts without obligation or compensation of any kind to the Contractor.

In the event a VECP is accepted by the County, the provisions of the Contract Documents which pertain to adjustment of Contract unit prices due to alterations of Contract quantities will not apply to the items adjusted or deleted as a result of effecting the VECP by Contract Modification.

TC-2.04 OWNER/OPERATOR

For the purpose of labor compliance, the term "Owner/Operator" shall be defined as being the individual who owns and operates his/her own vehicle.

The prevailing wage rates shall not apply to a "Owner/Operator". However, they shall appear on the payroll of the Contractor or Subcontractor with the notation "Owner/Operator".

Employees of an "Owner/Operator" shall be subject to prevailing wage rates and shall appear on a certified payroll.

TC-2.05 DEBARMENT/SUSPENSION

Pursuant to the emergency regulations which were approved by the AELR Committee of the State General Assembly on July 27, 1982, and which went into effect on July 28, 1982, the State Department of Transportation, State Highway Administration, pursuant to applicable laws and regulation, established a list of "Debarred or Suspended Contractors."

The current list of "Debarred or Suspended Contractors or Suppliers" is available at the Baltimore County Department of Public Works and Transportation, 111 West Chesapeake Avenue, Room 300, Towson, Maryland 21204, for inspection by all interested parties.

TC - SECTION 3
SCOPE OF WORK

TC-3.01 GOVERNING ORDER OF CONTRACT – RESERVED

TC-3.02 CONSTRUCTION DOCUMENTS TO SUCCESSFUL BIDDER – RESERVED

TC-3.03 CONTINGENT ITEMS – RESERVED

TC-3.04 WARRANTY OF CONSTRUCTION – RESERVED

TC-3.05 RIGHTS IN AND USE OF MATERIALS FOUND ON THE WORK SITE

The Contractor may use on the Contract any excavated stone, gravel, sand or other Material found on the Work site that conforms to the requirements of the Contract Documents and are approved by the Engineer.

When these Materials are used for select, capping, modified, or common borrow and conform to the pertinent Contract provisions and Contract Documents, payment will only be made at the Contract unit price for the class of excavation from which the Materials are obtained.

In the event these Materials are processed through a crushing, screening, washing or sorting plant for use as another Pay Item, the Contractor will be paid both for the excavation of such Materials at the Contract unit price and at the Contract unit price for which the Material is used. The Contractor shall replace at its own expense with other acceptable Material all of the portion of the excavated Material removed and used which was needed for use in the embankments, backfills, approaches or otherwise.

If, however, these Materials are not processed and paid for as described in the preceding paragraph, and their use creates a shortage of embankment or other Material, the Contractor shall provide acceptable replacement Material for all Material needed for embankment, backfill, approaches or otherwise.

The replacement Material shall be paid for at the Contract unit price Bid for the Contract Item that the Class I Excavation is used for, or the Contract unit price Bid for Class I Excavation, whichever is the lowest Contract unit price Bid.

The Contractor shall not excavate nor remove any Material which is not within the limits of excavation, as indicated by the Slope and grade lines, without written authorization from the Engineer.

TC-3.06 SAFETY HAZARDS IN CONFINED SPACES – RESERVED

TC - SECTION 4
CONTROL OF WORK

TC-4.01 WORKING DRAWINGS

(a) General. The Plans will be supplemented by Working Drawings as necessary to adequately control the Work. All alterations affecting the requirements and information given on the Working Drawings shall be authorized in writing to the Engineer. When at any time reference is made to the Working Drawings, the interpretation shall be the Working Drawings as affected by all authorized alterations then in effect.

Working Drawings will show details of all Structures, lines, grades, typical cross section of Roadway, general cross sections, location and designation of all units and elements.

The Contractor shall provide, at the Contractor's expense, all required Working Drawings and shall have them adequately checked, after which they shall be submitted to the Engineer for review. The Engineer may reject Working Drawings and return them for revisions, in which case the Contractor shall submit revised Working Drawings as required. No Contract Items involving the Working Drawings shall be incorporated into the Work until those Working Drawings have been accepted for use by the Engineer; however, acceptance shall not relieve the Contractor of any responsibility in connection therewith. All Working Drawings shall be furnished in duplicate for preliminary examination for Contracts prepared by the Administration and in triplicate for Contracts prepared by consultant engineering firms for the Administration. After Working Drawings have been accepted for use by the Engineer, the Contractor shall furnish additional copies as requested.

All Working Drawings shall be on sheets measuring twenty-two inches (22") by thirty-six inches (36") or as required by the Engineer and shall have a standard title block at the lower right corner approximately four inches (4") by eight inches (8") (two inches (2") for the revision column on the left side and the remaining six inches (6") for the title) indicating the following information in the order named:

Name of Contractor (and Subcontractor, if applicable)
Address of Contractor (and Subcontractor, if applicable)
Sheet Title (Reinforcement Details, etc.)
Name of Structure Crossing
For (Baltimore County)
By (Indicate name of Contractor's official or engineer, or other parties authorized to sign official documents.)

All Working Drawings shall list all County Contract Numbers, complete federal aid number, if any, and the date the Working Drawing was completed. The left portion of the title block shall be headed "Revisions" and the space used as needed.

Working Drawings for standard scuppers are not required. A sketch or statement specifying the type and number of standard scuppers required and the length of the downspout is acceptable.

(b) Working Drawings for Falsework Systems. Falsework systems Plans (design and Construction) shall be the responsibility of the Contractor, including submitting and obtaining written acceptance of the design and Plans by the Engineer before erection. The Contractor shall utilize a Professional Engineer (P.E.) registered in the State who has a minimum of five (5) years experience in falsework design for Bridge Construction and Repair. The falsework design calculations and Plans shall be signed by the P.E. and bear the seal of the P.E. The submittal of the design and falsework Plans shall include the P.E.'s resume showing evidence of the required experience.

The P.E.'s Plans and design calculations shall evaluate and qualify all products and components including manufactured products and proprietary items for their intended service. Acceptance by the Engineer of falsework systems shall not in any way relieve the Contractor of the

responsibility for the safety and adequacy of the design and Construction for the falsework systems and operations, including all components. Every Structure in the Contract will require a separate falsework design analysis, separate Plans, and separate design submittals as set forth above. This applies even though Structures may appear to be identical.

Each falsework system shall be designed to have the capacity to support all vertical and horizontal loading with enough redundancy to prevent progressive failure. Vertical loading, differential settlement forces, live load where applicable and all horizontal lateral and longitudinal forces shall be taken into account. Unbalanced temporary loading caused by placement sequence shall also be provided for in the design. Adequate diagonal bracing in all planes shall be employed.

All falsework systems designs and Plans shall provide for adequate foundations with bearings below the frost line or on rock or on piling and for possible settlement. If additional subsurface data is necessary, it shall be obtained and analyzed by the Contractor for proper design of the Plans and performance of Construction.

Falsework designs and Plans shall include protection against impact from uncontrolled Highway vehicles, accidental collision of a crane boom or other Construction Equipment and vehicles, traffic vibration, flood waters, high winds and any other envisioned contingent situations.

TC-4.02 FAILURE TO ADEQUATELY MAINTAIN PROJECT – RESERVED

TC-4.03 USE PRIOR TO COMPLETION – RESERVED

TC-4.04 WORK SUSPENSION – RESERVED

TC - SECTION 5
LEGAL RELATIONS AND PROGRESS

TC-5.01 INSURANCE – RESERVED

TC-5.02 NOTICE TO PROCEED – RESERVED

TC-5.03 SUBCONTRACTORS – RESERVED

TC-5.04 CULTURAL RESOURCES – RESERVED

TC-5.05 DETERMINATION AND EXTENSION OF CONTRACT TIME – RESERVED

TC - SECTION 6
RESTRICTIONS AND PERMITS

TC-6.01 MOVING OF EQUIPMENT

(a) The Contractor will not be permitted to move over or operate on any Road (except on the Road under Construction) any power shovels, rollers, concrete mixers, cranes, tractors or any other heavy Equipment of weight or dimensions in excess of State Motor Vehicle Law or Administration's regulations without first obtaining the applicable permit. In case of permits for oversize and overweight vehicle movements, attention is directed to State Motor Vehicle Laws requiring the Administration to collect a fee on every such vehicle movement using Highways of the State. The payment of and securing of such permit is required irrespective of whether the movement is in connection with a subject Contract or for other purposes.

(b) The Contractor shall adhere to all State and local laws and regulations including but not limited to all State Motor Vehicle Laws and safety regulations.

TC-6.02 RESTORATION OF SURFACES OPENED BY PERMIT

The right to construct or reconstruct any utility in a County Highway or to grant permits for same at any time is reserved by the Administration.

Upon the presentation of a duly authorized and satisfactory permit which provides that all necessary Repair Work shall be paid for by the party to whom such permit is issued, the Contractor shall allow parties bearing such permits to make openings in a County Highway.

The Contractor shall, when ordered by the Engineer, make in an acceptable manner all necessary Repairs due to such openings, and such necessary Work will be paid for as Extra Work, as provided in these Standard Specifications, and will be subject to the same conditions as original Work performed.

TC-6.03 RAILROAD HIGHWAY GRADE CROSSINGS AND SEPARATIONS

When the Contractor is required to haul Materials across the tracks of any railroad, or elects to do so, the Contractor shall coordinate with and make arrangements with that railroad for any new private crossings or for the use of any existing private crossing in accordance with the terms and conditions of any permit issued by the applicable railroad.

All Work to be performed by the Contractor in the Construction of railroad-Highway separation Structures on the railroad right-of-way shall be done in a manner satisfactory to the railroad company and shall be performed at such times and in such manner as not to unnecessarily interfere with the movement of trains or traffic upon the tracks of the railroad company. The Contractor shall use care and precaution in order to avoid accidents, damage, or unnecessary delay or interference with the railroad company's trains or other property. In addition to the insurance specified in Section GP-7.14 and when Work covered under the Contract is to be performed on or about the rails of a railroad's tracks, the Contractor shall be required to carry

Contractor and railroad public liability and property damage insurance as specified in the Contract Documents and/or required by the applicable railroad.

Prospective Bidders on Contracts crossing railroad right-of-way are advised that the railroad company will require the Contractor to obtain, pay for and have approved by the railroad, certain railroad forms of public liability and property damage insurance policies before entering upon the railroad property. Details of such policies may be set forth in the Contract Documents; but in case of omission from the Contract Documents, the Contractor shall and is required to communicate with the railroad to ascertain the type of insurance required, if any, and make provisions for same in its Bid.

Unless otherwise specified, cost for the insurance policies whether described in the Contract Documents or ascertained by the Contractor will not be paid for by the County. The cost for any and all insurance related to a railroad company will be incidental to the other Contract Items specified in the Contract Documents and be the sole responsibility of the Contractor.

All Work on portions of Structures over railroad right-of-way shall conform to all rules and regulations of the owners of the right-of-way, including, but not limited to, any applicable railroad company. The Contractor is responsible for acquiring full knowledge of these rules and regulations and complying therewith to the satisfaction of the owners of the railroad right-of-way, including, but not limited to, any applicable railroad company.

TC-6.04 BRIDGES AND OTHER WORK IN OR OVER WATERS OF THE STATE

All Work in, on or over waters under control of the United States Department of the Army and the Environmental Protection Agency of the United States shall conform to all applicable federal permits, rules and regulations. All such rules and regulations are hereby part of and incorporated into the Contract. The Contractor is cautioned and charged with the responsibility of obtaining complete knowledge thereof and compliance therewith.

The Contractor shall also comply with the provisions of all other applicable federal, State and local laws**,** permits, rules and regulations, and shall be knowledgeable of any and all pertinent laws and regulations of the State Department of Natural Resources and Maryland Department of Environment. All such laws, permits, rules and regulations are also hereby part of the Contract.

TC-6.05 USE OF EXPLOSIVES

All blasting operations, including the storage and handling of explosives and blasting agents, shall be performed in conformance with the applicable provisions of the Standard Specifications and all other pertinent federal, State, and local laws and regulations. Whenever explosives are used, they shall be of such character and in such amount as is permitted by the State and local laws and ordinances and all respective agencies having jurisdiction over them.

The Engineer will at all times have the authority to prohibit or halt the Contractor’s blasting operations if it is apparent that, through the methods being employed, the required results are not being obtained, an unstable condition exists, or the safety and convenience of the public is being

jeopardized. The Contractor shall not damage any adjacent property or Structures. A pre-blasting and post-blasting survey inspection is required to be performed by the Contractor.

(a) **Blasting Plan Required.** Not less than two (2) weeks prior to commencing drilling and blasting operations, or at any time the Contractor proposes to change the drilling and blasting methods, the Contractor shall submit a blasting plan to the Engineer for review. The blasting plan shall contain the full details of the drilling and blasting patterns and controls the Contractor proposes to use. The blasting plan submittal is for quality control and record keeping purposes.

Review of the blasting plan by the Engineer shall not relieve the Contractor of the responsibility for the accuracy and adequacy of the plan when implemented in the field. If at any time during the progress of the Work the method of drilling and blasting does not produce the desired result, the Contractor shall submit a revised blasting plan until a technique is arrived at that shall produce the desired results.

(b) **Responsibility.** Control of blasting is a major responsibility of the Contractor. The Contractor shall execute vibration control and shall at all times be responsible for damage caused by vibrations due to blasting or any of the Contractor's other operations.

(c) **Extraordinary care.** When the use of explosives is necessary for the prosecution of the Work, the Contractor shall use extraordinary care so as not to endanger life or property. Before the firing of any blast in areas where flying rock may result in personal injury or unacceptable damage to property or the Work, the rock to be blasted shall be covered with approved blasting mats, soil, or other equally serviceable material, to prevent flyrock.

(d) **Safeguard of Public.** The Contractor must safeguard the traveling public during dynamiting operations. The Contractor shall use enough watchmen, flagmen, signs, etc. to warn the public including, but not limited to, motorists and pedestrians during blasting.

(e) **Storage.** The Contractor shall store all explosives in a secure manner and shall clearly mark storage places "DANGEROUS - EXPLOSIVES". The storage places must be in the care of competent watchmen at all times and all explosives shall be stored and handled according to the provisions of the statutes of the State and local laws and ordinances.

(f) **Permits & Insurance.** Before any blasting is done, the Contractor shall apply for and obtain a blasting permit from the applicable governing authority. Insurance shall be maintained and certified as specified in Section GP-7.14.

(g) **Protection of Underground Utilities.**

(1) The Contractor shall ensure the protection of underground utilities. The Contractor shall notify each public utility company and those applicable Utility Companies having Structures close to the site of Work of the Contractor's

intentions to use explosives. The notice must be given far enough in advance to enable all Persons and the Utility Companies to take such steps as they deem necessary to protect their property from injury. Such notice does not relieve the Contractor of responsibility for any damage resulting from Contractor's blasting operations.

(2) At and below the elevation of the top of the buried utility line, the vertical depth of blast holes shall be restricted to one-half the horizontal distance to the closest portion of the utility. The blast hole shall be restricted to a maximum of three inches (3"), with no more than one hole per delay.

(h) Peak Particle Velocity. When blasting has to be done next to a Structure, the Contractor shall ensure that the "Peak Particle Velocity" at the Structure does not exceed 0.50 inches/second for frequencies less than 40 Hz. The "Peak Particle Velocity" is the maximum of the three-velocity components measured at a point with a three-component vibration recording instrument capable of producing a permanent record.

(i) Maximum charge weight. If a scaled distance, as defined below, of seventy (70) or greater is used with minimum delays of ten (10) milliseconds, the following formula may be used to determine the maximum charge weight per delay which can be used without seismic instrumentation:

Scaled Distance = Actual Distance to Damage Point in Feet (Charge Weight in Pounds per delay) $^{1/2}$

Charge Weight in = (Actual Distance to Damage Point in feet) squared pounds per Delay (Scaled Distance) squared

(j) Blast holes. Blast holes are to be limited to three inches (3") in diameter. Prepackaged material only shall be used with no free flowing explosive permitted.

(k) Use of Explosives Within State Road Right-of-Way.

(1) The use of explosives is not permitted within rights-of-way of the State Highway Administration (SHA) except when specifically allowed under a SHA permit or by amendment of the same. The Contractor shall conduct and perform all blasting operations according to the permit and/or any addenda issued.

(2) Before using any explosives, notify the following office:

Utility Division
Maryland State Highway Administration
District No. 4
320 West Warren Road
Hunt Valley, Maryland 21030
Telephone (410) 229-2300

(l) Each blasting shall be seismographically recorded by the Contractor and the Contractor shall send a copy of the report to the SHA Highway District Utility Engineer at the above address.

(m) **Use of explosives.** The use of explosives is not permitted within railroad rights-of-ways except when specifically allowed under a railroad permit or by amendment of the same. All blasting operations shall be conducted and performed according to the permit and/or any addenda issued.

(n) **Payment for blasting.** Payment of all blasting operations, control measures and monitoring systems shall be included in the unit price Bid for each Contract Item for which blasting is required.

TC-6.06 AERIAL ELECTRIC LINES (750 VOLTS OR MORE)

The Contractor shall be aware that State law requires that a ten foot (10') radial clearance shall be maintained for all Construction Equipment and Materials in relation to electric lines carrying seven hundred fifty (750) volts or more. Because the State law is more stringent than the federal laws, the State law shall be considered the minimal distance.

The Contractor shall also be aware of, and comply with, all other federal, State, County and local laws, utility company requirements and regulations, as specified in Section GP-7.01 "Compliance With Laws".

TC-6.07 LOAD AND SPEED LIMITATIONS – RESERVED

TC-6.08 HAZARDOUS MATERIAL

If the Contractor encounters or exposes during Construction any abnormal conditions which indicate the presence of a hazardous material or toxic waste, Work in the area shall immediately be suspended and the Engineer notified in writing. The Contractor's operations in this area shall not resume until permitted in writing by the Engineer; however, the Contractor may continue working in other areas of the Work site, unless directed otherwise.

Abnormal conditions shall include, but not be limited to, the presence of barrels, obnoxious or unusual odors, excessively hot earth, smoke, or any other condition which could be a possible indicator of hazardous material or toxic waste.

Disposition of the hazardous material or toxic waste shall be made in conformance with all applicable laws, requirements and regulations. Where the Contractor performs necessary Work required to dispose of these Materials and no Contract Items have been identified in the Contract Documents, the Work shall be performed under an Extra Work Order.

For any Material furnished in connection with the Contract and/or on the Work site by the Contractor that is suspected to be hazardous or toxic, the Engineer may require the Contractor to have it tested and certified to be in conformance with all applicable requirements and regulations. Material found to be hazardous or toxic shall not be incorporated into the Work. The required testing will be determined by the Engineer and may include, but not be limited to, the EPA Toxicity Characteristic Leaching Procedure (TCLP) or its successor. The evaluation and interpretation of the test data will be made by the Engineer. Testing and Certification shall be at the Contractor's sole expense.

TC-6.09 RECYCLED OR REHANDLED MATERIALS

For recycled or rehandled Material furnished on the Work site by the Contractor for use in embankment, base, Subbase or drainage media, the Engineer may require the Contractor to have the Material tested and certified to be in conformance with all applicable environmental requirements. The required testing will be determined by the Engineer and may include, but not be limited to, the EPA Toxicity Characteristic Leaching Procedure (TCLP) or its successor. The evaluation and interpretation of the test data will be made by the Engineer and be based on the Work site environment. Testing and Certification shall be at the Contractor's sole expense.

TC-6.10 CONSTRUCTION AND WASTE MATERIAL

All wood, trash, debris, and other foreign matter shall be removed from within the Right-of-Way limits and disposed of by the Contractor. The Contractor shall make all necessary arrangements to obtain suitable disposal locations at the Contractor's sole expense. Disposal shall be in conformance with all federal, State and local ordinances.

TC - SECTION 7
PAYMENT

TC-7.01 MEASUREMENT OF QUANTITIES – RESERVED

TC-7.02 PAYMENT ALLOWANCES FOR STORED MATERIALS – RESERVED

TC-7.03 FORCE ACCOUNT WORK – RESERVED

TC-7.04 PROGRESS PAYMENTS – RESERVED

TC-7.05 FINAL ACCEPTANCE AND FINAL PAYMENT– RESERVED

TC-7.06 LATE PAYMENTS – RESERVED

(This page intentionally left blank)

CATEGORY 100
PRELIMINARY

SECTION 101 – CLEARING AND GRUBBING

101.01 DESCRIPTION. This work shall consist of clearing and grubbing within the limits specified in the Contract Documents.

101.01.01 Definitions.

(a) Clearing is the removal and disposal of trees, fallen timber and rotten wood, brush, shrubs, vegetation, rubbish, fences, and structures not specified in the Contract Documents for removal and disposal. Unless otherwise specified, clearing outside the LOD includes the removal of rubbish only.

(b) Grubbing is an earth-disturbing activity, which includes the removing from the ground and disposing of all stumps, roots and stubs, brush, and debris.

(c) Limit of Disturbance (LOD) is the maximum allowable limit of earth disturbance as delineated in the Contract Documents. When not delineated in the Contract Documents, the LOD will be the top of cut, toe of slope, or limit of ditch excavation. Do not perform earth-disturbing activities beyond the LOD without authorization.

(d) Limits. Clearing and grubbing is confined to the LOD and authorized modifications to the LOD. When indicated in the Contract Documents, the limit of clearing may include the area between the LOD and the right-of-way or easement lines.

(e) Grading Unit is the area of erodible material exposed at one time, not to exceed 20 acres.

(f) Disturbed Area is an area where erodible material is exposed by construction activities.

(g) Stabilization Measures are activities that provide vegetation or otherwise prevent erosion. These activities include the placement of temporary or permanent seeding or mulching, soil stabilization matting, riprap, stone aggregate, and asphalt or concrete paving. The placement of one or more of these temporary or permanent stabilization measures to the satisfaction of the Engineer will meet the requirements for proceeding to the next grading unit or operation.

101.02 MATERIALS. Not applicable.

101.03 CONSTRUCTION.

101.03.01 Erosion and Sediment Control. Unless otherwise specified in the Contract Documents or as directed by the Engineer, the clearing and grubbing area shall be limited to

one 20-acre grading unit per grading operation. Once this first unit is 50 percent graded, the Contractor will be allowed to proceed with the second 20-acre grading unit. With the permission of the Engineer, the Contractor may be allowed to exceed the one grading unit requirement to balance earthwork or when grading interchanges. Erosion and sediment control shall conform to the Contract Documents and Section 308.

The grading operation will be limited to the Contractor's ability to provide adequate resources to perform the grading in a timely manner and to provide and maintain the proper erosion and sediment control measures. The Engineer is the final authority in this determination. A grading unit need not be 20 contiguous acres. When wet soil conditions are encountered, the clearing, grubbing, and grading of another unit will be allowed, once stabilization of the initial unit is approved. No more than two grading units may be active at any time.

101.03.02 Vegetation. The Engineer will designate and mark trees, shrubbery, and plants that are to remain in place. Protect them from any damage, as specified in Section GP-7.11. Cut and properly trim the branches of trees overhanging the roadway to maintain a vertical clearance of 16 ft. Employ a tree expert licensed by the State of Maryland to supervise all trimming operations. Perform all trimming and repair of cuts and scars as specified in Section 712.

101.03.03 RESERVED – See Section 110

101.03.04 RESERVED – See Section 110

101.03.05 Grubbing.

(a) Excavation Areas. Remove all embedded stumps and roots to a depth of at least 3 ft below the subgrade or slope surface. Refill all depressions made below the subgrade or slope surfaces with materials suitable for embankment and compact as specified in Section 204.

(b) Low Embankments. Grub areas where the total depth of the embankment is less than 3 ft.

(c) High Embankments. In areas where the embankment is 3 ft or more in depth, cut off trees and stumps as close to the ground as practical but not greater than 1 ft above the ground surface. Near the toe of embankment slopes, remove trees and stumps that are within 1 ft of the slope surface.

101.03.06 Stream and Channel Changes. When an LOD is not specified, clear and grub 5 ft beyond the top of the cut slopes or as directed.

101.03.07 Disposal.

(a) Burning. If perishable material is burned, it shall be burned under the constant care of a watchperson. Burning shall conform to the applicable laws and ordinances of

Baltimore County and shall have the written approval of the Engineer and the owner of the property.

(b) Disposal Locations. Remove from the right-of-way and dispose of all unburned material and debris. Make all necessary arrangements to obtain suitable disposal locations. Furnish the Engineer with a copy of resulting agreements.

(c) Wood Disposal. No disposal of wood to the general public shall be accomplished off the job site without prior written approval of both the Engineer and the property owner. Any plan for such disposal shall be submitted to and approved by the Engineer prior to beginning the clearing and grubbing operation.

101.03.08 Damage to Trees and Other Protected Resources. Ensure that the LOD and all protected resources are demarcated as specified in Section 107.

Perform damage repair and damage compensation as specified in Section 712 for damage beyond the LOD due to work operations.

101.04 MEASUREMENT AND PAYMENT. ***Clearing and Grubbing*** will not be measured but will be paid for at the Contract lump sum price. The payment will be full compensation for selective tree trimming and scar repair, repair or replacement of damaged trees, restoration measures for damaged or destroyed protected resources, repair to other damaged properties, removal and disposal of existing buildings when not covered as a specific pay item in the Contract Documents, and for all material, labor, equipment, tools, and incidentals necessary to complete the work.

SECTION 102 – REMOVAL AND DISPOSAL OF EXISTING BUILDINGS

102.01 DESCRIPTION. This work shall consist of the removal and disposal of existing buildings, including foundations, footings or any part thereof, and backfilling, as specified in the Contract Documents. The work also includes protection of the buildings until the removal and disposal are accomplished as directed by the Engineer. Locations of buildings included in the work will be designated in the Contract Documents by the circled numbers ①,②,③, etc.

102.02 MATERIALS. Not applicable.

102.03 CONSTRUCTION. Schedule the removal, razing, or occupation of buildings and appurtenances as one of the first items of work. Post and protect the buildings from vandalism and theft.

Remove and dispose of buildings scheduled for temporary use immediately when vacated.

Buildings and appurtenances may be disposed of by burning if they are not located close to habitable dwellings and if not prohibited by local or State laws, regulations, ordinances, or by the fire marshal. Removal by burning shall be scheduled with the Engineer and shall have the prior written approval of the Engineer, the County Fire Marshall and the owner of the property. Removal by burning shall not be done on days when windy weather or dry conditions could endanger adjacent properties, as determined by the Engineer or the County Fire Department.

Salvaged materials not claimed by the County as described by Contract Documents shall become the property of the Contractor. Selling of merchantable material and removal by the purchaser shall be done only during daylight working hours and accompanied by a Contractor's representative.

102.04 MEASUREMENT AND PAYMENT. ***Removal and Disposal of Existing Buildings*** will not be measured for payment but will be paid for at the Contract lump sum price. The payment will be full compensation for all material, labor, equipment, tools, and incidentals necessary to complete the work. All buildings not designated for removal and disposal in the Contract Documents will not be measured but will be incidental to Section 101 "Clearing and Grubbing".

The County reserves the right to eliminate from this item any or all buildings or structures. For each building eliminated from this item, the item will be credited to the extent of the cost eliminated, which will be determined from a breakdown to be submitted by the Contractor showing the tabulation of individual unit costs used in arriving at the Contract price for this item. A breakdown of the Contract lump sum price for ***Removal and Disposal of Existing Buildings*** shall be submitted to the Engineer prior to beginning work.

SECTION 103 – ENGINEERS OFFICE

103.01 DESCRIPTION. Furnish, clean, and maintain in good condition an Engineers office at an approved location within the immediate vicinity of the project. The office shall be separate from any offices used by the Contractor, and it and all items therein shall be for the exclusive use of the County's Engineers and Inspectors. Rented properties that conform to the type of office specified in the Contract Documents will be acceptable.

103.02 MATERIALS. Not applicable.

103.03 CONSTRUCTION. Set up, equip, and make the office ready for use at least five days prior to commencement of other work on the project. Leave the office and appurtenances in place until all field records are complete. Upon removal of the office, restore the location to a condition acceptable to the Engineer.

Unless otherwise specified, the office and all furnished equipment and accessories shall become the property of the Contractor at the completion of the project.

103.03.01 Reserved.

103.03.02 Handicap Accessibility. When handicap accessibility is necessary, comply with Title II (28 CFR Part 35) and Title III (28 CFR Part 36) of the Americans with Disabilities Act (ADA) and the 2010 ADA Standards for Accessible Design.

103.03.03 Mobile Office Trailers. Anchor in accordance with the manufacturer's recommendations. Office trailers, as defined under the Industrial Building and Mobile Act of Maryland, shall be approved by the Maryland Department of Housing and Community Development and bear the Maryland Certification Insignia in the interior of the office.

Office Trailers shall not be placed within designated floodplain areas.

103.03.04 Reserved.

103.03.05 Requirements for all Offices.

(a) Entirely enclosed, waterproofed, and completely insulated to at least an R11 rating.

(b) Double thick floor with building paper placed in between the floor layers.

(c) Finished inside and outside as approved.

(d) A ceiling height of at least 7 ft, a pitched roof, and a ventilating louver in each gable.

(e) A 4 x 1 ft sign with the message:

FIELD OFFICE
DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION
BALTIMORE COUNTY

attached to or mounted in front of the office. The sign shall have a black background and have white lettering at least 3 in. high.

(f) A 5 x 7 in. "No smoking" sign posted on the outside of each entrance to the office.

(g) Interior and exterior doors equipped with different key locks. Interior doors keyed alike. Exterior doors keyed alike. An additional dead bolt lock for each exterior door. Four keys for each interior and exterior lock.

(h) Windows capable of being opened and closed. Equip with latches, screens, and venetian blinds or shades.

(i) Electrified in accordance with national and State electrical codes with satisfactory artificial lighting and lighting services. Ensure an illumination level of at least 75 ft-c.

(j) Equipment capable of heating the office to at least 70 F and cooling to at least 78 F.

(k) All offices shall be provided with neat, sanitary toilet and hand-washing accommodations for the exclusive use of the County employees; and such facilities shall meet the requirements of the State Department of Health and Mental Hygiene or other authorities having jurisdiction.

(l) The field office is to be maintained in a clean and sanitary manner. Trash shall be removed and the office broom-cleaned daily. The floors shall be damp-mopped weekly. Interior and exterior windows shall be cleaned weekly.

(m) Protect the County and County employees from any loss or damage to their property stored in the Engineers Office. Provide protection in the amount of twenty thousand dollars ($20 000), nondeductible, per each occurrence, for any loss or damage due to fire, theft, vandalism, storms, or floods. Complete the reimbursement, replacement, or repair within 30 days from the date the Engineer reports the loss.

(n) A parking area for the exclusive use of County employees. Provide the specified number of spaces. Post signs to designate the assigned parking areas. Stabilize the parking area as directed.

(o) Fire extinguishers of a dry chemical or multi-purpose ABC type (at least 10 lb), equipped with a visual air pressure gauge, and maintained in accordance with OSHA standards.

(p) A 24 unit first aid kit furnished and maintained as described in the Code of Federal Regulations, Title 29 Subpart D, Section 1926.50(d)2.

(q) A 4 x 8 ft waterproof bulletin board. Place in an easily accessible area within the project limits and conspicuously displayed to all employees. Post and maintain all pertinent and required notices for the duration of the project.

(r) Touch-tone telephones equipped with an answering device capable of answering, recording, storing, and playing back incoming messages at least 30 minutes in length and recording outgoing messages up to 15 seconds in length. The device shall be voice activated, beeperless, record as long as the speaker speaks, and play back recorded messages without dial tone or pauses.

Replace stolen equipment and equipment that becomes defective or for any other reason does not function as intended. Provide an equal or better unit within eight hours after notification. Replacement shall be at no additional cost to the County. Post emergency telephone numbers at a conspicuous location.

(s) One sanitary electric water cooler, including bottled water and disposable cups.

103.03.06 Microcomputer System for all Offices - as specified in the Contract Documents.

103.03.07 Facsimile (FAX) Transceiver for all Offices.

Provide a FAX/copier machine that:

(a) Is connected to a dedicated phone jack with a separate independent telephone line and phone number.

(b) Is in accordance and compatible with CCITT Group Transmission Standards (see specific line items for compatibility requirements).

(c) Uses public switched telephone networks and standard two wire leased line through RJ11C jacks or similar devices.

(d) Transmits at least 9600 BPS with automatic stepdown to compensate for phone line conditions.

(e) Is capable of transmitting a standard 8-1/2 x 11 in. page within 20 seconds through a clear phone line, based on CCITT #1 test chart.

(f) Is capable of two levels of resolution with contrast control:

(1) Standard 200/96 lines

(2) Fine 200/196 lines

(g) Is capable of self-test and providing activity reports with page headers, time, and date.

(h) Uses standard copy paper for receiving transmissions.

(i) Has an automatic document feeder tray (see specific requirements for each transceiver class).

(j) Has handsets.

(k) Has automatic answer, receive, and disconnect features.

(l) Provide the FCC registration number, ringer equivalence, and connection circuitry for each transceiver.

103.03.08 Specific Field Office Requirements.

Engineers Office No. 1 – Standard office trailer with at least 200 ft^2 of floor area under one roof.

Engineers Office No. 2 – Standard office trailer with at least 400 ft^2 of floor area under one roof.

Engineers Office No. 3 – Standard office trailer with at least 700 ft^2 of floor area under one roof.

Engineers Office No. 4 – One-story structure containing at least 1300 ft^2 of floor area under one roof. Modular construction is acceptable. Office trailers are not acceptable.

ENGINEERS OFFICE				ITEM
1	**2**	**3**	**4**	
–	1	2	–	Inner Offices–100 ft^2 each
–	1	1	–	General office area
–	–	–	4	Inner Offices–120 ft^2 each
–	–	–	1	Conference room–240 ft^2
–	–	–	1	Storeroom with shelves–120 ft^2
–	1	1	1	Inner office ingress and egress to the other rooms
3	4	4	5	32 x 60 in. Executive type desks with center drawers
3	4	4	5	Swivel chairs, padded with arm rests
1	1	1	1	30 x 72 in. slant top drafting table and stool, approximately 40 in. high at the front edge
1	2	3	6	30 x 72 in. folding utility table, 30 in. high
–	–	–	1	12-person conference table with padded chairs
2	6	10	12	Additional padded chairs
1	2	2	3	Plan racks
1	1	1	2	Coat racks
1	1	1	1	3 x 6 ft blackboard or whiteboard
1	2	3	3	Electronic desk calculators with memory and tape readout (including manuals, and tapes as needed)
1	1	2	6	Legal size steel filing cabinets, 4 drawer fire resistant (D label) with locks
–	2	2	2	Standard size steel filing cabinets, 4 drawer with locks
1	1	1	5	Bookcases having four shelves 36 x 12 in.
1	2	2	2	Closets, full height, measuring at least 24 x 30 in., equipped with locks, and at least two shelves in each
1	1	1	–	Utility cabinet with 3 adjustable shelves
1	1	1	–	Overhead cabinet at least 8 ft long, 15 in. deep, and 18 in. high
1	1	1	2	Fire extinguisher as specified in Section 103.03.05
1	2	2	4	Telephones with separate lines, as specified in Section 103.03.05
2	2	2	2	Battery-operated smoke detectors
4	8	10	15	Designated parking spaces

103.03.09 Recyclable Materials (Paper, Bottles, Cans, Etc.). Recycling of suitable material is encouraged at all Engineers Offices and Contractor's facilities. However, when the project includes an Engineer's Office No. 4, recycling will be required at both the Engineers Office and the Contractor's facilities for the project. Provide the necessary containers and arrange for the removal of the recycled material from the site.

103.04 MEASUREMENT AND PAYMENT. ***Engineer's Office*** will not be measured but will be paid for at the Contract lump sum price for the pertinent Engineers Office specified.

The payment will be full compensation for site preparation, utility costs, all specified furnishings, to provide, equip, clean, maintain, insure, remove and dispose of the office, restore the site, recycling, and for all material, labor, equipment, tools, and incidentals necessary to complete the work.

All costs for the telephones and answering machines required for each specific office including furnishing, installation, maintenance, replacement, tapes for answering machine and monthly service charges (local and long distance) will not be measured but the cost will be incidental to the Contract lump sum price for the specific type of Engineers Office.

The only exception to the all-inclusive Contract lump sum price is the stabilization of the parking area, which will be measured and paid for using the pertinent items as directed.

SECTION 104 – MAINTENANCE OF TRAFFIC

104.00 GENERAL. This work shall consist of maintaining traffic, vehicular and pedestrian, on or along any transportation facility as specified in the Contract Documents. This Section sets forth the traffic control requirements necessary for the safe and continuous maintenance of traffic throughout the area affected by the work, and is intended to minimize inconveniences to the traveling public, while providing for the safety of motorists, pedestrians and workers.

Work shall be as specified in the Contract Documents or as directed by the Engineer. These documents shall include the latest Maryland Manual on Uniform Traffic Control Devices (Md MUTCD), Standard Specifications and Interim Specification Addenda (ISA), the State Highway Administration's Book of Standards for Highway and Incidental Structures, Traffic Control Plans (TCP), Plans, the Solicitation for Bids (SFB), and Special Provisions.

When speed of traffic is noted, this means the posted speed or prevailing travel speed, whichever is higher unless otherwise specified.

Items used for temporary maintenance of traffic shall be removed from the project site when no longer needed and shall become the property of the Contractor, unless otherwise specified in the Contract Documents.

Ninety percent of all reflective barrier markers, warning lights, and raised pavement markers shall be operational at any given time unless more are specified by the Engineer. Any deficiencies shall be corrected within 24 hours.

Upon initial installation reflectorized traffic control signs shall have a minimum of 70 percent reflectivity specified in Section 950.03 over 90 percent of their reflectorized surface, and channelizing devices shall have a minimum of 80 percent reflectivity specified in Section 950.03 over 90 percent of their reflectorized surface.

The Engineer may direct that traffic control devices, such as yield or stop signs that become damaged be replaced within four hours of notification to the Contractor. The Contractor shall take the necessary corrective action as approved by the Engineer to adequately warn and protect the public until the signs are replaced.

The Contract Documents specify one or more of the items listed in the following sections. When work is specified to be accomplished under the item ***Maintenance of Traffic***, the work will be incidental to the lump sum price for ***Maintenance of Traffic***. When work is required other than the above and no pay item is specified in the Contract Documents, refer to Section GP-4.06 (Changes) for basis of payment.

104.01 TRAFFIC CONTROL PLAN (TCP).

104.01.01 DESCRIPTION. This work shall consist of the development and implementation of a TCP. The TCP will include the design and placement of such items as signing, pavement markings, delineation, channelization, barriers, crash cushions and other items as required.

TCPs may be implemented within a single project or jointly between two or more projects. In situations where TCPs are jointly implemented, care shall be exercised to present correct and non-conflicting guidance to the traveling public.

The Contractor shall implement the County's TCP or he may develop his own TCP. The Contractor's TCP shall be submitted in writing to the Engineer at least 20 days prior to starting any work. Changes to the approved TCP shall be submitted in writing at least five days prior to implementing the change. For an emergency, the approval process will be completed within four hours. The Contractor shall have written approval of any TCP changes from the Engineer prior to their implementation. No work shall begin until the required traffic control patterns and devices are in place.

Unless otherwise specified in the Contract Documents, all travel lanes shall be restored at the end of the work day and no travel lane shall be reduced to less than 10 ft. Prior to opening the closed lane or shoulder, the Contractor shall clear the lane or shoulder of all material, equipment, and debris.

104.01.02 MATERIALS. Not applicable.

104.01.03 CONSTRUCTION. Not applicable.

104.01.04 MEASUREMENT AND PAYMENT. Any traffic control plan developed by the Contractor will not be measured but the cost will be paid for as part of the lump sum price paid for Maintenance of Traffic.

104.02 MAINTENANCE OF TRAFFIC (MOT).

104.02.01 DESCRIPTION. This work shall consist of maintaining traffic safely and efficiently through and/or around the area affected by the work.

104.02.02 MATERIALS.

Traffic Materials	950

104.02.03 CONSTRUCTION.

(a) Traffic Manager (TM). The Contractor shall assign to the project an employee or employees to serve in the capacity of TM. When a TM item is included in the Contract Documents the TM shall serve in the capacity full time. The TM may assume additional duties when a TM item is not included specifically in the Contract Documents and payment is made as part of a payment item for Maintenance of Traffic. The TM shall be experienced and trained in traffic control.

The Contractor shall submit the TM's name to the Engineer for approval at least 10 days prior to commencing any work on the project. The TM shall provide proof of completing a State Highway Administration-approved Temporary Traffic Control (TTC) training course within the last four years. Change in the appointment of any TM throughout the duration of the Contract will require a written submission to and approval by the Engineer.

The TM shall implement the TCP, maintain an up to date TCP and provide an acceptable copy to the Engineer following any changes.

The TM shall closely coordinate his operations with the Engineer and shall supervise the maintenance of traffic on the project, including those involving subcontractors. The TM shall be required to make on-site inspections of the area affected by the work on a regular basis including Saturdays, Sundays, and holidays and shall be available for consultation at all times. When the TCP is in place, the TM shall be responsible for making daily inspections during hours of operations. A minimum of one night inspection per week will be required. More inspections may be required as directed by the Engineer. The monitoring of the maintenance of traffic by the TM shall include surveillance of any area affected by the work of the Contract during holiday periods. The TM shall maintain a daily log for the inspections and shall include the date, time, condition of maintenance of traffic and any corrective action taken.

The TM shall be responsible for coordination between adjacent work zone operations to assure that inappropriate or conflicting traffic control sign messages or devices are not displayed to traffic.

The TM shall immediately notify the Engineer of any accident or incident within the area affected by the Contract.

The TM shall make inspections during and immediately after adverse weather conditions to ensure that the traffic control devices are clean, undamaged, and in their proper position. The superintendent and/or the traffic manager for the project shall meet all requirements of a Traffic Manager for this section.

(b) Maintenance of Existing Roadway. The Contractor shall be responsible for maintaining the existing roadway surface and shoulders, including crossroads, ramps, approaches, crossovers, medians, detour roads, entrances, and pavement markings within the limits of the project, throughout the duration of the Contract.

Any hazardous condition that exists or develops throughout the duration of the Contract, such as potholes and shoulder defects shall be repaired or patched by the Contractor as directed by the Engineer.

(c) Existing Regulatory, Warning, and Guide Signs. Existing signs that are no longer applicable, due to temporary traffic conditions, shall be relocated when necessary, turned, completely covered or removed with the approval of the Engineer. They shall be properly redisplayed to traffic as soon as conditions warrant. The Contractor shall replace at no cost to the County any existing signs misplaced, lost or damaged by the Contractor's operations.

Prior to commencement of construction and in the company of the Engineer, the Contractor shall inventory and note the location, type, size and color of all existing pavement markings, legends, symbols and signs. Submit the results on a mark- up set of the Contract Plans or on Contractor-prepared sketches or drawings.

(d) Storage and Movement of Equipment, Materials, and Vehicles. No equipment or material shall be stored or permitted to stand in unprotected areas or open areas within 10 ft from where traffic is being maintained unless protected by traffic barriers. Storage of equipment and materials may be permitted closer than 10 ft, subject to the following restrictions:

(1) Temporary traffic barriers, approved by the Engineer, shall be in place prior to storage of any equipment or materials.

(2) No equipment or materials shall be permitted to stand within 4 ft behind the face of the traffic barrier.

Areas used for storage of equipment and materials shall be restored to their original condition immediately upon completion of their use. No additional compensation will be provided for this work.

Vehicles and equipment shall enter and leave the work area in the direction of the traffic flow.

Paving work conducted on, or adjacent to the traveled way, shall be performed in the direction of traffic flow unless written approval is obtained from the Engineer prior to beginning such work.

The Contractor's vehicles and equipment shall enter on and exit from the roadway at interchanges or legally allowed public use crossovers. Making U-turns across any medians or crossovers signed FOR USE OF AUTHORIZED VEHICLES ONLY by the Contractor's vehicles or equipment are prohibited unless written approval is granted by all regulating entities.

(e) Warning Lights and Devices. Warning lights and flags shall be used on warning signs as specified in the TCP, the Contract Documents, or as directed by the Engineer. During hours of darkness, any channelizing device used to warn of a spot hazard shall have one Type A low intensity flashing warning light attached to the side adjacent to traffic. Two Type A low intensity flashing warning lights shall be attached to the top of each Type III barricade.

(f) Temporary Pavement Markings.

(1) Temporary pavement markings (TPMs) are those markings placed upon the roadway to serve an area of work activity or a work phase for a period of time after which they are to be removed.

When approved by the Engineer, a less than full complement of pavement markings and reduced dimension markings for dashed center lines and lane lines may be permitted. Where less than a full complement of pavement markings or reduced dimension markings are used, the time of use shall not exceed two weeks.

(2) TPMs may be either full dimension or reduced dimension as specified in the Contract Documents or as directed by the Engineer.

(3) Full dimension TPMs shall conform to the Md MUTCD, Part III and the Pavement Marking Dimension Table.

(4) Reduced dimension TPMs shall conform to the Md MUTCD, Part III and the Pavement Marking Dimension Table except that the dashed center lines and lane lines may consist of 4 ft segments and 36 ft gaps. All other dimension elements shall be as specified in the Md MUTCD and the Pavement Marking Dimension Table.

PAVEMENT MARKING DIMENSION TABLE

LINE TYPE	MATERIAL	REQUIRED MINIMUM EFFECTIVE WIDTH	
		EXPRESSWAYS AND FREEWAYS	OTHER ROADS
Lane Lines	Paint	6 in.	4 in.
	Preformed Tape	4 in.	4 in.
Lane Shifts Lane Divides and Severe Alignment Changes	Paint	8 in.	4 in.
	Preformed Tape	6 in.	4 in.
Center Lines (See Note 1)	Paint	6 in. (if operated two ways)	4 in.
	Preformed Tape	4 in. (if operated two ways)	4 in.
Edge Lines	Paint Preformed Tape	Same as adjacent lane or shift line	Same as adjacent lane or shift line
Ramp Edge Lines	Paint	6 in.	6 in.
	Preformed Tape	4 in.	4 in.
Gore Marking	Paint	8 in.	—
	Preformed Tape	8 in.	
Auxiliary	Paint Preformed Tape	Same as particular line being extended	Same as particular line being extended

NOTE 1: Discernible space between double lines shall be 4 to 5 in.

NOTE 2: The 8 in. tape width can be achieved by placing two-4 in. wide segments of preformed tape adjacent to each other as approved by the Engineer.

NOTE 3: This table shall apply only to roads maintained by Baltimore County. For MdSHA-maintained Roads, refer to the applicable MdSHA permit.

(5) TPMs generally use short-lived marking materials that are easily removed. Material requirements are described elsewhere in these Specifications.

(6) Specific TPM requirements:

(a) As a minimum at the close of each day, the roadway shall have all center and lane lines in place.

(b) During the work day while work activity is underway, center and lane lines shall be in place or the lines shall be represented by channelizing devices, signs, or other traffic control devices to clearly define and mark all vehicle paths.

(c) Along two-lane, two-way roadways, the center line shall consist of a continuous double solid yellow center line, a single dashed yellow center line at full dimension, or a single dashed yellow center line at reduced dimension as directed by the Engineer.

(d) All no-passing zones shall be marked and signed as specified in the Contract Documents or as directed by the Engineer. All no-passing zones may be identified by signing for a period not to exceed seven days.

(e) Along multi-lane, undivided roadways the center line shall be identified using a continuous double solid yellow line.

(1) If a two-way left turn is present, see **(f)** below.

(2) If the roadway is three lanes, the center line may be either a continuous double solid yellow center line or a continuous single solid yellow and single dashed yellow combination center line permitting vehicles in the single lane direction to pass. For the placement of no-passing zones, see (f)(6)(d) above.

(f) Along multi-lane undivided roadways having a two-way left turn lane, the two-way left turn lane need not be marked provided that channelizing devices are used continuously throughout the length of the left turn lane at a maximum spacing of 200 ft to delineate the left turn lane, separate the opposing flows of traffic and provide areas within which left turning vehicles may queue while awaiting opportunities to turn.

(g) Along multi-lane roadways having reversible lanes, the lanes shall be marked with the full complement of pavement markings as described in the Md MUTCD Part III.

(h) Where edge lines are not in place, appropriate channelizing devices or other delineation shall be used to delineate the edge of the roadway.

(i) Specific pavement marking and complementary signing details are shown on the Temporary Traffic Control (TTC) Standard Drawings.

(j) For the latest approved TPM materials contact the State Highway Administration Office of Materials and Research.

(g) Channelizing Devices. Install traffic channelizing in accordance with the Md MUTCD, the Contract Documents and the following:

(1) Spacing in feet for channelizing devices in a taper shall be no more than the posted speed limit in mph**.**

(2) Spacing in feet for channelizing devices in a tangent shall be no more than twice the posted speed limit in mph.

(3) To define interchange gore areas or other unusual alignments, space channelizing devices at 25 foot intervals, unless the Engineer directs a closer spacing.

(4) Where possible, space channelizing devices at approximately 6 foot intervals at driveways and intersections, so that sight distance at these locations is not restricted.

(5) The Contractor's name or identification mark may be placed in an inconspicuous location on the channelizing device, facing away from traffic. No advertising is permitted.

104.02.04 MEASUREMENT AND PAYMENT. Unless otherwise specified, the Contract lump sum price for ***Maintenance of Traffic*** will be full compensation for all work necessary to maintain traffic, including relocating, turning, completely covering or removing, maintaining in like new condition and cleaning all existing and temporary traffic signs, and any other traffic control devices not included elsewhere in these Specifications but are necessary for the fulfillment of the Contract requirements and implementation of the approved Traffic Control Plan, and for all material, labor, equipment, tools, and incidentals necessary to complete the work. Payment of 50 percent of the Contract lump sum price will be payable on the first monthly estimate. The remaining 50 percent will be prorated and paid in equal amounts on each subsequent monthly estimate. The number of months used for prorating will be the number estimated to complete the work.

(a) When additional Contract pay items for Maintenance of Traffic are specified in the Contract Documents, measurement and payment will conform to the pertinent pay items included in the Contract Documents.

(b) Maintenance of Existing Roadway. Measurement and payment for this work will conform to the pertinent pay items included in the Contract Documents.

(c) Items for cones, reflective collars, anchoring devices, STOP/SLOW paddles, sign flags, and warning lights will not be measured but the cost will be incidental to the Contract lump sum price for ***Maintenance of Traffic*** unless otherwise specified in the Contract Documents.

(d) The Contractor shall immediately replace temporary traffic control devices when so directed by the Engineer. The cost to replace traffic control devices, including all material, labor, equipment and tools, will not be measured but will be incidental to the Contract lump sum price for ***Maintenance of Traffic*** except when specifically set up in the Contract Documents as a separate Contract pay item.

(e) Materials, equipment, and labor necessary for the construction and removal of temporary or detour roads will be measured and paid for at the Contract unit price for the pertinent items used.

(f) The ***Traffic Manager*** will be measured and paid for at the Contract price per unit day unless otherwise specified in the Contract Documents. The payment will be full compensation for all materials, fees, equipment, tools, and incidentals necessary to complete the work. A unit day shall consist of any 24 hour calendar day period.

When an item for a ***Traffic Manager*** is not specified, the cost for the Traffic Manager will not be measured but will be incidental to the Contract lump sum price for ***Maintenance of Traffic***.

104.03 TEMPORARY RAISED PAVEMENT MARKERS (RPMs).

104.03.01 DESCRIPTION. This work shall consist of furnishing, installing and removing temporary RPMs as specified in the Contract Documents or as directed by the Engineer.

104.03.02 MATERIALS. Temporary RPMs shall conform to the approved list maintained by the SHA's (and recognized by Baltimore County for this item) Office of Traffic and Safety.

104.03.03 CONSTRUCTION. All material, labor, equipment, tools and incidentals necessary for the complete installation / removal of temporary RPMs, as specified in the Contract Documents, shall conform to the manufacturer's recommendations.

104.03.04 MEASUREMENT AND PAYMENT. The payment will be full compensation for all material, labor, equipment, tools, and incidentals necessary to complete the work.

(a) ***Temporary Raised Pavement Markers*** will be measured and paid for at the Contract unit price per each, installed in a manner acceptable to the Engineer.

(b) ***Removal of Temporary Raised Pavement Markers*** will be measured and paid for at the Contract unit price per each, removed in a manner acceptable to the Engineer.

(c) The County will reimburse the Contractor at the Contract unit price per each marker damaged by snowplow operations.

When work is specified to be accomplished under the item ***Maintenance of Traffic***, the work will be incidental to the lump sum price for ***Maintenance of Traffic***. When work is required other than the above and no pay item is specified in the Contract Documents, refer to Section GP-4.06 (Changes) for basis of payment.

104.04 TEMPORARY PRECAST CONCRETE TRAFFIC BARRIER (TCB) FOR MAINTENANCE OF TRAFFIC.

104.04.01 DESCRIPTION. This work shall consist of furnishing, placing, resetting, painting, and removing TCBs for use at locations specified in the Contract Documents or as directed by the Engineer.

104.04.02 MATERIALS.

Vertical Panels, Reflective Barrier Markers and Warning Lights	As approved by the MdSHA QPL
Precast Concrete Traffic Barrier	950.01

104.04.03 CONSTRUCTION. The Contractor shall be responsible for maintaining TCBs in alignment and in a like new condition acceptable to the Engineer.

Resetting TCBs shall consist of removing and relocating TCBs as directed by the Engineer.

Items such as reflective barrier markers, vertical panels (object markers), and warning lights, shall be installed on the TCB as specified in the Contract Documents. Both faces and the top of the TCB shall be painted or repainted as directed by the Engineer.

104.04.04 MEASUREMENT AND PAYMENT.

(a) ***Temporary Precast Concrete Traffic Barrier*** and ***Reset Temporary Precast Concrete Traffic Barrier*** will be measured and paid for at the Contract unit price per linear foot measured along the center line of the top of the barrier. The payment will be full compensation for furnishing, placing, painting, maintaining and removal from the project site as directed by the Engineer, and for all material, labor, equipment, tools, and incidentals necessary to complete the work.

(b) Reflective barrier markers, vertical panels, and warning lights will be measured and paid for at the Contract unit price per each. The payment will be full compensation for furnishing, placing, maintaining and removal from the project site as directed by the Engineer and for all materials, labor, equipment, tools, and incidentals necessary to complete the work.

(c) The payment for ***Reset Temporary Precast Concrete Traffic Barrier*** will be full compensation for removal from its original placement, transporting and resetting it in its new temporary location, applicable portions of Section 104.04.04(a), and for all material, labor, equipment, tools, and incidentals necessary to complete the work.

When work is specified to be accomplished under the item ***Maintenance of Traffic***, the work will be incidental to the lump sum price for ***Maintenance of Traffic***. When work is required other than the above and no pay item is specified in the Contract Documents, refer to Section GP-4.06 (Changes) for basis of payment.

104.05 TRAFFIC BARRIER W BEAM (TBWB) FOR MAINTENANCE OF TRAFFIC.

104.05.01 DESCRIPTION. This work shall consist of furnishing, erecting, maintaining, resetting, and removing temporary TBWB at locations specified in the TCP or as directed by the Engineer.

104.05.02 MATERIALS.

Traffic Barrier W Beam	918.01
Traffic Barrier Posts	918.02
Hardware for Traffic Barriers	918.03
Wood Offset Blocks	M168
Recycled Composite Offset Blocks	612

104.05.03 CONSTRUCTION.

TBWB. Construction methods shall conform to the applicable portions of Section 612, Metal Traffic Barriers.

TBWB-Replacement. Any portion of the TBWB that is damaged shall be replaced immediately. This work shall be accomplished utilizing the Contract item TBWB for Maintenance of Traffic Replacement. The TBWB shall be installed to the correct horizontal and vertical alignments.

TBWB-Reset. When work is sufficiently completed through a traffic control area, and TBWB is no longer required, the TBWB and all components shall be removed and reset in a new work area as specified in the Contract Documents or as directed by the Engineer. The area shall be restored to its original condition.

104.05.04 MEASUREMENT AND PAYMENT. The payment will be full compensation for furnishing and installing all cables, posts, brackets, Traffic Barrier W Beam, hardware, galvanizing, excavation, back-filling, concrete connections to rigid structures, removal, restoration of the area, and for all material, labor, equipment, tools, and incidentals necessary to complete the work as directed by the Engineer.

(a) ***Traffic Barrier W Beam for Maintenance of Traffic*** will be measured and paid for at the Contract unit price per linear foot measured from end to end, including all types of end sections.

(b) ***Traffic Barrier W Beam Replacement for Maintenance of Traffic*** will be measured and paid for as described in the preceding paragraph, with the exception that the limits of linear measurement will be at the ends of the newly installed Traffic Barrier W Beam, including end sections.

(c) ***Reset Traffic Barrier W Beam for Maintenance of Traffic*** will be measured and paid for as described in paragraph (a) above.

When work is specified to be accomplished under the item ***Maintenance of Traffic***, the work will be incidental to the lump sum price for ***Maintenance of Traffic***. When work is required other than the above and no pay item is specified in the Contract Documents, refer to Section GP-4.06 (Changes) for basis of payment.

104.06 TUBULAR MARKERS.

104.06.01 DESCRIPTION. This work shall consist of furnishing, installing and removing tubular markers for maintenance of traffic. Tubular markers shall be used to provide reflective delineation for channelizing traffic through work areas and detours as specified in the Contract Documents or as directed by the Engineer.

104.06.02 MATERIALS.

Tubular Markers	As approved by MdSHA QPL
Reflectorization	950.03

104.06.03 CONSTRUCTION. Tubular markers shall be installed on paved surfaces only, as recommended by the manufacturer and as approved by the Engineer.

104.06.04 MEASUREMENT AND PAYMENT. ***Tubular Markers*** will be measured and paid for at the Contract unit price per each. The payment will be full compensation for the removal of and for all material, labor, equipment, tools, and incidentals necessary to complete the work.

Tubular markers that are damaged as a result of traffic operations shall be replaced and will be measured and paid for at the Contract unit price per each for ***Replacement of Tubular Marker Mast***. If the base detaches from the pavement, the entire tubular marker assembly shall be replaced by and at the Contractor's expense.

When work is specified to be accomplished under the item ***Maintenance of Traffic***, the work will be incidental to the lump sum price for ***Maintenance of Traffic***. When work is required other than the above and no pay item is specified in the Contract Documents, refer to Section GP-4.06 (Changes) for basis of payment.

104.07 ARROW PANEL (AP).

104.07.01 DESCRIPTION. Furnish and place APs for temporary use. Arrow panels are required for use at lane closures on multi-lane roads.

Furnish APs that are self-contained, vehicle mounted or portable, and approved by the Engineer. Use self-contained trailer units unless otherwise specified.

APs shall have both manual and automatic dimmer devices capable of reducing the light intensity by 50 percent. Periodically clean the photocells in order to prevent malfunctioning of the brightness control. Dimmer devices are mandatory during night operation. The devices shall include a fail safe system ensuring that maximum brightness is displayed during sunlight and 50 percent brightness is displayed during darkness, regardless of which dimmer device is operational.

104.07.02 MATERIALS.

Arrow Panel	As approved by MdSHA QPL

104.07.03 CONSTRUCTION. Furnish and test the APs as directed 24 hours in advance of actual use. The AP unit shall conform to the Arrow Panel table and be arranged with double pointed arrow configuration capable of displaying a left arrow, right arrow, double arrow, and a four corner caution mode. A sequential chevron shall not be displayed.

ARROW PANEL				
AP UNIT	Md MUTCD TYPE	LAMP OPTIONS*		
		No. 4412 A-Par 46	No. 4415A	**1295 GE**
Portable	A, D	—	X	X
Vehicle Mounted	B	X	—	—
Self-Contained Trailer	C	X	—	—

*Or as approved.

Use an AP to close any lane of a multilane highway. Place APs as specified. Maintain APs in good operating order.

(a) The AP shall conform to the applicable requirements of the Md MUTCD and only be used to supplement other required traffic control devices. Use the "Arrow" mode when closing a through travel lane on a multilane roadway. Place only one AP in the "Arrow" mode for each stationary lane closure. Moving work operations may utilize one or more APs for a single lane closure. Ensure that placement does not cause driver confusion near ramps, median crossovers, and side road intersections.

(b) Aim the AP at approaching traffic in conformance with the minimum legibility distance specified in the Md MUTCD. Ensure that the display is level.

(c) For stationary lane closures, place the AP on the shoulder at the beginning of the taper (nearest to oncoming traffic). Where there are narrow or no existing shoulders in the closed lane behind the channelizing devices, place the AP as near to the beginning of the taper as possible.

(d) For a lane closure on a two-lane, two-way roadway, or for a shoulder closure on any roadway, use the “Caution” mode. In "Caution" mode, one light is displayed in each corner.

104.07.04 When work is specified to be accomplished under the item ***Maintenance of Traffic***, the work will be incidental to the lump sum price for ***Maintenance of Traffic***. When work is required other than the above and no pay item is specified in the Contract Documents, refer to Section GP-4.06 (Changes) for basis of payment.

Each ***Arrow Panel*** will be measured and paid for at the Contract price per unit day. A unit day shall consist of any approved usage within a 24 hour calendar day period. Each ***Arrow Panel*** will be paid for only once per unit day, regardless of how many times it is relocated. When an arrow panel is used for part of a day, it will be measured and paid for as a unit day.

The payment will be full compensation for all material, labor, equipment, tools and incidentals required to set up and operate at the site as required by the Traffic Control Plan or as directed.

104.08 TEMPORARY TRAFFIC SIGNS (TTS).

104.08.01 DESCRIPTION. This work shall consist of furnishing and installing TTS on or along any transportation facility as specified in the Contract Documents.

The Contractor shall maintain sign faces free of tape, tape residue, or any other foreign matter, and shall remove any advertisements from signs and supports. Supplemental signs shall not cover any part of the face of the primary sign.

104.08.02 MATERIALS.

Wood Sign Supports	921.05 and 921.06
Reflectorization	950.03
Signs	950.08
Portable Sign Supports	As approved by MdSHA QPL

104.08.03 CONSTRUCTION. TTS shall be as specified in the Contract Documents or as directed by the Engineer.

The signing shall conform to Section 6B of the Md MUTCD or the State Highway Administration's Standard Highway Sign Book (SHSB). All work area warning signs shall be 48 x 48 in. unless otherwise specified. The SHSB may be obtained from the State Highway Administration Office of Traffic and Safety, Traffic Engineering Design Division, Telephone No. (410) 787-4022. Designs of signs not included in the SHSB may be prepared by the Contractor in sketch form, to scale, and approved by the Engineer (Baltimore County) or such sign designs may be obtained upon seven day request from the Office of Traffic and Safety. Requests shall be directed to the Engineer (Baltimore County) in writing.

Signs that will be in place for more than three working days shall be mounted on two 4 x 4 in. posts, unless otherwise specified at a minimum height of 5 ft from the near edge of the roadway pavement to the bottom of the sign in rural areas and 7 ft in urban areas. Additional bracing of signs is prohibited. The tops of the wood posts shall not protrude more than 3 in. beyond the nearest edge of the sign. Wood posts shall be placed a minimum of 4 ft into the ground for 4 x 4 in. wood posts and a minimum of 5 ft into the ground for 4 x 6 in. wood posts.

Signs mounted on portable supports for temporary conditions shall be mounted so the bottom of the sign shall not be less than 1 ft above the roadway pavement elevation. Higher mountings are desirable. Portable sign supports shall be self-erecting, able to withstand a wind velocity of 70 mph and shall be able to maintain themselves within five degrees rotation around their vertical axis.

Fabricated wood signs or flexible roll up signs shall be used only as directed by the Engineer. Fabricated aluminum signs including material thickness shall conform to the Maryland State Highway Administration's Standard Highway Sign Book. Diamond shaped warning signs 48 x 48 in. or larger shall be 0.100 in. minimum thickness.

TTS shall not be installed until inspected and approved by the Engineer. The signs shall not be displayed to traffic until directed by the Engineer. TTS shall be properly maintained, remain in place only as needed, and be immediately removed thereafter. Where operations are performed in phases or stages, only those signs that apply to the present conditions shall be displayed to traffic.

When a sign is not indicative of actual conditions such as during periods of partial shutdown or extended periods of no work being performed (including lunch times and overnight periods), the Contractor shall remove the sign, turn it away from all traffic, or completely cover it with an opaque material that is approved by the Engineer. The entire work zone setup does not have to be removed for non-work periods of time up to one hour. Special care shall be exercised to properly space signs along the highway to insure that traffic is provided adequate sight distance to both work zone signs and existing signs.

Signs shall not be obscured by weeds, shrubs, trees, construction equipment, materials or waste materials, personal vehicles, or any other obstruction and shall conform to the sight distance requirements as specified by the County.

TTS for both daytime and nighttime use shall be reflectorized.

Sign Replacement. Signs shall be new or in like new condition. Signs that become faded, illegible, or damaged shall be replaced as directed by the Engineer. Signs that are not new will be permitted to be used only if their reflective intensity at a divergence angle of 0.2 degrees and incidence angle of minus four degrees conforms to at least 70 percent of the values specified in Section 950.03.01. At other times throughout the duration of the Contract the sign's reflective intensity shall be a minimum of 60 percent. The acceptability of the signs shall be measured by means of 60 percent and 70 percent calibrated 1 ft square test plates at the appropriate times. The test plates shall conform to these requirements.

104.08.04 MEASUREMENT AND PAYMENT.

(a) ***Temporary Traffic Signs*** will be measured and paid for at the Contract unit price per square foot in accordance with Section 109 of these Standard Specifications. The payment will be full compensation for furnishing, erection, relocation, maintenance, cleaning, replacement due to damage or normal wear, removal, and for all materials, labor, equipment, tools, and incidentals necessary to complete the work.

(b) Signs damaged by traffic will be measured and paid for at the Contract unit price per square foot for ***Temporary Traffic Signs***. The payment will be full compensation for the furnishing and erection of any replacement signs. The replacement of the sign supports will not be measured but the cost will be incidental to the Contract unit price per square foot for ***Temporary Traffic Signs***.

Temporary traffic signs and all associated hardware, fittings, posts, brackets, and incidentals shall be removed from the project site when no longer needed and shall become the property of the Contractor.

When work is specified to be accomplished under the item ***Maintenance of Traffic***, the work will be incidental to the lump sum price for ***Maintenance of Traffic***. When work is required other than the above and no pay item is specified in the Contract Documents, refer to Section GP-4.06 (Changes) for basis of payment.

104.09 TEMPORARY TRAFFIC BARRIER END TREATMENTS.

104.09.01 DESCRIPTION. Furnish, install, maintain, reset, and remove temporary traffic barrier end treatments in conformance with the manufacturer's recommendations or as directed.

104.09.02 MATERIALS.

Temporary Traffic Barrier End Treatments	Refer to the Contract Documents
Temporary Crash Cushion Sand Filled Plastic Barrels (SFPB)	104.10.02

104.09.03 CONSTRUCTION.

Temporary End Treatments.

(a) Install Temporary Type E and J Traffic Barrier End Treatments in conformance with the manufacturer's recommendations and as approved.

The nose section shall be reflectorized as approved by the MdSHA Office of Traffic & Safety.

(b) Install Sand Filled Plastic Barrels (SFPB) as specified in Section 104.10.03.

Inspection of End Treatments.

(a) Perform a daily visual inspection of the devices to ensure that no damage has occurred, and that the end treatment is capable of functioning as intended.

(b) Following an impact, an approved reflectorized drum will suffice temporarily as reflectorization for the end treatment. Repair or replace the damaged end treatment within four hours after notification.

104.09.04 MEASUREMENT AND PAYMENT. ***Temporary Traffic Barrier End Treatments***, ***Remove and Reset Temporary Traffic Barrier End Treatments***, and Repairing Temporary Traffic Barrier End Treatments will be measured and paid for at the Contract unit price for one or more of the items listed below unless otherwise specified.

(a) ***Temporary Traffic Barrier End Treatments*** will be measured and paid for at the Contract unit price per each for the type specified. The payment will be full compensation for all material, labor, equipment, tools, and incidentals necessary to provide a complete temporary traffic barrier end treatment.

(b) Temporary crash cushion sand filled plastic barrels will be measured and paid for as specified in Section 104.10.04.

(c) ***Remove and Reset Temporary Traffic Barrier End Treatments*** will be measured and paid for at the Contract unit price per each for the type specified. The conditions specified for the initial installation and removal of the end treatment shall be applicable to removing and resetting the end treatment.

(d) ***Temporary Traffic Barrier End Treatment Spare Parts Package*** furnished and installed will be measured and paid for at the Contract unit price per each for the type specified. The payment will be full compensation for the complete clearing and removal of debris and damaged unsalvageable parts, and for all material, labor, equipment, tools, and incidentals necessary to construct the temporary end treatment to the configuration specified.

Payment will not be made for spare parts packages used for end treatments damaged due to the Contractor's operations.

(e) Removal of the temporary traffic barrier end treatments will not be measured but the cost will be incidental to the initial Contract unit price per each. Removal shall include patching of any holes made to anchor or stabilize the end treatment, and cleaning and clearing the area of all debris.

When work is specified to be accomplished under the item ***Maintenance of Traffic***, the work will be incidental to the lump sum price for ***Maintenance of Traffic***. When work is required other than the above and no pay item is specified in the Contract Documents, refer to Section GP-4.06 (Changes) for basis of payment.

104.10 TEMPORARY CRASH CUSHION SAND FILLED PLASTIC BARRELS (SFPB).

104.10.01 DESCRIPTION. This work shall consist of furnishing and installing SFPB. SFPB shall be arranged as specified in the TCP or as directed by the Engineer.

104.10.02 MATERIALS.

Plastic Barrels	As approved by MdSHA QPL
Sand	901 — Table 901A

104.10.03 CONSTRUCTION. The ground shall be leveled with material comparable to the existing ground to support the system prior to installing the SFPB.

The components, assembly, placing configuration, and filling of the individual standard yellow plastic barrels with varying weights of sand shall conform to the manufacturer's recommendations or as specified in the Contract Documents. Each SFPB shall be separated from all other SFPB by a distance of 3 in. The distance between the last row of SFPB and the object being shielded shall be 12 in. SFPB may be permitted to stand on pallets 4 in. or less in height.

The first barrel of the SFPB configuration shall be reflectorized as specified in the Contract Documents. Following an impact, an approved reflectorized drum, conforming to Section 104.12, will suffice temporarily as reflectorization of the SFPB until the damaged SFPB can be replaced. The damaged barrels shall be replaced no later than four hours after the Contractor is notified.

All sand to be placed in the barrels shall be dry and loose. Bags of sand are prohibited. The Contractor shall have available sufficient replacement items including sand. The barrels shall be watertight. An antifreeze agent shall be added to the sand in conformance with the manufacturer's recommendations.

Immediately after the SFPB have served their intended purpose, the Contractor shall remove the installation and restore the site as directed by the Engineer.

104.10.04 MEASUREMENT AND PAYMENT. ***Temporary Crash Cushion Sand Filled Plastic Barrels*** will be measured and paid for at the Contract unit price per barrel for one or more of the items listed below and specified in the Contract Documents.

(a) ***Temporary Crash Cushion Sand Filled Plastic Barrels - Maintenance of Traffic***.

(b) ***Replace Temporary Crash Cushion Sand Filled Plastic Barrels - Maintenance of Traffic***.

(c) ***Remove and Reset Temporary Crash Cushion Sand Filled Plastic Barrels - Maintenance of Traffic***.

The payment will be full compensation for all furnishing, cleaning, placing, replacement, remove and reset, and removing from the project the individual weighted barrels, excavation, sand, regrading, antifreeze agent, machinery, labor, equipment, tools, and incidentals necessary to install, maintain, replace, remove and reset, and remove from the project the Sand Filled Plastic Barrels in a manner acceptable to the Engineer.

When work is specified to be accomplished under the item ***Maintenance of Traffic***, the work will be incidental to the lump sum price for ***Maintenance of Traffic***. When work is required other than the above and no pay item is specified in the Contract Documents, refer to Section GP-4.06 (Changes) for basis of payment.

104.11 TEMPORARY PAVEMENT MARKINGS.

104.11.01 DESCRIPTION. Furnish, install, and remove temporary pavement markings. These markings include lines (striping), legends (letters and numbers) and symbols. The requirements found in Section 549 of the MdSHA Standard Specifications for Construction and Materials shall apply to this specification.

104.11.02 MATERIALS.

Pavement Marking Paint	Refer to Contract Documents
Removable Pavement Marking Tape	Refer to Contract Documents
Black Out Tape	As approved by MdSHA QPL

104.11.03 CONSTRUCTION.

104.11.03.01 Quality Control/Quality Assurance. Perform Quality Control testing in conformance with MSMT 729. Technicians will be certified by the County. The Engineer will complete the Quality Assurance checks by performing the Nighttime Visibility Evaluations.

Retroreflectance. The initial retroreflectance readings for temporary pavement markings shall be at least 250 millicandelas per lux per square meter for white and 150 for yellow. The Engineer will monitor the pavement markings in conformance with MSMT 729 during the service life of the material.

104.11.03.02 Service Life. Maintain the pavement markings for the applicable service life of the materials. The service life shall be at least 180 days for tape and 60 days for paint. Replace the materials if the retroreflectance falls below 150 millicandelas per lux per square meter for white and 100 for yellow.

Replace or repair the pavement markings as necessary within this period and within four hours or as directed at no additional cost to the County. Refer to Section GP-5.11.

104.11.03.03 Application. Apply pavement markings in accordance with the manufacturer's recommendations and the Contract Documents. Apply markings prior to allowing traffic on the pavement and in the same direction as the flow of traffic.

Surface Condition. The pavement surface shall be clean, dry, and free of all contaminants, including curing compound, dirt, and loose particles. Remove all residual, loose, and poorly constructed pavement markings.

104.11.03.04 Pavement Marking Removal. Completely remove all removable pavement markings prior to application of the permanent markings. On stage construction or final surfaces of Portland cement concrete pavements, remove any objectionable adhesive residue by water blasting or other approved methods. Do not use open flame to remove adhesive residue, or any pavement markings. Completely remove or obscure pavement markings within the travel way or adjacent to the travel way that are not applicable.

Ensure that neither the existing nor the final surface is damaged by the operations.

Refer to the Contract Documents for the removal of existing permanent paving markings.

Completely remove or obscure all nonapplicable pavement markings within the travel way or adjacent to the travel way with removable pavement marking tape, as specified in Section 104.11.02.

104.11.04 MEASUREMENT AND PAYMENT. ***Pavement Marking Paint*** and ***Removable Pavement Marking Tape*** will be measured and paid for using one or more of the items listed below and as specified.

The payment will be full compensation for furnishing, installing, and removal of lines, letters, numbers, arrows, symbols, and the removal of all residue. In addition, payment will cover maintenance and replacement during the service life, and for all material, labor, equipment, tools, and incidentals necessary to complete the work.

(a) Replacement of Pavement Markings required beyond the service life per linear foot for the specified pavement marking item.

(b) Replacement of Removable Markings made necessary during the service life as a result of plowing (as determined by the Engineer) per linear foot for the specified removable marking item.

(c) ***Pavement Marking Paint Lines*** - in width specified - per linear foot.

(d) ***Pavement Marking Paint Letters*** / ***Numbers*** / ***Symbols*** per square foot. The square foot quantity for Legends (letters and numbers) and Symbols will be as specified in the Traffic Control Standard Detail Plates.

(e) ***Removal of Removable Pavement Marking Tape Lines*** - in width specified - per linear foot.

(f) ***Removal of Removable Pavement Marking Tape Letters*** / ***Numbers*** / ***Symbols*** per square foot. The square foot quantity for letters, numbers and symbols will be as specified in the Traffic Control Standard Detail Plates.

(g) ***Placement of Removable Pavement Marking Tape Lines*** – any type, any width – per linear foot.

(h) ***Placement of Removable Pavement Marking Tape Letters / Numbers / Symbols*** per square foot. The square foot quantity for letters, numbers and symbols will be as specified in the Traffic Control Standard Detail Plates.

(i) ***Black Out Tape Lines*** – any type, any width – per linear foot.

When work is specified to be accomplished under the item ***Maintenance of Traffic***, the work will be incidental to the lump sum price for ***Maintenance of Traffic***. When work is required other than the above and no pay item is specified in the Contract Documents, refer to Section GP-4.06 (Changes) for basis of payment.

104.12 DRUMS FOR MAINTENANCE OF TRAFFIC.

104.12.01 DESCRIPTION. This work shall consist of furnishing and placing drums and maintaining in like new condition, as warning or channelizing devices to control and maintain traffic.

Drums shall be manufactured of low density polyethylene (PE) to withstand impact without damage to themselves or vehicles. The drum shall be 36 in. in height and a minimum of 18 in. in diameter. The reflective stripes shall be horizontal, circumferential, orange and white, 6 in. wide, two each of white and orange alternating with the top stripe being orange. Drums may have one or more flat sides as long as the minimum 18 in. diameter is satisfied.

104.12.02 MATERIALS.

Plastic Drums	As approved by MdSHA QPL
Reflectorization	950.03

Use high performance wide angle white and fluorescent orange sheeting on all drums.

104.12.03 CONSTRUCTION. Drums shall be adequately weighted with bags of sand to keep them from moving. These bags, with no other attachments, shall rest on the base of the drum. The drums shall be maintained in like new condition. Rubber or plastic bases or recycled tires weighing between 20 and 40 lbs. may be used as a substitute for sand bags. Drums shall be spaced per Section 104.02.03(g)(3) or as specified in Contract Documents or as directed by the Engineer.

The Contractor will be permitted to neatly stencil his name or identification mark at the bottom of the non-reflective portion of the drum in maximum 2 in. high letters. No other markings or writings will be permitted on the vertical side of the drum.

Drums damaged by traffic shall be replaced no later than four hours after the Contractor is notified.

104.12.04 MEASUREMENT AND PAYMENT. ***Drums for Maintenance of Traffic*** will be measured and paid for once at the Contract unit price per each. The payment will include reflectorization, setting, resetting, removing, bags of sand, maintenance, cleaning of drums to like new condition, and for all material, labor, equipment, tools, and incidentals necessary to complete the work.

Where drums have been set and are subsequently damaged by traffic, and in the opinion of the Engineer, are not repairable they shall be replaced and will be measured and paid for at the Contract unit price per each.

When work is specified to be accomplished under the item ***Maintenance of Traffic***, the work will be incidental to the lump sum price for ***Maintenance of Traffic***. When work is required other than the above and no pay item is specified in the Contract Documents, refer to Section GP-4.06 (Changes) for basis of payment.

104.13 BARRICADES FOR MAINTENANCE OF TRAFFIC.

104.13.01 DESCRIPTION. Furnish, set, reset, maintain, and remove barricades for maintenance of traffic.

104.13.02 MATERIALS.

Reflectorization	950.03
Barricades	As Approved by MdSHA QPL

104.13.03 CONSTRUCTION. Use barricade rails conforming to the Md MUTCD, with a minimum rail length of 5 ft. Use approved reflective sheeting and installation procedures.

Replace barricades damaged by traffic within four hours after notification.

Mount signs so that no more than half of the top two rails or one third of the barricade is covered. Mount signs on the barricade so that the bottom of the sign is at least 12 in. above the ground or surface. The bottom of rectangular signs shall not be mounted higher than the bottom of the top rail. Do not use aluminum signs.

104.13.04 MEASUREMENT AND PAYMENT. ***Barricades for Maintenance of Traffic*** will be measured and paid for once at the Contract unit price per each for the pertinent barricade item specified in the Contract Documents. The payment will be full compensation for warning lights (when required), the maintenance and removal of any required warning lights, and for all material, labor, equipment, tools, and incidentals necessary to complete the work.

Where barricades have been set and damaged by traffic, and the Engineer determines that they are not repairable, replacement will be measured and paid for at the Contract unit price.

When work is specified to be accomplished under the item ***Maintenance of Traffic***, the work will be incidental to the lump sum price for ***Maintenance of Traffic***. When work is required other than the above and no pay item is specified in the Contract Documents, refer to Section GP-4.06 (Changes) for basis of payment.

104.14 CONES FOR MAINTENANCE OF TRAFFIC.

104.14.01 DESCRIPTION. Furnish, set, reset, maintain, and remove cones for maintenance of traffic.

104.14.02 MATERIALS.

Reflectorization	950.03
Cones	As Approved by MdSHA QPL

Cones shall be new or like new condition. Cones shall be at least 28 in. high, at least 10 in. diameter at the inside of the base, reflectorized, and equipped with approved anchor collars as needed to maintain an upright position.

104.14.03 CONSTRUCTION. The Contractor's name or identification mark may be neatly stenciled at the bottom of the cone in maximum 2 in. high letters. Place no other markings or writings on the vertical area of the cone. Turn the cone so that Contractor's name or identification mark faces away from traffic. Cones shall be spaced per Sections 104.02.03(g)(1) through (4).

Replace cones damaged by traffic within four hours or as directed after being notified.

104.14.04 MEASUREMENT AND PAYMENT. Cones for maintenance of traffic and cones that have to be replaced will not be measured but the cost will be incidental to the Contract price for ***Maintenance of Traffic***.

104.15 FLAGGER.

104.15.01 DESCRIPTION. This work shall consist of furnishing flaggers when specified in the Contract Documents or as directed by the Engineer. Flagging shall conform to Section 6F of the Md MUTCD. All outfits and equipment will be approved by the Engineer. Flaggers shall have completed a State Highway Administration-approved Temporary Traffic Control (TTC) training course within the last three years. The failure of any flagger to perform the required duties shall be grounds for the Engineer to require a replacement.

Flaggers shall use STOP/SLOW paddles unless the Engineer allows other devices; paddles shall be 24 x 24 in. with minimum 8 in. high letters. Reflective sheeting on the STOP/SLOW paddle shall be encapsulated sheeting conforming to Section 950.03. Standard paddle sign designs shall be as specified in the Contract Documents.

Two-way radios or pilot vehicles shall be used whenever flaggers are not within sight distance of each other, or when directed by the Engineer.

104.15.02 MATERIALS. Not applicable.

104.15.03 CONSTRUCTION. Not applicable.

104.15.04 MEASUREMENT AND PAYMENT. ***Flaggers*** will be measured and paid for at the Contract unit price per hour when specified in the Contract Documents. The payment will be full compensation for clothing, STOP/SLOW paddles, pilot cars or other vehicles, air horns or bull horns, field telephones, walkie talkies, site illumination, and for all material, labor, equipment, tools, and incidentals necessary to complete the work.

When an item for ***Flagger*** is not specified, the cost for the Flagger will not be measured but will be incidental to the contract lump sum for ***Maintenance of Traffic***.

104.16 MODIFICATION OF EXISTING SIGNS.

104.16.01 DESCRIPTION. This work shall consist of relocating, removing, covering, modifying, re-erecting, or changing existing highway signs relating to the construction activity. This work is in addition to the temporary traffic signs specified in Section 104.08.

104.16.02 MATERIAL.

Sign Panel Supports and Hardware	909.07, 921.05, 921.06, 950.04 A 123, A 153 and A 709
Reflective and Non-reflective Sheeting	950.03
Sign Materials	950.08

Use an approved opaque sign covering material.

104.16.03 CONSTRUCTION. Modification of existing signs shall be as specified in the Contract Documents or as directed by the Engineer.

104.16.04 MEASUREMENT AND PAYMENT. Modification of existing signs will be measured and paid for using one or more of the items listed below and specified in the Contract Documents.

The payment will be full compensation for all excavation, backfill, hardware, relocation, removal, covering, modifying, re-erecting changes to existing highway signs, and for all material, labor, equipment, tools, and incidentals necessary to complete the work.

(a) ***Relocate Wood Sign Supports*** per each.

(b) ***Sign Modifications to Overhead Sign Structures*** per linear foot.

(c) ***Relocate Sign*** per square foot.

(d) ***Remove Sign*** per square foot.

(e) ***Modify Copy*** per character.

(f) ***Shield*** per each.

(g) ***Cover Sign*** per square foot.

(h) ***Relocate Sign Luminaire*** per each.

104.17 TEMPORARY MOVABLE TYPE CONCRETE TRAFFIC BARRIER (MCTB).

104.17.01 DESCRIPTION. Furnish, place, assemble, maintain, move, and remove and dispose of movable interlocking type concrete traffic barrier. Movable barrier systems shall consist of individual units that remain connected for the total length when being moved in one continuous operation.

104.17.02 MATERIAL.

Precast Movable Concrete Barrier & Transfer Device	As Approved by MdSHA QPL
Reflective Barrier Markers	As Approved by MdSHA QPL

104.17.03 CONSTRUCTION. Perform all transfer shifts using the transfer device. The transfer device shall be capable of moving and transferring the barrier as required, and of operating on the curve and grades specified. Ensure that the device does not extend into traffic.

The Engineer will inspect the movable barrier upon delivery and throughout the life of the project. Replace any damaged or defective units as directed. Install reflective barrier markers as specified. Maintain the barrier and reflective barrier markers in a like new condition.

Perform all maintenance operations for the transfer device. Have sufficient spare parts and personnel available to ensure that the required lane configurations are in place at the required times. Failure to move the MCTB at the proper time will be cause for penalty under Section GP-5.12.

104.17.04 MEASUREMENT AND PAYMENT. The payment will be full compensation for all material, labor, equipment, tools, and incidentals necessary to complete the work.

(a) The initial installation of the ***Temporary Movable Type Concrete Traffic Barrier*** will be measured and paid for at the Contract unit price per linear foot measured in place from end to end.

(b) Transfer shifts of the barrier will be measured and paid for at the Contract unit price per linear foot for the ***Transfer Shift of Movable Type Concrete Barrier*** item. The

measurement will be end to end of the barrier actually shifted. The Contract unit price will apply to each shift.

(c) Replacing sections of the barrier that have been damaged by vehicular traffic while in place will be measured and paid for at the Contract unit price per each for the ***Replacement Sections for Movable Type Concrete Barrier*** item. Replacement of sections damaged by the Contractor's operations shall be at no additional cost to the County.

(d) Resetting the barrier will be measured and paid for at the Contract unit price per linear foot for the ***Reset Movable Type Concrete Barrier*** item. The payment will also include removal from its original placement and transporting and resetting it in its new temporary location.

(e) Reflective barrier markers will be measured and paid for as specified in Section 104.04.04(b).

(f) End treatments will be measured and paid for under the pertinent item specified in the Contract Documents.

104.18 RESERVED

104.19 PORTABLE VARIABLE MESSAGE SIGNS (PVMS)

104.19.01 DESCRIPTION. Furnish, install and relocate portable, self-contained, trailer mounted variable message signs.

104.19.02 MATERIALS.

PVMS	As Approved by MdSHA QPL

All materials shall be like new, corrosion resistant, and unaffected by water spray, salt, oil, gasoline, and all other contaminants in the quantities normally found along the edge of the traveled roadway. Construction, materials, and operation shall meet NFPA, UL, and NEC. Ensure that sign messages are visible and legible for a distance of 900 ft from any point along the traveled approach roadway at all times. The PVMS shall be equipped with a sighting device to provide alignment for maximum visibility.

104.19.03 CONSTRUCTION.

104.19.03.01 Equipment.

Trailer. In accordance with Maryland Motor Vehicle Law.

Structural Support. The structural support framework shall allow the system to be assembled into a unit and be mounted on the trailer, and shall provide the support mechanism between the sign panel assembly, the power supply, and the controller.

The framework shall provide sufficient support to prevent damage to any unit component when the sign is in the down and locked position during normal highway travel.

The deployed structure shall supply adequate support to allow complete sign operation, including raising and lowering of the sign panel, during sustained wind speeds of 85 mph.

The display windows shall be made of impact-resistant clear Lexan or as approved.

Sign Panel. Not to exceed 144 in. length, 90 in. height, 12 in. depth.

Display.

(a) Capable of displaying three lines of text.

(b) Each line of text shall be constructed using either a discrete matrix or a full matrix display.

(c) Capable of displaying eight characters per line.

(d) The character height shall be at least 18 in.

(e) If discrete matrix display is used, each character shall be displayed using a 5 x 7 array with at least eight array modules per line.

A 4-1/4 to 7 in. space shall exist between each display line with no glare reflection.

(f) If full matrix display is used, the sign shall have at least 25 rows and 45 columns of disks. Each display line shall have at least 7 rows and 45 columns of disks and a 4-1/4 to 7 in. space between each display line with no glare reflection.

Flip Disk Mechanism.

(a) Be electromagnetically activated, with a service life of at least 200 million operations.

(b) Have a reflective surface that will maintain color intensity for at least three years.

(c) Be circular or rectangular, with a visible surface area between 3-3/4 and 4-1/4 in^2.

LED Illumination. LED illumination for each matrix element shall:

(a) Meet ITE specification for amber color.

(b) Utilize AlInGaP substrate.

(c) Each LED shall produce at least a 1candela output on center at 25 mA drive current.

(d) Each matrix element shall have at least two LED's located within the perimeter of the flipping disk.

(e) Provide full illumination within at least a 24 degree cone perpendicular to the sign face.

(f) Have an operating temperature range of -40 to 160 F.

PVMS UNIT.

Lift Mechanism.

(a) Electric or electrically assisted hydraulic mechanism capable of raising and lowering the sign panel.

(b) Capable of being raised or lowered manually.

(c) Furnished with a stainless steel safety bolt to prevent the sign panel from lowering once in the raised position. A self-locking mechanism shall be incorporated into the safety bolt to prevent it from being inadvertently dislodged.

(d) Designed to allow the raised sign panel to rotate 360 degrees about the vertical axis.

(1) Allow rotation clockwise and counter-clockwise.

(2) A mechanism shall be provided to lock the sign panel in place, at any position.

Electrical Connections and Gauges.

(a) All wiring from power sources to PVMS equipment shall use locking cable connectors.

(b) Volt and amp gauges shall be provided for both AC and DC.

(c) Standard negative ground system shall be tied to the sign chassis.

(d) Lightning protection shall be supplied to the load side of the sign system's distributed power lines to withstand multiple surges in excess of 600 volts.

Power Supply. Either a solar powered electrical system, or existing commercial electrical service.

Solar Powered Electrical System. Battery power system and solar array panels capable of displaying a two page message for 21 consecutive days without auxiliary charge.

Sign Controller.

(a) Capable of driving the matrix display panel operating over a -50 to 150 F range and in a 20 to 100 percent noncondensing humidity range.

(b) Accommodate 100 preprogrammed, user-defined messages.

(c) Capable of displaying three sequenced messages. On/Off time for each message in a sequence shall be user adjustable within a range of 0 to 5 seconds.

(d) Designed for fail-safe prevention of improper information display in the case of a system malfunction.

(e) Cause a user defined default message to be displayed in case of failure of the PVMS unit when flip disk mechanism is used.

(f) Have the capability of retrieving all messages stored in temporary memory.

(1) Temporary memory shall be nonvolatile.

(2) All messages and programs shall remain resident in the controller's memory in the event of a power failure.

(3) Have an RS-232 port to facilitate connection of an external communication device.

(g) Capable of automatic system recovery after power outages to the central controller without operator intervention, including the ability to maintain an up-to-date status on a remote unit if sign is operated from a remote location.

(h) Monitor and display the battery output voltage and solar array activities (charging/discharging), and blank the sign when the battery output voltage drops below the manufacturer's recommended output level.

(i) Capable of monitoring and displaying the status of the photocell and adjusting the sign illumination to match the ambient light conditions. The controller shall have at least nine levels of dimming from 10 to 100 percent brightness.

(j) Contained in a weatherproof cabinet located on the controller housing and insulated to protect against excessive vibration and temperature.

(1) Equipped with a lockable door latch and interior cabinet dome light.

(2) Provided with a keyboard storage location inside the cabinet.

Character Set Software.

(a) Have all of the standard ASCII characters and symbols.

(b) Provide left and right arrows.

(c) Have all alphanumeric entries performed with a keyboard or keypad that causes the same character to be displayed on the matrix. Arrow symbols shall be generated via a cursor pad on the keyboard or keypad.

(d) Have messages default to self-centering display with the ability to left or right justify a display when full matrix is used.

104.19.03.02 Set up and operate the PVMS on the project site 24 hours in advance of actual use. Ensure that each unit is functioning properly and approved. Locate the PVMS as specified.

Aim the PVMS at approaching traffic in accordance with the 900 ft minimum visibility and legibility requirement. Ensure that the PVMS is level and that the sign face is not obscured by highway alignment or glare from either sunlight or vehicle headlights.

104.19.04 MEASUREMENT AND PAYMENT. The ***Portable Variable Message Sign*** (PVMS) will be measured and paid for at the Contract price per unit day. A unit day shall consist of any approved usage within a 24 hour calendar day period. Each unit will be paid for only once per unit day, regardless of how many times it is relocated. When a unit is used for part of a day, it will be measured as a unit day. This unit price will be the same regardless of the type of unit used.

The payment will be full compensation for the electrical power and hook up, setup and maintenance of computer programs, changing messages, and for all material, labor, equipment, tools, and incidentals necessary to complete the work.

104.20 Through 104.28 – RESERVED

104.29 TRUCK-MOUNTED VARIABLE MESSAGE SIGN (TVMS).

104.29.01 DESCRIPTION. Furnish, install and relocate a portable, self-contained, truck mounted, variable message sign.

104.29.02 MATERIALS. Each unit shall contain the work vehicle structural support system, sign panel assembly, lift mechanism, power supplies, sign mounted controller, and ancillary equipment.

All materials for TVMS shall be like new, corrosion resistant, and unaffected by water spray, salt, oil, gasoline, and all other contaminants in the quantities normally found along the edge of the traveled roadway. The TVMS construction, materials, and operation shall meet NFPA, ULI, and NEC. Ensure that sign messages are visible and legible for a distance of 900 ft from any point along the traveled approach roadway at all times.

The TVMS shall not block the driver's rear view vision when either in the transport or the deployed position.

104.29.03 CONSTRUCTION.

104.29.03.01 Equipment.

Truck. The work vehicle size and the method of attachment shall be as specified in the manufacturer's specifications. All vehicles shall be in accordance with Maryland Motor Vehicle Law.

Structural Support. The structural support framework shall allow the system to be assembled into a unit and be mounted on the truck, and shall provide the support mechanism between the sign panel assembly, the power supply, and the controller.

The framework shall provide sufficient support to prevent damage to any TVMS components when the sign is in the down and locked position during normal highway travel.

The sign panel shall be mounted as a permanent fixture of the truck and provide a minimum height of 7 ft from the bottom of the sign to the surface of the roadway when in its operating position. Affixing a trailer-mounted unit to a truck is prohibited.

The deployed structure shall supply adequate support to allow complete sign operation including raising and lowering of the sign panel during sustained wind speeds of 85 mph.

The display windows shall be made of impact-resistant clear Lexan or as approved.

Sign Panel. Sign panel dimensions shall not exceed 92 in. wide by 54 in. high unless approved. The TVMS shall be capable of displaying three lines of text with the following requirements:

(a) Each line of text shall be constructed using a full matrix display.

(b) The sign shall be capable of displaying six characters per line.

(c) The character height shall be at least 12 in.

(d) The sign shall have a pixel arrangement of at least 20 rows by 40 columns, with at least 3 LEDs per pixel.

LED Illumination. LED illumination for each matrix element shall have the following characteristics:

(a) LED shall meet to the ITE specification for amber color.

(b) LED shall utilize A1InGap substrate.

(c) Each LED shall produce at least one candela output on center at 25 mA drive current.

(d) LED shall provide full illumination within at least a 24 degree cone perpendicular to the sign face.

(e) Operating temperature range of the LED shall be -30 to 125 F.

TVMS Unit. Submit a catalog cut and character set for any TVMS approval to the Bureau of Traffic Engineering and Transportation Planning. Furnish examples of standard messages to be used on the sign.

Lift Mechanism.

(a) The lift mechanism shall be capable of being raised and lowered manually.

(b) A self-locking mechanism shall be provided to prevent the sign panel from lowering once in the raised position.

Electrical Connections and Gauges.

(a) All wiring from power sources to TVMS equipment shall use locking cable connectors.

(b) Each sign shall be equipped with an automatic lamp intensity regulator that maintains a constant output with a varying battery voltage.

(c) Standard negative ground system shall be tied to the vehicle chassis.

Power Supply. The TVMS shall operate from a solar powered electrical system.

Sign Controller. The controller shall:

(a) Be capable of driving the matrix display panel operating over a -30 to 125 F range and in a 20 to 95 percent non-condensing humidity range.

(b) Accommodate 50 preprogrammed, user-defined messages.

(c) Be capable of displaying three sequenced messages. On/Off time for each message in a sequence shall be user adjustable at increments of one-tenth of a second within a range of 0 to 5 seconds.

(d) Be designed for fail-safe prevention of improper information display in the case of a system malfunction. In the event of a system malfunction, the sign shall display a blank message.

(e) Have the capability of retrieving all messages stored in temporary memory.

(1) Temporary memory shall be nonvolatile.

(2) All messages and programs shall remain resident in the controller's memory in the event of a power failure.

(3) Have an RS-232 port to facilitate connection of an external communication device.

(f) Monitor and display the battery output voltage and solar array activities (charging and discharging) and blank the sign when the battery output voltage drops below the manufacturer's recommended output level.

(g) Be capable of monitoring and displaying the status of the photocell, adjust the sign illumination to match the ambient light conditions, and have at least nine levels of dimming from 10 to 100 percent brightness.

(h) Be contained in a sheet metal or high density polyethylene (HDPE), weatherproof cabinet located on the controller housing, and insulated to protect against excessive vibration and temperature.

(1) The cabinet shall have a lockable door latch.

(2) The keyboard/input device storage location shall be provided inside the cabinet.

Character Set Software. The character set software shall:

(a) Have all the standard ASCII characters and symbols.

(b) Provide left and right arrows.

(c) Have all alphanumeric entries performed with a keyboard or keypad that causes the same character to be displayed on the matrix. Arrow symbols shall be generated via a cursor pad on the keyboard or keypad.

(d) Have messages default to self-centering display with the ability to left or right justify.

104.29.03.02 Operation. Set up and operate the TVMS 24 hours in advance of actual use to ensure that each unit is functioning properly and approved.

Variable Message Sign Mode. Use the TVMS in variable message sign mode on roadways where the posted speed limit is less than or equal to 40 mph. The TVMS is intended for mobile operations. If used for stationary construction or maintenance operations, do not leave the TVMS in place for more than eight consecutive hours.

Arrow Panel Mode. The TVMS may be used in lieu of a Type C arrow panel on any roadway as long as the TVMS is capable of displaying a left arrow, right arrow, double arrow, and a four-corner caution mode.

Use the TVMS only as a supplement to other required traffic control devices. When closing a through travel lane on a multilane roadway, use the "Arrow" mode only. Only one TVMS in the "Arrow" mode shall be used for each stationary lane closure. Moving work operations may utilize one or more TVMS for a single lane closure.

(a) Ensure that the placement does not cause driver confusion near ramps, median crossovers, and side road intersections.

(b) For stationary lane closures, place the TVMS on the shoulder at the beginning of the taper (nearest to oncoming traffic). Where there are narrow or no existing shoulders in the closed lane behind the channelizing devices, place the TVMS as near to the beginning of the taper as possible.

(c) For moving maintenance type activities along multilane highways where a lane is closed, place the TVMS at the rear of the activity in the closed lane on a vehicle separate from the maintenance vehicle itself. For paint striping activities, additional vehicles with TVMS or arrow panels in the arrow mode may be required to supplement the work operation. TVMS shall always remain upstream of the maintenance vehicles where adequate recognition distance is available. The vehicle carrying the TVMS shall be equipped with signing and lighting as required by the standard TCPs.

(d) TVMS shall only display the "Caution" mode for a lane closure on a two-lane, two-way roadway, or for a shoulder closure on any roadway. The "Caution" mode on a TVMS shall show displays of circular appearance in each of the four corners of the TVMS. The circle diameters shall range from 9.5 to 11 in. and utilize approximately 30 pixels. The circles shall be offset from the left and right edge between 3 and 6 in. and from the top and bottom edge between 1.5 and 3 in. The vertical spacing between the centers of the circles shall range from 2.5 to 3 times the diameter of the circles. The horizontal spacing between the centers of the circles shall range from 1.75 to 2 times the vertical spacing.

Install the TVMS as specified.

The TVMS shall be designed so that it supplies a minimum visibility and legibility distance of 900 ft. Ensure that the TVMS is level and that the sign face is not obscured by highway alignment or glare from either sunlight or vehicle headlights.

104.29.04 MEASUREMENT AND PAYMENT. The ***Truck Mounted Variable Message Sign*** (TVMS) will be measured and paid for at the Contract price per unit day. A unit day shall consist of any approved usage within a 24 hour calendar day period. Each ***Truck Mounted Variable Message Sign*** will be paid for only once per unit day, regardless of how many times it is relocated. When a unit is used for part of a day, it will be measured as a unit day.

The payment will be full compensation for the vehicle, setup and maintenance of computer programs, changing messages, and for all material, labor, equipment, tools, and incidentals necessary to complete the work.

SECTION 105 – AGGREGATE FOR MAINTENANCE OF TRAFFIC

105.01 DESCRIPTION. Aggregate material placed for maintenance of traffic.

105.02 MATERIALS.

Crusher Run Aggregate CR-6	901.01
Graded Aggregate Base	901.01

105.03 CONSTRUCTION. Refer to Section 501.03.

105.04 MEASUREMENT AND PAYMENT. ***Crusher Run Aggregate CR6 – Maintenance of Traffic, Graded Aggregate Base for Stage 1 Maintenance of Traffic***, and ***Graded Aggregate Base for Maintenance of Traffic, Driveways, etc.*** will be measured and paid for at the Contract unit price per ton. The payment will be full compensation for all aggregate, hauling, placing, compacting, removal, rehandling, reworking, disposal, and for all material, labor, equipment, tools, and incidentals necessary to complete the work.

When aggregate is used as part of any base or pavement course in the construction and maintenance of temporary detours, approaches, crossings, and widenings, the item of work will be measured and paid for as specified in Section 501.

SECTION 106 – HOT MIX ASPHALT (HMA) FOR MAINTENANCE OF TRAFFIC

106.01 DESCRIPTION. Place HMA for maintenance of traffic.

106.02 MATERIALS.

Tack Coat (Rapid Setting)	904.03
HMA	904.04
Crack Filler	911.01& 911.01.01
Production Plant	915

106.03 CONSTRUCTION. Refer to Standard Detail Plate R-38 and to Section 504.03.

106.04 MEASUREMENT AND PAYMENT. ***Hot Mix Asphalt for Stage 1 Maintenance of Traffic;*** and ***Hot Mix Asphalt for Maintenance of Traffic, Driveways, etc.*** will be measured and paid for at the Contract unit price per ton. The payment will be full compensation for all tack coat, crack filler, hauling, placing, compacting, maintaining, removal, rehandling, reworking, disposal, and for all material, labor, equipment, tools, and incidentals necessary to complete the work.

When hot mix asphalt is part of any base or pavement course used for the construction and maintenance of temporary detours, approaches, crossings, and widenings, the item of work will be measured and paid for as specified in Section 504. For payment of temporary tie-ins, refer to Section 504.04.

SECTION 107 – CONSTRUCTION STAKEOUT

107.01 DESCRIPTION. This work shall consist of furnishing, placing and maintaining construction layout stakes as specified in the Contract Documents or as directed by the Engineer by either Method One or Method Two. Method 1 is for Baltimore County capital projects and Method 2 is for development projects.

107.01.01 METHOD ONE. The Contractor shall, as part of the construction stakeout operation, before any clearing operation commences, demarcate any wetlands and the limit of clearing throughout the entire project as shown in the Contract Documents and labeled as Limit of Clearing or Wetlands to the satisfaction of the Engineer.

Where limits of clearing are not shown in the Contract Documents, the limit of clearing will be the top of cut, toe of slope or limit of ditch excavation.

107.02 MATERIALS.

107.02.01 METHOD ONE. The material for flagging the clearing limits shall be a 3 in. international orange vinyl material. The flagging material shall have "CLEARING LIMIT" in minimum 2 in. high letters printed with an indelible black marker subject to the Engineer's approval. The material for flagging wetlands shall be 1-1/2 in. pink vinyl flagging with "WETLAND" printed on it with minimum 1 in. high blue letters using indelible marker.

107.02.02 METHOD TWO. Not applicable.

107.03 CONSTRUCTION.

107.03.01 METHOD ONE (Baltimore County capital projects):

107.03.01.01 Line and Grade. The surveyor will provide the Contractor with the following subject to the approval of the Engineer:

(a) Roadway and Utility Stakeout.

(1) A staked center line of the roadway or base line for the utility with the maximum spacing of stations (stakes, nails, crosses, etc.) of 100 ft.

(2) Establish appropriately spaced benchmarks and mark with a known elevation. Establish the necessary references including all points of curvature (P.C.), and points of tangency (P.T.) for the preservation and control of the centerline.

The Engineer shall furnish two sets of prints of the cross sections and the cross sections will be used as guides only. Dimensions or elevations scaled from the cross sections are not sufficiently precise for use in the construction.

(b) Structure Stakeout.

(1) A staked out centerline or working line, whichever applies, with stations not over 100 ft apart and extending at least 100 ft beyond ends of the structure.

(2) When the structure is on a curve, the surveyor will furnish a staked out center line or working line, whichever applies, consisting of stations not over 100 ft apart and including the P.C., P.T., and at least one point on the tangents beyond each end of the curve.

(3) The surveyor shall establish at least two benchmarks, one on each end of the structure.

107.03.01.02 Equipment and Personnel. The Contractor shall use competent personnel and industry standard equipment for all surveying work required to set and maintain the elevations and dimensions as specified in the Contract Documents.

107.03.01.03 Control Markers. The Contractor shall exercise care in the preservation of stakes and bench marks set by the surveyor and shall reestablish them upon the request of the Engineer and at no additional cost to the County when any are damaged or destroyed.

107.03.01.04 Control Stakes. For roadways as specified in Section 107.03.01.01, the Contractor shall furnish, set and preserve stakes at each station along each side of the project on the right-of-way or easement line, whichever is furthest from the center line of construction. Where only part of an ultimate dual highway is to be constructed, the stakes on the side of the future improvement shall be set 10 ft beyond the construction limits. On each of these stakes shall be marked its offset distance from the center line and its top elevation or the cut or fill to the profile grade line. The Contractor shall set additional stakes as needed for horizontal and vertical controls necessary for the correct layout of the work.

107.03.01.05 Layout. For structures as specified in Section 107.03.01.01**,** the Contractor shall proceed with his layout work. However, before any actual construction begins, the Contractor shall rerun the surveyor's approved lines and grades to check same and then establish all center line or working line intersections with the center line or center of bearing of all piers, bents and abutments. From these field layouts, the Contractor shall check the proposed span lengths by electronic distance measurement or by taping, using a steel measuring tape. When manual taping is used, the measurements shall be compensated for temperature, sag, and horizontal alignment of the steel measuring tape. The Contractor shall also check the location of the structure to affirm its correct location with relation to existing structures, roads and existing conditions that are to remain in their original positions. If any discrepancies are found, the Contractor shall notify the Engineer at once in writing, otherwise, it will be assumed that all planned dimensions, grades and field measurements are correct. All lines established on the ground shall be preserved or referenced, marked, and kept available at all times.

The Contractor shall establish the field elevations for all bridge seats and assume responsibility for finishing to proper grade. If any steel beams or girders are incorporated in the project, the Contractor shall run elevations over the tops of the beams or girders after they are in place, before any forms are attached to them, to determine the deflection of each member. This information shall then be applied to the deflection diagram to determine the corrected elevation of bottom slab forms and screed supports. The Engineer shall check the information assembled by the Contractor with the surveyor before final adjustments are made and before any quantity of concrete is placed in said forms.

107.03.01.06 Utilities. The Contractor shall furnish to the utility companies or agencies working within the limits of the project, promptly upon request, reference to control points, alignment and grade data, so that they may properly locate and coordinate their work and improvements in relation to this project.

Intersection Utility Stakeout. The Contractor shall notify the appropriate agencies listed below within a minimum of 72 hours (excluding weekends and holidays) prior to the Contractor's anticipated beginning of any underground work.

(a) Request a **MISS UTILITY** stakeout and possess a valid **MISS UTILITY** clearance ticket number for any underground work.

(b) Contact all utilities within the limits of the project that are not a member of **MISS UTILITY** and obtain a stakeout of their respective facilities.

(c) Request the Traffic Engineering Division to assist with locating and identifying County-maintained traffic signal facilities.

(d) Request the State Highway Administration's District Utility Engineer to stakeout their lighting facilities should the proposed work impact a State roadway. Within a State highway right-of-way, follow the requirements of the State permit.

The Contractor shall stakeout the proposed construction as indicated in the Contract Documents and allow the surveyor and Engineer to verify location of the proposed facilities.

107.03.01.07 Right-of-Way and Easement Lines. The Contractor shall define only right-of-way and easement lines of the project for adjacent property owners, promptly upon request.

107.03.01.08 Subgrade, Subbase and Base Controls. The Contractor shall furnish for subgrade, subbase and base courses, string line and grade with fixed controls having a maximum longitudinal and transverse spacing of 25 ft.

The Contractor shall place along each form line for cement concrete pavement line and grade with fixed controls not to exceed 25 ft.

107.03.01.09 Flagging. The flagging shall be placed continuously through wetland areas. In areas where trees are not to be disturbed, the Contractor shall individually flag those trees in a line along the clearing limits that are not to be moved or destroyed. If the wetland flagging has been destroyed and the Engineer determines that it is still required, the Contractor shall reflag the area.

If the Contractor does not replace the destroyed flagging within 48 hours after notification by the Engineer that replacement flagging is needed, the surveyor may proceed to have the area re-flagged. The cost of the re-flagging by the surveyor will be charged to the Contractor and deducted from any monies due under the Contract.

At the completion of construction, the Contractor shall remove all flagging.

107.03.02 METHOD TWO (Development projects):

(1) For all Developer Projects the term "Engineer" in paragraph (2) shall be the Developer's Engineer as the term applies to construction stakeout. For all Developer Projects the Engineer shall submit a copy of the stakeout grade sheets to the Division of Construction Contracts Administration. All developer stakeout work shall be done under the

supervision of a Professional Land Surveyor or a Property Line Surveyor (as applicable) registered in the State of Maryland.

(2) The Engineer shall have a surveyor furnish and set construction stakes establishing lines, grades, and measurements to be furnished for the contracted work under these Specifications for roadway (highway) and utility work. For all structure work, including bridges and buildings, the surveyor shall furnish the centerline stakeout and the benchmark for reference points to the Engineer, with the balance of the grades and measurements to be furnished to the Engineer by the Contractor. The Contractor shall provide and shall have available to the project an adequate surveying and engineering staff which is competent and qualified to set all lines and grades needed to construct bridges and buildings.

(3) Only those survey control marks shown on the drawings (or marks extended from those control marks) shall be used for construction. The Contractor shall furnish the assistance for their preservation after being set. The Contractor shall, however, be held responsible for their preservation. If, in the opinion of the Engineer or his surveyor, the marks are willfully or carelessly disturbed or destroyed by the Contractor or his employees, the entire cost of replacing them shall be charged against the Contractor and the cost shall be deducted from the Contractor's final payment.

(4) Where electronic alignment control devices are used, the Contractor shall verify the alignment by conventional methods at intervals of 100 ft for lines 200 ft long between structures, or at changes in alignment when the structure is on a curve, and at the midpoint of lines under 200 ft long as defined above.

(5) Intersection Utility Stakeout. The Contractor shall notify the appropriate agencies listed below within a minimum of 72 hours (excluding weekends and holidays) prior to the Contractor's anticipated beginning of any underground work.

(a) Request a **MISS UTILITY** stakeout and possess a valid **MISS UTILITY** clearance ticket number for any underground work.

(b) Contact all utilities within the limits of the project that are not a member of **MISS UTILITY** and obtain a stakeout of their respective facilities.

(c) Request the Traffic Engineering Division to assist with locating and identifying County maintained traffic signal facilities.

(d) Request the State Highway Administration's District Utility Engineer to stakeout their lighting facilities should the proposed work impact a State roadway. Within a State highway right-of-way, follow the requirements of the State permit.

The Contractor shall stakeout the proposed construction as indicated in the Contract Documents and allow the Engineer to verify location of the proposed facilities.

107.04 MEASUREMENT AND PAYMENT.

107.04.01 METHOD ONE. ***Construction Stakeout*** will not be measured but will be paid for at the Contract lump sum price. The payment will be full compensation for furnishing, placing and maintaining construction layout stakes, flagging of clearing and wetlands, and for all material, labor, equipment, tools, and incidentals necessary to complete the work. Payment of the Contract lump sum price will be prorated and paid in equal amounts on each monthly estimate. The number of months used for prorating will be the number estimated to complete the work.

107.04.02 METHOD TWO. All work related to Construction Stakeout will not be measured but the cost will be incidental to other items provided for in this contract.

SECTION 108 – MOBILIZATION

108.01 DESCRIPTION. This work shall consist of the construction preparatory operations, including the movement of personnel and equipment to the project site and for the establishment of the Contractor's offices, buildings, and other facilities necessary to begin work.

108.02 MATERIALS. Not applicable.

108.03 CONSTRUCTION. All work performed in providing the facilities and services shall be done in a safe and workmanlike manner.

108.04 MEASUREMENT AND PAYMENT. Mobilization will not be measured for payment but will be paid for at the Contract lump sum price.

The cost of all required insurance and bonds will be incidental to the Contract lump sum price for mobilization.

Payment of 50 percent of the Contract lump sum price will be made in the first monthly estimate after the Contractor has established the necessary facilities. The remaining 50 percent will be prorated and paid in equal amounts on each of the next five monthly estimates. The payment will be full compensation for all material, labor, equipment, tools, and incidentals necessary to complete the work.

Payment of the Contract lump sum price will not be made more than once, regardless of the fact that the Contractor may have, for any reason, shut the work down on the project, moved his equipment away from the project and then back again.

If an item for mobilization is not provided, the cost of mobilization will be incidental to the other items specified in the Contract Documents.

SECTION 109 – FIXED PRICE CONTINGENT ITEMS

109.01 DESCRIPTION. To provide for certain contingencies during construction, some contracts include Fixed Price Items for use as the work proceeds. These items only apply when included in the proposal with prices established prior to bidding. Should any of these items not be included in the proposal as described above, they shall be addressed as described elsewhere in the Specifications and, if to be paid for, as bid by the Contractor.

Only those items listed below in Table 109.1 may be treated as Fixed Price Contingent Items, and then only if and as directed by the Engineer:

Effective December 13, 2017, fixed price contingent values are as follows:

Table 109.1 Fixed Price Contingent Items

Code	Description	Unit of Measure	Fixed Price
109005	TEMPORARY TRAFFIC SIGNS	SF	$22.00
109110	TEST PIT EXCAVATION / CONVENTIONAL EXCAVATION METHODS	CY	$360.00
	TEST PIT EXCAVATION BY VACUUM	CY	$650.00
109205	CLASS 3 EXCAVATION/SELECT BACKFILL – PROPER DISPOSAL OF UNSUITABLE MATERIAL	CY	$130.00
109305	BORROW FOR BACKFILLING TRENCHES - PROPER DISPOSAL OF UNSUITABLE MATERIAL	CY	$80.00
109405	MIX NO.1 CONCRETE	CY	$450.00

109.02 MATERIALS. Not applicable.

109.03 CONSTRUCTION.

1. Borrow for Backfilling Trenches - Proper Disposal of Unsuitable Material: Material found to be unsuitable by the Engineer shall be disposed at a location as directed by the Engineer. See Section 203.

2. Class 3 Excavation / Select Backfill - Proper Disposal of Unsuitable Material: Material found to be unsuitable by the Engineer shall be disposed at a location as directed by the Engineer. See Sections 301 and 302.
3. Test Pit Excavation / Conventional Excavation Methods: See Section 205.
4. Test Pit Excavation By Vacuum: See Section 205.
5. Mix No.1 Concrete: This item covers the furnishing and placing of air-entrained concrete work as directed by the Engineer, and furnishing all labor, tools, equipment and appliances necessary to complete the work as directed by the Engineer. See Sections 405, 414, and 902.
6. Temporary Traffic Signs: See Section 104.08.

109.04 MEASUREMENT AND PAYMENT.

1. ***Borrow for Backfilling Trenches - Proper Disposal of Unsuitable Material***: Payment for furnishing suitable backfill shall be in accordance with the stipulated price per cubic yard in place and compacted. Price is full compensation for excavating, hauling, depositing and compaction of material and disposal of unsuitable material on-site or offsite. Payment shall not be made for suitable backfill material placed outside of specified trench widths.
2. ***Class 3 Excavation / Select Backfill - Proper Disposal of Unsuitable Material***: Payment for furnishing select backfill shall be in accordance with the stipulated price per cubic yard in place and compacted. Price shall include disposal of unsuitable material on-site or offsite. Payment shall not be made for select backfill material placed outside of specified trench widths.
3. ***Test Pit Excavation / Conventional Excavation Methods***: Test Pit Excavation performed by conventional (non-vacuum) excavation equipment will be measured and paid for at the contract unit price per cubic yard for the material actually removed from within the limits specified. The payment will be full compensation for all material, labor, equipment, tools, and incidentals necessary to complete the work. Tamped backfill will not be measured but the cost will be incidental to the Contract unit price per cubic yard for ***Test Pit Excavation / Conventional Excavation Methods***. Any pavement to be replaced will be paid for as specified in Section 106.
4. ***Test Pit Excavation By Vacuum*** *(no depth constraint)*: Test Pit Excavation performed by vacuum excavation equipment will be measured and paid for at the contract unit price per cubic yard excavated by this method. The payment will be full compensation for all material, labor, equipment, tools, and incidentals necessary to complete the work.
5. ***Mix No. 1 Concrete***:

   A. Price per Cubic Yard:

   Payment for furnishing and placing air-entrained concrete work in roads, paving, curbs, gutters, footways, etc., if and as directed, is made at the stipulated price per cubic yard. This price includes furnishing and placing air-entrained concrete work as required and furnishing all labor, tools, equipment and appliances necessary to complete the work as shown, specified and directed.

   B. Paving Beyond Limits:

   Payment is not made for replacing paving beyond limits shown in the Standard Detail Plates. Payment is never made for replacement of damaged paving when the damage is due, in any way, to the Contractor's fault or negligence.

6. ***Temporary Traffic Signs***: See Section 104.08.

Note: Referring to all test pit excavation fixed price contingent items, test pits shall be limited to: contract tie-in locations, utilities not shown on the Contract Drawings, locations identified by the Contract Documents, and locations as directed by the

Engineer. Test pits performed by the Contractor: to identify the location of sewer house connections, water services, water service reconnections, utilities (including buttresses), test stations, traffic signal appurtenances, pilings, or miscellaneous structures; or to identify pavement or subsurface composition; shall not be measured but shall be considered incidental to the Contract.

SECTION 110 – ADJUSTING AND REPLACING FENCES, SHRUBS, TREES, HEDGES, ETC.

110.01 DESCRIPTION. This item includes the removal and relocation adjacent to the work of fences, shrubs, trees, hedges, mail boxes etc., all as directed by the Engineer.

110.02 MATERIALS.

See Section 900, MATERIALS.

110.03 CONSTRUCTION METHODS.

Existing fences shall be carefully removed as directed by the Engineer and to the extent required to permit construction operations. The Contractor shall safely store all elements during the time that they are down and, when possible, re-erect them at the locations designated by the Engineer. If, through no fault of the Contractor, these elements cannot be re-erected, then they shall be replaced on a force account basis for the cost of the materials only.

Shrubs and trees shall be transplanted with sufficient earth to insure that no damage to their major root system occurs. General reference is made to Section 710.03 for acceptable planting methods. After transplanting has been accomplished, it shall be the Contractor's responsibility to water all plants until their growth is established. The relocation of trees will only be required when indicated on the Plans.

110.04 METHOD OF MEASUREMENT & BASIS OF PAYMENT.

This item will not be measured. Payment for this work will be at the lump sum price for "Adjusting and Replacing of Fences, Shrubs, Hedges, Trees, etc." which price shall be full compensation for all excavation materials, removing, transporting, planting, equipment, labor, tools, and any other work incidental to the satisfactory completion of this item. The replacement of materials as specified above will be paid for on a force account basis for the cost of the materials only.

SECTION 111 – TEMPORARY ORANGE CONSTRUCTION FENCE

111.01 DESCRIPTION. Furnish, install, and maintain new or like new temporary orange mesh construction fence. This fence is not to be used as a safety barrier.

111.02 MATERIALS.

Precast Concrete Blocks	903.05
Tie Wire, Tension Wires, Tension Wire Clips and Hardware	914.02
Orange Mesh Fencing	As approved

Fence posts shall be 4 ft high, 1.90 in. diameter round posts; or 5-1/2 ft high, 2 in. steel U channel posts, as specified herein.

Submit samples of the fence fabric, fence posts, movable precast concrete blocks, tie wire, tension wires, and other miscellaneous hardware for approval.

111.03 CONSTRUCTION. Temporary orange construction fence shall be at least 4 ft high and with a maximum post spacing of 8 ft. When installed on a paved surface, support the fence by inserting the round post into a precast concrete block having a round hole through the center of the block. When installed in unpaved areas, use steel U channel fence posts driven 1-1/2 ft into the ground. Installation of the fence in any other manner will require approval.

Secure the fabric to the posts by wrapping a tie wire around the horizontal fence strands and the posts. Install a top tension wire to prevent sagging. When installed on paved surfaces, the Engineer will determine if a bottom tension wire is required.

Remove the fence when the Engineer determines that the fence is no longer required. The removed fence is the property of the Contractor.

Damaged Construction Fence. Repair or replace damaged construction fence within four hours after notification.

111.04 MEASUREMENT AND PAYMENT. ***Temporary Orange Construction Fence*** will be measured and paid for at the Contract unit price per linear foot for the actual number of linear feet measured to the centers of end posts. ***Remove and Reset Temporary Orange Construction Fence*** will be measured and paid for at the Contract unit price per linear foot. The payment will be full compensation for all material, labor, equipment, tools, and incidentals necessary to complete the work.

SECTIONS 112 Through 119 – RESERVED

SECTION 120 – TREE PRESERVATION AREA

120.01 DESCRIPTION. Establish and maintain a Tree Preservation Area (TPA).

120.02 MATERIALS.

Temporary Orange Construction Fence	111.02
Fertilizer	920.03.01

120.02.01 Tree Preservation Program (TPP). The County will develop a TPP to establish the goals and specify the procedures for tree branch pruning, brush removal, tree felling, tree root pruning, tree fertilizing, and other tree preservation operations to protect trees and vegetation within the TPA.

120.03 CONSTRUCTION.

120.03.01 Maryland Licensed Tree Expert (LTE). A LTE shall perform or directly supervise the operations specified in the Contract Documents and the TPP in conformance with the Maryland Roadside Tree Law, the Forest Conservation Act, and accepted arboricultural practices.

120.03.02 Delineation. Delineate the perimeter of the TPA as specified in the Contract Documents.

120.03.03 Temporary Orange Construction Fence (TOCF). Ensure that the delineated TPA is approved prior to installing the TOCF. Perform installation and maintenance as specified in Section 111.03. Complete installation of the TOCF before:

(a) Beginning clearing and grubbing operations.

(b) Installing erosion and sediment controls.

(c) Conducting the Tree Preservation Meeting.

(d) Performing tree preservation operations.

120.03.04 Tree Preservation Meeting. Prior to beginning work, meet at the TPA with the Engineer, the County Arborist, and the LTE to review the TPP.

120.03.05 Tree Preservation Operations. Maintain the TPA as specified in the TPP and the Contract Documents. Perform the following operations, as specified in the TPP:

(a) Tree Branch Pruning. Section 712.

(b) Brush Removal. Section 713.

(c) Tree Felling. Section 714.

(d) Tree Root Pruning. Section 715.

(e) Tree Fertilizing. Section 716.

120.03.06 Prohibited Activities within the TPA.

	PROHIBITED ACTIVITIES
a	Felling, removing, or harming any tree or plant designated for preservation.
b	Removing wood, soil, stones, and other natural materials.
c	Any kind of foot or vehicular traffic.
d	Driving, storing, washing, or maintaining trucks or construction equipment.
e	Placing backfill, stacking or storing supplies.
f	Grading, trenching, draining, dewatering, and burning activities.
g	Dumping waste or storing toxic or hazardous materials.

120.03.07 Restricted Activities. The following activities are restricted in the area near the TPA unless authorized by the Engineer.

	RESTRICTED ACTIVITIES
a	Felling trees.
b	Grading that will disrupt drainage patterns.
c	Draining and dewatering activities.
d	Storing construction equipment.
e	Truck washing and maintenance activities.
f	Dumping waste and storing toxic or hazardous materials.
g	Burning and trenching activities.

120.03.08 Cleanup and Restoration. When construction activities are complete, remove the TOCF, construction materials, and debris without damaging trees in the TPA and adjacent areas. Grade the perimeter of the TPA to blend with nearby areas. Seed as specified in Section 705.

120.03.09 Damage Repair. Refer to Section 712.03.11.

120.03.10 Damage Compensation. Refer to Section 712.03.12

120.04 MEASUREMENT AND PAYMENT. Work performed as specified in the Tree Preservation Program or Contract Documents will be measured and paid for as part of one or more of the items listed below. Payment will be full compensation for all material, labor, equipment, tools, and incidentals necessary to complete the work.

120.04.01 ***Temporary Orange Construction Fence***. Refer to Section 111.04.

120.04.02 ***Tree Branch Pruning***. Refer to Section 712.04.

120.04.03 ***Brush Removal***. Refer to Section 713.04.

120.04.04 ***Tree Felling***. Refer to Section 714.04.

120.04.05 ***Tree Root Pruning***. Refer to Section 715.04.

120.04.06 ***Tree Fertilizing***. Refer to Section 716.04.

120.04.07 The licensed tree expert services will not be measured but the cost will be incidental to the Contract unit price for the Clearing and Grubbing item.

(This page intentionally left blank)

CATEGORY 200
GRADING

SECTION 201 – ROADWAY EXCAVATION (CLASS 1, CLASS 1-A, CLASS 2)

201.01 DESCRIPTION. This work shall consist of the excavation and grading for roadways and their appurtenances to the lines and grades specified in the Contract Documents. The Contractor shall use all suitable materials from excavation in the construction of embankments throughout the limits of the work as directed by the Engineer.

201.01.01 Classification.

CLASS 1 EXCAVATION: All excavation where the width of the bottom of the cut is 15 feet or more.

CLASS 1-A EXCAVATION: All excavation of unsuitable material below the lowest excavation limits established.

CLASS 2 EXCAVATION: All excavation where the width of the bottom of the cut is less than 15 feet. Excavation for flumes, ditches, and stream and channel changes are included in this classification unless otherwise specified in the Contract Documents.

201.01.02 Excavation. Excavation shall include the following:

(a) Cut areas within the boundary faces of the typical cross sections specified in the Contract Documents, including ditches within the cut sections, and excavation for entrances, approach roads, streets, intersections, gutters, ditches, berm ditches, and flumes.

(b) Topsoil to be salvaged within the limits of excavation as specified in the Contract Documents or as directed by the Engineer.

(c) The removal and disposal of existing pavement, sidewalks, curb and combination curb and gutter, when within the limits of excavation. The work shall be as specified in Section 206.

(d) The removal and disposal of below grade structures other than as specified in Sections 102 or 207.

201.02 MATERIALS. Not applicable.

201.03 CONSTRUCTION.

201.03.01 Grading Units. Each grading unit shall be the surface area of erodible earth that can be exposed to construction operations without undue erosion or sedimentation. The size and number of these units that can be opened up at one time are specified in the Contract Documents.

201.03.02 Use of Excavated Materials. No excavated material shall be wasted without prior approval of the Engineer. Borrow shall not be used unless provisions have been made for utilizing all available suitable excavated material in embankments.

201.03.03 Broken Pavement Material. Existing pavement, sidewalks, gutter, curb or combination curb and gutter materials from the excavation may be broken and used in embankments. The broken material shall be considered to be rock conforming to Section 204.02.01. If the Engineer considers the material to be unsuitable, it shall be disposed of as excess or unsuitable material.

201.03.04 Rock Excavation.

(a) Boulders and rock from the excavation may be broken and used in embankment provided the materials conform to Section 204.02.

(b) Blasting. Where rock encountered in cuts requires drilling and blasting, the finished slope shall remain reasonably straight and clean. The Contractor shall adjust blasting operations to obtain the required slope specified in the Contract Documents.

(c) Pre-splitting. When pre-splitting of rock slopes is specified in the Contract Documents, the pre-splitting operation shall be carried in advance of the primary blasting so that knowledge gained from excavation to the pre-split face may be applied to subsequent pre-splitting operations. No portion of any primary blast hole shall be drilled closer than half the spacing of the drilling pattern to the proposed finished slope.

The Contractor shall submit a plan for his pre-splitting operations. The plan shall include the drill size, lift height, explosives and detonator specifications, loading pattern, stemming materials, stemming depth, charge size, and charge timing. The purpose of the plan is to document the operation so that if adjustments are needed, rational decisions can be made.

The initial pre-split shot shall not be longer than 100 feet. The Contractor shall drill holes along the slope line having a diameter of not less than 2½ in. nor more than 3 in. Drill holes shall be placed at the slope angle as specified in the Contract Documents. All drill holes shall maintain the same plane. The initial pre-split holes shall be drilled on maximum 3 foot centers and to a maximum depth of 20 feet unless otherwise directed by the Engineer. If the vertical depth of cut to be pre-split is greater than the maximum permissible depth of holes as determined by the Engineer,

the blasting shall be done in two or more lifts; in which case the first line of drill holes shall be set back a sufficient distance from the slope line to allow for a 1 foot offset for each succeeding line of drill holes.

The initial pre-split shot shall be excavated for inspection by the Engineer prior to the commencement of further pre-splitting. If the results are approved by the Engineer, the pre-splitting may continue using the approved drilling and loading pattern. Whenever the pre-splitting is found to be unsatisfactory, the Contractor shall make adjustments in his operations and repeat the inspection procedure used for the initial pre-split shot.

The pre-split face shall not deviate more than 6 in. from the front of the line of drill holes nor more than 1 foot from the back of the line of drill holes except where the character of the formation being pre-split (badly broken rock, vertical seams, etc.) will, in the opinion of the Engineer, result in irregularities.

The line of pre-split holes shall extend a minimum of 30 feet beyond the limits of the primary blast holes to be detonated or to the end of the cut.

Only cartridge explosives manufactured for pre-splitting shall be used. The maximum diameter of explosives used in pre-split holes shall not be greater than half the diameter of the pre-split hole. Bulk explosives are prohibited in pre-split holes.

The Engineer may order the discontinuance of the pre-splitting operations wherever the rock is of a character that no apparent advantage is gained.

201.03.05 Frozen Material. Frozen material shall not be placed in embankments. It shall be stockpiled outside of the construction limits and reserved for future use at a time when its condition is acceptable to the Engineer. Rehandling of the excavated material shall be at the expense of the Contractor. The Contractor shall replace any wasted material with approved material at no expense to the County.

201.03.06 Serrated Slopes. Serrated cut slopes are defined as slopes having continuously benched faces. Slopes (which are to be serrated) and the width of benches will be as specified in the Contract Documents or as designated by the Engineer. The benches shall be constructed parallel to each other, and they shall be level, not graded to drain, and shall be constructed as the excavation progresses.

201.03.07 Drainage. During construction of the roadway, the roadbed shall be maintained in a well-drained condition at all times. No excavated material shall be deposited or left within 3 feet of the edge of the ditch or channel or be permitted to obstruct normal surface drainage into the ditch or channel. Ditches draining from cuts to embankments or otherwise shall be constructed to avoid damage to embankments by erosion. All drainage necessary to provide free and uninterrupted flow of the surface and underground water shall be installed before surfacing is placed. When stabilized, side and outlet ditches provide the principal means for drainage, the cutting and stabilization of ditches for the disposition of surface water shall be the first work in the grading operation.

201.03.08 Excavation Beyond Specified Limits. The widening of cut or excavation sections beyond the limits of the typical cross section as specified in the Contract Documents is prohibited in all instances except by written order from the Engineer. When so ordered by the Engineer, the procurement of additional suitable materials for embankments, except as otherwise specified under Borrow excavation, shall conform to the following provisions:

(a) Finished Excavation. The widening of cuts or excavation sections shall be finished so that completed flat and slope areas shall be uniform in appearance. The slopes shall not be steeper than the cut slopes specified in the Contract Documents or as directed by the Engineer.

(b) Roadway Excavation Limits.

(1) If the Engineer directs the Contractor to excavate beyond the limits of the typical cross section originally proposed, and within the limits of the right-of-way or easement, prior to the starting of earthwork construction in an excavation section, then all material within the limits will be classified as ***Class 1 Excavation***.

(2) If the Contractor with approval of the Engineer elects to obtain material by widening cuts beyond the limits of the typical cross section originally proposed and within the right-of-way or easement, the excavation of the materials will be classified as ***Class 1 Excavation***.

(c) Borrow Excavation Beyond Specified Limits. If the Engineer directs the Contractor to excavate beyond the limits of the typical cross section originally proposed and after the Contractor has substantially completed the roadway excavation in a cut section, then all material removed beyond the limits of the typical cross section will be classified as ***Borrow Excavation***.

201.03.09 Unsuitable Material. Unstable or other unsuitable material encountered at or below the lowest normal excavation limit as specified in the Contract Documents shall be removed to the extent directed by the Engineer and classified as ***Class 1-A Excavation***. In rock areas, the limit of measurement for excavation will be at the bottom of the normal plan section. All voids created by the removal of unsuitable material except when rock is encountered at sub-grade shall be backfilled to the lines and grades specified in the Contract Documents. Backfill material shall conform to Section 916.

201.03.10 Coal Deposits. The Contractor is required to notify the Maryland Department of Environment when coal is encountered on any construction project. The notice shall be sent to the Director, Maryland Department of Environment. Any coal encountered on the project shall be disposed of as directed by the Engineer.

201.04 MEASUREMENT AND PAYMENT. Roadway Excavation will be measured and paid for at the Contract unit price per cubic yard. The payment will be full compensation for all excavation and hauling, formation and compaction of embankments and backfills, disposing of excess and unsuitable materials, preparation and completion of sub-grade and shoulders except as otherwise specified, serrated slopes, rounded and transition slopes, and for all material, labor, equipment, tools, and incidentals necessary to complete the work. Payment will not be made for excavation of any material that is used for purposes other than those designated. Unless otherwise noted in the Special Provisions, measurement of ***Class 1 Excavation*** shall be by the Template Method.

201.04.01 Limits of Measurement.

(a) Roadway Excavation. The lower limit of measurement will be the surface upon which roadway materials, including base course, surfacing or selected capping material is to be placed in either pavement or shoulder areas.

(b) Concrete Pavements. Measurement will be taken to 1 foot outside of the outer edge of the pavement on each side. Where concrete curb or combination concrete curb and gutter is built contiguous to the pavement measurement for excavation will be the outer limits of the concrete curb or combination concrete curb and gutter.

(c) Rocks and Boulders. If ledge rock, scattered rock, or boulders of 1/2 cu yd or larger volume are removed, any resulting undercutting approved by the Engineer will be measured for payment.

(d) Slides or Breakages. Slides or breakages not attributable to the carelessness of the Contractor as determined by the Engineer will be measured and included in the final quantities for ***Class 1 Excavation***.

(e) Topsoil and Root Mat. Measurement will be made for the removal of topsoil and root mat when removal is required from fill areas. In the case of removal of root mat, however, ***Class 1 Excavation*** shall only apply when the strata underlying the root mat are suitable for supporting embankment. If material is unsuitable for supporting embankment then removal of root mat and unsuitable material will be measured as ***Class 1-A Excavation***.

Excavation will always be measured in its original position. No liquids will be included in any measurement.

No measurement will be made for any additional excavation required to construct new curb, curb and gutter, paved ditch, paved gutter, paved flume, or sidewalk paving.

201.04.02 Template Method of Measurement. Unless otherwise specified, excavation will be computed using the template from preliminary cross sections of the original ground surface combined with templates of the typical cross sections. If this method is used, certain volumes will be excluded.

Excluded volumes are:

(a) Undercutting for cushion over rock.

(b) Entrances and intersections for which details are not specified in the Contract Documents and for which no quantity was allowed in the Contract Documents.

(c) Salvaged topsoil from under embankments.

(d) Removal of root mat from under embankments.

The template method will not be used:

(a) Where there are approved changes in design and typical section.

(b) Where there are approved deviations from planned slope faces in rock cuts.

(c) Where the original ground conditions upon which preliminary cross sections were taken have been changed before the Contractor begins work.

(d) For ***Class 1-A Excavation***.

(e) When the work of the Contractor does not conform to the line, grade, or cross section specified in the Contract Documents or as changed by subsequent written orders of the Engineer. Unless corrective action is required, payment will be based on the changed quantities as determined by the cross section method in Section 201.04.03.

201.04.03 Cross Section Method of Measurement. When specified, Excavation quantities for payment will be computed by average end areas, from the cross sections of the original ground combined with cross sections of the completed work. ***Class 1 Excavation*** will be allowed in median areas of cut sections only where topsoil depths of 4 in. or greater are to be placed. This method will also apply to ***Class 1A Excavation*** and ***Class 2 Excavation*** unless otherwise specified.

201.04.04 Pre-splitting will not be measured but the cost will be incidental to the Contract unit price per cubic yard for excavation.

201.04.05 Removal of existing pavement, sidewalk, paved ditches, curb or combination curb and gutter outside the limits of construction will be measured and paid for as specified in Section 206.04.

201.04.06 Removal of existing pavement, sidewalk, paved ditches, curb or combination curb and gutter within the limits of construction for any class of excavation will not be measured but the cost will be incidental to the Contract price per cubic yard for the class of excavation in which it occurs.

201.04.07 Re-computation of Quantities. The Contractor or the County may elect to re-compute quantities in any section where it is believed the planned quantities are incorrect. When re-computation reveals an error, the corrected quantity shall be used.

SECTION 202 – CHANNEL OR STREAM CHANGE EXCAVATION (CLASS 5)

202.01 DESCRIPTION. This work shall consist of excavation for changes in streams and channels when specified in the Contract Documents. The Contractor shall use all suitable materials from excavation in the construction throughout the Contract.

202.02 MATERIALS. Not applicable.

202.03 CONSTRUCTION. Refer to the applicable provisions of Section 201.

202.04 MEASUREMENT AND PAYMENT. ***Class 5 Excavation*** will be measured and paid for at the Contract unit price per cubic yard. The payment will be full compensation for all excavation and hauling, formation and compaction of embankments and backfill, backfilling old stream beds or otherwise disposing of excess and unsuitable materials, and for all material, labor, equipment, tools, and incidentals necessary to complete the work.

Material will be measured in its original position and the volume computed by the Method of Average End Areas. The cross sectional area measured will not include water or other liquids. Measurement for channel or stream change excavation will not include any material removed outside the limits of payment as specified in the Contract Documents.

SECTION 203 – BORROW EXCAVATION

203.01 DESCRIPTION. This work shall consist of furnishing, excavating, hauling, and depositing approved materials for embankments and backfills when sufficient quantities of suitable materials are not available from other excavations as specified in the Contract Documents. It shall include all work prescribed for backfills, embankments, subgrade, and earth shoulders, all necessary clearing and grubbing, the removal and disposal of overburden or other unsuitable spoil material and the trimming, shaping, dressing, draining, and reclamation of the pit or location from which borrow material is secured.

203.01.01 Contractor's Options. The Contractor, as a duly authorized agent of the County, may elect one of the following three methods to obtain borrow material for use on public highway Contracts:

OPTION 1 — Acquire material from a licensed commercial operating supplier.

OPTION 2 — Make application to the Department of Environment under the Annotated Code of Maryland, Article 26.21.01.02, entitled "Surface Mining".

OPTION 3 — Make application to the County to operate under the standard adopted in conformance with the Annotated Code of Maryland, Article 26.21.01.08, entitled "Exemptions." A Contractor who elects to use Option 3 shall submit an application to the County and all appropriate agencies fulfilling all the requirements of the cited subtitle.

203.01.02 Notice to Contractor - Borrow Pits. The Contractor will be responsible for obtaining all necessary permits. The Contractor shall submit to the Engineer written proof that all permits and/or approvals have been secured for the borrow pits. All shall be in accordance with Baltimore County's floodplain laws and regulations.

203.01.03 RESERVED.

203.02 MATERIALS. Materials shall conform to Section 916.

203.03 CONSTRUCTION.

203.03.01 Clearing and Grubbing. Clearing and grubbing shall conform to Section 101.

203.03.02 Borrow Pit Material. The Contractor shall notify the Engineer 30 days in advance of the opening of any borrow pit so that soil analysis, elevations, and measurements of the ground may be made. After the pit is opened the material excavated is to be used only for the project intended. The Contractor shall not excavate additional material for other purposes until a final survey is made of the pit.

Borrow Pit After Excavation. The borrow pit shall conform to the Reclamation (Permit) Plan after the necessary quantity of materials has been removed. Steep slopes and sheer faces shall be avoided. All disturbed areas shall be seeded and mulched at the Contractor's expense as specified in Section 705. These shaping and seeding requirements do not apply to commercial borrow pits.

203.03.03 RESERVED.

203.03.04 RESERVED.

203.03.05 Borrow Excavation Beyond Specified Limits. Refer to Section 201.03.08.

203.03.06 Compaction. Refer to Section 204.03.04.

203.04 MEASUREMENT AND PAYMENT. ***Borrow Excavation*** will be measured and paid for at the Contract unit price per cubic yard. The payment will be full compensation for clearing and grubbing, furnishing, excavating and hauling, sloping, draining and reclamation of pits (if Option 2 or 3 is selected), the formation and compaction of embankments, backfills, subgrade, manipulation and additives for select borrow, all work and materials for earth shoulders except as otherwise specified, disposing of all unsuitable spoil material, and for all material, labor, equipment, tools, and incidentals necessary to complete the work. For materials delivered by weight, the volume shall be determined by dividing weight received by typical in-place density of the compacted material.

When requested by the Contractor in writing, the Engineer may approve an alternate method of measurement for computing borrow excavation quantities. This alternate method will not be considered for approval unless the Contractor can show that the cross section method computed by average end area is not a feasible method of measurement. When approved in writing by the Engineer, this alternate method shall consist of measuring the Borrow Excavation in approved hauling vehicles in the following manner:

(a) The Contractor shall designate, prior to the start of hauling operations, the identification number of vehicles to be used. The Engineer will determine the water level capacity of each vehicle so designated. The measured capacity shall be multiplied by a factor of 0.85 to determine the pay volume.

(b) The Contractor shall furnish a delivery ticket to the Engineer for each load of borrow material delivered to the project. Any ticket not signed by the Engineer to acknowledge receipt will not be used in the computation of the borrow quantity.

The ticket shall include the following information:

(1) The supplier's name.

(2) The County's Contract number.

(3) The date and ticket number.

(4) Vehicle identification number.

(5) Type of material delivered.

(6) Pay volume computed as specified in (a).

SECTION 204 – EMBANKMENT AND SUBGRADE

204.01 DESCRIPTION. This work shall consist of constructing the embankment and subgrade of suitable material obtained from roadway, structure, borrow, and other excavation included in the Contract, and it shall be placed, processed, and compacted to the lines and grades specified in the Contract Documents.

204.02 MATERIALS. Soils and soil aggregate mixtures used in the construction of embankments shall conform to the common borrow requirements in Section 916 unless otherwise specified in the Contract Documents.

204.02.01 Rock. Rock may be used in embankments, provided that individual pieces do not exceed 24 in. in any dimension. Larger size rocks may be wasted with the approval of the Engineer.

204.02.02 Frozen Material. Frozen material shall not be placed in embankments. It shall be stockpiled outside the construction limits and reserved for future use at a time when its condition is acceptable to the Engineer. Re-handling of the excavated material shall be at the expense of the Contractor. Any material that freezes after being placed in the embankment shall not be covered until it has thawed. The Contractor shall replace any wasted material with approved material at no expense to the County.

204.02.03 Embankment Adjacent to Structures. The Engineer may require the use of specially selected material adjacent to structures to insure good compaction or to protect the structure from damage. Rock shall not be used. Where embankment material is placed at locations of pile supported foundations the material shall be such that piles may be easily driven through the embankment material.

204.03 CONSTRUCTION.

204.03.01 Embankment Foundation.

(a) Foundation Material. Prior to the construction of an embankment, the Engineer will inspect the foundation. Topsoil, root mat, or unsuitable material shall be removed to the depth directed by the Engineer.

(b) Embankment Over Existing Pavement. When the embankment is placed on an existing pavement, the pavement shall be thoroughly broken up, scarified or removed as specified in the Contract Documents or as directed by the Engineer.

(c) Test Rolling. When test rolling is specified in the Contract Documents or directed by the Engineer, the foundation shall be tested by rolling with a 35 ton pneumatic tired roller, or other as approved by the Engineer.

204.03.02 Placing and Spreading. The material shall be placed in horizontal layers across the full width of the embankment. An adequate crown shall be maintained to provide drainage at all times. Side slopes shall be maintained at the specified slope throughout the progress of the work.

(a) Embankment on Unstable Ground. When embankment is to be constructed in wet and unstable ground that will not support the weight of the construction equipment,

the first layer of the fill may be constructed by depositing material in a layer no thicker than that required to support the equipment. Subsequent layers shall be 8 in. compacted depth.

(b) Earth Embankment. Except as otherwise specified, no layer shall exceed 8 in. compacted depth.

(c) Rock Embankment.

(1) In rock embankment, the thickness of layers shall be determined by the size of the rock, but in no case shall layers exceed 24 in. depth. The portion of the embankment less than 6 feet below the subgrade at the profile grade line shall be placed in layers not more than 8 in. compacted depth, and these layers shall be filled solid and fully choked with spalls, rock dust, or earth. Each layer shall be filled and compacted before the next layer is placed.

(2) The top of the rock material shall provide a uniform surface, determined by connecting with straight lines the points on the typical cross section which are 9 in. below any median ditch invert and 9 in. below the bottom of the pavement structure and then sloping downward and outward under the shoulders at the rate of 3/4 in. per ft to the outer slope of the embankment.

(3) The remaining upper portion of the embankment, unless otherwise specified in the Contract Documents, shall be constructed of suitable earth, free from stones that would be retained on a 3 in. sieve.

204.03.03 Benching. When embankment is to be placed and compacted on hillsides or when new embankment is to be compacted against existing embankments, the slopes on which the embankment is to be placed shall be continuously benched where they are steeper than 4:1 when measured at right angles to the roadway. The benching operation shall be done as the embankment is brought up in layers. Benching shall be of sufficient width to permit operation of placing and compacting equipment with a minimum width of 5 feet. Each horizontal cut shall begin at the intersection of the original ground and the vertical sides of the previous cut. Material meeting embankment requirements cut from the benches shall be compacted along with the new embankment material at the Contractor's expense.

204.03.04 Compaction. Immediately after spreading of each layer, the material shall be compacted with compaction equipment approved by the Engineer. Rolling shall be done in a longitudinal direction along the embankment, beginning at the outer edges and progressing towards the center. The travel paths of traffic and equipment shall be dispersed over the width of the embankment to aid in obtaining uniform compaction.

Material 1 foot below the top of subgrade shall be compacted to not less than 92 percent of the maximum dry density as specified in T 180. Material in the top 1 foot shall be compacted to not less than 95 percent of the maximum dry density. When necessary, the layer shall be wetted or dried in order to compact the layer to the required density.

When required by Contract, provide a Portland cement concrete compaction block having dimensions 18 x 18 x 9 in., weighing at least 200 lb, and with one 18 x 18 in. level and broomed working surface.

204.03.05 Stability of Embankments. The Contractor shall be responsible for the stability of all embankments in the Contract and shall remove and replace with acceptable material any embankment or portion thereof which has been constructed with unsuitable material. The Contractor shall bear the expense of removing and replacing unstable material as well as removing and replacing portions of the embankment that become unstable or displaced as the result of Contractor negligence.

204.03.06 Protection of Structures and Utilities During Construction. The Contractor shall be responsible for protecting all structures and utilities from any damage in the handling, processing, or compacting of embankment or backfill material. Particular care shall be exercised in the vicinity of arches, retaining walls, culverts, and utility trenches to assure that no undue strain or movement is produced. In areas where rollers cannot be used, the embankment or backfill shall conform to Section 210.

204.03.07 Subgrade.

(a) The subgrade shall be constructed and shaped to the specified cross section after all cuts, embankment and backfilling have been substantially completed. The subgrade shall be proof rolled as specified in Section 204.03.01 (c).

(b) Before any Developer contracts are initiated, grading shall be completed to the established subgrade within a tolerance of two inches for the full width of the road or street right-of-way. The Contractor shall make final subgrade preparation and compaction of the subgrade. All unsuitable material found in the subgrade shall be replaced with crusher run stone CR-1 or CR-6. The Engineer will determine which type of stone material to be used.

204.03.08 Maintenance. During construction and after completion of the embankment and subgrade, the Contractor shall maintain the embankment and subgrade until finally accepted. Embankment and subgrade material which may be lost or displaced as a result of natural causes such as storms and cloudbursts, or as a result of unavoidable movement or settlement of the ground or foundation upon which the embankment and subgrade is constructed shall be replaced by the Contractor with acceptable material from excavation or borrow. The Contractor shall at all times maintain ditches and drains to provide adequate drainage. The travel paths of any traffic or construction equipment on the finished embankment and subgrade shall be held to a minimum to avoid the displacement of material or formation of ruts. When ruts 2 in. or more in depth are formed in the subgrade they shall be removed by reshaping and recompacting.

204.04 MEASUREMENT AND PAYMENT. Embankment, Subgrade, and all necessary work will not be measured but the cost will be incidental to the Contract unit price per cubic yard for the pertinent classes of excavation. The Contract unit price per cubic yard shall

include the formation, sprinkling, compacting, test rolling, shaping, scarifying, breaking or removing of the existing pavement, sloping, trimming, finishing, maintaining embankments and subgrade, and for all material, labor, equipment, tools, and incidentals necessary to complete the work.

Excavation and replacement of material for Section 204.03.07(b) shall be measured and paid for at the contract unit price per cubic yard for ***Class 1A Excavation*** and refill with ***Crusher Run CR-1*** or ***Crusher Run CR-6*** stone.

Replacement of material lost as a result of natural causes will be measured and paid for at the Contract unit price per cubic yard for ***Class 1 Excavation*** or ***Borrow Excavation*** as directed by the Engineer.

Compaction by means of mechanical tampers or vibratory compactors will not be measured nor paid for except when an item for ***Tamped Fill*** is included in the Contract Documents.

These Provisions for Measurement and Payment do not apply to UA and RA contracts.

SECTION 205 – TEST PIT EXCAVATION

205.01 DESCRIPTION. This work shall consist of excavation and backfilling for test pits to determine the location of underground structures and utilities as specified in the Contract Documents or as directed by the Engineer.

205.02 MATERIALS. Not applicable.

205.03 CONSTRUCTION. It shall be the responsibility of the Contractor to determine the location of underground structures and utilities by the use of test pit excavation prior to excavation operations.

Test pits shall be of the size, depth and location as authorized by the Engineer. Each pit that is excavated by using conventional (non-vacuum) excavation equipment shall be tamp backfilled as specified in Section 210 following completion of utility work at the test pit location, as approved by the Engineer.

All test pits shall be done a sufficient distance ahead of work so that changes in line and grade, or relocation of existing utilities may be done without hindering construction progress. The test pit excavation may be left unfilled if the proposed utility proceeds through the test pit location and temporary plating is adequate to provide protection of the public during the proposed period of work.

205.04 MEASUREMENT AND PAYMENT. Refer to Section 109 regarding fixed price items. ***Test Pit Excavation / Conventional Excavation Methods*** that use non-vacuum equipment will be measured and paid for at the Contract unit price per cubic yard for the material actually removed from within the limits specified. ***Test Pit Excavation by Vacuum*** shall be measured and paid for at the Contract Unit Price per cubic yard. The payment will be full compensation for all material, labor, equipment, tools, and incidentals necessary to complete the work required to locate and identify the utility under investigation except when otherwise specified in Contract Documents. Tamped backfill will not be measured but the cost will be incidental to the Contract unit price per cubic yard for ***Test Pit Excavation***. Any pavement to be replaced will be paid for as specified in Section 106.

SECTION 206 – REMOVAL OF EXISTING PAVEMENT, SIDEWALK, PAVED DITCHES, CURB, OR COMBINATION CURB AND GUTTER

206.01 DESCRIPTION. This work shall consist of the full depth removal and disposal of existing pavement, sidewalk, paved ditches, curb or combination curb and gutter as specified in the Contract Documents or as directed by the Engineer.

206.02 MATERIALS. Not applicable.

206.03 CONSTRUCTION. The Contractor shall saw cut the existing pavement, sidewalk, paved ditches, curb or combination curb and gutter along the lines specified in the Contract Documents or as directed by the Engineer. The Contractor shall not damage sections that are not to be removed. Damage done by the Contractor to those areas to remain in place shall be repaired or restored at the Contractor's expense.

206.03.01 Broken Material. Broken pavement, sidewalk, paved ditches, curb or combination curb and gutter materials may be broken and used in the work with the approval of the Engineer. The broken material shall be considered to be rock as specified in Section 204.02.01.

206.04 MEASUREMENT AND PAYMENT. The payment will be full compensation for all work specified regardless of the type or depth of material removed and for all material, labor, equipment, tools, and incidentals necessary to complete the work.

206.04.01 Removal of Existing Pavement, Sidewalk, Paved Ditches, Curb or Combination Curb and Gutter within the limits of construction for any class of excavation will not be measured but the cost will be incidental to the Contract unit price per cubic yard for the class of excavation in which it occurs.

206.04.02 When this work falls outside the limits of construction, it will be measured in the original position and paid for as follows:

(a) ***Saw Cuts*** per linear foot when specified in the Contract Documents.

(b) ***Removal of Existing Pavement***, ***Removal of Existing Sidewalk***, and ***Removal of Paved Ditches*** per cubic yard.

(c) ***Removal of Existing Curb*** or ***Removal of Existing Combination Curb and Gutter*** per linear foot.

SECTION 207 – REMOVAL OF EXISTING MASONRY

207.01 DESCRIPTION. This work shall consist of removing all or part of existing concrete, concrete block, brick or stone structures (headwalls, toe walls, etc.), including concrete piles as specified in the Contract Documents or as directed by the Engineer. Removal of existing bridge structures shall conform to Section 402.

207.02 MATERIALS. Not applicable.

207.03 CONSTRUCTION.

207.03.01 Removal. All removal shall be to an elevation of at least 1 foot below subgrade or existing ground, unless otherwise specified in the Contract Documents or as directed by the Engineer. Blasting will not be permitted without the written approval of the Engineer. Piles, grillages, or cribbing under removed masonry shall be cut off and removed to these limits.

207.03.02 Use of Removed Masonry. Masonry material may be broken and used in the work. The broken material shall be considered to be rock in conformance with Section 204.02.01. If the Engineer determines the material to be unsuitable material, it shall be disposed of as excess or unsuitable material.

207.03.03 Protection of Retained Masonry. Retained sections that are damaged shall be repaired or replaced in a manner acceptable to the Engineer at the Contractor's expense. Connecting edges and surfaces shall be cut to lines specified in the Contract Documents or as directed by the Engineer.

207.04 MEASUREMENT AND PAYMENT. The payment will be full compensation for all excavation, backfill, disposal of excess or unsuitable material, blasting, and for all material, labor, equipment, tools, and incidentals necessary to complete the work.

207.04.01 ***Removal of Existing Masonry*** will not be measured but will be paid for at the Contract lump sum price.

207.04.02 When specified in the Contract Documents, ***Removal of Existing Masonry*** will be measured and paid for at the Contract unit price per cubic yard.

SECTION 208 – SUBGRADE PREPARATION

208.01 DESCRIPTION. This work shall consist of the preparation, protection, and maintenance of the subgrade prior to the construction of any succeeding courses.

208.02 MATERIALS. Materials shall conform to Section 916.

208.03 CONSTRUCTION. After roadway excavation and embankments have been completed and the requirements of Section 204 have been met, the subgrade shall be fine graded and compacted to a density not less than 95 percent of maximum dry density as specified in T 180.

208.03.01 Removal and Replacement of Unsuitable Material. All soft and unstable material and any other portions of the subgrade that will not properly compact shall be removed, disposed of and replaced with suitable material and compacted.

208.03.02 Subgrade Control. The subgrade surface shall be brought to line and grade and shaped to the specified cross section. Grade shall be set for subgrade control both longitudinally and transversely with fixed controls not to exceed 25 feet spacing. The finished subgrade shall not deviate more than a half inch from the established grade. It shall be compacted and smoothed over its full width by the use of an approved, smooth faced steel wheeled roller or by mechanical tampers and vibratory compactors if rolling is not feasible.

208.03.03 Bleeder Ditches. The Contractor shall at all times maintain adequate open bleeder ditches along the subgrade to keep it thoroughly drained. Erosion and sediment control practices conforming to Section 308 shall be maintained.

208.03.04 Subgrade Maintenance. Maintenance of the subgrade shall be the responsibility of the Contractor. The Contractor shall take precautionary measures to prevent damage by heavy loads or equipment. Any defects or damage shall be repaired or replaced at the Contractor's expense.

208.03.05 Subgrade Approval. No subsequent cover material shall be deposited upon a subgrade when it is frozen nor until it has been checked and approved by the Engineer.

208.04 MEASUREMENT AND PAYMENT. Subgrade Preparation, including bleeder ditches and any mechanical tamping will not be measured but the cost will be incidental to other pertinent items specified in the Contract Documents.

SECTION 209 – TRIMMING EXISTING DITCHES

209.01 DESCRIPTION. This work shall consist of trimming, sloping and shaping existing ditches, within the limits and to the lines and grades as specified in the Contract Documents. Included in the work is clearing and grubbing and the removal and disposal of surplus or unsuitable materials.

209.02 MATERIALS. Not applicable.

209.03 CONSTRUCTION. Clearing and grubbing for trimming existing ditches shall conform to Section 101. Existing ditches shall be trimmed, sloped, and shaped to a uniform grade and cross section. The side slopes shall be constant and shall not be steeper than 1:1 unless otherwise specified. Surplus or unsuitable materials removed shall be disposed of as specified in Section 201.

209.04 MEASUREMENT AND PAYMENT. ***Trimming Existing Ditches*** will be measured and paid for at the Contract unit price per linear foot of existing ditches on which work has been completed. Measurement will be along the center line of the ditch.

The payment will be full compensation for all clearing, grubbing, excavation, disposal of surplus and unsuitable materials and for all labor, equipment, tools, and incidentals necessary to complete the work.

SECTION 210 – TAMPED FILL

210.01 DESCRIPTION. This work shall consist of compacting embankment and backfill materials by means of mechanical tampers or vibratory compactors. This method of compaction shall be used wherever materials cannot be adequately compacted by other methods approved by the Engineer.

210.02 MATERIALS. Embankment and backfill material to be tamped shall conform to Section 916.

210.03 CONSTRUCTION. After the Engineer has given permission to backfill, the areas to be tamped shall be filled with approved materials furnished from excavation and

supplemented by additional approved material. The material shall be placed in horizontal layers not to exceed 6 in. of loose depth over the entire area to be tamped and uniformly compacted by means of mechanical tampers or vibratory compactors. The moisture and compaction requirements shall conform to Section 204.03.04.

When backfilling around abutments, retaining walls, culverts, utilities, or other structures, special care shall be taken to prevent any wedging action against the structure by the material being compacted. The existing slopes to be filled against shall be benched or stepped. The backfill shall be constructed in horizontal layers as described above and wide enough that there shall be a horizontal berm of thoroughly compacted material behind the structure at all times for a distance at least equal to the height of the structure remaining to be backfilled, except insofar as disturbed material protrudes into this space. Tamping may be required over additional widths when the material cannot be adequately compacted by other methods. When structures are installed below subgrade in embankments, the tamped fill shall be placed to a depth of 1 foot over the top of the structure, while in excavation sections the tamped fill shall extend to the surface of the finished earthwork.

210.04 MEASUREMENT AND PAYMENT. Compacting embankments and backfills by mechanical tampers or vibratory compactors will not be measured but the cost will be incidental to the other bid items unless a pay item for ***Tamped Fill*** is included in the Contract Documents.

SECTION 211 – GEOSYNTHETIC STABILIZED SUBGRADE USING GRADED AGGREGATE BASE

211.01 DESCRIPTION. Furnish and place a layer of geotextile and 12 in. minimum of graded aggregate base to bridge unstable material and minimize the use of undercutting. Use this item only when specified or directed. In extremely unstable areas, the Engineer may increase the thickness of the graded aggregate base material.

211.02 MATERIALS.

Graded Aggregate Base	901.01
Geotextile for Subgrade Stabilization Class ST	921.09
Securing Pins or Staples	921.09

211.03 CONSTRUCTION.

211.03.01 Test Strip. In extremely unstable areas, the Engineer may direct that a test strip be constructed to determine the thickness of aggregate layer required to stabilize the area. The Engineer will determine the depth of aggregate to be used in the test strip. Construct the test

strip a least 100 feet in length and at least one lane wide. The results of the test strip will be used to determine the thickness of aggregate required for subsequent construction.

211.03.02 Grade Preparation. Cut the area where the geotextile is to be placed to the depth shown or as directed. Bring the area to the specified line, grade, and cross section. Provide a grade that is smooth as practical and free of debris. Minimize construction traffic on the grade. Remove ruts by reshaping, but do not overwork the grade. Have the grade approved prior to placement of the geotextile. Maintain adequate surface drainage as specified in Section 208.03.03.

The Engineer may waive compaction and moisture requirements for the underlying soil.

211.03.03 Geotextile Placement. Place geotextile on the prepared surface for the full width of the area to be treated. In areas where longitudinal underdrain is to be placed, place the geotextile up to the edge of the proposed longitudinal underdrain trench, but not where the trench is to be excavated.

Unroll the geotextile parallel to the base line. Do not drag the geotextile across the grade. Remove wrinkles and folds by stretching and pinning.

Overlap the geotextile at least 30 in. at roll edges and ends. Overlap the end of the roll in the direction of aggregate placement, with the roll being covered by aggregate on top of the next roll. Pin all roll ends and roll end overlaps a maximum of 5 feet on center. Pin roll edges and roll edge overlaps a maximum of 50 feet on center.

For curves, fold or cut the geotextile and overlap in the direction of the turn. Pin folds in the geotextile a maximum of 5 feet on center. Immediately repair or replace damaged geotextile as directed. Overlap geotextile patches at least 3 feet into undamaged geotextile.

Do not allow traffic, including construction equipment, on the bare geotextile.

211.03.04 Aggregate Placement. Place the graded aggregate base as specified in Section 501, with the following exceptions:

(a) Placement and Spreading. Place the graded aggregate base within three working days of geotextile placement. Use the end dumping and spreading method. Place a single lift parallel to the baseline and at the thickness required to provide the specified compacted depth. Keep the turning of construction equipment on the graded aggregate base to a minimum.

(b) Density Requirements. Immediately after placement, compact the graded aggregate base material to the required density. Unless otherwise directed, compact the top 6 in. to at least 95 percent of maximum dry density within 2 percent optimum moisture. Use T 180 to determine the optimum moisture content and maximum dry density. Compaction requirements will be waived for the graded aggregate base material below the top 6 in.

(c) Vibration. Unless otherwise specified or directed, do not vibrate graded aggregate base.

211.04 MEASUREMENT AND PAYMENT. ***Geosynthetic Stabilized Subgrade*** Using Graded Aggregate Base will be measured and paid for at the Contract unit price per cubic yard. The payment will be full compensation for the test strip, and for all material, labor, equipment, tools, and incidentals necessary to complete the work.

CATEGORY 300
DRAINAGE & UTILITY CONSTRUCTION

SECTION 300 – GENERAL REQUIREMENTS

300.01 DESCRIPTION. This section provides specifications peculiar to water main, sanitary sewer and storm drain construction. Designated emergency work shall be generally excluded from the requirements set herein. Documentary requirements for such work are to be set by Baltimore County on a case-by-case basis. Specifications common to both highway and utility construction are found in other portions of this volume as applicable.

300.02 MATERIALS: Not applicable.

300.03 CONSTRUCTION.

300.03.01

(a) Contract and As-Built Drawings. The Contractor shall have contract drawings showing the location, dimensions and sizes of the materials, on the lines and slopes, at the depths, with the connections and the manner in which they are to be placed as called for by the Specifications. The Contractor shall also maintain a complete set of these contract drawings showing As-Built construction changes for use in maintaining a permanent record of the completed construction that shall become the property of Baltimore County at the completion of the Contract.

The Contractor shall provide the Engineer with "As-Built" survey data for new items installed per Contract and for existing items directly impacted by the Contract work. These items include but are not limited to the following:

(1) direct-buried: horizontal bends, vertical bends, crosses, horizontal tees, vertical tees, caps/plugs, horizontal wyes, vertical wyes/precast sanitary sewer wye blocks, pipeline closure pieces, corporation stops, sleeves/couplings, tapping sleeves (if not directly coupled to tapping valves), pipe anchors/thrust blocks, reducers, line stops (permanent or temporary), insertion valves, valves left direct buried, pipe connections, pipe boots, insulating flanges, anode bed limits, cathodic protection electrical separators, clay trench plugs, steel sheet piling left in place, pile ends/caps, casing/tunnel terminus points, storm drain inverts, sanitary sewer inverts, underdrain inverts, anti-seep collars, lateral seals, siphons, grease interceptors, bend structures, junction chambers, top of water mains along with their material(s) of construction, and top of sanitary sewer force mains along with their material(s) of construction.

(2) frames and covers, caps, lids, or hatches for: main valves, tapping valves, bypass valves, water meters, blow-off valves, dewatering valves, air release/relief valves, air/vacuum valves, grinder pumps, isolation valves, check valves, backflow preventers, curb stops, wells, special purpose corporation stops, sump pumps/pits, manway accesses/manholes, hand holes, clean-outs, dismantling joints, electric/fiber optic/communication junction boxes, and cathodic protection test stations.

(3) at grade, above-grade, or otherwise exposed appurtenances: fire hydrants (top of operating nut), sign posts, guard rail terminus points, traffic calming devices, bollards/guard posts, crash barriers, headwalls, end support walls, endwalls, end sections, inlets/combination inlets, grates, surface trench drains, inlet caps, gabion velocity breakers, check dams, trash rack/anti-vortex devices, and horizontal draw-down devices.

(4) items removed/replaced or removed/relocated as a direct result of utility construction: property corners, survey markers, utility poles, transformer pads, card reader/communication pedestals, rectifier/electric panelboards, fence corner posts, gate posts, bike racks, monuments, and septic tanks.

Survey data shall consist of horizontal positions based upon the Contract drawing datum, or as directed by the Department of Public Works and Transportation, and shall be accurate to 0.1 feet. Vertical datum shall be based upon the Contract drawing datum, or as directed by the Department of Public Works and Transportation, and shall be accurate to 0.1 feet. As-Built positions and elevations shall be certified and sealed by a Maryland Licensed Property Line Surveyor or Professional Land Surveyor.

At the Contractor's option, the required "As-Built" survey data, as described above, may be provided on either individual sketches or on the "red-lined" As-Built drawings that he is to supply to the Engineer at the completion of the Contract.

Items to be verified and included on the As-Built drawings shall be based on As-Built checklists to be provided by Baltimore County.

Final payment shall not be made and/or Contract acceptance shall not be given until the Contractor provides an acceptable As-Built plan and survey.

As-Built requirements for Stormwater Management facilities, specialized geotechnical or biotechnical inspections, use of geotextiles, and for other specified purposes shall be in accordance with Sections 306.03.02, 314 and 315.

(b) Digital As-Built Submission.

Final As-Built drawings shall be submitted in a digital format approved by Baltimore County. The drawings shall consist of the original Contract Drawing in black with all As-Built changes clearly noted in red. In addition to the digital As-Built drawings, a digital text file indicating the horizontal and vertical positions and the descriptions of the items indicated in Section 300.03.01(a)(1) through (4) shall be provided. The digital text file shall be in a format approved by Baltimore County.

(c) Ground Profiles.

(1) The ground profiles shown on the drawings represent the finished grade elevations along the centerline of the trenches, unless otherwise noted in the Contract Documents. Existing grades along utility trenches also shall be shown, if changes are proposed to the existing ground. No additional payment is made on lump sum bids where the actual elevations of the ground or surface over the structure differ from those shown on the profiles for pipe trenches.

(2) On all Developer Projects the Contractor and Developer shall provide the Engineer with a hold harmless agreement which stipulates that Baltimore County will not be responsible for any additional cost due to any road or right-of-way failing to comply with the subgrade or proposed profile as shown on the contract drawings. This form is available from the Division of Construction Contracts Administration, and shall be provided to the Engineer as soon as possible following the award of the Contract. The County does not require a hold harmless agreement for UA and RA contracts**.**

300.03.02 Removal and Storage of Surface Materials.

(a) General.

(1) Surface Materials. The Contractor shall grub and clear the surface and remove all surface materials, of whatever nature, over the line of the trench and from the site of other structures, and shall store, guard and preserve the materials as may be required for use in backfilling, resurfacing, repaving or for other purposes.

(2) Paving Materials. The Contractor is responsible for any loss or damage to curb, gutter, flagstone and paving material resulting from careless removal or neglectful or wasteful storage, disposal or use.

(b) Paving.

(1) Removal — The Contractor shall remove the paving only for such width as is necessary for the excavation of the trench as shown in the Standard Detail Plates. The County may retain from any monies due or to become due the Contractor the cost of permanently replacing paving removed under the following circumstances:

- Removing paving for a greater width than is deemed necessary by the Engineer;
- Removing or distributing paving on account of settlement, slides or caves; or
- Removing or distributing paving as a result of excavation outside the lines of the work without written order of the Engineer.

(2) Failed or Damaged Paving — The Contractor is responsible for the cost of replacing paving, surfacing or roadbeds that have failed or have been damaged at any time before the termination of the contract on account of work done by him. He also shall bear the expense of resurfacing or repaving over any tunnel excavation that settles.

300.03.03 Existing Utilities.

(a) Protection. Water mains, storm drains, sanitary sewers, gas mains and other utilities are shown on the Drawings in accordance with the best information available for the information of the Contractor. The County assumes no responsibility for accuracy or completeness of information shown. The Contractor shall carefully protect existing mains and services. Any damage to existing utilities shall immediately be brought to the attention of the Engineer.

Any damage to existing utilities caused by the work shall be immediately repaired to the satisfaction of the Engineer at the Contractor's expense.

(b) Locating Connection to Existing Utility. Before beginning excavation for the new installation, the Contractor must locate the connection to the existing utility by excavating for the end of the existing water main, sewer main or storm drain, as applicable, at the point of the proposed tie-in. This excavation and the associated backfill shall be measured and paid for as part of the fixed price contingent items for ***Test Pit Excavation***.

(c) Removal of Obstructions.

(1) Owner's responsibility. If the Engineer determines that the position of any pole, pipe, conduit or other structure requires its removal, realignment or change, it will be done as Extra Work or will be done by the owner of the obstruction without cost to the Contractor. Owners will brace their utility poles when required, at no expense to the Contractor.

(2) Contractor's Responsibility. Before removal and before and after realignment or change, the Contractor shall uncover, support and protect the structures in the limits of his trench at his expense as part of the Contract. The Contractor is not entitled to any claim for damage nor extra compensation on account of the presence of the structure or on account of any delay in its removal or rearrangement.

(d) Reconstruction of Obstructions. Without extra compensation, the Contractor shall break through and reconstruct, if necessary, the invert or arch of any sewer, culvert or conduit he may encounter if the Engineer determines that the structure is in such position as not to require its removal, realignment or complete reconstruction. This work must be done so as not to interfere in any way with the flow of water or other liquid which the sewer, culvert or conduit is designed to carry.

(e) Leaving a Gap. If obstructions would hold up the work of laying pipe, the Contractor, with the approval of the Engineer, may leave a gap and return to fill the gap after the obstructions have been removed.

(f) Non-Interference With Others. See Sections GP 5.06, 7.06 and 7.07.

300.03.04 Excavation. Excavation shall be by open cut except where and to such extent the Engineer permits, authorizes or requires that the Contractor excavate by tunneling. No extra compensation is allowed for tunneling over the cost of open cut unless provided for in the bid

item or negotiated by the Engineer. Generally, trenches may be excavated and refilled either by hand or by machinery as the Contractor chooses. However, the Contractor has no claim, and no extra compensation is allowed, if hand excavation or refilling is required to protect adjacent properties or improvements.

(a) Excavation of Trenches. Trench Requirements During Pipe Installation:

Prior to the start of trench excavation, the Contractor shall thoroughly familiarize himself with the latest OSHA requirements relating to the work specified.

Trenches for pipes or structures shall be excavated to the lines and grades or elevations shown on the Contract Drawings or as directed by the Engineer. The width of trench in which pipe is placed shall be sufficient to permit thorough tamping/compaction of the backfill under the haunches and around the pipe. Bell holes shall be excavated in the bottoms and sides of trenches to permit the proper making of joints, without extra payment therefore. The sides of trenches shall be vertical to the top of the pipe and practically plumb above this point with the following exception: in unimproved areas and in proposed subdivision streets, unless otherwise noted, sloping or benching of sides of trenches shall be permitted in accordance with the latest OSHA requirements from a point one foot minimum above the top of the pipe for pipes greater than 24 inches and from a point 3 feet above pipe subgrade for pipes 24 inches or less in diameter. The maximum depth of sloping shall be 8 feet below existing trench ground surface. Sloping or benching will not be allowed in locations where it might affect the subgrade of existing utilities or proposed water lines. A minimum of 18 inches clearance shall be maintained between existing utilities and the sloped side of the excavation for the new utility. When conditions are encountered which, in the opinion of the Engineer, render it impracticable to slope or bench sides, then the sides of trenches shall be practically plumb as stated above. Payment limits for any additional excavation or backfill shall be based upon excavated trench width and shall not exceed the limits shown on Baltimore County's Standard Detail Plate G-6, ***Trench and Trench Payment Width***.

All trench bracing or support systems shall comply with the latest requirements of the Maryland Occupational Safety and Health Administration (MOSHA) and the Federal Occupational Safety and Health Administration (OSHA).

(1) Single Tier Provision. If the Contractor elects to use single-tier bracing (either solid sheeting or metal trenching box), applicable Contract item payments are based on excavated trench width and shall not exceed the limits shown on Standard Detail Plates G-6 and G-7

- *Trench Width plus 2 feet,*
- *Crusher Run Paving Width plus 2 feet, and*
- *Finished Paving Width plus 2 feet.*

(2) Double Tier Provision. If the Contractor elects to use double-tier bracing (either solid sheeting or metal trenching box), 16 feet or more above invert in an excavation, the applicable contingent items associated with the bottom tier are based on (1) above. The applicable Contract items associated with the top tier are

based on excavated trench width and shall not exceed the limits shown on Standard Detail Plates G-6 and G-7

- *Trench Width plus 4 feet*
- *Crusher Run Paving Width plus 4 feet, and*
- *Finished Paving Width plus 4 feet.*

(3) Trench Width Around Appurtenances. Through areas of appurtenant construction (manholes, inlets, etc.) total trench width must be 4 feet greater than the outside width of the appurtenance for a total distance of 4 feet longer than its outside length. If depth is over 16 feet, trench width will be increased to 6 feet greater than the outside width of the appurtenance for the portion over 16 feet deep. Item payments are based on these widths.

(4) Non-Continuous sheeting. If the Contractor elects to use non-continuous sheeting, no additions to Trench Width are allowed.

(5) Use of trench boxes with flexible pipe. Prior to construction of pipe systems involving use of flexible metal or plastic pipe, the Contractor shall present and obtain approval from the Engineer for a trench design that will allow use of a trench box without disturbing placed and compacted pipe bedding and/or haunching used to support flexible pipes. The Engineer shall require that sheeting be left in place in lieu of using trench boxes if the movement of a trench box will disturb placed and compacted pipe bedding and/or haunching used to support flexible pipes. If the Engineer determines that disturbance of compacted pipe support material has occurred, the Contractor shall be solely responsible for replacement or repair to pipe alignment and compacted supporting material to the satisfaction of the Engineer in the event that any such disturbance occurs.

(b) Dewatering Excavations. The Contractor is completely responsible for adequately controlling water present in the excavation. He must provide for the disposal of water removed from excavations in such a manner as not to cause damage to public or private property or to any portion of the work completed or in progress, and he must not create any impediment to the use of any area by the public, or be in violation of MDE or Baltimore County Department of Environmental Protection and Sustainability requirements. During construction of storm water drains, sanitary sewers and water mains, the Contractor must not discharge into existing sanitary sewers.

(c) Condition of Excavation. The Contractor is responsible for the condition of all excavation made by him. He must remove all slides and caves, without extra compensation, at whatever time and under whatever circumstances they occur. The Contractor is also responsible for sizing and application of sheeting and shoring, as well as the methods and procedures employed to incorporate all labor and materials.

(d) Rock Bottom. Where the bottom of the trench at subgrade is in rock, excavation shall be carried at least 6 inches below the specified subgrade with a minimum of 4 inches under bells. The trench bottom shall be restored to subgrade with earth or granular material as approved by the Engineer. Excavation and refill to the 6-inch depth will be paid for as fixed price contingent item ***Class 3 Excavation/Select Backfill – Proper Disposal of Unsuitable Material*** (by Template method) except as otherwise directed by the Contract Documents.

(e) Unstable Bottom. If the bottom of the trench at subgrade is in unstable or unsuitable material, excavate to the depth ordered by the Engineer. Restore the trench bottom to subgrade with Selected Backfill. All excavation and refill is paid for as fixed price contingent item ***Class 3 Excavation/Select Backfill – Proper Disposal of Unsuitable Material***.

(f) Ownership of Excavated Material. The Contractor has no property right in any material taken from any excavation, and he must not remove any earth, sand or other material from the site of the work except on direction or written permission of the Engineer.

If the material excavated from the trench is a combination of materials that are suitable and unsuitable for backfill based upon strata or location, the Contractor shall be responsible for separating the suitable material for use as backfill in accordance with the instructions of the Engineer. All costs associated with this effort shall be included in the price of the pipe or structure being installed.

(g) Length of Open Trench. The Contractor shall not leave open a greater length of trench in any location in advance of the completed structure placed therein, than is authorized or directed by the Engineer. Trenches left open and unattended shall be properly secured.

(h) Refilling Trench.

(1) Required by Engineer. At any time, the Engineer may require the refilling of open trenches over completed pipelines if he believes such action is necessary. The Contractor has no claim for extra compensation even though, to accomplish the refilling, he must temporarily stop excavation or other work at any place.

(2) Work Stoppage. If work is stopped on a trench for any reason except by order of the Engineer, and if the excavation is left open for an unreasonable time in advance of construction, the Contractor, if so directed, shall refill the trench at his own cost and shall not open it again until he is ready to complete the structure therein. If the Contractor refuses or fails to refill the trench completely within 48 hours after notice, the Engineer shall cause the ditch to be refilled, and the County will charge the expense to the Contractor and will retain same out of any monies due or to become due to him under the contract.

(3) Refilling Procedures.

Refilling shall normally be accomplished by the use of suitable material, excavated on the project, which is free from large lumps, clods or rocks except as noted below and which can be compacted to the degree specified by normal means. Suitable material shall not be frozen or composed of ash, cinders, organic matter or other refuse. If suitable material is not available on the project or if directed by the Engineer, fixed price contingent item ***Borrow for Backfilling Trenches – Proper Disposal of Unsuitable Material***, shall be used. Payment limits for these materials shall be in accordance with the widths shown in the Standard Detail Plates.

No rock shall be allowed in refilling until earth has been placed at least 2 feet over the pipes or structure. Above this, except for the last 1 foot, small stones not larger than 10 inches in their greatest dimension will be permitted in an amount not to

exceed 20 percent of the volume of the backfill. Within these limits the stones will be well distributed throughout the mass.

Use all suitable excavated material for backfill or store for future use. Do not waste excavated material without approval. Prior to using excavated material as backfill, remove boulders, logs, and other unsuitable material. Dispose of unsuitable material in an approved disposal area.

(4) Compaction Around Pipes.

Prior to beginning excavation, the Contractor shall present the Engineer with manufacturer-approved specifications for compaction to be used for the particular pipe material being installed. The pipe to which the manufacturer-approved specifications apply shall be installed in full compliance with these specifications, except as otherwise directed by the Contract Documents.

For rigid pipes such as reinforced concrete pipe and for ductile iron pipes, the following compaction specifications shall be used: Suitable material shall be carefully placed around the pipe and brought up evenly along both sides of the pipe to a depth of 2 feet over the pipe or structure. This initial backfill shall be carefully placed and tamped by approved mechanical means in 6-inch layers, to a minimum of 92 percent of AASHTO T-180 density. Care shall be exercised during this operation in order to insure that the pipe is not damaged and the alignment of the utility is not disturbed.

In unimproved areas outside the existing or proposed road right-of-way, unless trench compaction as used within road right-of-way is specified on the Contract Drawings, compaction shall be accomplished as follows for the remaining depth of trench. Backfill material shall be placed in 12-inch layers and compacted in such a manner that a completely dense refill is obtained which is free of voids and not susceptible to settlement.

In all County and State roads, trench compaction as described below, will be required for rigid pipe and ductile iron pipe within rights-of-way except as noted on the Contract Drawings. The area extending from 2 feet above a pipe to the subgrade shall be refilled in layers not to exceed 8 inches. The refill shall be tamped by approved mechanical means and compacted to not less than 92 percent of the maximum density at optimum moisture content, as determined by the modified Proctor method, AASHTO designation T-180, to within the top foot of subgrade. Within County roads the top foot of subgrade shall be compacted to 95 percent of the maximum density determined as noted above. Within State rights-of-way, the top foot of subgrade shall be compacted to 97 percent of the maximum density determined as noted above.

In all proposed subdivision roads where rigid pipe and/or ductile iron pipe are used, the area extending from two feet above a pipe to the subgrade shall be refilled in layers not to exceed 12 inches. The refill shall be tamped by approved mechanical means to ensure no consolidation or settlement. If a waiver of 60-day maintenance of stone base is desired, the Developer must contact the Division of Construction Contracts Administration for application prior to grading. For all material with

moisture content more than 3 percent above optimum, the material shall be compacted to a minimum of 98 percent AASHTO T-180 density at existing moisture content. Soils more than 3 percent below optimum moisture content shall be wetted to bring the moisture content to within plus or minus 3 percent of optimum.

Prior to placement of the stone road base or subbase, the subgrade will be inspected and tested for structural capacity in accordance with existing procedures. In those instances where additional subgrade preparation is required to increase pavement support, the following procedures shall apply:

a. Undercut trench backfill 1 foot plus an overcut of 2 feet or each side of the trench.

b. Place soil reinforcing geotextile meeting AASHTO M-288 Class SE or ST as applicable or an equivalent reinforcing grid, as specified, and fill to original subgrade with Aggregate Base Course.

c. Aggregate backfill shall be rutted, regraded and compacted prior to pavement base construction.

Insofar as Specifications for mechanical tamping equipment or methods are concerned, no specific requirements are included in these Specifications other than the use of any particular type of equipment is subject to approval of the Engineer, and that he has the sole right to judge what equipment is suitable for the uses intended.

After the completion of refilling, all material not used therein shall be removed and disposed of in such a manner and to such a point as approved or directed by the Engineer; and all roads, sidewalks and other places on the line of the work shall be left clean and in good order. The Contractor shall clean up without extra compensation. If the Contractor fails to do such work within a reasonable time after receipt of notice, the Engineer shall arrange for the necessary clean up effort, and the cost will be retained out of monies due to or to become due to the Contractor, under the Contract.

(i) Place magnetically detectable plastic tape in the trench immediately above the structural backfill. The minimum thickness of the tape shall be 5.5 mils and the minimum tensile strength shall be 5000 psi. Demark the tape as to its purpose (i.e., "STORM DRAIN").

(j) Maintenance of Refilled Excavations Outside Paved Areas: Reshaping. At his own expense, the Contractor shall maintain refilled excavation in proper conditions as specified herein. Just before final restoration or final inspection, the Contractor shall give the trench surfaces a final reshaping where necessary.

300.03.05 Steel Plates.

300.03.05.01 Description. Work consists of temporary placement of steel plates to allow equipment access and maintenance of traffic where construction requires that an open trench or open cut excavation be maintained.

300.03.05.02 Materials. All steel plates shall be flat, shall be at least one (1) inch thick and shall be held in place with pins. Steel plates shall be large enough to allow a minimum of one (1) foot of bearing on the sides of the trench or open cut excavation. Steel plates shall be welded along abutting edges if required by the Engineer.

300.03.05.03 Construction. If the Contractor elects to bridge a trench or open cut excavation within paved areas of the construction area with steel plates, the Contractor shall notify the Engineer forty-eight (48) hours in advance of placement of any steel plates. If multiple plates are required to cover an open cut excavation, the Contractor shall also submit a detailed plan to the Engineer showing the placement of all steel plates and the proposed support system if required. The Engineer shall approve this detailed plan prior to any installation or use of steel plates by the Contractor. The County reserves the right to require that a registered Professional Engineer, licensed in the State of Maryland, sign and seal the plan. Steel plate locations in public roads shall be subject to speed restrictions as directed by the DPW&T Bureau of Traffic Engineering.

The Contractor shall place appropriate signs at the locations of all steel plates. These signs shall conform to Md MUTCD specifications. Spacing of these signs shall be approved by the Engineer and shall be determined by field conditions.

Steel plates shall be set as flush as possible with the road or ground surface. There shall be no lateral movement of the individual steel plates when vehicles cross the plates.

When steel plates will be left in any public road longer than seven (7) calendar days, the steel plates shall be recessed in order that the plate surface is flush with the road surface. Steel plates placed in paved roads shall have bituminous concrete cold mix placed along all edges of the plate in order to minimize the transition of vehicle wheels from adjacent paving to plate and from plate to adjacent paving. Cold mix shall be tapered from the height of the steel plates to the existing road surface to provide a smooth transition for traversing vehicles and minimize the risk to the public. The Contractor shall maintain the cold patch as a transition for as long as the plates are to be traversed by traffic.

The Contractor shall be responsible for maintaining the surface of steel plates in the case of wet or slippery weather. At the direction of the Engineer, the Contractor shall spread sand and/or salt to maintain tire traction on the surface of the plates.

The Contractor shall provide the Engineer with the names and phone numbers of at least two (2) contact persons that shall be available for the duration of the steel plate installation to respond to problems or emergencies involving the steel plates or its support system. If a problem or an emergency occurs with a steel plate in a public road that requires immediate attention, County forces will correct the issue. The County shall withhold payment to the Contractor for related items to compensate for any costs incurred by the County.

300.03.06 Television Inspection: Storm Drain, Sewer Pipes and Associated Structures.

300.03.06.01 DESCRIPTION OF WORK.

(a) Reference. All applicable requirements of other portions of the Contract Documents apply to the Work of this Section.

(b) Description of Work. The work covered by this section consists of providing all labor, equipment, material and supplies and performing all operations required to conduct the internal closed-circuit television inspection and recording of all storm drain and sewer pipelines.

(c) Definitions.

- Pre-Installation TV Inspection is a video inspection by the Contractor of sewer and storm drain pipelines specified for rehabilitation to confirm cleaning, location of drain and sewer service connections and constructability of the rehabilitation according to the Specifications.
- Post-Installation TV Inspection is a video inspection to determine that rehabilitation, replacement or new construction of a sanitary sewer or a storm drain pipeline has been completed according to the Specifications.
- TV Inspection Log. Information collected and recorded by each TV operator for any TV inspection that is submitted to the County.
- PACP: Pipeline Assessment and Certification Program. A CCTV inspection standardization certification and observation coding system sponsored by the National Association of Sewer Service Companies (NASSCO).
- Digital Recordings: For purposes of this work, inspections shall be digitally recorded. All digital recordings made shall be fully compatible with Baltimore County's Computerized Maintenance Management System (CMMS), and shall have the capability to be integrated into said CMMS.

(d) Submittals.

- Digital recordings for each pipeline project inspected are required.
- For each inspected pipe, the Contractor shall submit to the County a CCTV video inspection and associated PACP-compliant database. The database shall be provided in NASSCO PACP version 6.0 or higher. The Contractor shall submit the video and database to the Engineer.
- TV Inspection Log: Each TV Inspection Log shall be submitted to the County, accompanied by the respective digital recordings.
- PACP Operator Certification: Prior to initiating CCTV Inspection work associated with condition assessment assignments, the Contractor shall present the County with copies of PACP certifications of operators that will be performing the work.

300.03.06.02 MATERIALS.

(a) Closed Circuit Television Equipment. Select and use closed-circuit television equipment that will produce a color video.

(b) Pipe Inspection Camera. Camera shall produce a video using a pan-and-tilt, radial viewing, pipe inspection camera that pans ± 275 degrees and rotates 360 degrees. The television camera used for the inspection shall be specifically designed and constructed

for such inspection. The camera shall be operative in 100% humidity conditions. All attributes (distance, etc.) must be coded in accordance with accepted PACP standards. Use a camera with an accurate footage counter that displays on the monitor the exact distance of the camera (to the nearest tenth of a foot) from the centerline of the starting manhole. Use a camera with camera height adjustment so that the camera lens is always centered at one-half the inside diameter for circular pipe and two-thirds the rise (height) for elliptical pipe. Lighting for the camera shall be suitable to allow a clear picture of the entire periphery of the pipe. The video camera shall be capable of showing on the digital files the Owner name, Contractor name, date, line size and material, line identification (Owner's manhole numbers at both ends) and ongoing footage counter. The camera, television monitor, and other components of the video system shall be capable of producing picture quality to the satisfaction of the County; if picture quality is not satisfactory, the TV inspection will not be accepted. The camera shall remain properly focused at all times during recording. No payment will be made for an unsatisfactory inspection recording.

(c) Data Media.

- All television inspections shall be submitted to the Engineer on a digital media approved by Baltimore County. All digital media will become the property of the County when submitted to the Engineer.
- Submittals shall be equipped with an appropriate software viewer, to be supplied by the Contractor at no additional cost to the County. The submittal's electronic files shall be capable of being downloaded to the County's CMMS. The County's CMMS currently is capable of accepting POSM and WINCAM software. All conversion required to accomplish the download to the County's CMMS-compatible formats shall be done by the Contractor at his expense.
- Each submittal shall be permanently identified by a combination of labels and paper tag, as directed by Baltimore County. Labels/paper tag shall be securely attached to each submittal and shall include the following information:

  Contractor's Name
  Project Name
  Inspection Type (i.e. Survey, Pre-Installation, Post-Installation)
  Date Televised
  Contract Number
  Basin Number
  Drawing Number

  Manhole from and to, pipeline diameter and length and street name information shall be legibly included on a second label or added to the rear face of the tag, as appropriate.

300.03.06.03 CONSTRUCTION.

(a) Pre-Installation Inspection. For storm drain projects, a pre-installation inspection shall be done only for pipe rehabilitation projects.

1) Procedure.

- Perform pre-installation TV inspection immediately after pipeline cleaning and before pipeline rehabilitation work. Prepare Television Inspection Logs. Maintain copies of digital recordings and reports for reference by the County for the duration of the project.
- Prior to any repair work, the entire storm drain (from outfall to inlets) or sewer line from manhole to manhole shall be televised. The Engineer may direct at his discretion that camera inspection of large storm drains that are otherwise accessible for entry and inspection may be exempted from camera inspection. The pre-installation inspection shall be used to determine whether the pipeline has been cleaned sufficiently; to confirm the location and nature of defects; and to confirm that the proposed method of repair is proper for the defects observed.
- The camera shall be moved through the line in either direction at a moderate rate, stopping when necessary to permit proper documentation of the pipeline's condition. In no case shall the television camera be pulled at a speed greater than 30 feet per minute. Manual winches, power winches, TV cable, and powered rewinds or other devices that do not obstruct the camera view or interfere with proper documentation of the pipeline condition shall be used to move the camera through the storm drain.
- If, during the inspection operation, the television camera will not pass through the entire section of pipeline or the manhole/structure section, the Contractor shall set up his equipment so that the inspection can be performed from the opposite direction/manhole. If, again, the camera fails to pass through the entire pipe section, the inspection shall be considered incomplete until repair/adjustment is made allowing camera passage for completion of the TV inspection. If the section of pipeline is determined impassable, the Contractor shall request additional instructions from the Engineer, which may include making contact with the Design Division of the Bureau of Engineering and Construction or the associated consulting design engineer to identify subsequent actions. Improper cleaning is not acceptable as a reason for incomplete televising of a section of storm drain or sewer pipeline.
- When manually operated winches are used to pull the television camera through the pipeline, telephones or other suitable means of communication shall be set up between the two manholes of the section being inspected to insure good communication between members of the crew.
- The importance of accurate distance measurements is emphasized. Measurements for location of defects shall be above ground by means of a meter device. Marking on the cable, or the like, which would require interpolation for depth of manhole, will not be allowed. Accuracy of the distance meter shall be checked by the use of a walking meter, roll-a-tape, or other suitable device. The meter device shall be accurate to within one-tenth of a foot.
- During the internal inspection the television camera shall be temporarily stopped at each defect along the line. The Contractor shall record the nature and

location of the defect. Where defects are also active infiltration sources, the infiltration shall be classified in terms of PACP coding. In sewers, the camera shall also be stopped at active service connections where flow is discharging. If the flow is continuous, the Contractor shall check the property involved in an effort to determine whether the flow is indeed sewage. Flows from sewer service connections that are determined to be infiltration shall also be recorded. If soil/backfill has infiltrated into pipe at a joint or elsewhere, the location and severity shall be noted.

- Camera operator shall slowly pan and tilt at beginning and ending manholes/inlets, at each sewer service connection and drain pipe connection, at each joint, at visible defects and when pipe material transitions from one material to another. Zoom in on defects and connections if the camera will allow this.
- TV inspection digital recordings shall be continuous for pipe segments between manholes. Do not leave gaps in the recording of a segment between manholes, do not repeat pipe segment inspections on the same or subsequent digital recordings, do not show incomplete pipe inspections or overlap a pipe segment inspection between two (2) submittals.

2) Flow Control.

- Televising a storm drain pipeline shall be done only during periods when minimal base flow (or no flow) is present.
- The contractor shall remove all equipment from storm drains and replace manhole covers when rainfall sufficient to raise the level of water in the drain is imminent.
- Flow control for televising the pipeline shall be the responsibility of the Contractor.
- In sewers, if the flow depth of a manhole section exceeds 20% of the pipe diameter during a survey TV inspection, reduce the flow depth to an acceptable level by diversion pumping, by pulling a camera with swab, by high-velocity jet nozzle or by other acceptable dewatering devices or methods. If this is not possible, perform the survey TV inspection during minimum flow hours. A digital recording made while floating the camera is not acceptable unless approved by the County prior to doing the inspection.

3) Documentation of Television Inspection.

- The Television Inspection shall be documented using a computerized datalogger and reporting system.
- Television Inspection Logs: Printed location records shall be kept by the Contractor and shall clearly show the location of each defect or infiltration point (sewers) observed during inspection in relation to an adjacent manhole. Sanitary manholes should be identified by number, with no prefixes such as MH-, SMH-, etc. In addition, locations of drain connections, sewer service

connections, building sewers, unusual conditions, roots, cross connections with other utilities, broken or damaged pipe, presence of scale and corrosion on metal pipe, and other discernible features shall be recorded. A copy of these records shall be supplied to the County.

- Digital Photographs: Noted defects and connections shall be documented as digital files and hard copy print-outs. Photo logs shall accompany each photo submitted.
- Digital Recordings: The purpose of digital recording shall be to supply a visual and audio record of problem areas of the drains that may be replayed. Digital recordings shall include an audio track recorded by the inspection technician during the actual inspection work describing the parameters of the line being inspected (i.e. location, depth, diameter, pipe material), as well as describing connections, defects and unusual conditions observed during the inspection. Digital recording playback shall be at the same speed that it was recorded. Slow motion or stop-motion playback features may be supplied at the option of the Contractor. Once recorded, the digital recordings shall be labeled and become the property of the County. The Contractor shall have all digital recordings and necessary playback equipment readily accessible for review by the County during the project.
- All digital recordings and TV inspection records associated with a capital project shall be forwarded to the Division of Construction Contracts Administration for review. After completion and final approval of the project, the digital recordings and other inspection records shall be forwarded to the Storm Drain and Sewer Maintenance Division of the Bureau of Utilities for entry into the County's CMMS and for permanent storage for future reference. Digital recordings done for the Bureau of Utilities shall be forwarded to that agency upon completion of work.

(b) Post - Installation Inspection.

1) Procedure.

- Post-Installation TV inspection shall not be performed until all work, including inlet and/or manhole restoration, is complete on a section of pipeline. Manhole work, including benches, inverts and pipe penetrations into manhole, shall be complete prior to post-installation TV work. The post-installation TV inspection digital recordings shall be submitted to the Division of Construction Contracts Administration prior to acceptance of the work by the Department of Public Works and Transportation.
- The Contractor shall complete the post-installation TV inspection in the presence of the County. The post-installation TV inspection shall be completed to confirm completion of rehabilitation and to verify that the rehabilitation work conforms to the requirements of the Specifications. Provide a color digital recording showing the completed work, including the condition of restored connections. Prepare and submit Television Inspection Logs providing location of connections along with location of any discrepancies.

- For post-installation TV inspection, exercise the full capabilities of the camera equipment to document the completion of the rehabilitation and replacement work and the conformance of the work to the Specifications. Provide a full 360 degree view of pipe, joints, connections and service connections subject to the following:

    1. For new pipelines involving sewer pipe 18 in. or larger, at least one joint between manholes shall be panned and shown, and

    2. For new construction of smaller sewers, if the Contractor performs his smaller CCTV work following a successful pressure test, joint panning is not necessary, and

    3. Sewer relining projects require no joint panning.

    4. For storm drains larger than 48 in. in diameter, no joint panning is required. Storm drains smaller than 48" in diameter shall be panned at every fifth joint, unless the Engineer or the Contract Documents require more pans in areas of interest.

- **Procedure** shall be in accordance with Section 300.03.06.03(a) 1) for pre-installation inspection.

2) Flow Control and Documentation of Television Inspection shall be conducted as specified in Sections 300.03.06.03(a) 2) and 3) for pre-installation inspection.

300.03.07 Photographic Documentation: Polyethylene Encasement for Ductile Iron Water Mains and Copper Supply Lines.

300.03.07.01 DESCRIPTION OF WORK.

(a) Reference. All applicable requirements of other portions of the Contract Documents apply to the Work of this Section.

(b) Description of Work. The work covered by this Section consists of providing all labor, equipment, materials and supplies and performing all operations required to photographically document that polyethylene encasement for ductile iron water mains and copper supply lines has been properly installed prior to backfilling.

(c) Submittals.

- Submit photographs as cut and paste files onto a Word document (maximum 4 images to a page).
- Save digital page files in PDF format. On each page of photos, provide the following information:
    - Name of Project
    - Submittal Sequential Numbering (i.e. JR0001, JR0002, etc.)
    - Station Range (water centerline stationing)
    - Orientation of View
    - Date and Time image was taken; unless otherwise indicated, date and

time stamp each photograph as it is being taken such that stamp is integral to photograph
    - Service size, station, and address (when applicable)
    - Type of appurtenance and station (when applicable)
    - Type of fitting and station (when applicable)
    - Name of individual who took photograph
- Two (2) hard copies of files with each application for payment. Provide each copy of files in a separate 3-ring binder and provide each file printout inside separate sheet protectors. The 3-ring binders shall be furnished with the first submittal of files. Subsequent file submittals shall be provided in individual sheet protectors so that they can be added to the original 3-ring binders by the Engineer.
- A complete set of digital image electronic files of the Progress Record Documentation (PRD) on a CD-ROM corresponding with each application for payment. Hand-label the electronic media with permanent marker to identify the dates of the photographs contained within (i.e. PRD_06.01.19_thru_06.30.19).

300.03.07.02 MATERIALS.

(a) Camera Equipment. Select and use a digital camera capable of providing full color images with a density of 2.1 megapixels or greater. Camera shall be capable of providing a date and time stamp that is integral to each photograph as it is being taken.

(b) Three-Ring Binder. Provide hard copies of files to the Engineer in 3-inch wide binders complete with pockets on each inside face, clear plastic overlay on each outer face (including spine), and 'push to open' tabs on each end of the binder. Provide insert under front overlay identifying in order: Project Name, Contract Number, Job Order Number, and Name of Contractor. Provide insert under spine overlay identifying in order: Contract Number and Project Name.

(c) Sheet Protectors. Sheet protectors for inserting required submittals shall be: 3-hole punched, heavyweight (minimum 3.3 mils), archival quality, top loading, clear plastic.

300.03.07.03 CONSTRUCTION.

(a) The Contractor shall take photographs daily while polyethylene encasement of water mains and/or copper supply lines is being carried out.

(b) Prior to backfilling, color photographs shall be taken by the Contractor to document the placement of **all** polyethylene encasement…NO EXCEPTIONS.

(c) A separate photograph shall be provided for each of the following: joints, fittings (see Section 300.03.01(a)(1) for list of various types), service connections, appurtenances, and structures.

(d) In addition to the requirements described above, the Contractor shall take photographs at 40-foot intervals (maximum) along the pipe centerline (upstream or downstream) showing the progress of finished tape wrapping operations immediately prior to backfilling.

300.03.07.04 MEASUREMENT AND PAYMENT.

(a) The cost involved in providing photographic documentation of polyethylene encasement shall not be measured or paid for separately but shall be incidental and shall be included in the unit prices per linear foot of the various sizes of pipe furnished and installed as given in the Proposal Form.

(b) While photographic documentation of polyethylene encasement is not a separate Pay Item, said documentation shall be submitted to the Inspector with each application for payment for pipe and/or services installed (see third and fourth 'bullets' in Section 300.07.03.01(c)).

300.04 MEASUREMENT AND PAYMENT, CLASSIFICATION OF EXCAVATION

(a) Bid Price or Fixed Price. Payment for excavation is normally included in prices bid for items or at the fixed prices in the proposal and as defined in these Specifications. All trench excavation for pipe and structure installation shall be unclassified and included in the price of the associated pipe or structure.

(b) Class 3 Excavation.

(1) Definitions of Subgrade. In the case of pipelines, subgrade (except as modified herein) is the underside of the barrel of the pipe when the pipe is laid on a natural or concrete foundation, and the underside of the ribs or sills when the pipe is laid on a timber foundation.

For miscellaneous structures, subgrade is the underside of the masonry or fill material as shown on the Drawings.

(2) Excavation Below Subgrade. Additional depth is Class 3 Excavation when:

a. The character of the material at the bottom of an excavation requires excavation to an additional depth for any purpose except for the construction of a timber foundation or the laying of an underdrain, or

b. A trench was excavated by machinery to the grade directed by the Engineer, and he deems it necessary to excavate deeper because of a change in plan or because he had previously been given the wrong grade.

Excavation which may be taken out by default or the Contractor's negligence is not classified as Class 3 Excavation.

(3) Change of Trench Location. In case the Engineer directs that the location of a trench be changed to a reasonable extent from that proposed on the drawing on account of the presence of an obstruction, or from other cause, or if a changed location is authorized upon the Contractor's request, the Contractor will not be entitled to extra compensation or to a claim for damages, provided that the change is made before the excavation has begun. If, however, such change made at the direction of the Engineer involves the abandonment of excavation already made, such abandoned excavation, together with the necessary refill, will be classified as

Class 3 Excavation. Where trenches have been completely excavated, payment will be based on the widths shown in the Standard Detail Plates. In the event that the trench is abandoned in favor of a new location at the Contractor's request, the abandoned excavation and refill shall be at the Contractor's expense.

Class 3 Excavation for Incidental Construction shall be measured and paid for as fixed price contingent item ***Class 3 Excavation/Select Backfill – Proper Disposal of Unsuitable Material*** or at the Contract unit price per cubic yard of ***Class 3 Excavation for Incidental Construction*** in cases where backfill is not used. The payment shall be full compensation for all material, labor, equipment, tools, and incidentals necessary to complete the work.

(c) Preparation of Foundation. The Contractor must complete excavations in earth as nearly as practicable to the neat lines of the structures to be built therein. Fill all irregularities and cavities (either in earth or rock excavation or in the bottom of trenches or tunnels) to the required level with clean earth or other approved material and compact firmly before laying pipes. This work is performed without extra compensation unless the cavities were formed by the removal of unstable material under the direction of the Engineer, in which case, the excavation shall be measured and paid for as fixed price contingent item ***Class 3 Excavation/Select Backfill – Proper Disposal of Unsuitable Material***.

(d) Location of Connection to Existing Utility. The excavation and the refill required to locate a connection to an existing utility shall be paid for as part of the fixed price contingent items for ***Test Pit Excavation***.

(e) Steel Plates. Steel plates are considered as incidental to any Contract Construction and/or Work and shall not be measured for payment. No County payment shall be made to the Contractor for the use or installation of any steel plates and their support system or for any temporary or permanent trench or paving repair required by the County that is related to the use of steel plates. Refer to Section 300.03.05.

(f) TV Inspection. TV inspection shall not be measured. The costs associated with TV inspection shall be paid for as part of the costs associated with installation / rehabilitation of the pipelines of interest.

SECTION 301 – REPAIRING TRENCH OPENINGS IN PAVING

301.01 DESCRIPTION. This item consists of temporary and permanent repairs to trench openings. This work shall be performed in accordance with Standard Detail Plates R-38 and G-22 through G-29, or SHA's Book of Standards for Highway and Incidental Structures, as applicable.

301.02 MATERIALS.

Graded Aggregate Base	901
Hot Mix Asphalt	904.04
Portland Cement Concrete	902

301.03 CONSTRUCTION.

301.03.01 Stage 1 Temporary Repair. Place and compact temporary repairs for maintenance of traffic on a daily basis except when otherwise directed to use methods judged to be reasonable by the Engineer. Give minimal regard to seasonal constraints, recognizing the nature of a temporary patch and its relation to the early restoration of traffic. Stage 1 repairs shall be maintained at the Contractor's expense until Stage 2 repairs are done. Refer to Sections 105 and 106.

301.03.02 Stage 2 Permanent Repair. The Contractor shall obtain written approval of the Engineer prior to beginning any Stage 2 repairs. Place, compact and test permanent repairs in accordance with the requirements of Sections 504 and 520 of these Specifications as applicable.

301.03.03 Trench Repair Per SHA Permit. Work items for permanent and temporary trench repair in SHA-maintained paving sections shall follow all requirements of the applicable SHA permit. In the event the Contractor determines there is a conflict between the contract requirements and the requirements given in the SHA permit, the Contractor shall notify the Engineer immediately for a determination of how to resolve the conflict.

Specific requirements of trench repair shall be provided in the SHA permit included as part of the Contract Documents. Limitations and restrictions may include, but not be limited to: weather events, holiday scheduling, day-of-week scheduling, and time-of-day scheduling. The SHA permit may also include specific work zone limitations.

301.04 Method of Measurement & Basis of Payment. Stages 1 and 2 repair measurements (except those involving Reinforced Concrete repairs, see item 2 below) are by the ton as determined by computation. The tonnage reported is determined as the product of trench length, standard width, standard thickness and standard weight based on samples from the supplier for aggregate base course, divided by 2000 pounds per ton.

1. The quantity reported, as provided above, for use in Baltimore County Right-of-Way is paid at the contract unit price per ton for ***Graded Aggregate Base for Stage 1 Maintenance of Traffic***; ***Hot Mix Asphalt for Stage 1 Maintenance of Traffic,*** and for ***Hot Mix Asphalt for Stage 2 Permanent Pavement Repairs***. Refer to Sections 105 and 106.
2. ***Reinforced Concrete Trench Repair Per SHA Permit*** shall be measured and paid for at the contract unit price per Cubic Yard for the volume of Portland cement concrete furnished and installed within SHA Right-of-Way. The payment shall be full compensation for all work specified regardless of the depth or volume of concrete placed, including trench excavation and backfill; aggregate installation; compaction; reinforcing, including epoxy coating where required; Portland cement concrete

placement; steel plating; cleaning; saw cutting and removal of existing surface and/or base material; and for all materials, labor, equipment, tools and incidentals necessary to complete the work. Payment for trench excavation, backfill, and compaction; aggregate; and traffic control shall be paid for under other bid items in the Contract.

3. ***Bituminous Concrete Temporary Trench Repair Per SHA Permit*** shall be measured and paid for at the contract unit price per Ton for the weight of temporary hot mix asphalt furnished and installed within SHA Right-of-Way. The payment shall be full compensation for all work specified regardless of the depth or weight of material placed; shall include full compensation for saw cutting and removal of existing surface and/or base material; trench excavation and backfill; aggregate installation; compaction; temporary hot mix asphalt placement; joint sealing; steel plating; cleaning; and shall include full compensation for all materials, labor, equipment, tools, and incidentals necessary to complete the work. Payment for trench excavation, backfill, and compaction; aggregate; and traffic control shall be paid for under other bid items in the Contract.

4. ***Bituminous Concrete Permanent Trench Repair Per SHA Permit*** shall be measured and paid for at the contract unit price per Ton for the weight of permanent hot mix asphalt furnished and installed within SHA Right-of-Way. The payment shall be full compensation for all work specified regardless of the depth or weight of material placed; saw cutting and removal of existing paving; excavation of aggregate and temporary asphalt as required; addition of new aggregate; compaction; permanent hot mix asphalt placement; joint sealing; steel plating; and cleaning; cut back and removal of existing surface and/or base material, including temporary trench repair material; and shall include full compensation for all materials, labor, equipment, tools, and incidentals necessary to complete work. Payment for trench excavation, backfill, and compaction; aggregate; and traffic control shall be paid for under other bid items in the Contract.

SECTION 302 – SELECTED BACKFILL

302.01 DESCRIPTION. This work shall consist of placing selected backfill material as specified in the Contract Documents or as directed by the Engineer.

302.02 MATERIALS.

No. 57 Aggregate	901, Table 901 A
Crusher Run Aggregate CR-6	901, Table 901 A
Geotextile	921.09

302.03 CONSTRUCTION. Unsuitable foundation material shall be replaced as directed by the Engineer. Compaction may be achieved using tamped fill methods conforming to Section 210, acceptable to the Engineer. No. 57 Aggregate greater than 6 inches in thickness shall be completely protected with AASHTO M-288 Class SE Geotextile unless directed otherwise by the Engineer.

302.04 MEASUREMENT AND PAYMENT. Selected Backfill using No. 57 Aggregate**,** or Selected Backfill using Crusher Run Aggregate CR-6 required to replace Class 3 Excavation for unsuitable pipe and structure foundations will be measured and paid for as fixed price contingent item ***Class 3 Excavation/Select Backfill – Proper Disposal of Unsuitable Material***. The payment will be full compensation for all material, labor, equipment, tools, and incidentals necessary to complete the work. Geotextile shall be measured and paid for at the Contract unit price per square yard.

SECTION 303 – PIPE CULVERTS

303.01 DESCRIPTION. This work shall consist of placing pipe on a firm bed to the specified line and grade. The pipe shall be the size and type as specified in the Contract Documents.

303.02 MATERIALS.

No. 57 Aggregate	901, Table 901 A
Crusher Run Aggregate CR-6	901, Table 901 A
Concrete Mix No. 2	902.10.03
Pipe Materials	905
Roofing Paper	911.07
Asphalt Sealer for Concrete Pipe	911.09
Geotextile	921.09

Pipe Certification. Manufacturer's Certification is required for each shipment of pipe. When requested by the Engineer, this Certification shall include a copy of the actual test results indicating that the delivered units conform to the Contract Documents. Provide a copy of the Certification to the Engineer, to the testing facility if applicable, and to the Contractor with each shipment. One copy shall remain at the plant. Include the name and address of the manufacturer, the material, type, size and classification of pipe, the identification number, the date of manufacture, the date of shipment, a statement that indicates conformance with the Specifications, and the signature of the plant's quality control manager. Any manufacturer's documentation regarding warranty, disclaimers, or third party interests shall be delivered to the Engineer with the Manufacturer's Certification.

Pipe shall be marked in accordance with Sections 905.01.01 through 905.01.16 of these Specifications, as applicable.

303.03 CONSTRUCTION. Pipe lengths and gradients shall be verified by the Contractor and shall be acceptable to the Engineer before installation. Existing pipes shall be cleaned and resulting refuse shall be removed from the work site and disposed of in a lawful manner.

When a pipe is to be laid on existing ground, on or under fill, an embankment shall be constructed to a height of at least 9 inches, but not more than 3 feet above the top of the proposed pipe. A trench is then excavated to receive the pipe within this embankment in accordance with Standard Detail Plate G-6.

Use all suitable excavated material for backfill or store for future use. Do not waste excavated material without approval. Prior to using excavated material as backfill, remove boulders, logs, and other unsuitable material. Dispose of unsuitable material in an approved disposal area.

303.03.01 Excavation. The width of trench shall be sufficient to permit thorough tamping of the backfill under the haunches and around the pipe. See Standard Detail Plate G-6, "Trench and Trench Payment Width" in *Standard Details for Construction*, latest edition.

303.03.02 Bedding. Where the bottom of the trench at subgrade is in rock, excavation shall be carried at least 6 inches below the specified subgrade with a minimum of 4 inches under bells. The trench bottom shall be restored to subgrade with earth or granular material (completely protected with geotextile if greater than 6 inches) as approved by the Engineer.

When directed by the Engineer to provide a bedding of 12 inches or greater the selected backfill shall be crusher run aggregate CR-6 or No. 57 stone completely protected with geotextile.

Culverts 48 inches or more in nominal horizontal diameter shall be bedded in an approved foundation shaped by means of a template that will support the pipe for at least 10 percent of its overall height.

303.03.03 Installation. Pipes shall be laid with hubs upgrade. Subject to approval by the Engineer, a single lay hole through the shell of the pipe will be permitted with an approved lifting device for pipes 54 inches in diameter and larger. The lay hole shall be cast in the pipe during fabrication or cored into the pipe without damaging or exposing any reinforcement. After installation, the lay hole shall be filled completely using expandable insulating foam or another acceptable watertight seal.

303.03.04 Pipe Joints. All storm drain pipe installed in Baltimore County shall have joints that are soil-tight, meaning that the joint shall not allow intrusion of soil particles of any size into the pipe through any joint. The preferred method of accomplishing soil-tight joints is use of a pipe with a joint design that has previously been accepted by the County as soil-tight. Acceptable pipe joints include ASTM C-76 concrete pipe with joints meeting ASTM C-443 Specifications, low head concrete pressure pipe (ASTM C-361) for applications in pond embankments, pipe joints designed in accordance with AASHTO Standard Specifications for Highways and Bridges Section 26.4.2, or any other pipe joints accepted as watertight by these Standard Specifications.

Per AASHTO Standard Specifications for Highways and Bridges Section 26.4.2.4(e), joints with the ability to pass a 2-psi hydrostatic test without leakage will be considered soil-tight.

As alternates to the use of approved soil-tight joint designs, soil-tightness may be accomplished by one or more of the following methods:

- Selected backfill around pipe of a non-erodible nature, including granular soil with grain sizes equivalent to coarse sand, small gravel or larger (ratio of soil D_{85} to maximum size of any joint opening > 0.2 for uniform sand or 0.3 for medium to fine sand), cohesive clay soils (P.I.>12) or flowable fill. This selected backfill must fill the entire trench width from the bottom of the excavation to a minimum of 12 inches above the crown of pipe, with specified compaction.

OR

- Asphalt sealers (AASHTO M198) or resilient grouts with prior approval for use in Baltimore County as pipe sealers that penetrate the entire joint and fill all voids in the pipe joints, used in accordance with manufacturer's recommendations.

OR

- Wrapping the circumference of the pipe at the joint with a double layer of geotextile overlapping the joint on both sides by 18 inches minimum. The geotextile selected shall be suitable for filtering out fine sands and silts per AASHTO M-288.

OR

- Application of interior or exterior sealing bands or pipe gaskets with prior approval for use in Baltimore County and used in accordance with manufacturer's recommendations.

Mortared concrete pipe joints shall NOT be considered soil-tight without additional measures as described above. The Engineer shall approve the soil-tightness and suitability for use of each installed pipe joint. Costs of all gaskets, filter fabric, joint sealing or sealing bands shall be included in the cost of the pipe.

303.03.05 Pipe Connections. Pipe connections shall be prefabricated when made between two new pipes and whenever possible between a new and existing pipe. A field pipe connection (cut-in) shall include cutting a hole in a cleaned area on the side of an existing pipe at the spring line, inserting and trimming the connecting pipe and placing a concrete collar at the connection. In the case of corrugated pipes, a welded connection may be substituted for the concrete collar, the weld to be coated with a zinc-rich paint coating per M-36. All pipe connections shall be inspected and determined to be soil and water-tight prior to backfilling.

For connections to drainage structures, refer to Section 305.03.05.

Field connections (cut-ins) shall be used only where:

1. the larger pipe is existing;
2. 15" pipes enter 33" and larger pipe;
3. 18" pipes enter 42" and larger pipe; and
4. a manhole or inlet is within 10 feet of the cut-in for adequate access for maintenance.

Where possible, spring lines of pipes to be joined at a cut-in shall be at the same elevation at the point of junction. Approval for cut-ins not meeting all of the above requirements shall be obtained from the Storm Drain Design Section, BCBEC.

303.03.06 Pipe Encasement and Low / High Concrete Cradles. When specified in the Contract Documents or when directed by the Engineer, pipe shall be encased in concrete or shall have a low or high concrete cradle per Standard Detail Plate G-8.

303.03.07 RESERVED

303.03.08 Removal of Existing Pipe Culverts. Where specified in the Contract Documents, existing pipe culverts shall be removed and shall become the property of the Contractor. Backfilling of trenches resulting from pipe removal shall conform to the pertinent backfilling provisions of Section 210.

303.03.09 Relaying Existing Pipe. When specified in the Contract Documents, removed culverts shall be salvaged and relaid in the same manner as described for new pipe.

303.03.10. Television Inspection of Storm Drains. Refer to Section 300.03.06.

303.03.11 Connecting Existing Property Drains. An item may be provided to drain abutting properties, swales, roofs, etc. Connections are not necessarily shown on the Contract Drawings, but shall be constructed where, if, and as directed by the Engineer.

It is County policy that roof leaders may be connected to the proposed storm drains, if directed by the Engineer. Basement drains may be connected, if desired by the Engineer, provided that the property owner has previously obtained written permission from the County to do so.

303.03.12 Abandoned Pipes. When specified, plug abandoned pipes using Concrete Mix No. 2 or brick masonry. When specified, fill pipes with Flowable Backfill. Refer to Sections 313 and 424.

303.03.13 Clean Existing Pipes. When specified, clean existing pipes of all sediment and debris without damaging the pipe and drainage structures. Remove and dispose of sediment and debris as specified in Section 308.03.16.

303.03.14 Inspection and Acceptance. No sooner than 30 days after installation visually inspect all new pipe in the presence of the Engineer. Any cracks, differential movement, efflorescence, rust stains, spalls, exposed reinforcement, slabing, dents, buckling, holes, damaged coating, obstructions, improperly engaged joints, improper gasket placement, excessive joint gaps, misaligned joints, excessive deflection, or undue horizontal or vertical misalignment will be cause for repair or replacement at no cost to the County. Video inspect pipe and send to the Division of Construction Contracts Administration for approval per Section 300.03.06. Ensure that thermoplastic pipe deflection does not exceed 5 percent.

303.04 MEASUREMENT AND PAYMENT. The payment for the items specified in the Contract Documents will be full compensation for all applicable excavation, sheeting, shoring, dewatering, hauling, invert paving, storing, rehandling of material, removal and disposal of excess and unsuitable material, tamped fill, forming bed or foundation, backfilling, compaction and for all material, labor, equipment, tools, and incidentals necessary to complete the work.

303.04.01 New ***pipe*** for culverts and storm drains will be measured complete in place and paid for at the Contract unit price per linear foot for the type, size, cross-section and grade of pipe used.

303.04.02 ***Pipe connections*** and ***pipe elbows*** will be measured and paid for at the Contract unit price per each for the type, size, cross-section and grade of pipe used. No deduction from the pipe measurement will be made for pipe connections. Connection to drainage structures containing prefabricated holes in which the pipe will be connected will not be measured but the cost will be incidental to the pertinent pipe item.

303.04.03 Additional excavation required below the planned elevation will be measured and paid for as specified in Section 300.04. For bedding in rock subgrade (Section 303.03.02), excavation and refill to the 6-inch depth will be paid for as fixed price contingent item ***Class 3 Excavation/Select Backfill – Proper Disposal of Unsuitable Material*** (by the template method).

303.04.04 ***Removal of Existing Pipe Culverts*** 12 inches in diameter or larger will be measured and paid for per the total number of linear feet removed, regardless of the type of pipe and its condition. When a multiple pipe installation is removed, each pipe will be measured and paid for. Endwalls, etc. removed with the pipe will not be measured but the cost will be incidental to the Contract unit price per linear foot. Removal of existing pipe culverts less than 12 inches in diameter will not be measured but the cost will be incidental to the Contract unit price per linear foot.

Where the proposed new pipe or new pipe arch culvert is at the location of an existing pipe culvert so as to interfere with the construction of the new culvert, the cost of removal and disposal of the entire existing culvert will be included in the cost per linear foot of the new pipe or new pipe arch culvert. Where shown on the Contract Drawings or directed by the Engineer, only that portion of the existing culvert in the new pipe trench need be removed. The cost of abandonment, brick bulkheads and/or filling with suitable material will be included in the cost per linear foot of the new pipe.

303.04.05 ***Selected Backfill using No. 57 Aggregate*** or ***Selected Backfill using Crusher Run Aggregate CR-6*** required to replace the Class 3 Excavation for Incidental Construction will be measured and paid for as specified in Section 302.

303.04.06 ***Relaid Existing Pipe Culverts*** will be measured and paid for as specified in Section 303.04.01 unless otherwise specified in the Contract Documents. Endwalls, end sections, etc. removed with the pipe will not be measured but the cost will be incidental to the Contract unit price per linear foot.

303.04.07 New ***Endwalls***, ***End Sections*** etc., will be measured and paid for as specified in Section 305.

303.04.08 ***Removal of Existing Headwalls***, etc., that are not incidental to the Contract unit price for the respective pipe items will be measured and paid for as specified in Section 207.

303.04.09 Encasement concrete, and concrete or brick masonry to plug existing pipes will be measured and paid for at the Contract price for the pertinent ***Mix No. 2 Concrete for Miscellaneous Structures*** or ***Brick Masonry for Miscellaneous Structures*** item, each measured in cubic yards.

303.04.10 Television Inspection for New or Rehabilitated Pipes will not be measured. Payment for television inspection will be included in the prices bid for items in the proposal as defined in these Specifications.

303.04.11 Connection of property drains encountered within a trench excavated for construction of a storm drain pipe or structure shall be paid for as part of the price bid per linear foot for that pipe complete in place, or shall be paid for as part of the price bid per "each" for the minimum depth of that drain structure complete in place.

The cost of connecting existing roof leaders or basement drain lines into the proposed storm drains will be incidental to the Contract prices for the storm drains. If it is necessary to run connecting lengths of pipe for the connection, payment will be made under the appropriate bid items included in the proposal.

303.04.12 ***Clean Existing Pipe Any Size*** will be measured and paid for at the Contract unit price per linear foot. Removal and proper disposal of construction debris and sediment will not be measured for payment.

SECTION 304 – STRUCTURAL PLATE PIPE AND STRUCTURAL PLATE PIPE ARCH CULVERTS - RESERVED

SECTION 305 – MISCELLANEOUS STRUCTURES

305.01 DESCRIPTION. This work shall consist of constructing, reconstructing or repairing miscellaneous cast-in-place concrete or masonry structures and installing precast concrete structures as specified in the Contract Documents or as directed by the Engineer.

305.02 MATERIALS.

Mortar Sand	901.01, Table 901 A
Curing Materials	902.07
Concrete Mix No. 2, No. 3 or No. 6	902.10.03
Grout	902.11
Brick	903.02
Masonry Cement	903.06
Reinforcement Steel	908
Castings for Frames, Covers, Gratings and Steps	909.04
Zinc Coating	A 153
Precast Concrete Inlets and Manholes	M 199
CR-6, CR-1	901.01

Certification. Manufacturer's Certification is required for each shipment of precast units and metal castings for frames, etc. When requested by the Engineer, this Certification shall include a copy of the actual test results indicating that the unit conforms to the Contract Documents. Provide a copy of the Certification to the Engineer, to the testing facility if applicable, and to the Contractor with each shipment. One copy shall remain at the plant. Include the name and address of the manufacturer, the type of structure, the identification number, the date of manufacture, the date of shipment, a statement that indicates conformance with the

Specifications, and the signature of the plant's quality control manager. Copies of any manufacturer's documentation regarding warranty, disclaimers, or third party interests shall be delivered to the Engineer with the Manufacturer's Certification.

Mark the precast unit with the station number/location and designation, the identification number, the name or trademark of the manufacturer, the date manufactured, and stamp that indicates conformance with the Specifications, using indentation or waterproof paint. The manufacturer will mark metal castings in accordance with Section 909.04 of these Specifications.

Replacement grates shall be flat and true on all bearing surfaces and shall not "rock" within the matching frame after installation is complete. Existing frames to be re-used shall be cast iron (Section 909.04) and shall not be cracked, broken, warped, improperly sized or otherwise unsuited for continued use.

305.03 CONSTRUCTION. Construction shall conform to the following:

Portland Cement Concrete (PCC)	414
Brick Masonry	424

305.03.01 Construction Sequence. Underground drainage structures shall be completed before roadway surfacing is placed. Manholes, catch basins and inlets shall not be completed to final grade until the grading has been finished and all necessary arrangements have been made to insure suitable connections and tie-ins at proper grade and alignment with pavements, gutters and curbs.

305.03.02 Castings. Frames for grates and covers for inlets and manholes shall be set in full beds of mortar and rigidly secured in place to proper grade and alignment as specified in the Contract Documents**,** unless otherwise directed by the Engineer or shown otherwise in the Construction Documents.

305.03.03 Pipe Connections. Inlet and outlet pipes at drainage structures shall be set or cut flush with the inside faces of the structures and shall extend a sufficient distance beyond the outside faces of these walls to provide ample room for making proper connections. The joint around the pipe in the structure wall shall be completely and neatly closed with mortar or other specified materials.

305.03.04 Inverts. Drainage structures containing two or more pipes shall have channeled inverts conforming to the Contract Documents.

305.03.05 Drainage Structures. Inlets and manholes shall contain two 6 in. minimum diameter underdrain stubs for future connections of underdrains or for erosion control. Precast drainage structures may substitute two precast knockouts as shown on the Standard Details for the underdrain stubs. The drainage structures shall be backfilled with CR-6 for a width of 1.5 ft outside of the structure and extend from the bottom of the structure to the subgrade. Stone around underdrains and knockouts for underdrain are not required for precast manholes unless otherwise shown on the Contract Drawings or directed by the Engineer.

CR-6 or CR-1 shall be used for the top 10 ft of backfill below the road sub-base around manhole and inlet structures in roads. Where the structure is less than 10 ft in depth, this

material shall be used for the full depth of structure. With the Engineer's approval, recycled concrete meeting CR-1 or CR-6 gradations (RC-1 or RC-6) may be substituted.

Extend backfill to undisturbed earth on all sides of structure (18 inches minimum typical) in all present or future road rights-of-way. A maximum 3 feet of aggregate is required for structures having 3 or more pipes.

See Standard Detail Plate G-2.

305.03.06 Precast Drainage Structures. Precast drainage structures shall conform to the more restrictive of M199 or the Contract Documents. Working drawings for structures not detailed in the Contract Documents shall be submitted to the Engineer for approval prior to fabrication. Designs for precast drainage structures that vary in dimension or reinforcement from those shown on Baltimore County's *Standard Details for Construction* shall be submitted with supporting design calculations to the Engineer for approval. The submission documents shall be signed and sealed by a Professional Engineer registered in the State of Maryland.

Certification from the manufacturer for each shipment of precast units shall be required at time of receipt. Each unit shall be marked by indentation or with waterproof paint showing station location, Specification designation or intended use, the date of manufacture, the name or trademark of the manufacturer (this information shall be noted on the unit, near the top inside). Each unit shall include a certification that shall contain a copy of the actual test results indicating that the unit conforms to the Contract Documents. Absence of test is basis for rejection of items and revocation of plant certification.

No precast unit shall be shipped unless the unit has been tested and is shown to be in full compliance with the Contract Documents.

The placement and consolidation of the required bedding under the unit shall be a minimum 6 in. of No. 57 aggregate unless otherwise directed by the Engineer.

Pre-installed steps in precast manhole/inlet units shall align correctly with access openings and with adjacent precast units and shall arrive on the work site in undamaged condition. Precast sections with steps that fail to align, have improperly spaced steps when assembled with another section or are otherwise unsatisfactory shall be rejected and removed from the work site.

305.03.07 Encasement. Where specified in the Contract Documents or directed by the Engineer, the pipe shall be encased using Mix No. 2 Concrete.

305.03.08 Precast Structures - Lifting Devices. Lifting devices for precast concrete manholes, inlets and valve vaults shall be designed in accordance with ASTM C890-06, Section 8.4 that states:

> *Lifting inserts which are embedded or otherwise attached to the structure will be designed for four (4) times the maximum load transmitted to the inserts.*

305.03.09 Clean Existing Inlets. Clean existing inlets and dispose of the material. Reset and anchor existing grates as directed.

305.03.10 Inlet and Manhole Adjustment. This work shall consist of permanent vertical adjustment of inlets and manholes to match changes in elevation of street paving. The inlet or manhole frame shall be adjusted using approved methods such as a rubber riser ring (Standard

Detail Plate G-3B), precast concrete grade adjustment ring (Standard Detail Plate G-3) or poured-in-place concrete, or other methods as approved by the Engineer for the particular project.

305.03.11 Inlet and Manhole Connection. This work shall consist of making a connection to an existing inlet or storm drain manhole for purposes of extending the drain system upstream in accordance with Contract Documents. The work will include any necessary adjustments to the structure walls and invert in order to accommodate the new connection.

305.03.12 Grate and Frame Replacement for Inlets. This work shall consist of replacement of existing cast iron parallel bar grates, broken cast iron frames and all reticular grates and frames. This work shall apply to all inlets located within road right-of-way and within the limits of work of any Baltimore County capital project that involves street improvements. Reticular grates and frames to be removed include NR and WR grates and frames and replacement Type E and S reticular grates. These items shall be replaced with cast iron curved vane grates and cast iron frames in accordance with the Standard Detail Plates.

All existing cast iron grates and frames to be retained shall be visually inspected and determined to be free of cracks and breakage before reinstallation.

Rejected frames and grates shall be salvaged and returned to the nearest Bureau of Utilities' yard.

Inlet wall adjustment to include masonry removal or saw-cutting of concrete walls shall be performed to adjust an NR inlet with reticular frame to match the street elevation due to the greater depth of the replacement type E frame.

Curved vane grates shall be installed in the frame so that the directional arrow on the top of the inlet grate matches the direction of flow of storm water in the gutter to the inlet. In the case of sumped multiple grate inlets, the cast-in directional arrows shall point to the center of the inlet, with vanes directed outward.

The Engineer shall check each installation to be certain that grates do not "rock" or rattle within their frame under a moving wheel load prior to approving the work. If a frame is encountered that doesn't allow the grate to sit properly, and this condition cannot be corrected as evidenced by improper fit, rocking or rattling under load, that frame shall be removed and replaced with a new frame that performs satisfactorily.

Where existing inlets are encountered that have frames and grates that would require replacement under this Section but do not match either the Type E or the Type S frames and grates in size, the Engineer shall determine if an adjustment to the inlet box to fit the Standard frames is feasible. If this is not the case, the Engineer shall, with assistance from the Design Division of the Bureau of Engineering and Construction, determine whether replacement of the inlet box with a standard inlet box is suitable.

305.03.13 Inlet and Manhole Repair. This work shall consist of repair to existing County-maintained inlets and manholes to include repair to brickwork and replacement of concrete components that have failed. Manhole frames and covers and inlet grates and frames shall be thoroughly inspected for cracks, breakage or other signs of excessive wear requiring replacement. Inlet grates and frames that require replacement shall be replaced in accordance with Section 305.03.12.

Prefabricated concrete pieces delivered to the site shall be thoroughly inspected for cracks, breakage and for compliance with the applicable Standard Detail Plates. Prefabricated curb pieces shall have a visible steel angle embedded in the top lip of the curb piece per Standard Detail Plate D-2.08. Type A and B inlet slabs shall be measured upon delivery to confirm exact fit in accordance with Contract Documents.

Where sidewalk is not placed behind Type A and B inlet slabs, the Engineer shall direct that concrete be poured behind the slab to assist with preventing movement in the event that the slab is bumped by a tire on a parking vehicle. See the Top Slab Anchor Detail on Standard Detail Plate D-2.03.

Longitudinal reinforcement in monolithic concrete curb and gutter for Type A and B inlets as shown in Standard Detail Plates D-2.01A, D-2.01B, D-2.02A, D-2.02B and D-2.03 shall extend at least 12" inches beyond both ends of the inlet and shall not be spliced.

Damaged inlet/manhole brickwork shall be removed to a depth where a complete course of brick has intact mortar. This layer shall be cleaned of mortar debris and leveled. The inlet or manhole shall be reconstructed using a prefabricated riser section (or using new or clean unbroken salvaged brick with new mortar). Brick salvaged from the removed structure shall comply with Section 424, Brick Masonry.

The Contractor shall saw cut frame flanges or make other adjustments as directed by the Engineer to ensure a horizontal gap of 1" or less between the inlet frame and the inlet top piece. The vertical opening between the inlet frame or lip and the top piece/top slab shall not exceed the opening height specified for new inlets on the applicable Standard Detail Plate.

305.03.14 When directed by the Engineer, or when shown on Construction Documents, radial grates may be installed as a replacement for a storm drain manhole cover in order to collect street drainage or to prevent drain system back pressure from blowing off a normal drain manhole cover. Prior to installation of the radial grate, the Contractor shall verify in writing to the Engineer that the location of the proposed radial grate is a storm drain manhole, specifying the size of all incoming and outgoing pipes. A radial grate shall NEVER be installed on a sewer system manhole for any reason.

305.04 MEASUREMENT AND PAYMENT. The payment will be full compensation for all excavation, concrete, masonry, special or precast units, reinforcement, ladder rungs, drip stones, CR-6 or No. 57 aggregate, underdrain stubs, frames, grates and covers, grade and slope adjustments, backfill and for all material, labor, equipment, tools, and incidentals necessary to complete the work.

305.04.01 ***Standard Inlets***, ***Precast Inlets***, ***Standard Manholes*** and ***Precast Manholes*** specified in the Contract Documents will be measured and paid for at the Contract unit price per each, to a depth of 3 feet or less. An additional payment will be made for the vertical depth in excess of 3 feet, at the Contract unit price per linear foot of vertical depth.

305.04.02 ***Standard Endwalls***, ***Standard End Sections*** and Special Structures will be measured and paid for at the Contract unit price per each.

305.04.03 Nonstandard (special design) endwalls and other miscellaneous structures such as steps, spring boxes, junction boxes and pipe encasements, will be measured and paid for at the

Contract unit price per cubic yard of brick masonry or concrete for the mix specified unless otherwise specified in the Contract Documents.

305.04.04 No separate or additional measurement will be made for any precast concrete units, metal or castings used in the construction of any of the items noted in Sections 305.04.01, 305.04.02 or 305.04.03.

305.04.05 ***Cleaning Existing Inlets*** shall be measured and paid for at the Contract unit price per each, regardless of type, size, or depth of the inlet. ***Clean Existing Pipe Any Size*** shall be measured and paid for per Section 303.04.12.

305.04.06 When an existing drainage structure is to be removed and replaced with a new drainage structure in the same location, the cost to remove the existing drainage structure and a section of the existing pipe will be incidental to the cost of the new drainage structure.

305.04.07 ***Adjust Existing Inlet*** and ***Adjust Existing Manhole*** shall be measured and paid for at the Contract unit price per each.

305.04.08 Storm drain manhole items:
30" Heavy Traffic Manhole Frame & Cover,
Replacement 30" Heavy Traffic Manhole Cover,
24" Shallow Heavy Traffic Manhole Frame & Cover,
Sidewalk Frame and Cover,
Replacement Cover For Sidewalk Frame,
Precast Rubber Grade Adjustment Ring – 24"Manhole,
Precast Rubber Grade Adjustment Ring – 30"Manhole,
Replacement Grade Adjustment Ring - 2" Thick,
Replacement Grade Adjustment Ring - 3" Thick,
Replacement Grade Adjustment Ring - 6" Thick,
Adjustable Riser Ring - 24" Heavy Traffic Manhole Frame & Cover, and
Replacement Manhole Steps – Miscellaneous Structures
shall be measured and paid for at the Contract unit price per each.

305.04.09 ***Replacement 24" Dia. Radial Grate***, ***Radial Grate In 24" Std. Heavy Traffic Manhole Frame*** and ***Radial Grate In 24" Shallow Heavy Traffic Manhole Frame*** shall be measured and paid for at the Contract unit price per each.

305.04.10 Replacement grates shall be measured in kind complete in place and paid for at the Contract unit price per each, as ***Replacement Type E Curved Vane Grates*** or ***Type S Curved Vane Replacement Grate***. Replacement frames and grates shall be measured in kind complete in place and paid for at the Contract unit price per each matching set, as ***Type E Frame with Type E Curved Vane Grates*** or ***Type S Frame with Curved Vane Grate***. The costs for cutting flanges shall be included as part of the cost of the frame, as applicable.

305.04.11 Replacement inlet headpieces and top slabs shall be measured in kind complete in place and paid for at the Contract unit price per each, as ***Replace Type E Combination Inlet Headpiece***, ***Replace Double Type E Combination Inlet Headpiece***, ***Replace Type S Combination Inlet Headpiece***, ***Replace Double Type S Combination Inlet Headpiece***, ***Replace Type A-I Inlet Top Slab***, ***Replace Type A-2 Inlet Top Slab, Slab Width As Specified On Plan***, ***Replace B-1 Inlet Top Slab***, or ***Replace B-2 Inlet Top Slab, Slab Width As Specified On Plan***.

305.04.12 Brickwork required for repair of existing brick inlet boxes or for adjusting existing brick inlet boxes to accept standard inlet frames shall be measured and paid for at the Contract unit price per cubic yard of ***Brick Masonry for Miscellaneous Structures***.

Cost of adjusting existing NR inlet walls to accept standard E inlet frames shall not be measured but shall be included as part of the cost of frame and grate.

In accordance with Section 305.04.03, concrete required to repair or replace broken concrete inlet components in place (such as Type A and B Inlet monolithic curb and gutter section) shall be measured and paid for at the Contract unit price per cubic yard of ***Mix #3 Concrete for Inlet Repair***. This payment shall be full compensation for saw cutting, removal, excavation, bedding, forming, reinforcement as specified, cutting, bending, placement, supports and tying of reinforcement, placement of concrete, concrete finishing and for all labor, tools, equipment, and materials necessary to complete the work.

305.04.13 Concrete placed behind A or B inlet top slabs shall be measured and paid for at the Contract unit price per cubic yard of ***Mix #2 Concrete for Miscellaneous Structures***.

305.04.14 Support Post Installation for Type A and Type B Inlets shall not be measured and will be included as part of the cost of replacing the concrete gutter pan for these inlets when gutter replacement is done. When these posts are installed into an existing gutter pan, the work shall not be measured and will be included as part of the cost of a new top slab to be replaced at the same time.

SECTION 306 – UNDERDRAINS, SUBGRADE DRAINS, AND SPRING CONTROL

306.01 DESCRIPTION. Construct underdrains, subgrade drains, underdrain for spring control, underdrain pipe outlets, and blind drains using pipe, geotextile, and granular material. Clean existing underdrain outlets.

306.02 MATERIALS.

No 57 Aggregate	901.01
Concrete Mix No.2	902.10
Pipe	905
Geotextile, Class as specified	921.09
Securing Pins or Staples	921.09
Flexible Delineator Post and Rodent Screens	As approved by BCBEC

306.03 CONSTRUCTION. Coordinate the field installation of traffic barrier, signs, lighting, and landscaping with the Engineer to avoid any damage to the underdrains, subgrade drains, or outlet pipes. Correct any damage to the underdrains, subgrade drains, or outlet pipes.

306.03.01 Excavation. Excavate trenches to the specified dimensions and grade. Ensure that the sides and bottom of trenches are smooth and uniform to prevent tearing of the geotextile when backfilling. For excavated material, refer to Section 404.03.01.

306.03.02 Geotextile. Place geotextile when specified. Place it with the machine direction parallel to the longitudinal direction of the trench. Ensure that it is of sufficient width to completely enclose the underdrain trench, including specified overlaps.

Place the geotextile tightly against the underdrain trench to eliminate voids beneath the geotextile. Avoid wrinkles and folds. Maintain at least a 24 in. overlap at joint ends or breaks. Pin joints and overlaps to securely hold the geotextile in place until placement of the cover material. Pin longitudinal joints, overlaps, and edges no more than 50 ft on center.

Replace or repair damaged geotextile.

The geotextile design, the materials used and its placement in the field shall be reviewed, inspected and certified by a geotechnical engineer as described in Section 314, except that an As-Built plan is not required.

306.03.03 Pipe Placement. Slope the underdrain pipe to maintain positive drainage toward the outlet. Place perforated pipes with the perforations down and arranged symmetrically about the vertical axis. Plug the ends of trunk lines, wyes, tees, or ells as directed. Make joints and connections in accordance with the manufacturer's recommendations.

306.03.04 Outlets. Outlet the underdrains into drainage structures whenever possible. Outlets that empty into a drainage structure shall be at least 9 in. above the normal flow line in the structure and be constructed of normal underdrain outlet pipe. Maintain at least 18 in. of cover over the pipe. Rodent screens are not required when an underdrain outfalls into a drainage structure.

When a pipe outfalls into a slope or ditch, slope the outlet pipe at least three percent. Use Type 'S' (smooth interior wall) polyethylene (PE), or smooth-wall polyvinyl chloride (PVC) as specified in Section 905. Construct a sloped concrete headwall with a removable rodent screen at the end of the outlet pipe. Place a flexible delineator post on the slope headwall.

Space outlets for longitudinal underdrains at intervals no more than 250 ft and at the lowest elevation on all vertical curves. When changing the direction of the longitudinal underdrain or outlet pipe, all bends shall have a radius of at least 3 ft.

306.03.05 Backfill. Trenches shall be backfilled to the specified dimensions and grades. Underdrain and outlet trenches shall be backfilled as the work progresses.

(a) Underdrain. Lightly tamp aggregate backfill, and screed or rake to provide proper thickness and grade.

(b) Outlets. Backfill per Section 210.

Replace geotextile, underdrain pipe, and outlet pipe damaged by excessive tamping.

Cover longitudinal underdrain with the next pavement layer within 72 hours. Cover all other underdrain within 48 hours. Protect underdrain, including the geotextile, from contamination by soil fines. Replace or repair clogged geotextile and any underdrain trench that becomes contaminated.

306.03.06 Video Inspection and Acceptance. Subject to the direction of the Engineer, perform a video inspection of all new longitudinal underdrain and outlets in the presence of the Engineer, as part of final acceptance. Correct all damage as directed.

306.03.07 Cleaning Existing Outlets. Clean existing underdrain pipe outlets and dispose of the material. Remove and replace existing rodent screens. Where there are no screens, install them as directed.

306.03.08 Permanent Subgrade Drains. Construct permanent subgrade drains when specified. Subgrade drains consist of trenches excavated through the shoulder and roadside grading from the edges of the road pavement to a side ditch, embankment slope, or other approved outlet and filled with aggregate. Locate subgrade drains at low points, and space them at 25 ft intervals for a distance of 125 ft on each side of the low point, then at intervals of 100 ft to within 125 ft of the high point. Before placing the road pavement and before completion of the shoulder paving or final roadside grading areas, cut and shape trenches to a width of 24 in. Place No. 57 aggregate to the underside of the shoulder material and to the underside of the specified topsoil thickness in the roadside grading area. The portion of the trench within the roadside grading area shall be completely wrapped in geotextile. The bottom of the trench at the end adjacent to the road pavement shall be at least 2 in. below the subgrade.

306.04 MEASUREMENT AND PAYMENT. The payment will be full compensation for all excavation, pipe, coupling bands, aggregate, backfill, geotextile, video inspection, and all material, labor, equipment, tools, and incidentals necessary to complete the work.

306.04.01 ***Underdrains***, ***Underdrain Pipe Outlets***, ***Subgrade Drains***, and ***Underdrain Pipe for Spring Control*** will be measured and paid for at the Contract unit price per linear foot.

Slope headwalls, rodent screens, and marker posts will not be measured but will be incidental to the cost of the ***Underdrain Pipe Outlet***.

306.04.02 When an underdrain pipe is not used for spring control, all excavation and backfill for spring control will be measured and paid for at the Contract unit price per cubic yard for ***Class 3 Excavation for Incidental Construction*** and ***Aggregate Backfill for Underdrains***.

306.04.03 When directed by the Engineer, excavation for underdrains, subgrade drains, and underdrain for spring control required to lower the trench to an elevation deeper than specified in the Contract Documents will be measured and paid for at the Contract unit price per cubic yard for ***Class 3 Excavation for Incidental Construction*** and ***Aggregate Backfill for Underdrains***.

306.04.04 When measuring the length of a manufactured connection (tee, elbows, etc.) other than coupling bands, each actual linear foot will be doubled and payment made at the Contract unit price per linear foot for the appropriate underdrain pipe item specified in the Contract Documents.

306.04.05 ***Clean Existing Underdrain Outlets*** will be measured and paid for at the Contract unit price per each. The payment will be full compensation for locating outlets, removing and replacing the existing rodent screens, removal and disposal of material removed from the pipe, and for all material, labor, equipment, tools, and incidentals necessary to complete the work.

306.04.06 Geotechnical Engineer. The Geotechnical Engineer's work involved in review, inspection and certification of the geotextile design, materials used and their placement in the field shall not be measured or paid for as part of the construction contract. The work shall be considered a part of the design function and shall be contracted and paid for by Baltimore County.

SECTION 307 – PREFABRICATED EDGE DRAINS

307.01 DESCRIPTION. This work shall consist of constructing a prefabricated edge drain system and underdrain pipe outlets as specified in the Contract Documents.

307.02 MATERIALS.

Outlet Pipe	905
Select Borrow	916
Prefabricated Edge Drain	922
Fittings	922

307.03 CONSTRUCTION. Prefabricated edge drains shall be installed in conformance with the manufacturer's recommendations. Drains with support on only one side shall have the support side placed away from the pavement edge.

307.03.01 Trenches For Prefabricated Edge Drains. Trenches shall be excavated with a trencher and shall be as narrow as possible yet wide enough to allow insertion of the prefabricated edge drains at the required elevation. The maximum width of the trench shall not exceed 10 in. The exposed edge of the pavement shall be free of soil to insure direct contact between the drain and pavement. The excavation of the trench, placement of the edge drain and placement of the first lift of backfill shall be accomplished in a single continuous operation, unless otherwise directed by the Engineer.

307.03.02 Splices. Splices shall be made prior to placement of the prefabricated edge drain in the trench and in conformance with the manufacturer's recommendations. The Engineer shall approve all splices.

Solid, Central Cores (nonconnected two sided flow). Crossover couplings shall be used at all splices and at 200 ft intervals.

307.03.03 Connections to Outlets. The prefabricated edge drain shall be connected to the outlets using fittings recommended by the manufacturer.

Outlets shall be spaced at 200 ft intervals and at the lowest elevation on all vertical curves. Outlets shall be constructed in conformance with Section 306.03.04.

307.03.04 Backfilling of Trenches. Unless otherwise specified in the Contract Documents, material for backfilling trenches shall be the material generated from the trenching operation,

as approved by the Engineer. Additional backfill material, if needed, shall conform to Select Borrow.

Backfilling shall be completed in two layers with the first layer being placed simultaneously with the drain, holding the drain flush against the side of the pavement. Backfill material shall be compacted using a vibratory shoe compactor.

307.04 MEASUREMENT AND PAYMENT. The payment will be full compensation for all material, labor, equipment, tools, and incidentals necessary to complete the work.

307.04.01 Prefabricated Edge Drains and Outlet Pipe will be measured and paid for at the Contract unit price per linear foot.

307.04.02 Additional backfill material authorized by the Engineer will be measured and paid for at the Contract unit price per cubic yard for Select Borrow Excavation.

SECTION 308 – EROSION AND SEDIMENT CONTROL

308.01 DESCRIPTION. This work shall consist of the application of measures throughout the life of the project to control erosion and to minimize the siltation of rivers, streams, and impoundments (lakes, reservoirs, bays and coastal waters) as specified in the Contract Documents or as directed by the Engineer.

308.01.01 Erosion and Sediment Control Manager (ESCM). Unless otherwise specified, the Contractor shall assign to the project an employee to serve in the capacity of ESCM. This employee shall be thoroughly experienced in all aspects of construction and have satisfactorily completed the MDE "Responsible Personnel Training for Erosion and Sediment Control" or an equivalent Erosion and Sediment Control Training Program either conducted by or authorized by the Maryland Department of the Environment pursuant to the appropriate article published in the Annotated Code for the State of Maryland. The ESCM shall have the primary responsibility and sufficient authority for the implementation of the approved erosion and sediment control schedules and methods of operation, including both on-site and off-site activities.

308.01.02 Standards and Specifications. Construct and maintain all erosion and sediment control measures and devices in accordance with the latest "*Maryland Standards and Specifications for Soil Erosion and Sediment Control*" (MDE), "*Maryland Stormwater Design Manual, Volumes I and II*" (MDE), and "*2012 Urban Policy and Guidelines Manual*" as updated (Baltimore County Soil Conservation District).

308.02 MATERIALS.

Aggregate on upstream side of stone outlet structure	901, Table 901A, CA-PCC, Size No. 57.
Riprap	901.02
Pipe	905

Gabion Wire	906.01
Steel Plate	909.02
Welding Material	909.03
Seed, Mulch, Fertilizer, Soil Conditioner and Other Materials for seeding, soil stabilization and matting	920
Straw Bales	921.08
Geotextiles, Class as Specified	921.09
Fence Fabric, Tie Wires, & Posts	914
Lumber	921.05
Number 1 Stone	M43 No.1
4 to 7 In. Stone	901.05
2 to 3 In. Stone	M43 No.2
¾ to 1-1/2 In. Stone	M43 No.4
No. 57 Stone	Table 901A

Soil Stabilization Matting replaces Erosion Control Matting, and AASHTO M-288 Geotextile Class SE replaces Filter Cloth and Geotextile Class C where they appear in the 2011 "*Maryland Standards and Specifications for Soil Erosion and Sediment Control*".

308.03 CONSTRUCTION.

308.03.01 Contractor Responsibilities. Prior to beginning any earth disturbing activity, the contractor shall complete the following in accordance with the sequence of construction shown on the approved sediment control plans:

(a) Demarcate all wetlands, wetland buffers, floodplains, Waters of the United States, tree protection areas, and the Limit of Disturbance (LOD) as specified in Section 107.

(b) Have all demarcated wetlands, wetland buffers, floodplains, water of the United States, tree protection areas, and LOD inspected and approved by the Engineer.

(c) Construct all erosion and sediment control measures in conformance with Section 308.01.02.

(d) Have all control measures inspected and approved by the Engineer.

Ensure that all runoff is directed from disturbed areas to the sediment control measures.

Do not remove any erosion or sediment control measure without the approval of the Engineer and the Sediment Control Inspector. Refer to Section GP 7.12 for unforeseen conditions.

Ensure that dewatering practices do not cause any visible change to stream clarity.

308.03.02 Erosion and Sediment Control Plan (E & S Plan) and Sequence of Construction. Implement the E & S Plan and Sequence of Construction as shown on the approved Sediment and Erosion Control Plan. Minor adjustments to the sediment control locations may be made in the field with the approval of the Engineer and the Sediment Control Inspector. Major revisions, deletions, or substitutions to the E & S Plan require a formal review

and approval by the Design Engineer, BCBEC and the Soil Conservation District (SCD), and, if applicable, MDE. Submit changes to the approved E & S Plan to the County in writing at the earliest possible time. Obtain BCBEC and SCD approval for changes to the E & S Plan or Sequence of Construction prior to implementing the change.

308.03.03 Erosion and Sediment Control Manager (ESCM). At least 10 days prior to beginning any work, submit the name and credentials of the ESCM for approval. Any substitutes for the ESCM will be subject to approval. Time the substitution to ensure that an ESCM is assigned to the project at all times. The County reserves the right to request a reassignment of the ESCM duties to another individual for any reason.

Ensure that the ESCM is thoroughly experienced in all aspects of construction and has the required certifications. The ESCM is primarily responsible for and has the authority to implement the approved erosion and sediment control plans, schedules and methods of operation for both on-site and off-site activities. The ESCM's duties include:

(a) Inspect the erosion and sediment controls on a daily basis to ensure that all controls are in place at all times and to develop a list of activities and schedules to ensure compliance with the Contract Documents.

(b) Maintain a daily log of these inspections, including actions taken, and submit a written report at the end of the work day.

(c) Conduct after storm inspections with the Engineer both during and beyond normal working hours and submit a written report.

(d) Have the authority to mobilize crews to make immediate repairs to the controls during working and nonworking hours.

(e) When requested, accompany the Engineer on Quality Assurance Inspections and inspections made by the regulating agencies.

(f) Coordinate with the Engineer to ensure that all corrections are made immediately and that the project is in compliance with the approved plan at all times.

308.03.04 RESERVED

308.03.05 Preconstruction Conference. Prior to issuance of a grading permit, the project will have a complete set of Sediment and Erosion Control plans that have been approved and signed by the Baltimore County Soil Conservation District as meeting all applicable requirements. All plans will have an approved "Sequence of Construction" that will specify a sequence of clearing and grubbing operations, use of perimeter controls and sediment traps, road grading, placement and use of utilities, drains and storm water management facilities, final grading, stabilization, and removal of controls. A Pre-Construction Conference will be held by the Engineer to discuss the approved Erosion and Sediment Control "Sequence of Operations" if the County requests such a conference.

308.03.06 Meetings. **RESERVED**

308.03.07 Infiltration Devices. At sites where infiltration devices are used for the control of storm water, prevent runoff from unstabilized areas from entering the infiltration devices. Ensure that bottom elevations of sediment control devices placed in infiltration areas are at least 2 feet higher than the finish grade bottom elevation of the infiltration device. When

converting a sediment trap to an infiltration device, remove and dispose of all accumulated sediment prior to final grading of the device.

308.03.08 Stabilization Requirements. Permanently or temporarily stabilize areas flatter than 3:1 and stockpile areas as soon as possible, but not later than fourteen days after grubbing and grading activities have ceased in the area. Permanently or temporarily stabilize trap embankments and slopes, earth dikes, temporary swales, perimeter dike/swales, ditches, and slopes 3:1 or steeper as soon as possible, but not later than seven days after grubbing and grading activities have ceased in the area. The seven and fourteen day requirements mean that the stabilization operation is complete within the applicable seven or fourteen day time frame.

When the excavation or embankment reaches the bottom of the subgrade, those areas in which paving will be placed are exempt from the stabilization requirements. Areas between temporary berms, except median areas, need not be stabilized during incremental stabilization. When permanently stabilized areas are disturbed by grading operations or other activities not specifically approved, restabilization will be at no additional cost to the County.

Stabilization requirements may be reduced to less than seven days for sensitive areas. Perform maintenance as necessary to ensure continued stabilization.

Track all slopes within five days of establishment with cleated type equipment operating perpendicular to the slope.

308.03.09 Dewatering. Dewatering is considered an elective practice. Ensure that dewatering activities do not cause any visible change to stream clarity. If a sediment plume is visible, immediately cease the dewatering activity.

308.03.10 Maintenance. Maintain all erosion and sediment control devices during the construction season, the winter months, and other times when the project is inactive. All sediment control devices shall be left in good operating order before leaving the construction site for the night. Maintain access to all erosion and sediment controls until the controls are removed. Lack of maintenance as required by the Engineer and Sediment Control Inspector will be considered as noncompliance with the E & S Plan and grounds for a shutdown of the project.

Inspect controls immediately following storm events. Clean out as necessary and repair all damage as the first order of business after the storm event.

Direct any pumping activity, including dewatering sediment traps and basins, through a dewatering device approved by MDE and/or Baltimore County Soil Conservation District.

308.03.11 Waste Areas. Off-site waste areas on State or Federal property require MDE approval. The Baltimore County Soil Conservation District shall approve all other off-site waste areas. All waste areas and stockpile areas shall be protected by erosion and sediment control measures and stabilized in accordance with the seven or fourteen day stabilization requirement.

308.03.12 Inspections. The Baltimore County Sediment Control Inspector will conduct frequent field inspections. If the Inspector finds noncompliance with erosion and sediment control provisions, the Engineer will be notified that corrective action is required. This corrective action may require a shutdown of construction activities until the noncompliance is

satisfactorily corrected. No claims against the County will be considered due to either a shutdown of the grading operations or the entire project due to sediment control violations.

308.03.13 RESERVED

308.03.14 Removal of Controls. Do not remove erosion and sediment control measures until all previously disturbed areas are vegetated with at least a 3 in. growth of grass. The removal of all sediment control measures is subject to approval by the Engineer and the Sediment Control Inspector. No removals shall occur without these approvals. Backfill, grade, and stabilize the areas where sediment controls have been removed.

308.03.15 Erosion and Sediment Control Original Excavation. Excavate, construct embankments, grade, and backfill for sediment traps, sediment basins, and other sediment controls.

Ensure that excavation and embankments meet the dimensions for each sediment control as specified. Stockpile excavated material and use for backfill when the sediment controls are removed.

308.03.16 Erosion and Sediment Control Cleanout Excavation. Remove accumulated sediment from sediment controls or other areas during routine maintenance of sediment controls, or as directed.

Clean out sediment traps as necessary to ensure that at least 50 percent of the wet storage capacity is available at all times. Ensure that riprap outlet sediment traps have at least 75 percent of the wet storage capacity available at all times. Remove sediment from silt fence, super silt fence, stone outlet structures, stone check dams, and straw bales when it reaches 50 percent of the height of the device.

Place removed sediment in an approved waste site either on or off the project. Material stored on-site may be reused once it is dried and it meets embankment requirements.

308.03.17 Earth Dike. Do not use sod as stabilization unless specifically approved. Construct in accordance with MDE Detail C-1, page C.5, *Standard Specifications for Soil Erosion and Sediment Control*, latest edition.

308.03.18 Temporary Swale. Do not use sod as stabilization unless specifically approved. Construct in accordance with MDE Detail C-2, page C.11, *Standard Specifications for Soil Erosion and Sediment Control*, latest edition.

308.03.19 Perimeter Dike/Swale (PD/S). Do not use sod as stabilization unless specifically approved. Construct in accordance with MDE Detail C-3, page C.14, *Standard Specifications for Soil Erosion and Sediment Control*, latest edition.

308.03.20 Pipe Slope Drain (PSD). When slope drains are placed on grade, construct interceptor berms to direct flow into the flared end section. Construct in accordance with MDE Detail D-1, page D.3, *Standard Specifications for Soil Erosion and Sediment Control*, latest edition.

308.03.21 Riprap Inflow Protection (RRP). Gabions shall not be used. Construct in accordance with MDE Detail D-3-1, page D.10, *Standard Specifications for Soil Erosion and Sediment Control*, latest edition.

308.03.22 Gabion Inflow Protection (GP). Construct as specified in Section 312. Construct in accordance with MDE Detail D-3-2, page D.12, *Standard Specifications for Soil Erosion and Sediment Control*, latest edition.

308.03.23 Stone Check Dam (CD). Space as specified. Construct as applicable in accordance with MDE Detail D-2, page D.8, *Standard Specifications for Soil Erosion and Sediment Control,* latest edition.

308.03.24 Sediment Traps (ST-I through ST-III). Excavate sediment traps to the specified length, width, and depth as shown on approved sediment control plans. Construct in accordance with MDE Details G-1-1, G-1-2, or G-1-3, as applicable, on pages G.6 to G.8, G.11 to G.13, or G.16 to G.18 respectively, *Standard Specifications for Soil Erosion and Sediment Control*, latest edition.

When converting a sediment trap to an infiltration device, remove and dispose of all accumulated sediment prior to final grading of the device. See Section 308.03.07.

When grading and paving operations have been completed and vegetation has been established on the slopes and channels to the satisfaction of the Engineer, refill the sediment traps with suitable materials, and shape and treat them as specified.

308.03.25 Temporary Stone Outlet Structure (TSOS). Stabilize the area immediately after removal of the structure. Construct in accordance with MDE Detail E-7, page E.18, *Standard Specifications for Soil Erosion and Sediment Control*, latest edition.

308.03.26 Removable Pumping Station (RPS). Furnish the standpipe, pump, hoses, and connections required to perform dewatering activities. Excavate a pit to the dimensions required. Construct in accordance with Detail F-1, Appendix 24, *2012 Urban Policy and Guidelines Manual*, or latest edition.

308.03.27 Sump Pit (SP). Furnish the standpipe, pump, hoses, and connections required to perform dewatering activities. Excavate a pit to the dimensions required. Construct in accordance with Detail F-2, Appendix 25, *2012 Urban Policy and Guidelines Manual*, or latest edition.

308.03.28 Portable Sediment Tank. Furnish the standpipe, pump, hoses, and connections required to perform dewatering activities. Determine the dimensions necessary to provide the required storage volume. Construct in accordance with MDE Detail F-3, page F.7, *Standard Specifications for Soil Erosion and Sediment Control*, latest edition.

308.03.29 Silt Fence (SF). Trench the geotextile at least 8 in. vertically into the ground and extend to at least 16 in. above ground. Drive fence posts at least 16 in. into the ground and extend at least 18 in. above the ground. Construct in accordance with MDE Detail E-1, page E.2, *Standard Specifications for Soil Erosion and Sediment Control*, latest edition.

Remove and reset silt fence when and as directed, per the requirements for the original placement.

308.03.30 Inlet Protection (SIP, CIP, COIP, AGIP, MIP, MSIP, GIP). Install standard inlet protection, curb inlet protection, combination inlet protection, at grade inlet protection, median inlet protection, median sump inlet protection, or gabion inlet protection. Construct in accordance with: Appendices 21 and 21A (SIP), 22 (CIP), 23 and 23A (COIP), *2012 Urban Policy and Guidelines Manual,* or latest edition; and MDE Details E-9-2 (AGIP), E-9-4 (MIP),

E-9-5 (MSIP), and E-9-7 (GIP) on pages E.26, E.28, E.29, and E.32 respectively, *Standard Specifications for Soil Erosion and Sediment Control*, latest edition.

308.03.31 Stabilized Construction Entrance (SCE). Construct stabilized construction entrances at the specified locations. Construct in accordance with Detail B-1, page B.2, *Standard Specifications for Soil Erosion and Sediment Control*, latest edition.

Rehabilitate stabilized construction entrance consists of periodic top dressing with additional aggregate, replacement of pipe, or other repairs to the entrance and sediment trapping devices.

308.03.32 Super Silt Fence (SSF). Construct in accordance with Detail E-3, Appendix 17, *2012 Urban Policy and Guidelines Manual*, or latest edition.

Remove and reset super silt fence when and as directed, per the requirements for the original placement.

308.03.33 Temporary Asphalt Berm (TAB). Construct in accordance with Detail C-5, page C-18, *Standard Specifications for Soil Erosion and Sediment Control,* latest edition.

308.03.34 Straw Bales for Sediment Control (SBD). Use straw bales for temporary control of erosion and sedimentation in side ditches and where the placement of a stone outlet structure is not practical. Do not use straw bales in median ditches.

Use straw bales consisting of undecayed firmly packed straw, approximate size 14 x 18 x 36 in. as prepared by a standard baling machine, and firmly bound by at least two separate circuits of rope or band material that will withstand weathering for the length of time the bale is functioning as a sediment control device. Ensure that the binding tension on the baling machine is sufficient to produce a bale with voids no greater than the nominal thickness of the straw. Embed the bales to a depth of at least 4 in., and anchor in place with two No. 4 reinforcement bars, steel pickets, or 2 x 2 in. wood stakes, 36 in. length. Locate the anchoring devices at approximate third points along the longitudinal center line of each bale, driven through the bale and into the ground to a depth of 12 to 18 in. Construct as directed by the Engineer. Bales shall be placed along a contour in a row with ends tightly abutting adjacent bales. Bales shall be inspected frequently and after each rain event and maintained as directed by the Engineer and the Sediment Control Inspector. All bales shall be removed upon stabilization of upgrade areas.

308.03.35 Stone for Sediment Control. Place No. 57 stone, 3/4 to 1-1/2 in. stone, 2 to 3 in. stone, 4 to 7 in. stone, and riprap for sediment control as specified.

308.03.36 Maintenance of Stream Flow. Maintain the continuous flow of waterways during all operations for the locations indicated.

Upon completion of construction and after temporary drainage devices have served their purpose, remove and dispose of the devices in an acceptable manner.

Stream diversion details included in the Contract Documents will show a system and a location that is approved by the Maryland Department of the Environment.

The stream diversion system as shown may not be capable of blocking the flow of water through the soil beneath the system. Approved plans shall provide an effective means of diverting the water away from the designated areas. Ensure that all excavation performed within the diverted stream is performed in a dewatered condition, which may require additional

pumps, sheeting, shoring, cofferdams, etc. If the proposed system does not perform satisfactorily or additional material and equipment are required to dewater the site and excavated areas, adjust the stream diversion system and obtain approvals at no additional cost to the County.

Securely anchor the stream diversion system in place to prevent movement during high water events. Submit the proposed method of anchoring to the Engineer and the Sediment Control Inspector for approval. Anchors shall not go beyond the limits of disturbance shown on the Contract Drawings or infringe on the channel area available for stream flow. Do not install the diversion system in the stream without the approval of both the Engineer and the Sediment Control Inspector. All costs associated with the anchoring of the stream diversion system are incidental to the ***Maintenance of Stream Flow*** item.

308.03.37 Sediment Basins. Construct baffles in accordance with Detail G-2-4, page G.46, *Standard Specifications for Erosion and Sediment Control*, latest edition. Basin drawdown devices shall be constructed in accordance with Detail shown on Appendix 28 of *2012 Urban Policy and Guidelines Manual*, or latest edition.

308.03.38 RESERVED

308.03.39 RESERVED

308.04 MEASUREMENT AND PAYMENT. The payment will be full compensation for all material, labor, equipment, tools, and incidentals necessary to complete the work. The maintenance, repair, resetting, and final removal of all erosion and sediment control devices will not be measured, but the cost will be incidental to the Contract price to construct the device unless otherwise specified in the Contract Documents.

308.04.01 Erosion and sediment control manager will not be measured but the cost will be incidental to Erosion and Sediment Control items specified in the Contract Documents.

308.04.02 Implementation of the Erosion and Sediment Control Plan by the Contractor will not be measured but the cost will be incidental to the Erosion and Sediment Control items specified in the Contract Documents.

308.04.03 ***Erosion and Sediment Control Original Excavation*** will be measured and paid for at the Contract unit price per cubic yard. The payment will also include excavation, backfill, and grading.

308.04.04 ***Erosion and Sediment Control Cleanout Excavation*** will be measured and paid for at the Contract unit price per cubic yard. The payment will also include excavation and disposal.

308.04.05 ***Earth Dikes*** will be measured and paid for at the Contract unit price per linear foot. When 4 to 7 in. stone, temporary seeding, and soil stabilization matting are required, they will be measured and paid for as specified in Sections 308.04.22, 704.04, and 709.04, respectively.

308.04.06 ***Temporary Swales*** will be measured and paid for at the Contract unit price per linear foot. When 4 to 7 in. stone, temporary seeding, and soil stabilization matting are required, they will be measured and paid for as specified in Sections 308.04.22, 704.04, and 709.04, respectively.

308.04.07 ***Perimeter Dike/Swales*** will be measured and paid for at the Contract unit price per linear foot. When temporary seeding and soil stabilization matting are required, they will be measured and paid for as specified in Sections 704.04 and 709.04, respectively.

308.04.08 ***Pipe Slope Drain*** will be measured and paid for at the Contract unit price per linear foot. The payment will also include excavation, backfill, flared end section, geotextile, anchors, coupling bands, and pipe elbows.

Outlet protection will be measured and paid for as specified in Section 308.04.22.

308.04.09 Riprap inflow protection will be measured and paid for as specified in Section 308.04.22.

308.04.10 Gabion inflow protection will be measured and paid for as specified in Section 312.04.

308.04.11 Stone check dam will be measured and paid for as specified in Section 308.04.22.

308.04.12 Sediment traps will be measured and paid for at the Contract unit price for one or more of the items listed below:

(a) ***Erosion and Sediment Control Original Excavation*** as specified in Section 308.04.03.

(b) ***Pipe*** per linear foot based upon size, type and gauge of pipe.

(c) Stone as specified in Section 308.04.22.

(d) Inflow protection as specified in Sections 308.04.09 and 308.04.10.

(e) Baffle board and stakes will not be measured but the cost will be incidental to the other items.

308.04.13 Stone outlet structure will be measured and paid for as specified in Section 308.04.22. The baffle board and stakes will not be measured but the cost will be incidental to the Contract price.

308.04.14 ***Removable Pumping Station*** will be measured and paid for at the Contract unit price per each. The payment will also include excavation, pipe, geotextile, wire mesh, steel plate, hose, pump, and connections.

No. 57 stone will be measured and paid for as specified in Section 308.04.22.

308.04.15 ***Sump Pit*** will be measured and paid for at the Contract unit price per each. The payment will also include excavation, pipe, geotextile, wire mesh, steel plate, hose, pump, and connections.

No. 57 stone will be measured and paid for as specified in Section 308.04.22.

308.04.16 ***Portable Sediment Tank*** will be measured and paid for at the Contract unit price per each. The payment will also include pipe, geotextile, wire mesh, steel plate, hose, pump, and connections. No adjustments will be made for resizing or relocating portable sediment tanks to meet stream clarity discharge requirements.

308.04.17 ***Silt Fence*** will be measured and paid for at the Contract unit price per linear foot. ***Remove and Reset Silt Fence*** will be measured and paid for at the Contract unit price per linear foot.

308.04.18 ***Super Silt Fence*** will be measured and paid for at the Contract unit price per linear foot. ***Remove and Reset Super Silt Fence*** will be measured and paid for at the Contract unit price per linear foot.

308.04.19 ***Stabilized Construction Entrance*** and ***Rehabilitate Stabilized Construction Entrance*** will be measured and paid for at the Contract unit price per Square Yard or, if specified in the Contract Documents, per Each. When pipe is required, it will not be measured but the cost will be incidental to the Contract price.

308.04.20 ***Inlet Protection*** will be measured and paid for at the Contract unit price per each based upon the type specified.

308.04.21 ***Straw Bales*** will be measured and paid for at the Contract unit price per linear foot measured along the approximate center line of the row of bales. Excavation and anchoring the straw bales will not be measured but the cost will be incidental to the Contract price.

308.04.22 ***Stone for Sediment Control*** will be measured and paid for at the Contract unit price per ton for the pertinent Stone for Sediment Control item. Geotextile, excavation, and backfill will not be measured but the cost will be incidental to the Contract price.

308.04.23 ***Maintenance of Stream Flow*** will not be measured but will be paid for at the Contract lump sum price. The payment will also include designing and providing diversion structures regardless of the type required to satisfactorily divert the stream flow, excavation, backfill, dewater the site and excavated areas within the stream diversion area, maintenance of the diversion system, sandbags, polyethylene sheeting, diversion pipes, pumps, hoses, connections, and portable sediment tanks. This price will not be adjusted when consideration is given to an alternative stream diversion system regardless of any changes in quantities from that shown in the Contract Documents. The provisions of Section GP-4.05 will not apply to this work.

308.04.24 ***Temporary Mulching*** will be measured and paid for as specified in Section 704.04.02.

308.04.25 ***Temporary Seeding*** will be measured and paid for as specified in Section 704.04.01.

308.04.26 Temporary Wood Cellulose Fiber will be incidental to ***Temporary Seeding***.

308.04.27 ***Soil Stabilization Matting*** will be measured and paid for as specified in Section 709.04.

308.04.28 Turfgrass ***Sodding*** will be measured and paid for as specified in Section 708.04.01.

308.04.29 Temporary earth berms and interceptor berms for incremental stabilization will not be measured, but the cost will be incidental to the excavation items specified in the Contract Documents.

308.04.30 ***Temporary Asphalt Berm*** will be measured and paid for at the Contract unit price per ton. The price will include compaction, removal, and restoration to original conditions.

SECTION 309 – CONCRETE SLOPE AND CHANNEL PROTECTION

309.01 DESCRIPTION. This work shall consist of protecting slopes and channels with cast-in-place concrete and cutoff walls as specified in the Contract Documents or as directed by the Engineer.

309.02 MATERIALS.

Crusher Run Aggregate CR-6	901.01
No. 57 Aggregate	901.01
Curing Materials	902.07
Form Release Compounds	902.08
Concrete Mix No. 2	902.10.03
Welded Steel Wire Fabric	908.05
Joint Sealer	911.01
Preformed Joint Fillers	911.02
Roofing Paper	911.07
Borrow	916

309.03 CONSTRUCTION.

309.03.01 Excavation. Excavation, including excavation for cutoff walls shall conform to Section 609.

309.03.02 Cast-In-Place Concrete. Cast-in-place concrete slope protection shall be constructed in alternate strips so that construction joints are all in one direction and that tooled joints run perpendicular to the construction joints. The result shall be a checkerboard pattern having squares not less than 3 ft or more than 5 ft. The size of the squares and the size of squares around curved surfaces shall be as directed by the Engineer. Joints and cutoff walls shall be constructed as specified in the Contract Documents or as directed by the Engineer.

309.03.03 Forms. Forms shall conform to Section 609.

309.03.04 Concreting. Concrete mixing shall conform to Section 915.03.04. Volumetric batching and continuous mixing will be permitted on this work. Areas subject to the infiltration of water shall be dewatered by methods acceptable to the Engineer prior to placing the concrete. The concrete shall be spread, tamped or otherwise consolidated to secure maximum density as it is placed. It shall be struck off with an approved screed to the elevation of the top of the forms. The surface shall have a broomed finish. No plastering of the surface will be permitted. All edges and all joints shall be edged with a 1/4 in. edging tool.

309.03.05 Cold Weather Construction and Curing. Refer to Section 520.03.02 for cold weather construction and to Section 520.03.12 for concrete curing.

309.03.06 Backfill. After the forms have been removed, backfill shall be placed and compacted as directed by the Engineer.

309.04 MEASUREMENT AND PAYMENT. The payment will be full compensation for all concrete, forms, excavation, curing, joint sealer and filler, backfill, disposal of excess or unsuitable material, and for all material, labor, equipment, tools, and incidentals necessary to complete the work.

309.04.01 ***Concrete Slope and Channel Protection*** and ***Concrete Slope Protection for Streams*** will be measured and paid for at the Contract unit price per square yard of finished surface.

309.04.02 ***Cutoff Walls*** will be measured and paid for at the Contract unit price per linear foot.

309.04.03 The removal and disposal of unsuitable material below the subgrade will be measured and paid for at the Contract unit price per cubic yard for ***Class 2 Excavation***. The payment will include the cost of replacing the unsuitable material with suitable material acceptable to the Engineer.

309.04.04 When ***Borrow*** or ***Selected Backfill using No. 57 Aggregate*** or ***Selected Backfill using Crusher Run Aggregate CR-6*** is approved by the Engineer as replacement material for the ***Class 2 Excavation***, it will be measured and paid for at the Contract unit price per cubic yard for the respective items as specified in the Contract Documents.

SECTION 310 – RIPRAP DITCHES

310.01 DESCRIPTION. This work shall consist of constructing riprap ditches and riprap ditches with capping as specified in the Contract Documents or as directed by the Engineer.

310.02 MATERIALS.

Riprap	901.02 and 901.03
Geotextile, Class as specified	921.09
2 to 4 inch stone	M43, No. 1

310.03 CONSTRUCTION.

310.03.01 Excavation. Excavation shall conform to the line and grade specified in the Contract Documents. Ditch sides and bottom shall be smooth and firm. Ditch sides and bottom shall be free from protruding objects that would damage the geotextile. Ditch sides and bottom shall be constructed in a manner acceptable to the Engineer.

310.03.02 Geotextile Placement. Geotextile coverings shall be installed on prepared surfaces, with higher layers overlapping lower ones, in roofing fashion. The material must overlap by at

least two feet. Torn or damaged geotextile covering shall be replaced or repaired at the Contractor's expense and in a manner acceptable to the Engineer.

310.03.03 Riprap Placement. Stones shall be placed by mechanical or other acceptable methods to produce a reasonably graded mass of stone. Placing the stones by methods that cause extensive segregation will not be permitted. The depth of the riprap shall be as specified in the Contract Documents.

310.03.04 Backfill. Any excavation voids existing along the edges and ends of the placed riprap shall be backfilled with suitable material to blend in with contiguous slopes, ditch lines or existing ground. Riprap placed in the clear recovery area shall be capped with a layer of 3 to 5 in. stone.

310.04 MEASUREMENT AND PAYMENT. The payment will be full compensation for all stone, excavation, geotextile, backfill, disposal of excess material, and for all material, labor, equipment, tools, and incidentals necessary to complete the work.

310.04.01 ***Riprap Ditches*** and ***Riprap Ditches with Capping*** will be measured and paid for at the Contract unit price per square yard of finished surface. Area measurements will be actual surface measurements.

310.04.02 ***Bottom Cutoff Walls*** and ***Side Cutoff Walls for Riprap*** will be measured and paid for at the Contract unit price per linear foot.

SECTION 311 – RIPRAP SLOPE AND CHANNEL PROTECTION

311.01 DESCRIPTION. This work shall consist of protecting slopes and channels with a covering of geotextile and stone and an aggregate filter blanket as specified in the Contract Documents or as directed by the Engineer.

311.02 MATERIALS.

Aggregate Filter Blanket (Crusher Run Aggregate CR-6)	901, Table 901 A
Stone	901.02
Geotextile, Class SE	921.09
Staples/Securing Pins	921.09.03

311.03 CONSTRUCTION.

311.03.01 Excavation. Excavation for riprap and cutoff walls shall conform to the lines and grades specified in the Contract Documents. The subgrade shall be smooth and firm, free from protruding objects that would damage the geotextile and constructed in a manner acceptable to the Engineer.

311.03.02 Geotextile. Geotextile coverings shall be installed on prepared surfaces, with higher layers overlapping lower ones, in roofing fashion. The material must overlap by at least two feet. Torn or damaged geotextile covering shall be replaced or repaired in a manner acceptable to the Engineer at the Contractor's expense.

At the option of the Engineer, the geotextile shall be held in place with staples or securing pins approved for size and type based upon field conditions, soils, etc.

311.03.03 Aggregate Filter Blanket. When an aggregate filter blanket is specified, it shall conform to the lines and grades specified in the Contract Documents and shall be compacted in a manner acceptable to the Engineer.

311.03.04 Riprap Placement. The ground surface upon which the slope and channel protection is to be placed shall be free of brush, trees and stumps and shall be acceptable to the Engineer.

The first section of riprap placed shall consist of a minimum of 5 tons and will be inspected by the Engineer for conformance to gradation and placement requirements. This first section shall be used to evaluate quality control for the remainder of the project, following approval by the Engineer. If the material is rejected, it shall be removed from the project and additional sections, each consisting of a minimum of 5 tons, shall be placed.

The placement of the riprap shall begin with the bottom cutoff walls or toe sections. The larger stones shall be placed in the cutoff walls and along the outside edges of the limits of slope and channel protection. The riprap shall be placed with equipment that produces a uniformly graded mass of stones. Placing the stones by methods that cause segregation is prohibited.

The surface elevation of completed riprap installations shall be flush with adjacent channel bed or bank slope elevations, and shall not create an obstacle to the flow. The outer riprap surfaces shall be even and present a generally neat appearance. The plus or minus tolerance of the surface of the finished riprap installation shall be 3 inches for Class I Riprap and 5 inches for Class II and III Riprap from the lines and grades shown on the Contract Documents when measured perpendicular to the exterior surface of the stonework.

Placed material not conforming to the specified limits shall be removed and replaced as directed by the Engineer at no additional cost to the County.

The stone shall be placed and distributed so the resulting layer will contain a minimum of voids and there will be no pockets of same size material. The stone shall be placed to its full course thickness in one operation in a manner that the underlying material will not be displaced or worked into the course of riprap being placed. When an aggregate filter blanket is used, placement of the riprap shall proceed in a controlled manner to avoid disruption or damage to the layer of bedding material.

Imbricated riprap shall be placed and fitted together as specified by the Contract Documents.

311.03.05 Backfill. Any excavation voids existing along the edges of the completed slope and channel protection shall be backfilled in a manner acceptable to the Engineer.

311.04 MEASUREMENT AND PAYMENT. The payment will be full compensation for all stone, excavation, geotextile, backfill, disposal of excess material, prewashing when required

by the Engineer or the Contract Documents, preparation of quality control section, and for all material, labor, equipment, tools, and incidentals necessary to complete the work.

311.04.01 ***Riprap Slope and Channel Protection*** will be measured and paid for at the Contract unit price per square yard. Area measurements will be actual surface measurements.

311.04.02 ***Cutoff walls*** will be measured and paid for at the Contract unit price per linear foot.

311.04.03 Riprap For Scour Protection will be measured and paid for at the Contract unit price per ton for the item ***Class II Riprap For Scour Protection***.

311.04.04 ***Aggregate Filter Blanket*** will be measured and paid for at the Contract unit price per square yard for the depth specified in the Contract Documents.

311.04.05 ***Imbricated Riprap*** will be measured in place and paid for at the Contract unit price per ton for the depth specified in the Contract Documents.

SECTION 312 – GABIONS

312.01 DESCRIPTION. This work shall consist of protecting slopes and channels with stone filled wire baskets as specified in the Contract Documents or as directed by the Engineer.

312.02 MATERIALS.

Stone	901.05
Wire for Gabions	906.01
Geotextile, Class as specified	921.09

PVC Coating for Gabions shall be in accordance with Section 906.01.02 and shall be colored as indicated on the Contract Drawings, except that if no color is indicated on the Contract Drawings, the color shall be gray color No. 26440, Federal Standard 595.

312.03 CONSTRUCTION.

312.03.01 Excavation. Excavation, including excavation for cutoff walls, shall conform to the lines and grades specified in the Contract Documents. The subgrade shall be smooth, firm and free from protruding objects or voids that would affect the proper placement of the wire baskets or damage the geotextile.

312.03.02 Geotextile. Geotextile shall be required for all gabions and shall be placed on the prepared subgrade. Adjacent strips shall be overlapped a minimum of 2 feet. Care shall be exercised in placing and anchoring the empty basket units to ensure proper alignment and to avoid damage to the geotextile. If the geotextile should be damaged, it shall be replaced or repaired at the Contractor's expense as directed by the Engineer.

312.03.03 Wire Baskets. Placement of the units shall begin with the cutoff walls. The empty units shall be set on the geotextile and the vertical ends bound together with wire ties or interlocking fasteners spaced to permit stretching of the units to remove kinks. Stretching methods will be optional with the Contractor. Stakes, pins or other approved methods shall be used to insure a proper alignment.

312.03.04 Stone. The empty basket units shall be filled carefully with stone placed by hand or machine to assure good alignment with a minimum of voids between stones, avoiding bulging of the mesh. The maximum height from which the stone shall be dropped into the units shall be 36 inches. The stone shall be placed so as to provide a minimum of two courses. Care shall be taken in placing the top layer of stone to assure a uniform surface to avoid any bulging of the lid mesh. After a basket unit has been filled, the lid shall be bent over until it meets the ends of the unit. The lid shall then be secured to the sides and ends with wire ties or interlocking fasteners. When a complete basket unit cannot be installed on slopes or channels because of space limitations, the basket unit shall be cut to fit as directed by the Engineer.

312.03.05 Backfill. Any excavation voids existing along the edges of the completed gabions shall be backfilled in a manner acceptable to the Engineer.

312.04 MEASUREMENT AND PAYMENT. ***Gabions***, including cutoff walls will be measured and paid for at the Contract unit price per cubic yard of stone filled wire baskets complete in place. The payment will be full compensation for all stone, excavation, geotextile, ties or fasteners, backfill, disposal of excess material, and for all material, labor, equipment, tools, and incidentals necessary to complete the work.

SECTION 313 – FLOWABLE BACKFILL FOR UTILITY CUTS

313.01 DESCRIPTION. This work shall consist of furnishing, hauling and placing a flowable cement stabilized backfill material as specified in the Contract Documents or as directed by the Engineer. The material shall be used as utility cut backfill, pipe trench backfill or for filling abandoned pipes and shall set up to a stabilized mass.

313.02 MATERIALS. The flowable backfill shall consist of a mixture of sand, cement and water and shall be certified by the manufacturer.

Cement	902.03
Fine Aggregate for Portland Cement Concrete	901, Table 901A
Water	921.01

313.02.01 Fillers. Fillers, if required, shall be natural aggregates with a maximum size not to exceed 3/4 in. and may include sands. Bottom ash shall not be used as filler.

313.02.02 Components. Toxic or deleterious components shall not be used in the backfill mixture. The mixture shall have a 28 day, unconfined compressive strength of 100 psi to 300 psi maximum based on the manufacturer's certification. Certification shall include the actual test data for each mixture to be used.

313.03 CONSTRUCTION. Placement of the flowable backfill material shall conform to the manufacturer's recommendations or as directed by the Engineer. Utility trenches shall be backfilled full depth to the top of the subgrade using the mixture as specified in the Contract Documents or as directed by the Engineer.

The mixture shall fill all voids during the backfill operation.

The backfilled utility cut shall be protected from freezing and traffic for 24 hours. Paving operations shall not begin for at least 24 hours after backfilling is completed and has been approved by the Engineer.

The Contractor shall keep detailed records of all flowable backfill placed. These records shall be submitted to the Engineer.

313.04 MEASUREMENT AND PAYMENT. ***Flowable Backfill for Utility Cuts*** will be measured and paid for at the Contract unit price per cubic yard. The payment will be full compensation for all materials, labor, equipment, tools, and incidentals necessary to complete the work.

SECTION 314 – AS-BUILT REQUIREMENTS FOR STORMWATER MANAGEMENT (SWM) PONDS AND ASSOCIATED FACILITIES

314.01 DESCRIPTION. Prior to construction, Public Works shall enter into an engineering services contract with the Design Engineer of record or a third-party Professional Engineer to provide stormwater management (SWM) as-built engineering services. The SWM As-Built Engineer (ABE) shall make appropriate observations and measurements and submit a certification package that affirms that stormwater management (SWM) facilities and practices are constructed as specified or are functionally equivalent to the Construction Documents and meet the requirements of the Baltimore County Department of Environmental Protection and Sustainability, the Baltimore County Soil Conservation District (BCSCD), and other concerned agencies. This work shall be performed independently of County inspection but shall provide input to the Baltimore County Engineer regarding construction of SWM ponds and associated facilities.

314.02 SUBMITTALS. Submit a certification package that affirms that stormwater management (SWM) facilities and practices are constructed in accordance with Contract requirements or are functionally equivalent to the designs provided in approved SWM reports, revising the certification package as needed until final acceptance.

314.02.01 SWM As-Built Engineer. The ABE is responsible for assembling and certifying the SWM certification package. Duties include adequately documenting that the SWM facilities have been constructed as specified, and performing inspections during pertinent construction activities for SWM facilities and practices. The ABE shall be a Professional Engineer (P.E.) registered and licensed in the State of Maryland and who has at least three (3) years of experience in SWM facility design and SWM facility construction. Public Works shall maintain on file one copy of the ABE's resume for the duration of the construction Contract. The resume shall include the following:

(a) Full name of the ABE, License No. and expiration date.

(b) Name of employing company or firm.

(c) Contact information.

(d) Relevant work experience.

(e) Proof of valid certification of the Maryland Department of the Environment (MDE) Responsible Personnel for Erosion and Sediment Control training course (formerly "Green Card"). Note: All certifications for the former course MDE Responsible Personnel Training for Erosion and Sediment Control ("Green Card") expired on December 31, 2016 and are no longer valid.

(f) Proof of Errors and Omissions Insurance.

The ABE shall have the option to use designees, who are under the direct supervision of the ABE, to perform the following duties on behalf of the ABE:

(1) Documenting that the SWM facilities have been constructed as specified, including writing activity inspection reports, taking photographs, and obtaining copies of material approvals and material test results.

(2) Performing inspections during pertinent construction activities for SWM facilities and practices, and completing the pertinent portions of the SWM facility As-Built certification data tables.

When the ABE elects to use designees, the ABE shall submit the names and resumes indicating their experience in the design and inspection of SWM facilities, of those designees authorized by the ABE to represent the ABE to the Baltimore County Engineer. Only authorized designees may represent the ABE for the limited duties specified.

314.02.02 SWM Facility As-Built Certification Package. The SWM facility As-Built certification package contains documentation that verifies that all SWM facilities and practices on the Contract have been constructed in accordance with the Contract requirements or are functionally equivalent to designs provided in approved SWM Reports.

The SWM facility As-Built certification package shall include the following for each SWM facility in the Contract, presented neatly and legibly, and organized in an easy-to-follow format:

(a) SWM facility construction inspection reports. The inspection reports shall include the following:

(1) The SWM facility identification number (BMP No. or SWM Fac. No.) and type of SWM facility or practice.

(2) The date and location of the activity.

(3) Photographs, taken during inspections, that clearly show the construction activities as listed on the pertinent SWM facility As-Built data tables, with narrative descriptions of what appears in the photographs, the dates the photographs were taken, and the locations.

(4) Verification of whether SWM facility As-Built construction is as specified, noting any deviations from the Contract Documents and how the deviations have been addressed.

(b) Photographs of SWM facilities and practices after all landscaping has been installed and established, with narrative descriptions of what appears in the photographs.

(c) Copies of pertinent material approval forms.

(d) Copies of pertinent material and installation test reports and results.

(e) Completed As-Built certification data tables.

(f) Red line As-Built surveys of the SWM facilities and practices signed and sealed by a Professional Land Surveyor (PLS) under contract to the ABE and who is registered and licensed in the State of Maryland. The As-Built survey data shall be overlaid on the appropriate Contract plan sheet(s) and profile sheet(s), at the same scale and datum, and shall be coordinately correct. The As-Built survey data shall be red in color, clearly legible and easily distinguishable from the Contract Document information. The SWM facility As-Built survey shall thoroughly address all items on the As-Built Checklist(s) provided by Baltimore County.

(g) Applicable supporting computations demonstrating that the functionality of the SWM facilities and practices are in accordance with the designs as presented in the approved SWM Reports. This is only necessary when tolerances are not met and shall include but is not limited to water surface elevations, freeboard, storage volumes, depths, and other pertinent SWM functionality data that demonstrates the SWM facility performances meets the approved design.

(h) A narrative of justification for As-Built deviations in SWM facilities and practices. This is only necessary when 314.02.02 (g) applies.

(i) A copy of Final Acceptance from the Department of Environmental Protection and Sustainability for the landscaping establishment.

(j) Seal, signature, license number, and date of license expiration of the ABE.

314.02.03 Information Supplied by the Design Engineer. In circumstances where the As-Built Engineer is not the Design Engineer of record, upon written request, the Design Engineer shall provide CADD files and any approved Final SWM Reports in PDF format to facilitate completion of the SWM facility As-Built certification package. Requests shall

be submitted to the Baltimore County Engineer who will then forward the requests to the Design Engineer.

314.02.04 Submittals and Approval Process. Partial submittals of the SWM facility As-Built package may be made as construction of each individual SWM facility and practice is completed. Otherwise, the ABE shall submit the entire SWM facility As-Built package within 45 days of completion of construction activities associated with all SWM facilities and practices but not including establishment of the specified landscaping items. The landscaping phase of SWM facilities and practices need not be completed to submit the SWM facility As-Built certification package for Structural Acceptance but is required for Final Approval.

The ABE shall resubmit the SWM facility As-Built package with responses to all Public Works comments that may be received. Resubmit as many times as necessary, updating the SWM facility As-Built package as needed to address all Public Works comments, and making any field adjustments as needed to correct deficiencies, until Structural Acceptance is issued. In addition to approval from Public Works, some SWM facility types require approval from agencies other than Public Works. Resubmit the SWM facility As-Built package with responses to all comments that may be received from other agencies. Public Works will coordinate reviews and correspondence with these other agencies.

Concurrent with Public Works' review of the SWM facility As-Built certification package for Structural Acceptance, ensure establishment of landscaping items continues and ensure the area is permanently stabilized. Once landscaping is established, ensure the remaining data table information is completed and submit the SWM facility As-Built certification package for Final Approval.

Notice to Contractor:

(a) Final payment for construction of the SWM facilities shall not be made until after the entire SWM facilities As-Built package has been submitted for Final Approval by the ABE and has been reviewed and approved by Public Works. It is understood and agreed that the Contractor has considered in the Bid the requirements of the SWM facilities As-Built package described above and that no additional compensation will be allowed for delays or inconvenience due to the aforesaid approval process, provided the ABE has submitted the entire As-Built package within the allotted 45-day time frame.

(b) Plantings and/or turf provided as part of SWM facilities construction shall be installed, established, and maintained by the Contractor in accordance with the requirements given in Standard Specification Section 710.

(c) The warranty for structural elements of SWM facilities shall be in accordance with Standard Specification Section GP-4.10.

314.03 MATERIALS. Not applicable.

314.04 CONSTRUCTION.

Coordinate with the ABE designated by Baltimore County Public Works prior to beginning construction of SWM facilities and practices.

Perform all construction activities on SWM facilities and practices only in the presence of the ABE or the ABE designee.

Prior to beginning or continuing construction activities of SWM facilities and practices, ensure the ABE or the ABE designee is present. If the ABE or ABE designee is not present, suspend work on SWM facilities and practices and do not resume until the ABE or ABE designee is present for the activities. Any such work performed by the Contractor without the presence of either the ABE or the ABE designee shall be removed and replaced as directed by the Baltimore County Engineer at no additional cost to Baltimore County.

Whenever the ABE or the ABE designee indicates that SWM facilities and practices under construction do not match the Contract Documents, immediately correct the deficiencies before moving to the next construction activity associated with SWM facilities and practices. If it is not possible to correct deficiencies due to the site conditions or constraints and not due to negligence and inadequate quality of work, cease work on SWM facilities and notify the Baltimore County Engineer.

Upon completion of constructing SWM facilities and practices, an As-Built survey of the completed facility shall be performed per Section 314.02.02(f). Complete installation and establishment of landscaping items need not be completed to perform the As-Built survey of SWM facilities and practices.

The ABE shall submit the SWM facility As-Built certification package per Section 314.02.04. Update SWM facilities As-Built surveys when adjustments are made to address comments that may be received.

314.04.01 ABE Responsibilities. ABE shall be responsible for performing the following:

- **(a)** Is present for all activities specified on the SWM facilities As-Built certification data tables, performs duties as specified, and records requisite information for the SWM facility As-Built certification package. The ABE may elect to use a designee as specified in Section 314.02.01. Ensure the data is available at the Site and on-demand.
- **(b)** Prepares written inspection reports for construction activities associated with SWM facilities and practices. The ABE may elect to use a designee as specified in Section 314.02.01.
- **(c)** Takes photographs during construction activities of the SWM facilities and practices and of the completed SWM facilities, including photographs with completed landscape planting installation and establishment. The ABE may elect to use a designee as specified in Section 314.02.01.
- **(d)** Obtains copies of material approvals for items associated with the SWM facilities and practices. The ABE may elect to use a designee as specified in Section 314.02.01.

(e) Obtains copies of compaction test results for SWM facility embankments. The ABE may elect to use a designee as specified in Section 314.02.01.

(f) Alerts the Contractor when SWM facilities and practices under construction do not match the Contract Documents. The ABE may elect to use a designee as specified in Section 314.02.01.

(g) When necessary, performs all computations that demonstrate SWM facilities and practices function in the manner as presented in any approved Final SWM Report, including with all revisions to such report that may result from Redline Revisions. At a minimum, the parameters examined by the ABE shall include but are not limited to storage volumes, discharge rates, velocities, detention times, water surface elevations, freeboard, and all other information as recommended by the ABE and as requested by Public Works.

(h) Obtains copies of As-Built surveys for the SWM facilities and practices.

(i) Prepares the SWM facility As-Built certification package.

314.04.02 Construction Tolerances. As follows. Values outside of tolerance may require computations per Section 314.04.01(g).

(a) **Earthwork.** Elevations within 3 in. (0.25 ft) of values specified or as otherwise noted on the pertinent SWM facility As-Built data table.

(b) **Embankments, Clay Cores, and Cut-Off Trenches.** Elevations not less than the values specified.

(c) **Drainage Structures.** Elevations within 1.25 in. (0.10 ft) of values specified.

(d) **Pipe Inverts.** Elevations within 1.25 in. (0.10 ft) of values specified.

(e) **Riprap.** Dimensions within 3 in. (0.25 ft) of values specified.

(f) **Freeboard.** Not less than the values specified.

(g) **Aggregate, Sand, Bioretention Soil Mix (BSM), and Mulch Thicknesses.** Not less than values specified.

When construction tolerances cannot be met due to unforeseen site conditions or constraints, calculations shall be performed by the ABE per Section 314.04.01(g) before proceeding with the next construction activity associated with SWM facilities and practices. If, after performing computations, the ABE determines that the SWM facilities do not meet the functional parameters provided in approved Final SWM Reports, reconstruct the SWM facilities to meet the functional parameters. If this is not possible due to the site conditions or constraints and not due to negligence and inadequate quality of work, cease work on SWM facilities and notify the Engineer.

314.05 MEASUREMENT AND PAYMENT. The work involved in inspection for, preparation of, and agency approvals of As-Built drawings shall not be measured and paid for as part of the Construction Contract. The work shall be considered a part of the design function and shall be contracted and paid for by Baltimore County. The payment will be full compensation for all material, labor, equipment, tools, and incidentals necessary to complete the work. No additional compensation will be considered for addressing comments received

on the submitted SWM facilities As-Built certification package, revisions to the SWM facility As-Built certification package, or any construction activities necessary to address comments that may have been received or necessary to revise the SWM facility As-Built certification package. Payment shall be made only after the Engineer receives a letter confirming that As-Built approval has been received from the Department of Environmental Protection and Sustainability and other agencies as applicable.

SECTION 315 – INFILTRATION TRENCHES

315.01 DESCRIPTION. Install infiltration trenches as specified.

315.02 MATERIALS.

Class I Riprap	901.02
Geotextile, Class as specified	921.09
PVC Pipe, Schedule 40	D 1785
Stone	M 43 No. 2

315.03 CONSTRUCTION. Do not place infiltration trenches in service until all of the contributing drainage area has been stabilized and approved. Restrict heavy equipment and traffic from the proposed infiltration trench location.

315.03.01 Excavation. Remove excavated material from the trench site. Ensure that trench walls and bottom are free of protruding objects that could damage the geotextile. When necessary, slope the trench walls. Ensure that the bottom dimensions and stone depth are as specified. Roughen the side walls of the trench. Grade the bottom of the trench flat.

Use all suitable excavated material for backfill or store for future use. Excavated material shall not be wasted without the approval of the Engineer. Remove any unsuitable material prior to using excavated material as backfill. Dispose of unsuitable material in an approved disposal area.

315.03.02 Installation. Place geotextile on the sides of the trench and the top of the No. 2 stone. Do not cover the bottom of the trench. The geotextile for the sides of the trench shall overlap the top geotextile by 6 to 8 in. Extend the top geotextile the full width and length of the trench. All longitudinal joints in the top geotextile shall overlap at least 6 in. The upstream roll shall overlap the downstream roll by at least 2 ft, for a shingled effect.

Place an observation well vertically in the longitudinal center of each infiltration trench. Use 6 in. diameter perforated PVC pipe, Schedule 40. Place the pipe on a base plate at the bottom of the trench. Cap the well using a threaded PVC fitting and a vandal proof sewer cap. Set the cap 6 in. above ground, and mark the depth of the trench on the cap. Provide a plastic collar with ribs to prevent rotation of the well when removing the cap. When soil capping is used, construct the observation well using perforated PVC pipe within the No. 2 stone and non-perforated pipe through the soil capping.

All stone shall be clean and free of all soil and fines. Place the No. 2 stone in 12 in. lifts with no compaction. Avoid any intermixing of the soil and fines with the stone aggregate. Remove and replace contaminated aggregate. Cap the trench with at least 12 in. of stone or soil as specified.

The infiltration trench design, the materials used and placement in the field shall be reviewed, inspected and certified by an As-Built Engineer (ABE) as described in Section 314.

315.04 MEASUREMENT AND PAYMENT. Infiltration Trenches will be measured and paid for at the Contract unit price per cubic yard. The payment will be full compensation for all excavation, stone, capping, riprap, geotextile, PVC pipe, fittings, cap, and for all material, labor, equipment, tools, and incidentals necessary to complete the work.

Geotechnical Engineer. The Geotechnical Engineer's work involved in review, inspection and certification of the infiltration trench design, materials used and their placement in the field shall not be measured or paid for as part of the construction contract. The work shall be considered a part of the design function and shall be contracted and paid for separately.

SECTIONS 316 Through 350 – RESERVED

SECTION 351 – WATER MAIN CONSTRUCTION

351.01 DESCRIPTION. This section provides specifications pertaining to construction of water mains and appurtenances thereto. Sanitary sewer and storm drain construction are addressed elsewhere in Section 300 of this document. Specifications common to both highway and utility construction are found in other portions of this volume as applicable and as referenced.

Developer Projects. On all Developer Projects the Contractor and Developer shall provide the Engineer with a hold harmless agreement which stipulates that Baltimore County will not be responsible for any additional cost due to any road or right-of-way failing to comply with the subgrade or proposed profile as shown on the contract drawings. This form is available from the Division of Construction Contracts Administration, and shall be provided to the Engineer as soon as possible following the award of the Contract. The County does not require a hold harmless agreement for UA and RA contracts.

351.02 MATERIALS.

Ductile Iron Pipe & Fittings	905.02
Steel Pipe	905.03
Prestressed Concrete Cylinder Pressure Pipe	905.04

High Density Polyethylene Pipe & Fittings	905.05
Polyethylene Encasement for Ductile Iron Pipe	905.02.09
External Coating System for Insulating Flanges and Insulating Corporation Stops	905.07.06(a)
Pipe Wrap Tape	905.07.06(b)

351.03 CONSTRUCTION.

351.03.01 GENERAL REQUIREMENTS FOR HANDLING PIPES, FITTINGS, VALVES & HYDRANTS.

1. Care shall be exercised in handling and delivery of pipe, its fittings, valves and hydrants to prevent damage to these items and their coatings and linings. Under no circumstances shall pipe, fittings, valves or hydrants be permitted to drop, roll or skid against another pipe section or fitting. Belt slings shall be used as directed by the Engineer for handling pipe, fittings, valves and hydrants. Dropped pipe, fittings, valves or hydrants and items with apparent damage shall be removed from the work site. Pipe, fittings, valves and hydrants shall be placed for storage in an area away from roads, traffic and unrelated construction activity.
2. Stored materials shall be kept safe from damage. Pipe, fittings, valves and hydrants shall not be stacked higher than manufacturer's recommended limits and wood spacers shall be utilized as recommended by the manufacturer or required by the Engineer. Meter settings and (non-sectional) meter vaults shall not be stacked. Pipe, fittings, hydrants and valves shall be kept from contact with the ground through use of supporting rails, timbers or other suitable support materials. Pipes, fittings, valves and hydrants shall not be stored within a designated flood area.
3. Pipe, fitting, valve and hydrant interiors shall be kept free of soil, and other foreign matter at all times. Watertight plugs shall be used in pipes when pipe is not in the process of being placed, as applicable. Fire hydrants and valves shall be drained and stored so that they are protected from damage by freezing.
4. Under no circumstances shall any portion of a valve shaft, actuator or waterway be used to lift or position a valve or hydrant. Storage instructions from the manufacturer shall accompany gate and butterfly valves and be retained by the Engineer. The Contractor shall follow these instructions at all times when storing and handling these valves.
5. Gaskets stored for use with mechanical joints, push-on joints, and flanged joints shall be kept in a cool location out of direct sunlight, as shall rubber/resilient seats for valves and hydrants. Gaskets and seats may not come into contact with petroleum products, ozone sources, engine exhaust, sanitary waste or cleaning solvents. Gaskets shall be used on a first-in-first-out basis.
6. During construction, pipe, fittings, valves and hydrants shall be placed as near as practical to the joint where it will be laid, with sufficient support so that neither end touches the ground and so that movement is prevented.

7. The Contractor shall provide proper and suitable tools for the safe and convenient handling and laying of pipes and fittings.
8. Pipe, fittings, valves and hydrants shall be handled and installed only by experienced workers with pipe laying experience.
9. The Contractor shall not operate valves. The Contractor shall contact Baltimore City to make arrangements for City personnel to open and close valves.

351.03.02 General Installation of Water Mains.

1. Clearing and grubbing and storage of removed materials shall be in accordance with Section 101 of these Specifications. Excavation, bedding and backfill shall conform with the manufacturer's recommendations for the type of pipe to be used. Pipes shall be well bedded on a solid foundation. The Contractor shall correct any defects in the pipe foundation due to settlement at his sole expense. Pipe shall not be allowed to rest upon rock. Excavation shall be by open cut except where and to such extent the Engineer permits, authorizes or requires that the Contractor excavate by tunneling. Bell holes shall be excavated large enough to insure the making of proper joints where bell and spigot pipe is used. No extra compensation is allowed for tunneling over the cost of open cut unless provided for in the bid item or negotiated by the Engineer. Generally, trenches may be excavated and refilled either by hand or by machinery as the Contractor chooses. However, the Contractor has no claim, and no extra compensation is allowed, if hand excavation or refilling is required to protect adjacent properties or improvements. If the bottom of the trench at subgrade is in unstable or unsuitable material, excavate to the depth ordered by the Engineer. Restore the trench bottom to subgrade with Selected Backfill. The Contractor shall not leave open a greater length of trench in any location in advance of the completed structure placed therein, than is authorized or directed by the Engineer. Trenches left open and unattended shall be properly secured.
2. The Contractor shall remove the paving only for such width as is necessary for the excavation of the trench as shown on Standard Detail Plate G-6. The County may retain from any monies due or to become due the Contractor the cost of permanently replacing paving removed under the following circumstances:
    a. Paving is removed to a width greater than is deemed necessary by the Engineer;
    b. Removing or distributing paving on account of settlement, slides or caves; or
    c. Removing or distributing paving as a result of excavation outside the lines of the work without written order of the Engineer.
3. Before beginning excavation for the new installation, the Contractor shall locate the connection to the existing utility by excavating for the end of the existing water main at the point of the proposed tie-in.
4. All pipe and fittings shall be inspected and approved by the Engineer prior to placement. Defective pipe shall be removed from the work site. Pipe shall be cleaned as directed by the Engineer prior to installation. Damaged coatings shall be repaired as directed by the Engineer in accordance with the manufacturer's recommendations.

5. Defective pipe discovered after installation shall be removed and replaced with sound pipe in accordance with direction from the Engineer. The Contractor shall be responsible to keep pipe clean during and after installation. Open ends of installed pipe shall be closed with watertight plugs when pipe installation is not in progress.
6. Sufficient backfill shall be placed to prevent pipe flotation of plugged pipe. The Contractor shall not install additional pipe sections until trench is clear of standing water.
7. Installed pipe shall have sufficient cover at all times to protect it from the equipment that will cross it. The Contractor shall replace pipe that, in the opinion of the Engineer, has been subjected to excessive loading at the sole expense of the Contractor.
8. Pipe shall be laid to the required horizontal and vertical locations as shown in the Contract Documents. The pipe shall be uniformly supported, bedded and backfilled along its entire length in accordance with approved Contract Drawings, Special Provisions and manufacturer's requirements.
9. The Engineer shall direct placement of additional fittings in addition to those shown on the Contract Drawings as required to avoid existing utilities or obstructions encountered when opening the trench.
10. Pipe may be cut only with approval of the Engineer. Cuts shall be made by machine and shall be at right angles to the axis of the pipe. When cut ends are to be used with a matching bell end, the cut ends shall be beveled to conform to the manufactured spigot end. Where applicable, cement lining shall be undamaged.
11. Joints shall be assembled in strict accordance with the manufacturer's recommendations and with applicable sections of AWWA Standard Specifications for the type of pipe used, except as modified by these Specifications.
12. "Springing" of bell and spigot joints in order to effect a change in direction is not permitted. Crimping of unrestrained pipe is allowed within the limits shown on Standard Detail Plate W-7.
13. The Contractor is responsible for the cost of replacing paving, surfacing or roadbeds that have failed or have been damaged at any time before the termination of the contract on account of work done by him. He must also bear the expense of resurfacing or repaving over any trench or tunnel excavation that settles.
14. If obstructions would hold up the work of laying pipe, the Contractor may, with permission of the Engineer, leave a gap and return to fill the gap following removal of the obstructions.
15. Any damage to existing utilities caused by the work shall be immediately repaired to the satisfaction of the Engineer at the Contractor's expense.
16. If the Engineer determines that the position of any pole, pipe, conduit or other structure requires its removal, realignment or change, it will be done as Extra Work or will be done by the owner of the obstruction without cost to the Contractor. As required, respective owners will brace their utility poles at no expense to the Contractor. Before removal and before and after realignment or change, the Contractor shall uncover, support and protect the structures in the limits of his trench at his expense as part of the

Contract. The Contractor is not entitled to any claim for damage nor extra compensation on account of the presence of the structure or on account of any delay in its removal or rearrangement.

17. Without extra compensation, the Contractor shall break through and reconstruct, if necessary, the invert or arch of any sewer, culvert or conduit he may encounter if the Engineer determines that the structure is in such position as not to require its removal, realignment or complete reconstruction. This work must be done so as not to interfere in any way with the flow of water or other liquid which the sewer, culvert or conduit is designed to carry.
18. Bolts on mechanical joints and tie rods shall be tightened to the manufacturer's specified torque value using a calibrated torque wrench in the presence of the Engineer. No other tools may be used for this purpose.
19. Full compaction shall be required for all trenches. See Section 300.03.04(h)(4) of these Specifications for compaction requirements.
20. At his own expense, the Contractor shall maintain refilled excavation in proper conditions as specified herein. Just before final restoration or final inspection, the Contractor shall give the trench surfaces a final reshaping where necessary.
21. At crossings with sewer mains, water pipe shall be as close to full length as practicable with both joints as far from the sewer (equidistant) as possible.

351.03.03 Ductile Iron Pipe. In addition to the general requirements referenced above, water main projects utilizing Ductile Iron Pipe shall include the following:

1. The gasket position in a **"push-on" joint** shall be verified immediately after making the joint and compressing the gasket by going completely around the circumference with a feeler gage. If the gasket isn't in the proper position, the joint must be pulled apart and reassembled using a new gasket.
2. All **push type joints with welded-on lock rings** shall be fully extended during installation.
3. **Push type joints with integral restraint gaskets** shall not be used to restrain pipe that has a thick coating or tape wrap on the outside diameter of the pipe. Such a coating or wrap shall be removed from the spigot end of the pipe before joint assembly. Coatings shall be no more than 6 mils thick on the spigot end of the pipe; tape wrap shall be removed or held back cleanly from the spigot end of the pipe. After the joint is pushed together, the joint shall be pulled apart slightly to ensure that the teeth of the locking segments bite into the pipe.
4. **Mechanical Joints:** The contractor shall ensure that the bells, spigots and rubber gaskets are free of foreign material before making up joints. To install, (1) position a cast iron gland on the spigot end of the pipe, then install a fully lubricated rubber gasket with tapered side facing the bell. (2) Fully insert the spigot into the bell and push the gasket flush with the face of the bell. (3) Place the gland against the face of the rubber gasket and insert and finger-tighten the bolts. (4) Draw the bolts up evenly on alternating sides, beginning at the top while making certain that the gland stays parallel

to the bell at all times. (5) Tighten all nuts uniformly to the manufacturer's specified torque.

5. Deflections to restrained joints utilizing either **ductile iron set screw retainer glands** or **ductile iron wedge-action retainer glands** shall be made after joint assembly but before tightening bolts.
6. **Fifteen degree deflection ball and socket joints**: See Contract Special Provisions.
7. Arrange **flanged joints** so that all bolt holes straddle a common centerline.
    a. Before assembly, verify that all flanged pipe and fittings to be joined together have the same bolt circle and bolt hole diameters; Class 125 flanges cannot be joined to Class 250 flanges.
    b. Clean flange faces prior to installing gaskets. Gaskets shall be assembled dry; do not use joint or gasket compounds with flanged joints. For large diameter gaskets, the gasket may be glued to the face of the flange to keep the gasket in place during joint assembly. Glue, if used, shall have no deleterious effect on the gasket and shall be NSF61 certified safe for contact with potable water.
    c. Install flanged joints by first bringing adjacent sections into alignment, inserting the bolts, and hand-tightening the nuts. Keep the gap between the flanges approximately uniform during tightening. Tighten the bolts to the torque recommended by the manufacturer in several steps, alternating from one side to the other. After joint completion, a minimum of one (1) complete bolt thread shall project beyond each nut.
8. **Flanged joint adapters:** See Contract Special Provisions.
9. **Grooved joints:** See Contract Special Provisions.
10. **Couplings**: Slide coupling over pipe ends after cleaning. Center coupling sleeve over pipe ends while maintaining manufacturer's recommended gap dimensions. Gradually tighten nuts to recommended torque in an alternating pattern to keep flanges parallel and to compress the gasket evenly. Pressurize the line to check for leaks and recheck bolt torque. Bolts shall not be over-torqued. Coupling shall be removed and re-installed if a leak persists following application of the recommended torque.

    Standard flexible couplings shall not be used to connect restrained joint pipe. Contact the Design Division of the Bureau of Engineering and Construction for coupling requirements when restrained joint pipe is involved.
11. **Tie rods** designed to restrain against axial pipe movement shall be installed parallel to the pipe axis. Tie rods designed to restrain pipe movement due to thrust generated by vertical or horizontal pipe deflections shall be installed perpendicular to the pipe axis to the fullest possible extent.
12. **Coat** all bare steel shapes, plates and bars with two (2) coats of heavy mastic containing synthetic elastomeric additives in a mixed solvent. The mastic shall bond firmly to dry, clean and contaminant-free steel surfaces (to be wire brushed before coating) without the use of a primer; shall have high electrical resistance; and shall be totally resistant to aliphatic hydrocarbons. Apply the first coat of mastic to a dry film thickness of 10-

12 mils. Allow this coat to dry for one hour, or until it is dry to the touch. Apply a second coat to the same dry coat thickness as the first. Backfill only after the second coat is dry to the touch.

13. **Provide** zinc-coated pipe when required by the Contract Documents. Handle the zinc-coated pipe in such a way as to avoid abrasion or other damage to the coating. Immediately notify the Engineer should abrasion or damage occur to the zinc coating; after which the Engineer will determine if the coating is repairable. Should the Engineer determine that the coating is repairable, the Contractor shall make repairs in accordance with approved manufacturer's recommendations. Unless indicated otherwise by the Engineer, paint used for repair of zinc coating shall meet ISO 8179 requirements with a minimum of 85-percent zinc in the dry film. See the Approved Source of Supply for a list of approved manufacturers.

351.03.04 Installing Tapping Sleeves for Iron Pipe.

1. Maintain a minimum separation of 24 inches from the near end of sleeve to adjacent joints or fittings.
2. Clean any dirt, corrosion, or foreign material from pipe.
3. Lubricate gasket and install sleeve.
    a. For ductile iron body mechanical joint sleeves, insert side gasket into back half of gasket grooves. Make sure ends are flush with or slightly protrude into the end gasket seating area. Bolt sleeve halves together and trim side gaskets as necessary. Make sure sleeve will rotate freely on pipe. Install end gaskets, locating cut ends 90-degrees from side gasket. If pipe outer diameter is at the maximum of the sleeve range, stretch gasket to make certain cut ends match with no gap in between. Install glands and bolts and rotate sleeve to desired position, making sure pipe is centered inside the sleeve.
    b. For stainless steel body full circumferential band sleeves, lubricate the pipe and gasket with a thin coating of pipe joint lubricant. Place the saddle section of the sleeve on the pipe and lightly lubricate the outside surface of the exposed gasket. Mate the band section with the saddle section on the pipe making sure that the tapered ends of the gasket are not folded or rolled against the pipe. Make sure no foreign material is trapped between the pipe and the gasket. Loosely install the lug bolts, position the sleeve, and hand tighten the nuts to hold the sleeve in place.
    c. For epoxy-coated fabricated steel tapping sleeves, lubricate the pipe and gasket with a suitable gasket lubricant. Place the outlet half of the sleeve on the pipe and move into position. Do not slide outlet half of sleeve around pipe. Make sure that the gasket is correctly positioned and that no foreign material is trapped between the pipe and the gasket. Bring the back half of sleeve into position and insert the bolts. Install washers (plastic first and then steel) and nuts.
4. Tighten sleeve bolts in accordance with manufacturer's recommendation using a torque wrench that has been properly calibrated.

a. For ductile iron body mechanical joint sleeves, tighten gland bolts using an alternating pattern. (If subsequent pressure testing indicates additional tightening is required, release pressure and relax tension on gland bolts before tightening side bolts. Retighten side bolts and then retighten gland bolts.)

b. For stainless steel body full circumferential band sleeves, begin tightening the bolts on alternating sides and moving from inside bolts to outside bolts. Make sure the gap between the sleeve sections is equal on top and bottom and equal from end to end. Do not attempt to apply all the torque to the bolts in one occurrence; instead, tighten all the bolts several times with incremental torque settings, up to the recommended torque. (If subsequent pressure testing indicates additional tightening is required, relieve the pressure and retighten the bolts to the recommended torque.)

c. For epoxy-coated fabricated steel tapping sleeves, tighten nuts uniformly to the manufacturer's recommended torque. The gap between sleeve halves should be equal on both sides and from end to end when the nuts are fully torqued. Do not attempt to apply all the torque to the nuts in one occurrence; instead, tighten all the nuts several times with incremental torque settings, up to the recommended torque. (If subsequent pressure testing indicates additional tightening is required, relieve the pressure and retighten the nuts to the recommended torque.)

5. Install tapping gate valve to sleeve using the appropriate gasket, nuts, and bolts. Apply blocking to support the valve's suspended weight, as shown in Standard Detail Plate W-9. The tapping sleeve and valve flanges shall mate properly to ensure a straight centerline axis.

6. Test the valve and sleeve assembly using the tapping sleeve test port. Using potable water as the test medium, bring the pressure up to the test pressure indicated by the Contract Documents and hold for a period of 5 minutes. No leakage shall be permitted during the test period.

7. After attaching the sleeve to the existing main, but prior to making the tap, disinfect all surfaces to be in contact with potable water by swabbing with a 50 ppm chlorine solution.

8. Attach the drilling machine to the tapping valve and provide proper mating and alignment between the valve and the machine by using blocks and shims secured in place.

9. Perform the tap. Stresses induced during tapping may relax bolt torque; recheck tapping sleeve bolt torque and recheck torque on bolts connecting sleeve and valve. Tapping equipment shall be supported so that the sleeve does not support the weight of the equipment.

10. Provide buttress in accordance with Standard Detail Plate W-4.

11. Make connection between new main and tapping valve. To prevent undue stress on the tapping sleeve and valve assembly, the new main shall be installed such that it rests on a well-compacted bed with its centerline axis matching the centerline axis of the tapping valve.

12. Provide valve vault in accordance with the appropriate Standard Detail Plate (W-9 or W-10) and the requirements of Section 352.03.03 of these Specifications.

351.03.05 Steel Pipe. In addition to the general requirements referenced above, Steel Pipe for water main projects shall be installed in accordance with the requirements of AWWA C206 and C604 and the guidelines of AWWA Manual M11 except as modified by the Special Provisions provided by the Design Division of the Bureau of Engineering and Construction.

351.03.06 Prestressed Concrete Cylinder Pressure Pipe. In addition to the general requirements referenced above, water main projects utilizing Prestressed Concrete Cylinder Pressure Pipe shall be installed in accordance with the guidelines given in AWWA M9 except as modified by the Special Provisions provided by the Design Division of the Bureau of Engineering and Construction.

Tapping Sleeves for PCCP: Per manufacturer's recommendations.

351.03.07 High Density Polyethylene (HDPE) Pipe and Fittings. In addition to the general requirements referenced above, water main projects utilizing High Density Polyethylene Pipe and Fittings shall be constructed in accordance with the guidelines given in AWWA M55 and those Special Provisions provided by the Design Division of the Bureau of Engineering and Construction.

351.03.08 Connections. The Contractor shall make connections to existing work when and as directed by the Engineer. On being notified by the Engineer, the Contractor shall notify the consumers in the area to be affected by the shut-off. Baltimore City forces shall operate all valves involved in the work. The Contractor must complete the connections with the greatest possible speed in order to minimize public inconvenience. When the Contract Documents require that connections be made at night and/or during the weekend, the cost to make such connections shall be included in the original Price Bid and no additional compensation will be provided. Should night and/or weekend work requirements not be specified in the Contract Documents, and it becomes necessary for the Contractor to make connections at night and/or during the weekend as directed by the Engineer, the Contractor will be allowed extra compensation for such Work. If the Contractor has to remove existing buttresses in order to make connections, he shall do this work without additional compensation.

351.03.09 Buttresses, Anchorages and Thrust Blocks. Where restrained joints are not used, place buttresses behind all caps, horizontal bends and branches unless otherwise directed by the Engineer. Anchorages shall be placed beneath vertical bends. Place thrust blocks at reducers, as required by the Contract Documents. Buttresses, anchorages and thrust blocks must be of concrete and steel, as required. Extend them to solid, undisturbed soil and construct in accordance with the Standard Details or as shown on the Contract Drawings. The Contractor shall coat bare steel in accordance with the requirements of Section 351.03.03, item 12.

351.03.10 Chlorination, Bacteriological, Hydrostatic and Leakage Tests.

(a) Responsibility.

(1) Engineer. The Engineer will perform the chlorination and bacteriological tests on new water main installations, relined water mains and bypass water mains before connecting them to the existing structures. He will determine the amount of main to be chlorinated and tested at any one time and he may separate the installation into several sections for long extensions or installations of pipe designed for different head conditions or for other reasons.

(2) Contractor. The Contractor shall perform the hydrostatic and leakage tests on all new water main installations.

(b) Water Samples. Baltimore City Bureau of Water and Wastewater will perform bacteriological testing for the disinfection of water mains and storage facilities according to ANSI/AWWA C651, Sections 5.1.1, 5.1.2, 5.1.4 and 5.2. Two consecutive sets of samples shall be taken at least 24 hours apart and deemed acceptable by bacteriological standards before a water main or storage facility can be placed into service.

The Engineer will collect water samples and provide for their analysis for bacteriological quality. Samples must arrive at the Water Quality Lab no later than 6 hours after being taken. Because bacteriological analyses will be run on samples received in the lab by 1:00 PM, all field sampling must be completed by 12:00 Noon. Results will be available after 3:00 PM the following day, as the results require a full 24-hour incubation period.

(c) Requests for Testing. Requests for chlorination and bacteriological testing of new water mains shall be made to the Bureau of Engineering & Construction (Division of Construction Contracts Administration), Department of Public Works and Transportation, at least 3 working days before the date of the test (3 days notice in advance of actually charging water main). The hydrostatic test is conducted under the supervision of the Maintenance Division, Baltimore City Department of Public Works, and the Contractor must notify them that the tests are to be made.

(d) Temporary Stopping. At his cost and expense, the Contractor shall furnish all necessary bulkheads, caps, plugs, or other fittings required to temporarily isolate the main for test purposes. After the main is satisfactorily tested according to the requirements of the Specifications, the Contractor must remove the buttresses and caps and connect the new main with the existing main by sleeves and spacers.

(e) Discharge of Hydrous Solution. Discharge a hydrous solution of hypochlorite of lime or chlorine gas into the main near the point where the main is charged using the **continuous-feed method** found in AWWA C-651. This solution shall be of such strength and quantity as necessary to provide a minimum residual of 10 parts per million by weight of free chlorine everywhere along the main after a contact duration of 24 hours. If the required residual is not obtained, the Contractor shall repeat the chlorination process until he obtains this residual.

(f) Hydrostatic and Leakage Tests. While the main is filled with water, the Contractor shall raise the pressure at the lowest point in the main to the Test Pressure, as specified on the Contract Drawings, not exceeding this amount by more than 10%. All mains shall be subjected to the Test Pressure for 30 minutes duration.

(1) To pass the leakage and pressure tests, all mains with a nominal diameter of 24 inches and less (regardless of pipe material or joint type) and all welded steel pipe and all fused plastic (HDPE, or PVC if allowed per Contract) pipe, are required to maintain the test pressure, without the addition of water, for the 30-minute duration.

(2) Mains with a nominal diameter greater than 24 inches and incorporating gasketed joints passing the 30-minute hydrostatic test without the addition of water have passed the leakage and pressure tests.

(3) All mains with a nominal diameter greater than 24 inches and incorporating gasketed joints that are unable to maintain the Test Pressure for the 30-minute duration, without the addition of water, shall be retested over a 24-hour duration. To pass the leakage and pressure tests, the Test Pressure shall be maintained over the entire 24-hour duration; and water may be added at a rate not to exceed 10.0 gallons per inch of nominal diameter per mile of pipe. (Note: Contact the Design Division of the Bureau of Engineering and Construction for the allowable addition of water if large diameter ductile iron pipe is to be tested at a Test Pressure other than 150 psig.)

(4) If the test requirements were not met within the time frames set above, the Contractor shall make any repairs necessary, at his own expense, to remedy the defects and to retest the main as specified.

(g) Flushing. After successfully passing the 24-hour (minimum) disinfection period and the hydrostatic and leakage tests, the Contractor shall flush the water main until the chlorine residual is comparable to the source of the water.

(1) It shall be the responsibility of the Contractor to properly dispose of any water containing chlorine. No water containing measurable chlorine residual may be released, directly or indirectly, into any stream. The Contractor shall submit a proposed plan for the method of disposal or neutralization of chlorinated water to the Engineer for approval prior to proceeding.

(2) Following the flushing procedure, the Contractor shall assist the Engineer in obtaining water samples for bacteriological analysis.

(h) Tying In. Once the main has passed the bacteriological standards determined by Baltimore City's Water Quality Lab and they release the main for active service, the Contractor shall make the necessary connections, as shown on the Contract Drawings, to tie the main into the distribution system and install services.

(i) Labor and Equipment. The Contractor shall furnish all labor, water, material, and equipment necessary for making the tests and chlorinating the mains.

351.03.11 Installing Polyethylene Encasement for Ductile Iron Pipe and Adjacent Copper Supply Lines.

(a) Ductile iron pipe with polyethylene encasement shall be installed in accordance with the recommendations given in AWWA C105 and AWWA M41 and as shown on Standard Detail Plates W-35A and W-35B. Unless directed otherwise by the Engineer to suit unique conditions, the Contractor shall comply with AWWA's *Modified Method A: Wet Trench Conditions* requirements for all polyethylene encasement. All installations shall be carried out by personnel trained and equipped to meet these various requirements.

(b) Polyethylene wrap shall be overlapped one foot in each direction at joints and secured in place around the pipe. Any wrap at tapping locations shall be taped tightly prior to tapping and inspected for any needed repairs immediately following the tapping procedure.

(c) Polyethylene encasement for ductile iron pipe generally is used in combination with insulating corporation stops and zinc coating on the exterior of the pipe. To further prevent stray electrical currents from coming into contact with the ductile iron pipe, polyethylene encasement shall be provided along the service saddle (when utilized), corporation stop, and adjacent first three (3) feet of copper supply piping. Properly seal polyethylene encasement at both ends of 3-foot copper pipe section with two (2) layers of adhesive tape.

(1) See Section 353.03.03.4 for requirement to cut back polyethylene encasement at service saddles.

(2) As an alternative to extending polyethylene encasement three (3) feet along the copper supply line, the Contactor may wrap the adjoining first three (3) feet of copper supply piping with pipe wrap tape (see Section 351.03.12).

(d) Where polyethylene-encased ductile iron pipe joins iron pipe that is not polyethylene-encased, extend the polyethylene encasement a minimum distance of three (3) feet along the iron pipe, thoroughly covering the pipe in the process. Secure the end of the polyethylene encasement with adhesive tape.

(e) Provide photographic documentation of polyethylene encasement installation per Section 300.03.07. In the event photographic documentation depicts improper installation and/or damaged polyethylene encasement, the Engineer will direct the Contractor to effect repairs at the identified locations at no additional cost to the County.

(f) The installing Contractor shall submit an affidavit stating compliance with the requirements and practices of AWWA C105, AWWA C150, AWWA C151, AWWA C600, and AWWA M41.

351.03.12 Installing Pipe Wrap Tape Extending Along Copper Supply Lines.

(a) Copper supply lines connected to ductile iron pipe with insulating corporation stops shall be wrapped with pipe wrap tape as allowed by these Standard Specifications.

(b) Clean surface to receive pipe wrap tape in accordance with manufacturer's recommendations. Surface shall be free of frost and moisture.

(c) Start applying pipe wrap tape at outlet of corporation stop and extend along copper supply line a minimum of three (3) feet from the ductile iron main. Apply tape by spiral wrapping with a minimum overlap of one (1) inch.

351.03.13 Installing External Coating Systems for Insulating Flanges and Insulating Corporation Stops.

(a) It is not the intent of these Standard Specifications to provide thoroughly descriptive corrosion control requirements; instead, extensive corrosion control requirements shall be provided in Special Provisions unique to each Contract. Regardless, the Contractor shall carefully align and install the insulating components according to the insulator manufacturer's recommendations. Additionally, the Contractor shall test each insulator for electrical isolation prior to coating.

(b) Insulating flanges and insulating corporation stops shall be fully coated for a minimum of 12 inches on either side of the flange, saddle (if used), or corporation stop.

(c) Clean the surface of the insulator and all of its components by power tool cleaning in accordance with the Society for Protective Coatings (SSPC) SP#3 (*Surface Preparation Specification No. 3, Power Tool Cleaning*). Follow all surface preparation recommendations of the coating manufacturer.

(d) Apply a uniform coat of the primer to the external surface of the insulator and all of its components including, but not limited to, bolts, nuts, and washers. The primer shall extend the full width of the coating (12 inches on either side of the insulator) and shall extend a minimum of 12 inches along the copper supply line.

(e) Apply filler mastic to all irregular surfaces of the insulator so that a smooth profile is obtained prior to application of the inner tape coating.

(f) Apply innerwrap to the insulator and its components in a spiral fashion with a minimum overlap of fifty-five percent (55%). The innerwrap shall extend the full width of the coating (12 inches on either side of the insulator) and shall extend a minimum of 12 inches along the copper supply line.

(g) Apply outerwrap to the insulator and its components in a spiral fashion with a minimum overlap of one (1) inch. Outerwrap shall cover the innerwrap completely. The outerwrap shall be applied with sufficient tension to provide continuous adhesion of the outerwrap tape.

351.04 MEASUREMENT AND PAYMENT. Measurements for payment are made horizontally along the centerline of the trench through all fittings and valves except between vertical bends where measurement is made along the center of the pipe, including all fittings. The list of pipe fittings shown on water drawings is for convenience only. In case of discrepancy between the list of pipe fittings and the drawings, the drawings will govern.

Water Mains are paid for at the contract unit price per linear foot for the particular size and type of pipe specified on the Contract Drawings or directed by the Engineer. The contract price bid shall include: cutting of paving; unclassified excavation and refill; furnishing and placing backfill in the pipe embedment zone; removal, storage and rehandling of excavated material; bracing; pumping and other disposal of water; furnishing and placing of pipe, furnishing and installing polyethylene encasement (including documentation); concrete anchors, buttresses, fittings and appurtenances exclusive of valves, vaults and fire hydrants; contract tie-in operations; chlorination and field testing; and all labor, equipment and work necessary to complete the item.

The excavation and the refill necessary to locate the end of an existing water main for a tie-in shall be paid for as part of the fixed price contingent items for ***Test Pit Excavation***.

No separate measurement and payment will be made for: Polyethylene Encasement for Ductile Iron Water Mains, the required overlapping, any necessary wrapping or repair, or photographic documentation. These items shall be considered incidental to the water main bid item.

SECTION 352 – WATER VALVES AND VAULTS

352.01 DESCRIPTION. This item consists of placing water valves with appurtenant enclosures and access provisions in water mains at the locations specified on the Contract Drawings or as directed by the Engineer according to these Specifications.

352.02 MATERIALS. References to sections on concrete, masonry, reinforcement and casting:

Valves	905.07

352.03 CONSTRUCTION METHODS.

352.03.01 Delivery, Storage, Handling and Operation. See Section 351.03.01.

352.03.02 General. Refer to Section 351.03 and the following:

352.03.03 Vaults Around Valves.

(a) General. Erect and construct vaults around all valves according to the Standard Detail Plates or Contract Drawings. Precast concrete vaults as shown on the Standard Detail Plates are to be used unless otherwise noted on Contract Drawings or directed by the Engineer.

(b) Valves 8" and Smaller. When permitted or directed by the Engineer, erect small sectional or monobase concrete vaults around valves 8 inches in diameter and smaller.

(c) Valves 10" and 12". When permitted or directed by the Engineer, erect large sectional or monobase concrete valve vaults around 10- and 12-inch valves. Mortar concrete vault sections together and brick up pipe openings on the outside of the vault, using half brick set in mortar.

(d) Valves 16", 20", 24" and 30". Construct built-in-place vaults or fabricate and install precast concrete vaults around valves larger than 12 inches. Pipe layouts must be such that a bell end joint falls within 12 inches of the outside face of the vault with the bell end looking out.

The placement and consolidation of the required bedding under the unit shall be a minimum 6 inches of No. 57 aggregate unless otherwise directed by the Engineer.

352.03.04 Valve Installations (General).

1. All butterfly valves and all vertical, horizontal, and tapping gate valves, 16 inches in diameter and greater, shall be tested by Baltimore City before their installation in the pipeline. Baltimore City shall check the direction of opening, the number of turns to open/close, and freedom (apparent torque) of operation. The Contractor shall contact Baltimore City as soon as the valves arrive at the job site or local (i.e., Baltimore City or Baltimore County) storage yard. The Contractor shall not be entitled to any compensation for loss of production should it be determined that valves are unacceptable. Valves found to be unacceptable shall be repaired or replaced and shall be retested before installation. Under no circumstances shall the Contractor modify and/or repair in place valves that have failed the Baltimore City test.
2. In no case shall valves be used to bring misaligned pipe into alignment during installation.
3. Valves initially shall be installed in the closed position. Valves shall be installed with the valve stem perpendicular to the finished road or finished ground surface, as applicable.
4. Following installation, the Contractor shall provide to the Engineer "as built" survey data as described in Section 300.03.01(a) for each valve installed.

352.03.05 Installing Gate Valves.

1. Install gate valves in accordance with the *Standard Details for Construction* and at the locations shown on the Contract Drawings or as directed by the Engineer. Orient gate valves as follows:
   - Gate valves 12 inches in diameter and smaller: in the vertical position.
   - Gate valves 16 inches in diameter and larger: in vertical or horizontal position as shown or described in the Contract Documents.
2. All gate valves 4 inches in diameter and larger shall be housed in valve vaults; roadway boxes are not acceptable for use at gate valves unless expressly approved by the Engineer.

a. The operating nut for the valve shall be readily accessible for operation through the opening in the top slab of the valve vault.

b. The top slab shall be set in accordance with the *Standard Details for Construction*.

c. Backfill around valve vaults in paved sections shall be in accordance with Standard Detail Plate G-2.

3. Every gate valve shall be properly supported so that the adjacent pipe is not required to support the weight of the valve. All adjacent pipe shall be properly supported so that no loading is transferred to the gate valve.

4. All inline (non-tapping) gate valves, 16 inches in diameter and greater, shall have 1-inch corporation stops suitable for pitometer use installed on each side of the gate valve, as shown in the *Standard Details for Construction*.

5. After installation, but prior to pressurization of the valve, the Contractor shall use a calibrated torque wrench, adjusted to the manufacturer's recommendations, to inspect all pressure-containing bolting (bonnet, seal plate, packing gland, and end connections).

352.03.06 Installing Butterfly Valves.

1. All butterfly valves shall be housed in valve vaults; butterfly valves shall not be direct buried. All butterfly valves operated using an AWWA operating nut shall be oriented during installation so that the valve shaft is horizontal and the operating nut is vertical.

2. All butterfly valves shall be provided with an access assembly immediately adjacent to the valve. See Section 905.07.03(d), item 3 for specific requirements.

3. Provide a concrete foundation or support under all butterfly valves. Width of foundation or support is to be determined by the Engineer. Provide a 1/8-inch thick felt bond breaker between the valve body and the concrete.

4. Provide pipe supports under valve inlet and valve outlet piping as near to the valve as practical or as directed by the Engineer. Piping, including any access assemblies, shall be supported independently of the valve.

5. Install the butterfly valve such that the seat-adjustment side is adjacent to the access.

6. Prepare pipe ends and install valves in accordance with the pipe manufacturer's instructions for the joint used.

7. The Contractor shall demonstrate to the Engineer that valve, valve appurtenances, and vault have been installed properly. Also, the Contractor shall demonstrate to the Engineer that the operating nut, along with all appropriate appurtenances, is fully accessible from above.

8. Following installation, the Contractor shall arrange to pay for the Field Certification described in Section 905.07.03(a).

352.03.07 Installing Tapping Gate Valves.

1. Tapping gate valves 12 inches in diameter and smaller: install in the vertical position.
2. Tapping gate valves 16 inches in diameter and larger: install in vertical or horizontal position as shown or described in the Contract Documents.
3. Tapping iron pipe: See Section 351.03.04.
4. Tapping PCCP: See Section 351.03.06.

352.03.08 Installing Valve Extension Stems and Stem Guides.

1. Attach stem guides to vault walls using stainless steel expansion anchors with a minimum embedment length of 4 inches. Number and diameter of bolts shall be as recommended by the stem guide manufacturer.
2. Use a set screw to secure the female socket coupling to the valve operating nut.
3. Extension stems and stem guides shall be accurately aligned to eliminate distortion and undue stress.
4. Extension stems and stem guides shall be oriented such that they do not hinder access to the vault interior.
5. Payment for valve extension stems and stem guides shall be included in the price paid for valve and vault. Payment for valve and vault shall not be made until the Contractor demonstrates to the Engineer that valve extension stems and stem guides function properly and with minimum effort.

352.03.09 Replacing Existing Gate Valves.

1. General: See Sections 351.03, 352.03.03, 352.03.04 and 352.03.05.
2. Work shall consist of removing existing gate valves located along ductile or cast iron water mains and replacing them with new gate valves at the same locations. For information and requirements regarding replacement of gate valves along PCCP mains and replacement of tapping gate valves, contact the Design Division of the Bureau of Engineering and Construction.
3. For gate valves installed in pre-cast vaults per Standard Detail Plates W-14, W-14A, W-14B, W-14C, W-15, W-15A, W-15B and W-15C, the Contractor shall:
    a. cut and remove existing pipe on one side of the existing valve as required to remove valve, and remove the valve vault in its entirety;
    b. remove concrete grade rings or masonry as applicable;
    c. provide new pipe stub and gate valve;
    d. restrain gate valve to both the adjacent existing main and the new pipe stub;
    e. provide new restrained coupling to connect new pipe stub to outboard (far side) existing main;

f. provide a new valve vault and new concrete grade rings or masonry as applicable.

g. salvage existing frame and cover and reinstall on new valve vault.

With approval of the Engineer, the Contractor may substitute sleeve and spacer with ductile iron wedge-action retainer glands on each end for the required restrained coupling.

4. For gate valves installed in cast-in-place vaults per Standard Detail Plates W-16, W-16A and W-17 or as shown on the Contract Drawings, the Contractor shall:

   a. remove and safely store the top slab, frame and cover safely away from the work area;

   b. remove concrete grade rings or masonry as applicable;

   c. cut and remove the existing pipe on one side of the valve as required to remove the valve, without damaging the vault;

   d. remove the valve and the brick pier under the valve;

   e. provide and install new pipe stub and gate valve;

   f. restrain gate valve to both the adjacent existing main and the new pipe stub;

   g. provide new restrained coupling to connect new pipe stub to outboard (far side) existing main;

   h. provide new brick pier under new valve;

   i. remove any pre-molded expansion joint material disturbed by valve replacement and provide new pre-molded expansion joint material per Section 911.02;

   j. re-install top slab using new joint sealer per Section 911.01 between top slab and vault walls;

   k. provide new concrete grade rings or masonry as applicable.

   l. re-install existing frame and cover.

      (1) With approval of the Engineer, the Contractor may substitute sleeve and spacer with ductile iron wedge-action retainer glands on each end for the required restrained coupling.

      (2) Where the existing valve is supported by a cast-in-place concrete pier, and the pier is sound and compatible with the replacement valve, the pier may remain in place. The Contractor shall install new roofing paper per Section 911.07 as a bond-breaker between valve and pier.

      (3) As part of gate valve replacement, the Contractor is permitted to remove one existing pitometer corporation as shown on the referenced Standard Detail Plates. If both pitometer corporations are damaged or removed by replacement operations, the Contractor shall replace one pitometer corporation at no cost to the County.

5. Existing vertical gate valves shall be replaced with new vertical gate valves. Existing horizontal gate valves shall be replaced with new horizontal gate valves.

352.04 MEASUREMENT AND PAYMENT. ***Gate Valve and Vault – Vertical; Gate Valve and Vault – Horizontal; Butterfly Valve and Vault; Tapping Gate Valve and Vault, Vertical; Tapping Gate Valve and Vault, Horizontal;*** *and* ***Replace Existing Gate Valve*** are measured on the basis of the number of each type and size built or replaced as shown on the Contract Drawings or as directed by the Engineer.

Valves and vaults are paid for at the contract unit price bid per Each for the particular type and size installed or replaced, which price shall include all unclassified excavation and refill; removal, storage and re-handling of excavated material; bracing; pumping or other disposal of water; pitometer corporations; and all materials, tools and labor necessary to complete the item.

1. For tapping gate valves, price shall also include cost to measure diameter of parent pipe prior to tapping; cost of furnishing and installing tapping saddle; cost of tapping operations and equipment; pressure testing; disinfection; and all costs associated with hiring tapping specialists and/or pipeline representatives. Test pits for accessing the parent pipeline prior to tapping to determine pipeline diameter and location of existing joints and fittings shall be paid for as part of the fixed price contingent items for ***Test Pit Excavation*** and shall be performed only with the prior approval of the Engineer.
2. For replacing existing gate valves, price shall also include the pipe stub, restrained joints, restrained coupling or equivalent, cutting and removal of existing pipe, preparation of existing pipe for re-connection, rigging and all vault work.

Payment for butterfly valves and vaults installed shall not be made until all items have been demonstrated in the presence of the Engineer to function properly and the Engineer has accepted the Field Certification.

Payment for gate valves and vaults installed, payment for tapping gate valves and vaults installed, and payment for replacing existing gate valves shall not be made until the Contractor demonstrates to the Engineer that each valve and vault has been installed properly and the operating nut is fully accessible from above.

SECTION 353 – WATER HOUSE SERVICES, WATER METER SETTINGS, AND VAULTS

353.01 DESCRIPTION. This item consists of copper or ductile iron pipes with appurtenant meter housings and connections to the parent main, of the diameter shown on the Contract Drawings, arranged and constructed according to the Standard Detail Plates and these Specifications, and located as shown on the Contract Drawings or as directed by the Engineer.

353.02 MATERIALS.

Ductile Iron Pipe	905
Copper Pipe	905
Cast Iron Frames & Covers	905
Meter Vaults	905

353.03 CONSTRUCTION METHODS.

353.03.01 Delivery, Storage, Handling and Operation. See Section 351.03.01.

353.03.02 Installing Water Services and Water Meter Settings (2 inches and smaller).

1. All services shall be laid to the grade and lines in accordance with the Contract Documents or as directed by the Engineer.
2. All meter vaults shall be set at the location shown in the Standard Detail Plates, unless directed otherwise by the Engineer.
3. Special care shall be taken to insure that the service lines are well bedded on a solid foundation. Extreme care shall be taken during installation to ensure that copper tubing is not crimped, gouged or otherwise detrimentally damaged. Copper tubing shall not be installed near sharp stones or ledge that could cause damage to the tubing. The Contractor shall repair any defects resulting from settlement at the Contractor's expense.
4. Copper tubing between tap and water meter (or factory-assembled meter setting) shall be installed as one continuous length of tubing (no intermediate joints or connections), unless otherwise approved by the Engineer. Similarly, copper tubing between water meter and cap or plug at service end shall be installed as one continuous length of tubing.
5. Copper tubing shall be installed without sharp turns or bends. Smooth vertical bends are required for installations shown in Standard Detail Plates W-21, W-22, W-23, W-24, W-24A, W-25, W-26, W-26A, W-32, and W-33. Smooth horizontal bends are required for installation as shown in Standard Detail Plate W-28A. Contractor shall have available and shall utilize a pipe bending mandrel to bend copper tubing at no additional cost to the County, if so directed by the Engineer.
6. Only proper tube cutters shall be used to cut copper tubing; hacksaws and other similar equipment that result in rough edges are strictly prohibited.
7. Flared connections shall be provided only where indicated in the Standard Detail Plates. Contractor shall prepare the tubing end to be flared by using a reamer to remove burrs from the inside of the tubing. Then the Contractor shall utilize a flaring tool to create the flare on the end of the tubing.
8. Compression type couplings shall be provided where indicated in the Standard Detail Plates or as directed by the Engineer. Copper tubing ends to receive compression couplings shall be properly prepared to ensure strong, water-tight connections.
    a. Contractor shall de-burr copper tubing ends using tools designed for the work.
    b. Contractor shall re-round copper tubing ends using proper rounding tool.

9. Soft set pipe thread compound shall be used on all threaded connections to ensure a drip tight seal. Pipe thread compound shall be NSF61 approved for contact with potable water.
10. Only smooth jawed wrenches are permitted to tighten fittings and connections.
11. Water service connections may be installed by open-cut or by boring at the Contractor's option except when a method is specified by the Engineer.
12. All pipe and fittings shall be thoroughly cleaned before being installed and shall be kept clean until acceptance of the completed work.
13. All services shall be thoroughly flushed with potable water in the presence of the Engineer.
14. All service ends not immediately connected to house service shall be provided with either a cap or plug (see Standard Detail Plates) to prevent any foreign matter from entering the pipe. The Contractor shall mark the end of each water service not immediately connected to house service by providing a 2" x 6" wood post painted with blue paint. Post shall be approximately 4 feet long and driven into the ground approximately 18 inches.
15. Meters and meter settings shall be installed level and with the long axis of the meter installed perpendicular to the curb and gutter (existing or proposed) or edge of pavement (existing or proposed). Where the meter or meter setting is remote from the roadway, the long axis of the meter shall be aligned with the centerline of the water service.
16. Meter vaults shall be installed in non-traffic areas only; do not locate in driveway unless otherwise noted on the Contract Drawings or directed by the Engineer.
17. All meter vaults shall be bedded on firm undisturbed earth in combination with bricks or pre-cast vault bottom sections. Meter vaults shall be installed level. For circular meter vaults, vaults shall be centered over meter valves and fittings such that there is a uniform gap between meter valves and fittings and the inside surface of the vault. In no case shall any vault be installed such that the inside surface of the vault is in direct contact with any meter valve, fitting, or tubing.

353.03.03 Installing Corporation Stops.

1. General
    a. Protect the threads on corporation stops at all times.
    b. Use a good thread sealant on the inlet threads to provide a leak-proof connection. Petroleum-based products that might damage seals or o-rings are strictly prohibited.
    c. Use only a smooth jawed wrench to handle the corporation stop. Grip the corporation stop by using the flats provided nearest the thread being installed. Pipe wrenches with serrated jaws are strictly prohibited and shall be cause for rejection of the corporation assembly.

2. Orientation and Location

    a. Corporations used in service connections:

        1) ¾-inch and 1-inch corporations used for non-insulating water service connections to either iron pipe or PCCP shall be installed at a 45-degree angle up from the horizontal.

        2) 1.5-inch and 2-inch corporations used for non-insulating water service connections to either iron pipe or PCCP shall be installed at a 45-degree angle up from the horizontal, or subject to approval by the Engineer, may be installed horizontally at the springline.

        3) All corporations used for insulating water service connections (¾ inches to 2 inches) to either iron pipe or PCCP shall be installed as described above for non-insulating water service connections.

        4) For all connections, maintain a minimum separation (as measured along the pipe centerline) of 18 inches between other service connections or pipe joints.

        5) For service connections to other pipeline materials, consult the Design Division of the Bureau of Engineering and Construction.

    b. Corporations used in pitometer, pipeline monitoring, blow off, or air release applications shall be installed in the vertical position.

    c. Corporations used to install small domestic meters in FM meter vaults shall be installed in the horizontal direction, unless directed otherwise by the Engineer.

3. All connections to the water distribution system shall be made under full water service pressure unless otherwise approved by the Engineer. Install corporation taps in water mains only after they are chlorinated and tested according to Section 351.03.10.

4. Tapping pipe shall be performed using a tapping machine specifically designed for that purpose. Follow tapping machine instructions and these Specifications.

    a. Threaded Service Connections up to 2 Inch Diameter for Iron Pipe:

        1) Use a service saddle to tap the pipe where required by the Standard Detail Plates.

        2) For applications utilizing a service saddle, begin assembly by cleaning pipe surface thoroughly. For polyethylene-encased pipe this means cutting back the polyethylene encasement immediately adjacent to the service saddle. For bonded coated pipe, this means removing the bonded coating, including all adhesive, immediately under the body of the saddle. In all cases, the gasket on the underside of the saddle shall come into direct contact with the surface of the pipe.

            i. Mount the saddle on the pipe with the outlet in the required orientation. Using a calibrated torque wrench, tighten the saddle nuts in accordance with the manufacturer’s recommendation.

ii. Install the corporation. After installation, recheck the saddle torque and retighten as necessary.

3) Tapping iron pipe with either a combination of polyethylene encasement and zinc coating, or with bonded coating, requires special procedures to protect the polyethylene encasement/zinc coating or bonded coating. Regardless whether a service saddle is used or not, tapping machines used in these applications shall be secured to the pipe using wide belt slings, heavily padded chains, or by inserting several layers of asphalt mastic board between the coated/encased pipe and the chains. Under no circumstance shall chains or other metallic securing devices be allowed to come into direct contact with the coated/encased pipe.

4) Corporation stop shall be assembled with the tapping machine until it feels solid; do not attempt to force the corporation stop to its permanent tightness with the tapping machine. After tapping the pipe, remove the tapping machine and provide final tightening of the corporation stop using an appropriate wrench.

b. Threaded Service Connections up to 2 Inch Diameter for PCCP:

1) Consult the Design Division of the Bureau of Engineering and Construction to determine the approximate static pressure in the pipe to be tapped.

2) Nuts and bolts shall be tightened to the manufacturer's recommended torque value only with a torque wrench that has been calibrated to the satisfaction of the Engineer.

3) Expose the pipe at the location where the tap is to be made. Maintain a minimum separation of 18 inches from the near end of any joint band or fitting to the tap location.

4) Remove the cement mortar coating from an area slightly larger than the base of the tapping assembly gland to expose the prestressing wires and steel cylinder. Be sure that there is no cylinder weld seam in the area where the saddle gasket will seat.

5) Cut and remove prestressing wires from the opening in the mortar coating, taking care not to damage the steel cylinder. Remove any dust or debris from the exposed steel cylinder.

6) Position the saddle with inserted outlet bolts over the hole in the coating. Secure the saddle around the pipe in accordance with the manufacturer's recommendations.

7) Install the gland gasket, the gland and the outlet nuts. Tighten the outlet nuts to the recommended torque in an alternating pattern in accordance with the manufacturer's recommendations to attain a seal between the cylinder and gland gasket. The outlet nuts shall not be tightened beyond the recommended torque values.

8) Tighten the corporation stop into the gland. Perform a pressure test to ensure that the seal is water-tight. Test pressure shall be equal to the greater of either the approximate static pressure or 75 psi.

9) Connect the tapping machine to the corporation stop. A carbide steel tipped drill bit is recommended for tapping. Coordinate drill bit size with size of tap.

10) Open the corporation stop fully. Advance the drill bit and drill through the cylinder and concrete core.

11) Retract the drill bit completely. Close the corporation stop and remove the tapping machine.

12) Open the corporation stop and flush away the cuttings.

13) With the aid of a joint wrapper, apply a protective coating of cement mortar at least 1 inch thick over all exposed surfaces of the tapping assembly, including straps, strap bolts and gland bolts. All voids between the pipe and tapping assembly shall be filled with cement mortar.

14) Remove all cement above the inlet threads on the corporation stop.

15) The joint wrapper shall remain in place during all backfill operations. After the cement mortar has stiffened, install backfill around the exposed pipe and tapping assembly following approval by the Engineer.

5. Provide special insulating corporation stops where required by the Contract Documents. Disassemble insulating corporation stops as necessary to fit into the tapping machine.

   a. When installing an insulating corporation stop, engage the flats on the base of the assembly and bring it to its permanent tightness. Then proceed by tightening the nylon insert and outboard (terminal) end of assembly only enough to provide a watertight connection. Attempting to tighten the entire assembly at one time by engaging only the nylon insert or the outboard end of the assembly is prohibited as it may lead to failure of the nylon insert.

   b. Proper corrosion control procedures shall be used with insulating corporation stops. See Section 351.03 for corrosion control procedures utilizing polyethylene encasement, pipe wrap tape, and external coating systems.

      1) Verify proper electrical isolation at the corporation stop before providing polyethylene encasement, pipe wrap tape, or external coating system.

      2) See Section 905.02.09 for material description of polyethylene encasement.

      3) See Section 905.07.06 for material description of external coating system and pipe wrap tape.

353.03.04 Installing Water Services and Water Meter Settings 3 Inches and Larger (Including FM Meters and Detector Checks).

1. All meters shall be procured from Baltimore City. Contractor shall coordinate work efforts with meter procurement.
2. All services shall be laid to the grade and lines in accordance with the Contract Documents or as directed by the Engineer. Service leads shall have a minimum 4 feet of cover from the top of the curb.
3. All meter vaults shall be set at the vertical depth shown in the Standard Detail Plates and at the location shown in the Contract Documents. Meter vaults shall be installed in non-traffic areas only; do not locate in driveways unless otherwise noted in the Contract Documents or directed by the Engineer.
4. All meters shall be installed level and shall be installed with a minimum length of straight and level pipe on the inlet side equivalent to 8 pipeline diameters. Meters shall be properly supported using brick piers or other methods approved by the Engineer.
5. Meter vaults shall be installed using a minimum compacted bedding of 6 inches of No. 57 aggregate unless otherwise directed by the Engineer.
6. Refer to City of Baltimore Department of Public Works Standard Details for detector check installation requirements.

Meter Type	Standard Detail Plate Reference
FM meters	W-27A and W-27B
FM meters with Small Domestic Meters	W-28A and W-28B
FM meters with Large Domestic Meters	City of Baltimore Std Details
FM meters with Reduced Size Large Domestic Meters	City of Baltimore Std Details

7. Install a restrained mechanical joint cap(s) on the tailpiece(s) of the meter setting, as shown in the appropriate Baltimore County or Baltimore City Standard Details. Mark the location of the cap(s) as specified in Section 353.03.02, item14.
8. Perform chlorination, bacteriological, hydrostatic and leakage tests on service leads from parent main to required pipe joint outside of meter vault. Chlorination and tests shall conform to requirements specified in Section 351.03.10.
9. All pipe between service valve and meter vault shall be ductile iron and shall be installed as specified in Section 351.03.
10. Service isolation valves shall be gate valves, horizontal or vertical, as indicated in the Contract Documents. Install gate valves as specified in Section 352.03.05.
11. Tapping sleeves, if required for service connection, shall be installed as specified in Section 351.03.

353.03.05 Copper Service Lines. Take special care in placing precast meter vaults over copper service lines to ensure that the vault does not bear on the service and lessen its size. Service lines and tail pieces must have a minimum bury as shown on Standard Detail Plates.

Tail pieces on 3/4-inch to 2-inch service lines shall extend 5 feet past right-of-way line unless otherwise noted.

353.04 MEASUREMENT AND PAYMENT.

353.04.01 ***Water House Services and Fittings*** are measured along the centerline of the pipe and through fittings. Water House Services and Fittings are paid for at the contract unit price per linear foot for the pertinent size and type of pipe involved. This price shall include all material, fittings, pavement cutting, driving sleeves, polyethylene encasement (including documentation), pipe wrap tape, external coating system, unclassified excavation and refill, removal, storage and re-handling of excavated materials, bracing, pumping and other disposal of water, labor and all incidentals necessary to complete the work.

353.04.02 ***Water Service Tap and Corporation*** will be measured on the basis of the number of each type and size built or replaced as shown on the Contract Drawings or as directed by the Engineer.

Water Service Taps and Corporations are paid for at the Contract unit price per Each for the particular type and size installed or replaced, the price bid shall include: all unclassified excavation and refill; removal, storage and re-handling of excavated material; bracing; pumping or other disposal of water; and all materials, tools and labor necessary to complete the item. Price also shall include cost to measure diameter of parent pipe prior to tapping; cost of furnishing and installing tapping saddle; cost of tapping operations and equipment; insulator testing; pressure testing; disinfection; and all costs associated with hiring tapping specialists and/or pipeline representatives. Test pits for accessing the parent pipeline prior to tapping to determine pipeline diameter and/or to determine location of existing joints or fittings shall be paid for under the appropriate Test Pit pay item and shall be performed only with prior approval from the Engineer.

353.04.03 ***Meter Frames, Covers and Vaults*** will be measured on the basis of the number of each type and size built or replaced as shown on the Contract Drawings or as directed by the Engineer. Payment for *Meter Frames, Covers and Vaults* will include vaults, frames and covers, antenna retainer brackets, and fittings as shown on the Standard Detail Plates or Contract Drawings and all labor and incidentals necessary to complete the item.

Payment for *Meter Frames, Covers and Vaults* for Meters 2 Inches and Smaller installed shall not be made until the Contractor demonstrates to the Engineer that each meter installation and vault has been installed properly. Additionally, payment shall not be made until the required as-built survey data (see Section 300.03.01) has been provided.

353.04.04 ***Water Meter Setting*** for Meters 2 Inches and Smaller will be measured on the basis of the number of each type and size built or replaced as shown on the Contract Drawings or as directed by the Engineer. Payment for *Water Meter Setting* for Meters 2 Inches and Smaller will include all fittings as shown on the Standard Detail Plates and/or Contract Drawings and all labor and incidentals necessary to complete the item.

353.04.05 ***Meter Settings and Vaults*** for Meters 3 Inches and Larger are measured on the basis of the number actually built and accepted. Meter settings and vaults are paid for at the contract unit price per Each for the pertinent meter type and size involved. This price shall include furnishing and installing the vault, engineering design of the vault, coordination with Baltimore

City, surveying, frames and covers, antenna retainer brackets, fittings and pipe inside vault, fittings and joint restraints outside of vault as shown on the respective Standard Detail Plate or Baltimore City Standard Detail, tail piece with restrained cap, supports (piers), excavation, bedding, and compaction.

1. Service line between parent main and pipe joint on supply side of inlet tee (or for Standard Detail Plate W-27, between parent main and the inlet side pipe joint) shall be measured and paid for separately.
2. Service valve with associated vault shall be measured and paid for separately.
3. For small domestic meters installed in conjunction with FM meters, as shown on Standard Detail Plate W-28A, price paid shall include tapping of pipe with service saddle (when required), corporation stop, and small meter installation but shall not include the price for copper water service and associated small diameter fittings. Copper water service and fittings shall be measured and paid for as described in Section 353.04.01, *Water House Services and Fittings*.
4. For small domestic meters installed in conjunction with Detector Check meters, as shown on Baltimore City Standard Details, price shall include tapping the companion flange and small meter installation with brass pipe and brass nipple but shall not include the price for copper water service and associated small diameter fittings. Copper water service and fittings shall be measured and paid for as described in Section 353.04.01, *Water House Services and Fittings*.

353.04.06 ***Meter Relocations*** for Meters 2 Inches and Smaller are measured on the basis of the number actually relocated. Payment for relocating single meters are made at the Contract unit price per Each for the pertinent meter type and size involved. Payment for relocating twin meters are made at the Contract unit price per Pair for the pertinent meter type and size involved. If new meter frames, covers and vaults are required, they are paid as described in Section 353.04.03, *Meter Frames, Covers and Vaults*. If new meter settings, meter yokes, and/or meter fittings are required, they are paid for as described in Section 353.04.04, *Water Meter Setting*. In the event that Pay Items *Meter Frames, Covers and Vaults* and/or *Water Meter Setting* are not included in the Proposal Form and new meter vaults, frames and covers, antenna retainer brackets, meter settings, meter yokes, or meter fittings are required, they shall be paid as Extra Work on a force account basis for replacement materials only. All labor and incidentals required to relocate salvaged material, install new material, or revise service connections according to the Contract Drawings are included in the contract unit price.

SECTION 354 – FIRE HYDRANTS

354.01 DESCRIPTION. This work consists of the installation of fire hydrants in, or related to, the locations specified on the Contract Drawings or as directed by the Engineer according to these Specifications.

354.02 MATERIALS. Only fire hydrants and restrained joints approved by the Baltimore City Department of Public Works are accepted. See Section 905.

354.03 CONSTRUCTION REQUIREMENTS.

354.03.01 Delivery, Storage, Handling and Operation. See Section 351.03.01.

354.03.02 Installing and Commissioning Fire Hydrants.

1. Submit **Certificate of Compliance** to the Engineer as described in Section 905.07.02(l) of these Standard Specifications.
2. Fire hydrants shall be installed and restrained in accordance with Standard Detail Plate W-3A. Hydrants shall be set within a stone drainage well (No. 57 stone) extending the full width of the trench and covered with filter fabric. Stone shall be placed at least six inches (6") above the connection between the base (shoe) and the lower barrel.
3. **Elevation.** Install hydrants at an elevation recommended by the manufacturer for replacement of the breakaway bolts, in accordance with the requirements shown on Standard Detail Plate W-3A. Install extension pieces if necessary.
4. **Hydrant leads** shall be laid level on a firm foundation, and the hydrant shall be set plumb. Backfill around the hydrant shall be compacted to 92-percent of AASHTO T-180 density.
5. Install hydrants with a **Mix No. 2 concrete collar** 6-inches thick, 2-feet wide by 2-feet long (6" x 2' x 2') around the hydrant barrel as shown on Standard Detail Plate W-3A. Install expansion joint material between the concrete collar and the hydrant barrel. Concrete collar shall be cast monolithically.
6. Unless indicated otherwise on the Contract Documents, install fire hydrant such that the 4.5-inch outlet (pumper outlet) faces the adjacent curb or edge of pavement.
7. Drain holes shall not be blocked or plugged.
8. Hydrant operating nut and hydrant outlet caps shall be operated using an appropriately sized 5-sided wrench only. Hydrant nuts and/or caps that have been damaged due to the use of inappropriate tools (including, but not limited to, pipe wrenches) shall be replaced as directed by the Engineer at no additional cost to the County.
9. Following installation, all fire hydrants shall be given a flush test performed by the Contractor in the presence of the Engineer. The Contractor shall install a diffuser on the 4.5-inch nozzle and shall open the hydrant to demonstrate that the hydrant is functioning properly and to demonstrate that there are no obstructions or debris in the hydrant lead. Following the flush test, the Contractor shall remove the diffuser and shall reinstall the outlet cap.

354.03.03 Relocating Hydrants. This work consists of relocating a fire hydrant by extending or shortening the hydrant lead while preserving the hydrant valve, vault and the connection to the parent main. See Section 354.03.02.

1. The Contractor shall determine whether the hydrant valve has been restrained to the tee or tapping saddle before removing the hydrant. If the valve is not restrained to tee or saddle, or if use of restrained joints cannot be verified, the Contractor shall (1) block the hydrant valve in the valve vault before arranging with Baltimore City to close the valve, or (2) make arrangements with Baltimore City to isolate the entire hydrant lead by isolating the parent main.
2. The Contractor shall remove the entire hydrant, existing stone drainage well, filter fabric, brick support, buttress, and concrete shock slab or sidewalk section, as applicable. The Contractor shall remove existing hydrant lead pipe as required. The Contractor shall provide a new hydrant, restrained to lead pipe, shall provide any necessary new hydrant lead pipe, and shall provide a new stone drainage well, new filter fabric, new brick support, a new buttress and a new concrete shock slab or sidewalk section.

354.03.04 Remove Existing Fire Hydrant and Replace with New Fire Hydrant. This work consists of removing a fire hydrant and replacing it with a new fire hydrant at the same location. See Section 354.03.02.

1. See Section 354.03.03, item 1 for requirements prior to removing hydrant.
2. The Contractor shall remove the entire hydrant, existing stone drainage well, filter fabric, brick support, buttress, and concrete shock slab or sidewalk section, as applicable. The Contractor shall provide a new hydrant, restrained to lead pipe, shall provide any necessary new hydrant lead pipe, and shall provide a new stone drainage well, new filter fabric, new brick support, a new buttress and a new concrete shock slab or sidewalk section.

354.04 MEASUREMENT AND PAYMENT. ***Furnish and Install 6 In. Fire Hydrant*** or ***Relocate Existing 6 Inch Fire Hydrant*** or ***Remove Existing Fire Hydrant and Replace with New Fire Hydrant*** is measured on the basis of the number of hydrants installed, relocated or removed and replaced as shown on the Contract Drawings or as directed by the Engineer.

Hydrants, complete in place, are paid for at the contract unit price per Each for the 6-inch size installed, relocated or removed and replaced. This price paid shall include all excavation and refill, bracing, pumping and other disposal of water, filter fabric, concrete buttresses, and material, tools and labor necessary to complete the item. Extension pieces that were not included on the Contract Drawings, but required due to field conditions, are paid for as extra work. The hydrant valve and vault, connection to the parent main, and new or replacement hydrant lead pipe and fittings shall be paid for as part of other bid items in the Contract.

Payment for fire hydrants installed shall not be made until a satisfactory flush test has been performed.

SECTION 355 – FOUR-INCH DEWATERING VALVE & VAULT

355.01 DESCRIPTION. This work involves providing a 4-inch flanged gate valve connected to the crown of a water main 48 inches in diameter or less for the primary purpose of dewatering the main. See Standard Detail Plate W-2.

355.02 MATERIALS.

Meter Vaults	Std. Detail Plate W-2
Gate Valve	905.07.03

355.03 CONSTRUCTION.

1. Flanged gate valve shall be operated by hand-wheel and shall meet the requirements given in Section 905.07.03. Gate valve used for dewatering shall be installed in a pre-cast manhole riser with a 'doghouse' configuration to fit over the parent main. Pre-cast manhole riser shall be centered over the parent main with a minimum clearance of 2 inches.
   a. See Section 352.03.03 for bedding requirements under base slab.
   b. Subject to approval of the Engineer, a cast-in-place vault may be provided as an alternative to the pre-cast manhole riser.
2. The manufacturer shall provide a parent main (ductile iron, steel, or PCCP) with a 4-inch flanged outlet oriented in the vertical position to accept the 4-inch flanged gate valve. Contractor shall provide a 4-inch blind flange bolted to outlet end of gate valve.
3. Contractor shall provide a 24-inch frame and cover at all dewatering valve vaults. For dewatering valve vaults with limited vertical clearance, as shown on Standard Detail Plate W-2, Contractor also shall provide a 7-inch access with 7-inch frame and cover centered above dewatering valve outlet.
4. Following installation of 4-inch dewatering valve and vault, and following commission of water main, Contractor shall demonstrate to the Engineer proper operation of the dewatering valve. Following this demonstration, Contractor shall re-install blind flange.

355.04 MEASUREMENT & PAYMENT. ***4-Inch Dewatering Valve And Vault*** is measured on the basis of the number of each built as shown on the Contract Drawings or as directed by the Engineer. Four-inch dewatering valves and vaults are paid for at the contract unit price per Each for units installed, which price shall include all unclassified excavation and refill; removal storage and re-handling of excavated material; pumping and other disposal of water; 4-inch flanged outlet on parent main; vault work; survey data; and all materials, tools and labor necessary to complete the item.

SECTION 356 – AIR RELEASE VALVE & VAULT

356.01 DESCRIPTION. This work involves providing a hand-wheel-operated gate valve connected to the crown of a water main for the primary purpose of releasing air that has accumulated at a high point along the main. See Standard Detail Plate W-8.

356.02 MATERIALS.

Meter Vaults	Std. Detail Plate W-8
Gate Valve (4", 6")	905.07.03
Gate Valve (1", 1.5", 2")	905.07.05(c)

356.03 CONSTRUCTION.

1. Connection to water mains 30 inches in diameter and less shall be made to the crown of the pipe using a corporation stop. Contractor shall provide brass pipe threaded into corporation stop, followed by gate valve threaded onto brass pipe. Brass pipe with matching threaded cap shall be threaded into gate valve.

   Where a service saddle is used to connect the corporation stop to either iron pipe or PCCP, Contractor shall follow the requirements of Section 353.03.03 except that the corporation stop for air release applications shall be installed at the crown of the pipe.

   See the following requirements: Corporation stop: Section 905.07.05(a), item 1
   Gate valve: Section 905.07.05(c)
   Brass pipe: Section 905.07.05(d)
   Service saddle, iron pipe: Section 905.07.04(b)
   Service saddle, PCCP: Section 905.07.04(b)

2. Connection to water mains 36 inches in diameter and greater shall be made to the crown of the pipe using a flanged outlet provided by the pipeline manufacturer. The Contractor shall provide a flanged resilient wedge gate valve bolted to the pipeline outlet, followed by a blind flange (with corporation stop) bolted to the gate valve.

   See the following requirements: Gate valve: Section 905.07.03(a)
   Corporation stop: Section 905.07.05(a), item 2.

3. Vaults

   a. Vaults for air release installations along mains 16 inches in diameter and less shall be either large precast sectional or large precast monobase vaults as shown in Standard Detail Plates W-15, W-15A, W-15B, and W15C.

   b. Vaults for air release installations along mains 20 inches in diameter and larger require approval by the Engineer and shall be either cast-in-place or precast with 'doghouse' openings. Precast vaults with 'doghouse' openings shall be centered over the parent main and shall have a minimum clearance of 2 inches between main and opening. Cast-

in-place and precast vaults shall be provided with an 8-inch diameter sump in the base slab. See Section 352.03.03 for bedding requirements under base slab.

4. Following installation of air release valve and vault and commissioning of the water main, Contractor shall demonstrate to the Engineer proper operation of the air release valve; valve shall be opened until all air is exhausted.

356.04 MEASUREMENT & PAYMENT. ***Air Release Valve And Vault*** is measured on the basis of the number and size of each built as shown on the Contract Drawings or as directed by the Engineer. Air release valves and vaults are paid for at the contract unit price per Each for units installed, which price shall include all unclassified excavation and refill; removal, storage and rehandling of excavated material; pumping or other disposal of water; 4-inch or 6-inch flanged outlet on parent main or corporation stop and service saddle, as applicable; vault work; survey data; and all materials, tools, and labor necessary to complete the item.

SECTION 357 – BLOW-OFF & VAULT

357.01 DESCRIPTION. This work involves providing a handwheel-operated gate valve connected to a dead end water main 12 inches in diameter or less for the primary purpose of flushing the main. See Standard Detail Plate W-11.

357.02 MATERIALS.

Meter Vaults	Std. Detail Plate W-11
Gate Valve	905.07.03

357.03 CONSTRUCTION.

1. Connection to water main shall be made to the crown of the pipe using a corporation stop. Contractor shall provide a brass pipe threaded into the corporation stop, followed by gate valve threaded onto brass pipe. Brass pipe with matching threaded cap shall be threaded into gate valve.

   Where a service saddle is used to connect the corporation stop to iron pipe, Contractor shall follow the requirements of Section 353.03.03 except that the corporation stop for blow-off applications shall be installed at the crown of the pipe.

   Where a blow-off is to be installed on HDPE pipe, the Contractor shall use an electrofusion service saddle to connect the corporation stop to the crown of the pipe. Contractor shall install the service saddle in accordance with Special Provisions to be provided by the Design Division of the Bureau of Engineering and Construction.

See the following requirements: Corporation stop: Section 905.07.05(b)
Gate valve: Section 905.07.05(c)
Brass pipe: Section 905.07.05(d)
Service saddle, iron pipe: Section 905.07.04(b)
Service saddle, HDPE pipe: see Design Division Special Provisions

2. Contractor shall provide cap and standard concrete buttress on end of parent main. Concrete buttress shall be poured against undisturbed soil and shall be installed in accordance with Standard Detail Plate W-5.
   a. Use a buttress sized for a 6-inch cap for both 6-inch cap and 4-inch cap applications.
   b. For HDPE applications, cap shall be butt-fusion welded to parent main. See Special Provisions provided by the Design Division.
3. Vaults for blow-off installations shall be either small precast sectional vaults or small precast monobase vaults as shown in Standard Detail Plates W-14, W-14A, W-14B, and W-14C.
4. Following installation of blow-off valve and vault and commissioning of water main, Contractor shall provide temporary hose for connection to the blow-off piping and shall demonstrate to the Engineer proper operation of the blow-off assembly.

357.04 MEASUREMENT & PAYMENT. ***Blow-Off And Vault*** is measured on the basis of the number and size of each built as shown on the Contract Drawings or as directed by the Engineer. Blow-offs and vaults are paid for at the contract unit price per Each for units installed, which price shall include all unclassified excavation and refill; removal, storage, and re-handling of excavated material; pumping or other disposal of water; cap and buttress; vault work including service saddle as applicable; survey data; and all materials, tools, and labor necessary to complete the work.

SECTION 358 – PLUG & CLAMP

358.01 DESCRIPTION. This work involves providing a plug restrained to the bell end of an iron pipeline using steel angle straps and eyebolts. See Baltimore City Standard Detail No. BC 858.01.

358.02 MATERIALS.

Plug	See Baltimore City Std. Detail BC 858.01
Clamp	See Baltimore City Std. Detail BC 858.01

358.03 CONSTRUCTION.

1. Pipeline sizes utilizing plugs and clamps shall be limited to 8 inches maximum; consult the Design Division of the Bureau of Engineering and Construction if larger sizes are required.
2. See Section 351.03 for requirements pertaining to the installation of the pipe plug.
3. Unless indicated otherwise by the Engineer, torque eyebolts as follows:

   ¾-inch diameter eyebolts (4-inch and 6-inch mains): 155 ft-lbs

   7/8-inch diameter eyebolts (8-inch mains): 205 ft-lbs
4. After installation of plug and clamp, Contractor shall pressure test the installation as required by the Contract documents. If any leaks are detected, the Contractor shall re-torque the eyebolts or disassemble and reassemble the installation as necessary to effect repairs.
5. Following successful pressure testing of the plug and clamp assembly, Contractor shall encase the assembly as shown on the referenced detail. Bottom of concrete encasement shall be poured against undisturbed or compacted soil, as directed by the Engineer.

358.04 MEASUREMENT & PAYMENT. ***Plug And Clamp, Furnish And Install*** shall be measured on the basis of the number and size of each built as shown on the Contract Drawings or as directed by the Engineer. Plugs and clamps are paid for at the contract price per Each for units installed, which price shall include all unclassified excavation and refill; removal, storage and re-handling of excavated material; pumping or other disposal of water; and all materials, tools, and labor necessary to complete the item.

SECTION 359 – ABANDONMENT OF WATER MAINS AND WATER APPURTENANCES

359.01 DESCRIPTION. This work shall consist of the disposition of existing water mains and appurtenances of the water system noted on the Contract Drawings to be abandoned or removed and restoration of the site.

359.02 MATERIALS. Not applicable.

359.03 CONSTRUCTION.

1. Fire hydrants, water valves, and frames and covers to be abandoned shall become the property of the Contractor. Unless otherwise noted on the Contract Drawings, water mains shall be abandoned in place.

2. The Contractor shall remove water meters which are to be abandoned and return them to Baltimore City as directed.

3. The Contractor shall remove the top portions of valve vaults, meter vaults, and roadway boxes to be abandoned to a depth of 18 inches below final grade. The Contractor shall remove both upper and lower barrels of hydrants to be abandoned. As applicable for valves to be abandoned, the Contractor shall: abandon the valve in place, remove the valve in its entirety, or remove the valve bonnet and stem; such that no portion of the valve is within 18-inches of final grade. Contractor shall cap or plug all openings for water mains to be abandoned. Contractor shall backfill all disturbed areas.

4. The Contractor shall restore the surface with materials appropriate to the site as directed by the Engineer.

5. Remove Existing Fire Hydrant and Valve. Contractor shall: remove the existing tee or existing tapping sleeve, the existing hydrant valve and the valve vault and hydrant as described in Section 359.03, item 3. Contractor shall provide the necessary sleeves, spacers and pipe stub along the parent main.

359.04 MEASUREMENT AND PAYMENT.

a. ***Remove Existing Fire Hydrant and Valve*** is measured based upon the number of fire hydrants and valves removed, as shown on the construction drawings or as directed by the Engineer. Pipe and fittings installed along the parent main are paid for as part of other bid items in the Contract.

b. All other work under this item is not measured. Costs of Abandonment of Water Mains and/or Water Appurtenances are included in the price bid for items of new construction.

c. Restoration of the surface is paid for under the items bids for seed and mulch, sod, bituminous concrete for permanent trench repair, or concrete sidewalk, as applicable.

SECTION 360 – RESERVED

SECTION 361 – SANITARY SEWERS AND SANITARY SEWER HOUSE CONNECTIONS

361.01 DESCRIPTION. This work consists of sanitary gravity sewers and house connections of ductile iron, concrete, or PVC pipe of the diameter shown on the Contract Drawings, laid on a firm bed true to line and grade according to these Specifications.

361.02 MATERIALS.

Ductile Iron Pipe for Sanitary Sewers	905
PVC Plastic Pipe	905

Reinforced Concrete Pipe for Sanitary Sewers	905
Prestressed Concrete Cylinder Pressure Pipe	905

361.03 CONSTRUCTION METHODS.

361.03.01 Laying Pipe.

(a) Lowering into Trench. The Contractor shall carefully handle and lower pipe into the trench. In laying pipe, take special care to insure that each length abuts against the next so that there is no shoulder or unevenness along the inside of the bottom half of the pipe line. Blocking or wedging is not permitted in laying pipe unless by written order or permission of the Engineer.

(b) Securing in Place. Before making joints, the Contractor shall insure that each pipe is well-bedded on a solid foundation. He shall not bring the next pipe into position until the preceding length is thoroughly embedded and secured in place. The Contractor must correct any defects due to settlement at his own expense and shall dig bell holes large enough to insure that the pipe is firmly bedded on the full length of the barrel.

(c) Tools and Appliances. The Contractor shall use proper and suitable tools and appliances in the safe and convenient handling and laying of pipes.

(d) Cleaning. The Contractor shall thoroughly clean the pipes before laying them and shall keep them clean until the completed work is accepted. The Contractor shall keep dirt and other substances from entering.

(e) Cutting. When a pipe needs cutting to fit into the line or to bring it to the required location, the Contractor shall perform the cutting in a satisfactory manner so as to leave a smooth end, without extra compensation.

(f) Reinforcement. The Contractor shall place concrete required to support and reinforce Y-branches and bends as shown in the *Standard Details for Construction* or as directed.

(g) Construction. The Contractor shall lay sewer house connections on a 2-percent grade unless otherwise directed by the Engineer. Construct them of the same class and materials as the sewer mains to which they are connected. Construct single or twin sewer house connections to terminate perpendicular to the property line, with a plugged bell end that will accommodate 6-inch VCPX, unless otherwise noted on the Contract Drawings. House connections shall be placed in accordance with Standard Detail Plate S-12A.

(h) Watertightness. The Contractor shall keep the excavation in which pipe is being laid free from water. He shall not make any joints under water nor allow water to rise in the excavation until the joint material receives its set. He shall take the greatest care to secure watertightness and to prevent damage to, or disturbing of, the joints during refilling or at any time. After laying pipes and making the joints, he shall not walk on or work over them, except as may be necessary in tamping, until there is a covering at least 2 feet deep over their top.

(i) Branches. The Contractor shall locate in the position designated by the Engineer of his representative. He shall field-cut short pieces of lateral sewer to meet this condition.

The Contractor must have on the work, at all times, factory-approved equipment to machine and adapt the field-cut end of short pieces of pipe to standard couplings and jointing materials.

(j) Weather Restrictions. Do not lay pipe on a foundation into which frost has penetrated nor at any time the Engineer deems there is danger of the formation of ice or the penetration of frost at the bottom of the excavation, unless the minimum length of open trench and promptness of refilling are observed.

(k) In-Use Deflection Limit. The maximum allowable in-use deflection limit is 5%.

(l) References. See Section 351.03 for additional information on laying ductile iron and concrete pipe that is applicable to this work also. Refer to ASTM Designation D-2321 for installation requirements of PVC sewer pipe. Also refer to the manufacturers' recommendations.

361.03.02 Acceptance Testing.

(a) Examination. The Contractor shall examine all completed pipelines to insure that they are laid to proper alignment and grade and free of foreign materials. Upon the Engineer's approval, the Contractor shall test all portions of the sewers built under this contract.

(b) Method. The testing method shall be the low-pressure air test (ASTM F1417 for thermoplastic pipe, ASTM C924 for concrete and ductile iron pipe), unless otherwise directed by the Engineer.

(c) Test. If so directed by the Engineer, the following test methods may be required:

Negative Air Pressure (Vacuum) Test, ASTM C1214

Infiltration Test, ASTM C969 (for concrete or ductile iron pipe)

Infiltration Test, ASTM C1091 (for thermoplastic pipe)

(d) Standards. ASTM Standards shall be used to establish procedures, equipment, acceptance criteria, and safety precautions.

(e) TV Inspection. Refer to Section 300.03.06**.**

361.03.03 Connections to Existing Sewers. Connection can only be made with the permission of the Engineer.

Do not make connections to existing sanitary sewers until after the final inspection and approval of tests. The Contractor shall furnish all material and labor required for the tests. The cost thereof is included in the prices bid for furnishing and laying sewers. The Contractor shall also furnish water for leakage tests.

361.03.04 House Connections. All house connections to existing sewers shall be unobstructed, watertight, and capable of passing an air pressure test as described in Section 361.03.02, Acceptance Testing, above.

Only two methods are permitted for making house connections to existing sewers:

(a) Connections made by cutting the existing line and installing a compatible wye section by means of sleeves, all as approved by the Engineer.

(b) Tapping into the existing line using saddle connections as submitted to and approved by the Engineer.

House connections shall be marked with a 2" x 6" board extending vertically from the pipe to an elevation four (4) feet above grade, as an incidental to the house connection.

361.04 Measurement and Payment. ***Sanitary Sewers*** shall be measured horizontally along the centerline of the trench from center-to-center of manholes and through fittings.

Sewer House Connections shall be measured along the centerline of the 6-inch pipe through the 6-inch x 6-inch x 4-inch wye fitting from the home of the wye branch on the main sewer to the 6-inch cap and from the home of the 4-inch, 45 degree elbow to the 4-inch plug (Standard Detail Plate S-12A).

Sanitary Sewers and ***Sewer House Connections***, complete in place, are paid for at the Contract unit price bid per linear foot for the particular type and size of pipe specified in the Contract Documents. This price includes and covers cutting paving, unclassified excavation and refill removal, storage and re-handling of excavated materials, bracing, pumping and other disposal of water, furnishing and placing all pipe, fittings, and joining materials, including the encased 6-inch x 6-inch x 4-inch wye and 45 degree elbow on house connections in accordance with Contract Documents to the grade indicated, testing, and incidentals and related work as shown, specified, and directed.

SECTION 362 – SANITARY SEWER MANHOLES

362.01 DESCRIPTION. This work involves sanitary sewer manholes and miscellaneous structures of concrete or brick masonry, built to the shapes and dimensions shown in the *Standard Details for Construction* or on the Contract Drawings, at the locations indicated on the Contract Drawings or as directed by the Engineer.

362.02 MATERIALS.

362.02.01 General. The materials to be used in any particular structure shall be as specified on the Contract Drawings, the *Standard Details for Construction*, or the Special Provisions. Structures shall be of precast concrete unless noted otherwise. Un-reinforced concrete shall be Mix No. 1, air-entrained, unless noted otherwise.

362.02.02 Materials.

Sewer Brick	903.01
Manhole Brick	903.02
Concrete and Mortar	902
Reinforcement Steel	908
Castings	909

362.02.03 Manhole Steps. Manhole steps shall be constructed in accordance with Standard Detail Plates G-4 and G-4A.

362.02.04 Precast Concrete Manholes. These manholes must meet the requirements of ASTM C 478. See Standard Detail Plates S-4 and S-5.

362.03 CONSTRUCTION.

362.03.01 Precast Concrete Manholes shall be installed as shown on the Contract Drawings and the *Standard Details for Construction*. The placement and consolidation of the required bedding under the unit shall be a minimum 6 inches of No. 57 aggregate unless otherwise directed by the Engineer.

362.03.02 Weather Restriction (Brick Manholes). Do not lay brick when the temperature is below 40 F or when lower temperatures are predicted within 24 hours unless the Engineer approves a method for protection of brickwork. Take such measures as may be approved to prevent brickwork from being exposed to freezing temperatures for no less than 5 days after laying.

362.03.03 Plastering (Brick Manholes). Plaster the outside of brickwork with cement mortar 1/2 inch thick. Do not backfill around brick structures until the third day after completing brickwork.

362.03.04 Channels for Water. Form channels for receiving and passing water in the bottom of manholes as shown or directed. Line the channels with sewer brick. Channels must slope smoothly and evenly from the main pipe entering the manhole to the outlet pipe. Build channels for future extensions into manholes where shown on the Contract Drawings or where directed by the Engineer.

362.03.05 Wider or Deeper Foundations. Build foundations wider or deeper than shown on the detail drawings for manholes of concrete masonry, whenever directed. Build manholes as pipe laying progresses. The Engineer may stop work entirely on laying pipe until the manhole just passed is completed.

362.03.06 Templates (Brick Manholes). In constructing manholes, accurate templates, set at a height to which the manhole is to reach, may be required. From the templates, draw no less than 4 lines to serve as a guide for the brickwork. Neatly strike and point the joints on the inside of manholes. A reasonable number of bats originating on the work may be used.

362.03.07 Manhole Frames, Covers and Steps. Furnish and set these items as work progresses. Insure that the frames are installed in accordance with Construction Documents or per instructions of the Engineer. Space steps vertically, with alignment as shown on the Standard Detail Plates.

362.03.08 Drop Connections. Build drop connections of the various types shown in the *Standard Details for Construction* where shown on the Contract Drawings or where directed by the Engineer.

362.03.09 Acceptance Testing.

(a) The Contractor shall test all manholes using the Negative Air Pressure (Vacuum) Test ASTM C1244 which establishes procedure, equipment, acceptance criteria and safety procedures.

(b) The Contractor must replace or repair all defects on manholes failing to meet the test requirements.

362.03.10 Watertight Manhole Frames and Covers. Watertight manhole frames and covers shall be provided where the manhole location is subject to flooding over the top of the manhole cover and at locations indicated on the Contract Drawings. Use of watertight manhole frames and covers is allowed to control surcharging of the sanitary sewer if the frame is firmly anchored to the manhole in accordance with MdSHA's Book of Standards for Highway and Incidental Structures concerning anchoring of frames to manhole. Anchoring of frames is not required except when the manhole is subject to surcharging.

The Contractor shall use precast rubber grade adjustment rings per Standard Detail Plate G-3B when the cover of a sanitary sewer watertight manhole frame and cover is below the designated 100-year floodplain elevation at the manhole location.

Twenty-four inch (24") diameter watertight manhole frame and its cover shall comply with Standard Detail Plates S-13A, S-13B, and S-13C for off-road and in-road use as noted on the Standard Details. These watertight frames and covers shall be used only for those locations as specified on the Standard Detail Plates. The Contractor shall present the manufacturer's certification that manhole frames and covers to be used in public roads and other areas subject to vehicular traffic have traffic-bearing capacity exceeding HS-27 loading to the Engineer upon delivery of the watertight frames and covers to the work site.

Where Contract Drawings require a 30-inch diameter frame and cover for access, the Contractor shall provide a frame and cover in accordance with Baltimore County *Standard Details for Construction* or Special Provisions.

Care shall be taken so that the machined surfaces of the cover and frame are not damaged when the manhole frame is open. Watertight frames and covers damaged during contractor operations shall be replaced by the Contractor at no additional cost to the County at the sole discretion of the Engineer.

Watertight manhole covers shall be labeled as "Sanitary Sewer" in all cases. The cover shall be labeled as "Baltimore County Sanitary Sewer" only when Contract Drawings indicate that the manhole is located in either a public road right-of-way or a public utility easement.

362.04 MEASUREMENT AND PAYMENT.

362.04.01 The bid item ***Sanitary Sewer Manhole*** shall be measured in vertical feet from the bottom of the frame to the invert of the channel at the center of the manhole.

The bid item ***Sanitary Sewer Manhole*** shall be paid for at the contract unit price per vertical foot constructed for the specified manhole diameter. The price bid per vertical foot shall include and cover furnishing and placing all concrete and brick masonry and appurtenances, excluding frame and cover, and building manholes complete as shown, specified or directed.

Excavation and refill, bracing, acceptance testing and pumping or other disposal of water are included in the price bid for furnishing and laying sanitary sewers in accordance with Section 361.04.

362.04.02 Sanitary Sewer Frame and Cover. Measurement for the bid item ***Cast-iron Frame and Cover*** or ***Ductile Iron Watertight Frame and Cover*** of the size specified is based on the number installed and accepted. Payment for furnishing and placing these items is made at the unit price per each for the number of frames and covers furnished and set as shown, specified, and required. Payment for the ***Ductile Iron Watertight Frame and Cover*** shall include the costs of anchoring the frame and the costs of the adjustable rubber riser ring as applicable.

362.04.03 Building Drop Connection. Measurement for a ***Drop Connection*** is based on the number constructed and accepted. The manhole on which the drop structure is placed is measured and paid for separately. Payment is made at the unit price bid per each of the several types and various sizes of ***Drop Connection*** constructed as shown, specified, and directed.

362.04.04 Contingent Items. Payment is based on trench width as specified.

SECTION 363 – SANITARY SEWER FORCE MAINS

363.01 DESCRIPTION. This work consists of construction of sanitary sewer force mains (a pipeline that conveys wastewater under pressure from the discharge side of a pump to a discharge point) of Ductile Iron or Prestressed Concrete Cylinder Pressure Pipe and appurtenances of the sizes shown on the Contract Drawings, laid on a firm bed, true to line and grade, in accordance with these specifications.

363.02 MATERIALS. Ductile Iron Pipe. See Section 905. Force Main thickness class will be Class 54 unless otherwise noted on the Contract Drawings. The Contractor shall select fittings having socket dimensions and thickness suited for the class designated.

Prestressed Concrete Cylinder Pressure Pipe. See Section 905. For sanitary sewer force mains, PCCP shall be manufactured with ASTM C150, Type II cement, only. Coarse aggregate for pipe concrete shall consist only of hard, durable, particles of limestone.

363.03 CONSTRUCTION METHODS. Follow the methods outlined in Section 351.03 for Water Main Construction, except that chlorination is not required for testing force mains after installation of the pipe.

363.04 MEASUREMENT AND PAYMENT. Measurement for ***Sanitary Sewer Force Mains*** shall be made horizontally along the centerline of the force main through all fittings

except between vertical bends where measurement is made along center of the pipe, including all fixtures.

Sanitary Sewer Force Mains shall be paid for at the contract unit price per linear foot for the particular type of pipe specified on the Contract Drawings or directed by the Engineer. The contract price shall include: cutting and paving; unclassified excavation; refill; removal, storage and rehandling of excavated material; bracing; pumping or other disposal of water; furnishing and placing all pipe and appurtenances, concrete anchors and buttresses; testing; and related work as shown, specified and directed.

SECTION 364 – LOW PRESSURE SANITARY SEWER (LPSS) MAIN CONNECTIONS

364.01 DESCRIPTION. This work consists of installing polypropylene saddles connecting grinder pump laterals to low pressure sanitary sewer (LPPS) mains of High Density Polyethylene (HDPE) or Polyvinyl Chloride (PVC).

364.02 MATERIALS. For HDPE pipe and PVC pipe see Section 905. For grinder pump and pressure sewer requirements see Special Provisions provided by the Design Division of the Bureau of Engineering and Construction.

Saddles shall be constructed of UV-stabilized polypropylene and shall be provided with SBR gaskets. Nuts and bolts shall be manufactured from 18-8 stainless steel and shall be Teflon coated.

364.03 CONSTRUCTION METHODS. Clean pipe in the area where the saddle will be installed. Ensure gasket is positioned in the top half of the saddle and position top half of saddle with the outlet in the desired position. Insert the nuts into the bottom half of the saddle and hook the hinge pocket over the hinge pin on the top portion of the saddle and squeeze the bolt side together. Install the washers on the bolts and insert the bolts through the saddle top and engage the nuts. Tighten the bolts with a wrench using an alternating pattern to draw the top and bottom together evenly. Tighten until the saddle is drawn down to the main and the two flanges are together. Drill hole in the main with a hole saw, taking care to ensure that the saw bit does not engage the threads in the saddle outlet. (Use 1-1/8” hole saw for 1-1/4” outlet; use 1-3/8” hole saw for 1-1/2” outlet, and use 1-3/4” hole saw for a 2” outlet.) Use Teflon tape (minimum two wraps) on male threads that are threaded into the outlet of the saddle.

364.04 MEASUREMENT AND PAYMENT. LPSS main connections shall not be measured. Costs for installing LPSS main connections shall be included in the price bid for Pressure Sewer as described in Special Provisions provided by the Design Division of the Bureau of Engineering and Construction.

SECTIONS 365 Through 370 – RESERVED

SECTION 371 – TRENCHLESS EXCAVATION / TUNNELING

371.01 DESCRIPTION. This work consists of the furnishing of trenchless excavation (interchangeably used with the terms trenchless technology, tunnel, tunneling, or method for purposes of this specification). This excavation shall serve as a carrier for other utilities or as the conduits themselves. These trenchless excavations shall be installed to the lines and grades shown on the Contract Drawings by a method chosen by the Contractor unless otherwise specified on the Contract Drawings. The Contractor is responsible to select a method suitable for the conditions to be encountered and to assure no disturbance to the existing surface.

371.02 MATERIALS. The Contractor shall have the latitude to choose the material of the trenchless excavation subject to the restrictions noted below.

371.02.01 Design. The trenchless excavation method shall be designed for the earth, construction, and other loads present plus AASHTO HS-27 Highway Live Load increased 30 percent for impact. The Contractor's engineer, who must be registered in the State of Maryland, shall prepare the design for approval by the Engineer. Steel Tunnel Liner Plates, if used, shall be designed in accordance with the latest edition of the *Standard Specifications for Highway Bridges* adopted by the American Association of State Highway and Transportation Officials. All design shall be in accordance with OSHA, MOSHA, and all federal, state, and local regulations.

371.02.02 Steel Tunnel Liner Plates. Steel tunnel liner plates shall be galvanized in accordance with ASTM A123, latest version if under a state highway or if the steel tunnel liner is to be the conduit itself.

371.03 CONSTRUCTION.

371.03.01 Working Drawings. The Contractor shall submit working drawings for approval by the Engineer on the trenchless excavation method itself and on any required jacking and receiving pits. The working drawings shall be signed and sealed by an engineer registered in the State of Maryland. The Contractor shall submit six copies of drawings showing typical sections and details of the trenchless excavation method to be used, and any grouting procedures. Working Drawings shall contain certification by the Contractor's engineer that the proposed trenchless excavation method and the proposed construction of any jacking and receiving pits have been designed in accordance with these Specifications. These Specifications intend to specify a performance standard, leaving the choice of material and trenchless excavation method of construction to the Contractor. Approval of the Working Drawings is to insure preparation of design by a Professional Engineer and shall not relieve the Contractor of the responsibility for the adequacy and accuracy of the Working Drawings when implemented in the field.

371.03.02 Placing and Furnishing of Trenchless Excavation. After submittal of the Working Drawings and at least two weeks before Construction begins, the Contractor shall submit to

the Engineer a Trenchless Excavation Plan wherein the Contractor will present his schedule for trenchless excavation operations, and fully describe his proposed methods and operations to be employed. Review of the Trenchless Excavation Plan is for quality control and record keeping purposes and shall not relieve the Contractor of the responsibility for the accuracy and adequacy of the Trenchless Excavation Plan when implemented in the field. If at any time during the progress of the work the method of trenchless excavation does not produce the desired result, the Contractor shall submit a revised Trenchless Excavation Plan until a technique is arrived at that shall produce the desired results. The revised Trenchless Excavation Plan and method shall be performed at no additional cost to the County.

371.03.03 Grout. Mortar for grouting shall not be chemically reactive with tunnel liner plate materials and shall conform to the requirements of Section 903.06 with only enough water to permit the material to flow properly. Flowable Backfill may also be used for grouting in accordance with Section 313. Other backfilling methods may be submitted for approval but must be able to meet the performance standard that the grout or equivalent must be non-erodible, shall not be chemically reactive with tunnel liner plate materials, must completely fill the space between the conduit and the tunnel liner, and after the deterioration of the tunnel liner must be able to transmit all loads to the conduit. The Contractor shall also provide sufficient grouting plugs and make provisions to backgrout outside of the tunnel liner to fill voids, prevent shifting of the tunnel, and prevent overhead settlement.

371.03.04 Preconstruction Survey. The Contractor shall survey, photograph, and videotape all buildings, structures, and roadways within a horizontal distance of the centerline of the trenchless excavation that is three times the vertical distance from the invert of the trenchless excavation to the finished grade over the trenchless excavation. The company selected to perform this pre-construction survey shall demonstrate acceptable previous experience to the satisfaction of the Engineer and shall be governed by GP-8.01, Subcontracting. The prepared survey and analysis shall be sufficient to document the absence of, or presence and existing condition of any cracks, settlement, upheaval, spalls, or other existing deficiencies in existing buildings, structures, or roadways within the distance from the excavation noted above. If it is determined by the Engineer that significant buildings, retaining walls, structures, etc. are in such close proximity to the excavation that structural monitoring shall be performed during the work, targets or other remote sensing devices shall be attached to the structure(s) and monitored at intervals as determined by the Engineer. If the trenchless excavation is under wetlands or other surface, the complete condition of the wetlands or other surface over the proposed trenchless excavation shall be documented. The pre-construction survey and analysis shall be made before any trenchless excavation is done in the field.

371.03.05 Line and Grade. All trenchless excavations shall be constructed to the line and grade specified on the Contract Drawings without exception. The Engineer shall establish initial control information prior to the initiation of work. The Contractor shall furnish line and grade information to the Engineer at intervals not exceeding 25 feet, so that the Engineer can verify proper line and grade.

371.04 Measurement and Payment. ***Trenchless Excavation*** shall be measured and paid for as described in the Special Provisions. Except as modified by the Special Provisions, payment shall be full compensation for all trenchless excavation and refill; the storage and rehandling of excavation, disposal of all excess excavation; the furnishing of select borrow if required; replacing sod where disturbed; pumping or other disposal or control of water and sewage; the

protection of all structures, utilities, and wetlands, and their restoration in case of injury; the furnishing and placing of all pit sheeting and bracing to remain in place; the furnishing and placing of the tunnel material; the grouting of voids outside the tunnel liner if used; and the furnishing and placing of grout, concrete or sand fill, and brick bulkheads; and the furnishing of all labor, tools, materials, apparatus, equipment, Working Drawings, Trenchless Excavation Plan, pre-construction survey and analysis (including targets or other remote sensing devices and monitoring), and related work necessary to complete the trenchless excavation section. The furnishing and placing of the utility pipe in the trenchless excavation will be paid for under the item of the Proposal for furnishing and laying utility pipe of the size and material required on the Drawing.

CATEGORY 400
STRUCTURES

SECTION 401 – MAINTAINING EXISTING BRIDGE DECK DURING LIFE OF CONTRACT

401.01 DESCRIPTION. This work shall consist of patching the existing bridge deck as specified in the Contract Documents or as directed by the Engineer.

401.02 MATERIALS.

Rapid Hardening Cementitious Materials For Concrete Pavement Repairs	902.14

The Contractor shall submit the patching material to the Engineer for approval.

401.03 CONSTRUCTION. The Engineer and Contractor shall periodically review the existing deck and determine if any patching is necessary. All holes over 1 in. deep having an area greater than 2 square feet shall be patched.

Before patching begins, the Contractor's Traffic Manager shall confer with the Engineer to decide on a plan for diverting or detouring traffic during patching operations. All items relating to traffic safety and traffic control requirements shall conform to the Contract Documents.

The areas requiring repairs shall be clean and free of loose material and shall conform to the manufacturer's recommendations for surface preparation.

When working on a full depth repair area, the Contractor shall protect waterways and roadways under the structure from falling debris. No removed material shall be disposed of in any waterway.

The patching material shall be placed full depth to the top of the existing bridge deck surfaces.

New reinforcement shall be required only when directed by the Engineer.

If a patch has been made and it has not yet reached sufficient strength to support traffic when this section of the structure is opened to traffic, it shall be covered with a steel plate as specified in Sections 522.03.13 and 300.03.05. All areas around the plate shall be built up with asphalt material.

401.04 MEASUREMENT AND PAYMENT. The payment will be full compensation for all material, labor, equipment, tools, and incidentals necessary to complete the work.

401.04.01 ***Patching For Maintaining Existing Bridge Deck*** will be measured and paid for at the Contract unit price per square foot. The payment will also be full compensation for the removal and disposal of material required to prepare the patch area, including chipping and hand cleaning, as well as furnishing and placing reinforcement steel, forming, providing protective structures, floodlighting, and furnishing, placing and removing any steel plates. Patches performed day or night will be paid for at the Contract unit price.

401.04.02 All work, materials, sequence of operations, equipment, protection vehicle and channelization devices required to maintain traffic during each occurrence of patching including removal after patching is complete, will be measured and paid for at the Contract unit price per each for the pertinent ***Maintenance of Traffic for Bridge Patching Operation*** item. When more than one patch is made under one movement of traffic for patching, the item will be paid for only once, regardless of the number of patches made or the length of time traffic is rerouted. If traffic is maintained more than once for a particular patching operation, the work will be measured and paid for only once.

SECTION 402 – REMOVAL OF EXISTING STRUCTURES

402.01 DESCRIPTION. This work shall consist of the removal and disposal or salvage, wholly or in part, of existing structures as specified in the Contract Documents or as directed by the Engineer.

The Contractor is advised that prints of plans of the pertinent existing structure(s) may be available from the County. The County assumes no responsibility for the accuracy or completeness of existing plans. Dimensions, details, etc. as shown thereon may not be as built.

402.02 MATERIALS. Not applicable.

402.03 CONSTRUCTION. Before removal operations begin, the Contractor shall submit to the Engineer for approval a list of the equipment to be used and the removal method. Approval does not relieve the Contractor of responsibility for preserving those portions of the structure designated to remain and be incorporated into the rehabilitated structure, or to be used to maintain traffic.

Sheeting and shoring required for the removal of existing structures or portions thereof shall meet the requirements specified in Section 404.03.03.

Unless otherwise specified in the Contract Documents, the limits of removal for existing structures shall be 18 inches below the proposed ground-line or to the limits necessary to avoid conflict with the proposed construction. The material obtained from the removal of the existing structures shall become the property of the Contractor who shall be responsible for removing and disposing of the material on approved spoil areas.

When remaining portions of an existing structure will be exposed to view in the final structure, make a neat 1 in. deep saw cut to separate the removal operations from the remaining concrete. Protect existing reinforcing steel as specified in Section 416.03.07.

Regardless of whether or not a hot mix asphalt (HMA) overlay is depicted in the Contract Documents, or if it is depicted but the actual thickness varies from what is shown, no additional compensation or credit will be made. The provisions of Section GP-4.05 will not apply.

Immediately halt removal operations if any of these existing elements that are to remain permanently or temporarily are damaged by the Contractor's operation. Submit the material and work methods proposed for use to repair or replace the damaged elements to the Engineer for approval. Perform the approved method of repair or replacement of the damaged elements to the full satisfaction of the Engineer and BCBEC-Structures at no additional cost to the County. Any delays due to the required repair or replacement shall not be a clause for any claim.

Materials to be salvaged shall be removed in such a manner as not to damage the material. Salvaged material shall be loaded, hauled, unloaded and stacked at a site specified in the Contract Documents or as directed by the Engineer. The Contractor shall notify the County a minimum of 48 hours prior to the delivery of the salvaged materials. The Contractor shall arrange for provisions to store the material off the ground and for unloading and neatly packing the material at the County's designated storage site. The Contractor shall provide the labor, equipment, etc. needed to unload the salvaged materials at the County sites.

During construction only approved equipment and material (for maximum weight, size and location) required for a particular operation will be allowed on the existing or newly constructed portion of new bridge. Refer to Sections 402.03.05 and 420.03.05 for additional requirements.

When a structure contains existing protective shields (sheeting or planking) that have been previously placed to contain debris from a deteriorating deck, the Contractor shall remove and dispose of the debris and shields at no additional cost to the County.

402.03.01 Removal of Bridge Deck Slabs and Parapets. The Contractor shall protect the public against injury and damage from demolition operations when removing portions of existing bridge deck slabs. When deck removal is performed over or near roadways, railroads or waterways, the Contractor shall furnish and erect temporary protective shields to prevent any material or debris from entering these areas.

Protective shield working drawings per Section TC-4.01 shall be submitted to the Engineer for review and approval. Flooring and siding shall have no cracks or openings through which material particles may pass. The shields shall be able to support over their entire area 150 lb/sq.ft. in addition to their own dead weight.

A minimum underclearance of 14.5 ft shall be maintained over the roadway pavement and shoulders. No portion of the shield including connection devices shall encroach on this underclearance. If less than 16.0 ft underclearance is provided, the Contractor shall furnish and erect signs indicating the exact minimum underclearance. The Engineer shall approve signs in accordance with Section 813 and the location of those signs. They shall be removed when the original underclearance is restored and shall become the property of the Contractor.

After the Engineer determines that the protective shields have served their purpose, they shall be removed and become the property of the Contractor.

402.03.02 Bridge Deck Slabs to be Replaced. On structures where the existing structural steel will be used in the finished structure and the Contractor elects to support the protective shields from the steel, all connections thereto shall be made by means of clamps or other approved devices. The drilling of holes in the existing steel work, or welding to the steel work for this purpose is prohibited.

Before removal operations begin, the outlines of the top flanges or cover plates of all stringers and floor beams shall be drawn on the bridge deck and 1 in. diameter pilot holes made outside these lines to confirm the location of the steel.

Prior to removing the existing slabs, the Contractor shall take elevations at locations along the bottom of the bottom flange or top of the top flange by removing small sections of slabs over stringers using pilot holes at the center and quarter points of all stringers, and at other points if necessary, to provide a maximum spacing of 10 ft between elevations. After removing the deck, the Contractor shall take a new set of elevations at the same points and ascertain the rebound. These rebounds shall be used in lieu of dead load deflections to establish grade controls and to produce finished tops of concrete bridge decks that will be true to planned line and grade. For bridge decks constructed with a longitudinal construction joint between stringers, diaphragms between these stringers shall not be disconnected unless specified in the Contract Documents.

On continuous bridges, the Contractor's proposed sequence of deck removal shall address uplift at the ends of continuous spans.

If damage results from the Contractor's operations, the removal operation shall be modified and the damaged items shall be repaired or replaced by the Contractor in a manner acceptable to the Engineer at the Contractor's expense.

402.03.03 Removal of Existing Bridge. Existing bridges, including piles, shall be removed as specified in Section 207.03.01 and from any area that will interfere with proposed construction.

402.03.04 Removal and Salvage of Existing Bridge Railings. All existing posts, rails, nuts, washers, etc. shall be carefully removed from the bridge. The salvaged materials shall be loaded, hauled, unloaded and stacked as specified in this Section. All nuts and washers shall be separated and placed in strong wooden kegs. Each keg shall be securely sealed and clearly marked with size, amount and type of material contained within. Posts and rails shall be carefully loaded on trucks with layers of railing components securely tied down and separated by blocking to prevent scratching, marring and denting of the material.

402.03.05 Storing Materials and Equipment On/Against Structures Restrictions. Materials and equipment shall not be stored on or against any structure unless written permission is obtained from the Engineer and BCBEC-Structures for each type of material or equipment to be stored. Submittals to the Engineer shall include the type of material or equipment; the proposed storage location; the area at the base of the material or pallet and its total weight; height of stockpiles; number of axles, load per axle, and axle spacing; vehicle gross weight; and any other information necessary to calculate the stresses applied to the structure. Stockpiles shall not be placed against piers, parapets, or any other structure that could be possibly overstressed.

For structures under construction or rehabilitation, the Contractor shall also submit information pertaining to the phase of construction, which members have been modified or separated from the remainder of the structure, or have been newly constructed.

Any materials or equipment that would have a detrimental affect to the structure such as aluminum products placed against concrete surfaces shall be adequately protected to prohibit them from coming in contact with each other. Any discoloration or damage to the structure as a result of material or equipment being stored on/against the structure shall be removed or repaired.

402.04 MEASUREMENT AND PAYMENT. Removal of existing bridges and structures or any portion thereof will be measured and paid for as specified. The payment will be full compensation for all excavation, backfill, saw cuts, professional engineering services, removal of existing shields and debris, temporary protective shields, temporary sheeting and shoring, hauling, disposal, and for all material, labor, equipment, tools, and incidentals necessary to complete the work. On deck replacement projects, payment also includes obtaining all deck elevations specified to determine rebound, computations necessary to place new deck at required elevation, and submitting all data for review.

Construction fence used to restrict access under demolition areas will not be measured but the cost will be incidental to the pertinent Removal of Existing Structure item. When an item for construction fence is included in the Contract Documents, that portion of the construction fence used to protect demolition areas will be excluded from the measurement and payment for that item.

402.04.01 The items

Remove Existing Structure,
Remove Existing Bridge,
Remove Existing Bridge Substructure,
Remove Existing Bridge Superstructure,
Remove and Dispose of Existing Structural Steel,
Remove Portions of Existing Bridge Superstructure,
Remove Portions of Existing Bridge Substructure, and
Remove Portions of Existing Structure

will not be measured but will be paid for at the pertinent Contract lump sum price.

402.04.02 Removal of existing traffic barriers (parapets, railings, etc.) from bridges, including end posts, wing walls, and retaining walls will not be measured but will be paid for at the Contract lump sum price for the pertinent ***Remove Existing Traffic Barrier*** item.

402.04.03 Removal of existing structures for which no specific pay item is included in the Contract Documents will not be measured but the cost will be incidental to other pertinent items specified.

402.04.04 Salvaged materials will not be measured but will be paid for at the Contract lump sum price for the pertinent ***Remove and Salvage Existing Structural Steel*** bid item or for ***Remove and Salvage Traffic Barrier on Bridge***. The cost shall include protecting the material from damage, storing, shipping, stacking, loading, unloading, equipment labor and all incidentals necessary to complete the work. Materials damaged due to the Contractor's negligence shall be replaced at no additional cost to the County, or, at the direction of the Engineer, the Contractor shall reimburse the County for the replacement value. See also Section GP-6.06.

SECTION 403 – DRILLED HOLES IN EXISTING MASONRY

403.01 DESCRIPTION. This work shall consist of drilling holes in existing masonry for grouting of bars, bolts or anchorages, as specified in the Contract Documents or as directed by the Engineer.

403.02 MATERIALS.

Grout	902.11(c)

403.03 CONSTRUCTION. Holes shall be drilled only in the solid portion of the masonry. No holes will be permitted at points where cracks exist. The holes shall be drilled at least 1/2 in. larger than the outside diameter of the insert to be grouted and at least 6 inches from the face of any masonry surface. Dowel bars shall have a minimum diameter equivalent to a No.

6 reinforcing bar. Holes shall be cleaned and then filled two thirds full of grout. The insert shall be placed and allowed to set for 24 hours or the holes shall be filled with the cement mortar of the concrete mix placed around the inserts and placed simultaneously with the placing of the concrete.

403.04 MEASUREMENT AND PAYMENT. ***Drilled Holes in Existing Masonry*** will be measured and paid for at the Contract unit price per linear feet of drilled holes. The payment will be full compensation for all material, labor, equipment, tools, and incidentals necessary to complete the work.

Inserts and grout required for insertion in these holes will not be measured but the cost will be incidental to other pertinent items specified in the Contract Documents.

Drilled holes for which no specific pay item is included in the Contract Documents will not be measured but the cost will be incidental to the other pertinent items specified in the Contract Documents.

SECTION 404 – STRUCTURE EXCAVATION (Class 3 and Class 4)

404.01 DESCRIPTION. This work shall consist of excavation and backfill for bridges, box culverts and other major structures as specified in the Contract Documents or as directed by the Engineer. Classes of structure excavation are:

Class 3 Excavation — Excavation above the water surface specified in the Contract Documents.

Class 4 Excavation — Excavation below the water surface specified in the Contract Documents.

If Class 4 Excavation is not specified in the Contract Documents, all excavation shall be considered Class 3 Excavation regardless of the location of the water surface.

404.02 MATERIALS.

Crusher Run Aggregate CR-6	901, Table 901 A
No. 57 Stone	901, Table 901 A
Subfoundation Concrete	Table 902 A Mix #1 in Soil Mix #4 in Rock

404.03 CONSTRUCTION. All excavation contiguous to existing pavements and structures shall be sheeted, shored, braced, and supported in a substantial manner to prevent settlement, movement, or damage to the pavement or structure. Excavated material shall not be placed in any manner that may endanger any structure and shall be kept out of waterways.

404.03.01 Backfill and Embankment Material. All suitable material removed from the excavation shall be placed in backfill or stored for future use. Excavated material shall not be wasted without permission of the Engineer. Boulders, logs or other unforeseen obstacles encountered shall be removed. Unsuitable material shall be disposed of in an approved disposal area.

404.03.02 Footing Elevations. The elevation for the bottom of the footing specified in the Contract Documents shall be considered as approximate only, and the Engineer may, during the period of construction, order changes in dimensions or elevations of footings to secure a satisfactory foundation.

404.03.03 Footing Foundations. Footings for structures shall be on suitable foundations. The Engineer shall approve the foundations prior to placement of concrete and/or prior to driving foundation piles.

All rock or other hard foundation material shall be cleaned of all loose material and cut to a firm surface, either level or stepped as directed by the Engineer. All seams or crevices shall be cleaned out and grouted. All loose and disintegrated rock and thin strata shall be removed. When concrete is to rest on an excavated surface other than rock, special care shall be taken not to disturb the bottom of the excavation. Final removal of the foundation material to grade shall not be made until just before concrete is placed. If the Contract Documents include an item for Sub-foundation Investigation (Section 406) the item shall be used to verify the character of the foundation if directed by the Engineer.

Faces of footings shall be placed plumb against undisturbed material, rock, sheeting, shoring, or forms. Vertical faces of footings in rock shall bear against a minimum 1 ft depth of rock. If the excavation will not stand plumb, the Contractor shall furnish and install sheeting, shoring, or forms as required. When specified in the Contract Documents, sheeting used to construct spread footings shall be left in place and cut off 18 inches below finished grade. When not specified, or when sheeting is used to construct pile-supported foundations, the sheeting may be removed.

The design of sheeting and shoring shall be the responsibility of the Contractor. When the material retained by the sheeting and shoring is greater than 6 ft high, the detail, procedure, and computations shall be submitted the same as specified for falsework details in Section TC-4.01 and Section 499 and the Contract Documents. The experience specified in Section TC-4.01 will be waived.

Forms used for footings shall be removed and the void between the footing and the embankment shall be backfilled with sub-foundation concrete or tamped fill utilizing crusher run aggregate CR-6. The material shall be compacted to not less than 92 percent of maximum

density when tested in conformance with T 180, Method C. Sub-foundation concrete shall be used for this backfill when footings are submerged. Working drawings for forms used for footings are not required to be submitted for approval unless directed by the Engineer or the footing thickness exceeds 6 ft. However, working drawings for forms are required for footings of any thickness in submerged areas, cofferdams and adjacent to railroad tracks.

Where foundation piles are used, the excavation of each pit shall be completed to the as planned bottom of footing elevation before the piles are driven. After the driving is completed, all loose and displaced material shall be removed, without damaging the placed piling, leaving a suitable bed to receive the footing concrete. A 4 inch to 12 inch bed of No. 57 stone shall be placed on the bottom of the excavation prior to placing the footing concrete. The as planned bottom of footing elevation shall be maintained. For tremie seal, the displaced material may remain in place provided the minimum thickness of footing concrete, pile embedment and the required sealing of the foundation seal are maintained.

Where foundation piles are not used to support bridge piers or abutments, retaining walls, or wing walls of box culverts or rigid frames, and excavation to suitable bearing must be made below the as planned bottom of the foundation, the additional excavated spaces under these substructure units shall be backfilled with subfoundation concrete or the footing elevation shall be lowered, or the footing deepened as specified in the Contract Documents or as directed by the Engineer. Rock foundations that are to receive footing concrete shall have a rough finish and shall be excavated to provide level bearing areas and vertical steps. Where excavation to suitable bearing for box culverts must be made below the as planned bottom of the foundation, additional excavated spaces under the barrels shall be backfilled with No. 57 stone. The spaces under the wing wall footing shall be backfilled with sub-foundation concrete or the footing elevation lowered or footing depth deepened.

404.03.04 Cofferdams and Foundation Seals. When cofferdams are required, the Contractor shall submit for review, drawings and a complete description of the process for construction of the cofferdam. Timber or bracing left in the cofferdams or cribs shall not extend into the substructure concrete. Cofferdams shall be constructed to protect the concrete against damage.

(a) Foundation Seal. When the foundation cannot be dewatered, the Engineer may require the construction of a concrete foundation seal. The Contractor shall submit for review drawings and description of the process before placing of the seal. If a mud wave is created during the placement of the tremie seal, the displaced material shall be removed in order to preserve the full foundation cross section specified in the Contract Documents. The foundation shall then be pumped out and the footing placed in the dry. When weighted cribs are employed and the crib weight is utilized to overcome a part of the hydrostatic pressure acting against the bottom of the foundation seal, special anchorage such as dowels or keys shall be provided to transfer the entire weight of the crib into the foundation seal. When a foundation seal is placed under water, the cofferdam shall be vented or ported at low water level as directed.

(b) Pumping. Pumping will not be permitted during the placing of concrete. Pumping to dewater a sealed cofferdam shall not begin until the seal has set sufficiently to withstand the hydrostatic pressure.

(c) Removal of Cofferdams or Cribs. Cofferdams or cribs shall be removed by the Contractor after the completion of, and without damage to, the substructure.

(d) Stability of Foundation. The Contractor shall be responsible for stabilizing the foundation area so that the concrete footing can be constructed in the dry and in its proper place.

404.03.05 Backfilling. Backfill all excavated spaces resulting from structure excavation not occupied by the portions of the permanent work with suitable material approved by the Engineer. The backfilling shall be carried to the surface of the surrounding ground or grade as specified in the Contract Documents. Borrow shall not be used until the available project excavation is exhausted. The top surface of the backfilled areas shall be neatly graded. Backfill compaction shall conform to Section 204.03.04.

Backfilling Against Structures. Backfilling against various structures shall be done as follows:

(a) Brick Masonry. Backfilling is not permitted until seven days after completion of the section.

(b) Concrete Structures. Backfilling is not permitted until curing is completed and the concrete has achieved 80 percent of the specified compressive strength.

(c) Footings, Culverts and Piers. Fill placed around footings, culverts and piers shall be deposited on both sides to approximately the same elevation at the same time.

(d) Abutments, Retaining Walls, Culverts or Other Structures. The bed for the backfill shall be built up in horizontal layers so that at all times there is a horizontal berm of uniformly compacted material behind the structure for a distance at least equal to the height of the abutment or wall remaining to be backfilled, except insofar as undisturbed material protrudes into this area. Compaction of the berm shall conform to Section 204.03.04. Jetting of fills or other hydraulic methods involving liquid or semi-liquid pressure within the berm area is prohibited.

404.04 MEASUREMENT AND PAYMENT. ***Class 3 Excavation*** and ***Class 4 Excavation*** will be measured and paid for at the Contract unit price per cubic yard for the volume of material actually removed from within the limits specified.

No measurement or payment will be made for removing any water or liquids.

Class 3 Excavation and ***Class 4 Excavation*** will extend a maximum of 18 in. to vertical planes outside of the structure. Where blasting is required, a maximum of 6 in. will be allowed below the planned elevation.

Class 3 Excavation and ***Class 4 Excavation*** will include excavation for bridges, box culverts, and other structures as specified in the Contract Documents.

The upper limits for ***Class 3 Excavation*** on existing ground or embankments will be the existing ground line or the lower limit of roadway excavation. The lower limit of the two will control.

The upper limits for ***Class 3 Excavation*** on preliminary embankments will be the bottom of the proposed footing elevation. For stepped footings the upper limits will be the bottom of the proposed footing elevation of the highest portion of the footing. If the preliminary embankment has a surcharge, the upper limits will be the lower limit of roadway excavation.

The upper limits for ***Class 4 Excavation*** will be the bottom of the streambed or at the top of the waterline shown on the Contract Documents. The lower limit of the two will control.

The payment per cubic yard for ***Class 3 Excavation*** and ***Class 4 Excavation*** specified in the Contract Documents will be full compensation for all excavation, backfill, filling void around footings due to removing forms, blasting, grout, dewatering, removal and disposal of excess or unsuitable material, and for all material, labor, equipment, tools, and incidentals necessary to complete the work. When an item for ***Class 3 Excavation*** and ***Class 4 Excavation*** is not included in the Contract Documents, the excavation will not be measured but the cost will be incidental to other items.

Excavation for Culverts and Culvert Endwalls is not included in the ***Class 3 Excavation*** or ***Class 4 Excavation***.

404.04.01 Additional excavation required below the elevation specified in the Contract Documents and necessitated by the lowering or deepening of footings, or the placing of sub-foundations or underpinning, will be measured and paid for at the Contract unit price per cubic yard for either ***Class 3 Excavation*** or ***Class 4 Excavation*** as directed by the Engineer.

404.04.02 Sheeting, bracing, and shoring either removed or left in place, will not be measured but the cost will be incidental to other pertinent items unless otherwise specified in the Contract Documents.

404.04.03 Excavation necessary to expose or remove piles, grillages, sheeting, cribbing, masonry, or other obstructions will not be measured nor paid for if the excavation occurs outside the limits of excavation. The removal and disposal of obstructions within the limits of excavation will not be measured but the cost will be incidental to the Contract unit price per cubic yard for either ***Class 3 Excavation*** or ***Class 4 Excavation***.

SECTION 405 – POROUS BACKFILL

405.01 DESCRIPTION. This work shall consist of furnishing and placing of porous backfill material, reinforced concrete base and pipe drains at the rear of abutments, wing walls and retaining walls and other locations as specified in the Contract Documents or as directed by the Engineer.

405.02 MATERIALS.

Porous Backfill, No. 57, Aggregate	901
Concrete Mix No. 1	902.10.03
Pipe Drains	905
Reinforcement Steel	908
Geotextile	921.09

405.03 CONSTRUCTION. Porous backfill material shall be placed in layers in conjunction with the adjacent fill. Any fill material removed for placing the porous backfill material shall be at the expense of the Contractor. When a form is used between the porous backfill material and the earth backfill, the form shall be completely removed from the completed fill.

Concrete base shall be sloped to drain to points of discharge.

405.04 MEASUREMENT AND PAYMENT. ***Porous Backfill*** will not be measured for payment but will be paid for at the Contract lump sum price for the pertinent ***Porous Backfill*** item. If no item for ***Porous Backfill*** appears in the Contract Documents, the work will not be measured but the cost will be incidental to other items specified in the Contract Documents.

The payment will be full compensation for all excavation, concrete, reinforcement, drains, geotextile, and for all material, labor, equipment, tools, and incidentals necessary to complete the work.

SECTION 406 – SUB-FOUNDATION INVESTIGATION

406.01 DESCRIPTION. This work shall consist of drilling or augering test holes in rock or other foundation material as a means of verifying the character and suitability of material for foundation purposes.

406.02 MATERIALS. Not applicable.

406.03 CONSTRUCTION. Drill test holes in accordance with T206 and T225 as a first order of work or a minimum of 10 working days prior to excavation and/or pile driving in the area of the proposed test hole. The Engineer shall be notified a minimum of 10 days prior to the drilling. Test holes shall be located and bored to depths as specified in the Contract Documents. The Contractor shall submit to the Engineer for approval the name of the geotechnical engineer that will be responsible for supervising the test hole drilling and the preparation of the subsequent report. The geotechnical engineer shall be a Registered Professional Engineer in the State of Maryland.

The Contractor shall submit the drilling report to the Engineer within two working days unless directed otherwise by the Engineer. The Contractor shall schedule the borings such that a minimum of 10 working days will be available for the Engineer to review the test hole data and revise the proposed foundation if necessary. No excavation, pile driving, etc. shall occur unless directed by the Engineer. All reports, data, test results, etc. obtained from the test holes shall become the property of Baltimore County.

406.04 MEASUREMENT AND PAYMENT. ***Sub-foundation Investigation*** will be measured and paid for at the Contract unit price per linear foot for the actual total length of holes drilled or augered as directed by the Engineer. The payment will be full compensation for all geotechnical engineering services, material, labor, equipment, tools, and incidentals necessary to complete the work.

SECTION 407 – PILING

407.01 DESCRIPTION. This work shall consist of furnishing and installing piling as specified in the Contract Documents or as directed by the Engineer. See Special Provisions when drilled shafts (caissons, concrete-encased H-piles, etc.) or micropiles are specified. When required, dynamic pile monitoring shall be performed as specified elsewhere in the Contract Documents.

407.02 MATERIALS.

Sand	901, Table 901 A
Concrete for Steel Piles	902.10.03 Mix No.3 Slump 4 to 6 in.
Concrete Grout	902.11(a)
Epoxy Grout	902.11(d)
Timber Piles	907.01
Timber Sheet Piles	907.01
Resin and Fiberglass Caps	907.01.01
Casings for Cast-In-Place Concrete Piles	907.02
Steel Bearing Piles, including H Piles	907.03

Steel Sheet Piles	907.04
Reinforcement for Cast-In-Place Piles	908.01
Hardware	909.09
Water	921.01
Timber Preservatives	921.06
Steel Pipe Piles	907.06

407.03 CONSTRUCTION. The Contractor shall be responsible for ordering and delivering piling of the proper type and length to the structure site.

407.03.01 Storage and Handling. Piling shall be stored and handled to avoid damage. Damaged piling shall be repaired or replaced as directed by the Engineer.

407.03.02 Preparation for Driving. Piling shall not be driven until embankments and excavation have been completed as specified in the Contract Documents or as directed by the Engineer.

The Contractor shall provide templates or other approved means to assure that the piles are properly aligned and positioned.

The heads of all piling shall be equipped with a cap or cushion so that the energy imparted by the hammer can be transmitted to the pile evenly without injury to the top or butt. The top of the pile, irrespective of its type, shall be normal to the axis of the moving parts of the hammer.

407.03.03 Tapered Shells. Reserved.

407.03.04 Pile Tips.

(a) Timber piles shall be pointed where driving conditions require. The point shall be symmetrical and not less than a 4 in. diameter. Timber piles shall have their tips or bottoms shod with a metal shoe or point when specified in the Contract Documents or as directed by the Engineer.

(b) Timber sheet piling shall be drift sharpened or beveled at the bottom so as to wedge contiguous piles in tighter contact.

(c) Steel H piles shall be driven without any special tip reinforcement unless otherwise specified in the Contract Documents.

(d) Steel pipe piles shall be driven open-ended unless otherwise specified in the Contract Documents.

407.03.05 Splicing. Splicing of timber piles is prohibited. In the event of an isolated timber pile penetrating below planned tip elevation resulting in the top being below planned

elevation, the Engineer will determine if it must be replaced, supplemented by an additional pile or if the structure can be changed without detriment.

If splicing of steel H piles and steel pipes is necessary, they shall be spliced as specified in the Contract Documents by electric arc welding conforming to AWS Structural Welding Code for the full periphery. The number of splices permitted shall be compatible with driving conditions at the site and the standard lengths of piling produced by manufacturers; however, only one section of each pile shall be less than 20 feet.

When welding is required above a specified maximum elevation, weld as specified in Section 408.03 Metal Structures – Construction, excluding the submerged arc-welding requirement. Welders shall provide proof of certification in accordance with the AASHTO/AWS Bridge Welding Code D1.5 to the Engineer for approval.

All welding above the specified maximum elevation shall receive 100 percent Magnetic Particle Inspection (MT) on the root pass and completed weld, and 100 percent Radiographic Inspection (RT) in accordance with AWS D1.5. Inspectors shall be approved by the Engineer as specified for certification in accordance with AWS D1.5. Inspectors certified by an accredited Certified American Society for Non-Destructive Testing (ASNT) Level III in the inspection discipline, may submit certifications to the Engineer for approval.

Where a manufactured pile type is designed to be spliced by screwing two pieces together or by the use of couplings or collars, and the details for the splice are not specified in the Contract Documents, the device shall be submitted to and approved by the Engineer before use.

It is intended insofar as practical that piles be driven in a continuous operation, and that splicing be performed prior to approaching the estimated tip elevation.

407.03.06 Test Piling. Furnish for each test pile, a Wave Equation Analysis (WEAP) of pile driveability, sealed and signed by a Professional Engineer, registered in the State of Maryland, experienced in such work. The analysis shall demonstrate that the pile hammer proposed by the Contractor has sufficient power to drive the piles to the Driving Load and Estimated Minimum Penetration shown on the plans without overstressing or damaging the piles. The analysis shall, at a minimum, include the following:

(a) Analysis methodology.

(1) The ultimate soil resistance used in the analysis shall be not less than 225 percent of the required design capacity of the driven pile. The proportioning of the tip resistance and the distribution of the side resistance shall be based on the soil boring data using either static analysis or other strength correlations.

(2) For hammers with an adjustable energy range, analysis shall demonstrate that minimum energy used within the range can mobilize the ultimate soil resistance, and that the maximum energy used within the range will not overstress the pile during

driving operations based on allowable stresses in the AASHTO LRFD Bridge Design Specifications (current edition and all interims).

(3) The analysis shall demonstrate that with the hammer used, the required ultimate soil resistance shall be attained using hammer blows in the range of 2 to 10 blows per in.

(b) Interpretation of Soil Boring Data necessary to determine the resistance the pile will develop during driving to the estimated pile tip elevation.

(c) Computer input and output sheets and graphs showing soil resistance versus blow counts, and maximum tensile and compressive stresses in the pile versus blow counts.

(d) Provide for each hammer, at each test pile, charts of LRFD Driving Load (Pu) versus Energy (blow/minute) and Pile Set (blow/in.) using the formula shown on the plans for the End of Driving (EOD) condition.

(e) Test pile driving operations shall not commence until approval for the WEAP has been received.

(f) Drive test piles to determine the depth of penetration and the length of piling for structures.

Acceptance of the pile hammer and driving equipment will not relieve the Contractor's responsibility for properly driving piles, in satisfactory condition, to the driving resistance and tip elevations indicated or directed.

Drive test piles in permanent vertical position. Test piles found to be satisfactory shall be utilized as permanent piles.

407.03.07 Pile Driving. At least one month prior to the start of pile driving operations submit to the Engineer the hammer name, model, and manufacturer’s data for each pile hammer proposed to be used for pile driving, including Manufacturer’s Catalog Information and a completed Pile and Driving Equipment Data Form.

The hammer to be used for driving permanent piles shall be the same hammer that was used to drive the test piles. If the Contractor changes hammers, the Contractor shall drive additional test piles at his expense before driving the permanent piles, even if the energy ratings of the hammers are identical.

Hammers shall be operated at speeds recommended by the manufacturer for the bearing value specified. The manufacturer’s manual for the hammer employed shall be available to the Engineer at the project site.

Use pile-driving equipment of an acceptable type, mass (weight), and capacity. Use air compressors of sufficient capacity to provide 25 percent more air than shown in the manufacturer's specifications for air-driven hammers. Do not use capblocks or cushions containing asbestos.

Use drop-steam, air, diesel, or hydraulic actuated pile-driving hammers. Hammers shall be capable of developing at least the energy shown on the plans.

Equip hammers with a suitable drive head that accurately and securely holds the top of the pile in correct position, with reference to the hammer, and that distributes the blows from the ram over the entire top area of the pile or mandrel.

Within reasonable limits, use the optimum type and size of hammer for the indicated pile and subsurface conditions at the structure site. Use a hammer of a type and size that enables piles to be driven to any driving resistance without pile damage due to driving stresses, as indicated by the Wave Equation Analysis. Acceptance of a hammer relative to driving stress damage will not relieve the Contractor's responsibility for piles damaged because of misalignment of the leads, failure of capblock or cushion material, failure of splices, malfunctioning of the hammer, or other improper construction methods.

Construct pile driver leads to allow free movement of the hammer. Hold the leads in true vertical or inclined positions, as required, by guys or stiff braces to ensure support of the pile during driving. Provide leads of sufficient length so a follower will not be necessary under normal conditions.

No driving shall be done with the hammer out of the leads.

On all special, marine or water projects and pile bents, the leads shall be of sufficient length so that the use of a follower will not be necessary. Long piles and batter piles may require guides at intervals and additional support to prevent excessive bending or buckling under the hammer blow. Piles shall be held in place and alignment by templates or other means approved by the Engineer.

Water jets shall not be used unless specified in the Contract Documents or as directed by the Engineer. If it becomes necessary to remove material from within a pipe pile to advance the pile tip or merely to obtain room for concreting, leave a 10 foot soil plug undisturbed at the tip of the pile. Install turbidity curtains around piles being cleaned when appropriate.

Where piling must perforate strata resistant to driving, the Contractor shall auger or drill holes through the strata. The size of the auger or drill to be used shall not be larger than the nominal diameter of a round pile or the minimum diameter of a circle in which an H pile will fit and shall meet with the approval of the Engineer before use. After the hole is completed, the pile shall be inserted and dry sand shall be used to completely fill any voids between the pile and the walls of the hole. Driving shall then be completed, after which any remaining voids shall be completely filled with dry sand.

407.03.08 Pile Driving Tolerances.

(a) General. Foundation piles shall not be used out of the position specified in the Contract Documents by more than 6 in. in any direction after driving regardless of the

length of piles. Variation from the vertical or from the batter shall not be more than 1/4 in./ft .

(b) H Piles. Rotation of the pile in excess of 25 degrees from the as planned axis will not be permitted.

(c) Bents. Piles shall be driven so that the cap may be placed in its proper location.

407.03.09 Unacceptable Piles. Any pile not in conformance with the Contract Documents shall be corrected at the Contractor's expense by one of the following methods or other methods approved by the Engineer.

(a) The pile shall be withdrawn and replaced by a new pile.

(b) A second pile shall be driven adjacent to the unacceptable pile.

(c) The pile shall be spliced or built up (except timber piles).

(d) A sufficient portion of the footing shall be extended to properly embed the pile.

407.03.10 Unanticipated Driving Conditions. Should unanticipated driving conditions occur where resistance on the pile results in hammer blows per inch in excess of 20 with the hammer operated at its maximum fuel or energy setting (or at a reduced fuel or energy setting recommended by the Engineer based on pile installation stress control) then the Contractor shall stop driving and contact the Engineer for further guidance.

407.03.11 Pile Cutoff. The tops of all piles and pile casings except timber piles which support timber caps shall be cut off at the elevations specified in the Contract Documents and on a true plane perpendicular to the axis of the pile unless otherwise specified. Timber piles that support timber caps shall be cut off to insure that the plane of the bottom of the cap will bear fully on the pile head. Shimming between the timber cap and pile head is prohibited.

Cut off piles used for sheeting and shoring at least 18 inches below existing grade, channel bottom, or mud line as applicable. When specified, these piles may be removed. Dispose of all removed material in an approved manner.

407.03.12 Steel Pipe Piles. After driving, remove soil plugs to the specified elevation. Prior to placing filling (when specified) or reinforcement, use a suitable light to inspect the interior for the entire unplugged length. Do not fill or place reinforcement until the pile is approved.

Provide all required equipment for inspection including oxygen, light, boatswain's chair, and lift. Comply with Federal, State and local safety regulations.

407.03.13 Concreting Steel Pipe Piles. Perform concreting as specified in Section 414. Perform reinforcement work as specified in Section 416. Securely fasten the reinforcement together to form a cage, positioned and held at a uniform distance from the shell.

Except as specified herein, use tie wire to secure tie bars and bands of cage reinforcement. For foundation (footing) piles, tack welding may be used if a welder that has been certified in accordance with AASHTO/AWS Bridge Welding Code D1.5 performs the work.

For bents and column piles, tie bars, bands, and spacer lugs shall not be welded to the main reinforcing bars, except that a band may be placed at the top and bottom of the pile cage and all main bars welded to the band. Use tie wires to fasten the remainder of the intersections of ties and main bars.

Clean the areas in the top portion of the pile that are to be filled with reinforced concrete and tremie concrete. Place and cure tremie concrete prior to dewatering the top of the pile shell. Place the reinforcing unit in the top portion of the pile prior to filling with Mix No. 3 concrete.

Do not place concrete in any pile until completing driving within a radius of 15 ft or until all the piles for any unit of the structure (pier, bent, or abutment) have been driven to their final penetration and accepted. If this procedure is not feasible, discontinue driving within the above limits until the concrete in the last pile placed has set at least 72 hours.

Immediately prior to concreting, remove water and other foreign substances. Deposit the concrete in one continuous operation.

The restriction in Section 414.03.04 for dropping concrete more than 5 ft does not apply.

Set and fasten reinforcing steel cages in proper position in the pile before filling with concrete, except when the reinforcing steel cage extends 6 ft or less below the top of the pile, the concrete filling may be placed before installing the reinforcement. Thoroughly consolidate using mechanical vibrators from the bottom of the reinforcing steel cages to the pile top.

Do not disturb or apply loads to concreted piles until all concrete has been in place and cured at least 72 hours.

407.03.14 Treatment for Timber Pile Heads. Timber pile heads that are not to be imbedded in concrete shall be painted with an approved asphalt treatment. After the asphalt has sufficiently cured, it shall be covered with a glass resin composite shield. The first coat of resin shall be applied to the top and down the side a minimum of 1 in. beyond the limits of the woven glass. Precut woven glass cloth shall be applied using a 3 in. grooved aluminum roller to achieve “wet out.” Woven glass cloth shall be neatly wrapped over the top of the pile, draped down the side a minimum of 2 in. and nailed with copper nails. When the first coat of resin has taken a tack free set, a second coat of resin shall be applied to seal the entire application.

407.04 MEASUREMENT AND PAYMENT. The payment for the items specified in the Contract Documents will be full compensation for all material, labor, equipment, tools, and incidentals necessary to complete the work.

407.04.01 Piling (permanent and test) will be measured and paid for at the Contract unit price per linear foot for the pertinent ***Pile*** item. The measured length of all piling will be taken from its tip up to final cutoff unless otherwise specified in the Contract Documents. For test piles not utilized as permanent piles, the measurement for cutoff will be at the same elevation as the nearest proposed permanent pile or to actual top of test pile, whichever is lower. Where piling designated as test piles is accepted for use in the permanent structure, measurement will be made as test piles and no additional allowance will be made in other piling items.

407.04.02 Furnishing and setup of pile driving equipment required for driving permanent and test piles will be measured and paid for at the Contract unit price per each for the pertinent ***Setup for Driving Pile*** item. The unit price per each for the setup required for driving each pile for the proposed structure will be used regardless of the distance that the equipment must be moved for each pile setup. A maximum of one setup will be paid for any setup required for re-driving or any additional driving of any pile, no matter what reason the particular pile may require re-driving or additional driving.

407.04.03 Pile Points for Steel H Piles will be measured and paid for at the Contract unit price per each for the pertinent ***Pile Point for Steel H Bearing Pile*** item.

407.04.04 RESERVED.

407.04.05 ***Timber Sheet Piling*** will be measured and paid for at the Contract unit price per 1000 board feet (MBM) for the pertinent ***Timber Sheet Piling*** item. Computation of quantities will be based on nominal thickness of lumber, the length of the sheet piling, and the average depth of the sheet piling from cutoff at the top to the tip of the sheet piling in the completed structure. No allowance will be made for waste.

407.04.06 ***Steel Sheet Piling*** will be measured and paid for at the Contract unit price per square foot as measured along the plane of surface for the pertinent ***Steel Sheet Piling*** item.

407.04.07 The following will not be measured but the cost will be incidental to other pertinent items specified in the Contract Documents:

(a) Tips for pile shells or casings.

(b) Test pieces of sheet piling (timber or steel).

(c) Reinforcement and concrete used in cast-in-place piles.

(d) Pile splices.

(e) Augering.

(f) Cleaning, painting, or coating of piling.

(g) Piling or sheet piling for temporary structures, piles or sheet piling driven for the Contractor's convenience, or for any piles or sheet piling not specified in the Contract Documents.

(h) Piling not approved by the Engineer, such as piles not properly driven, piles with questionable safe bearing values, piles damaged during driving, or piles driven below planned cutoff or the removal of any pile rejected by the Engineer as unsatisfactory.

(i) Delays that are a result of changing cast-in-place concrete pile shell thickness resulting from driving test piles or for delays incurred by performing load tests not specifically called for in the Contract Documents.

(j) WEAP analysis will not be measured, but the cost will be incidental to the Contract unit price for the pertinent Pile item.

SECTION 408 – METAL STRUCTURES

408.01 DESCRIPTION. This work shall consist of furnishing, fabricating, transporting and erecting of steel beams, plate girders, trusses, grillages, columns and bents, shoes, pedestals, castings, miscellaneous steel and all incidental structural steel as specified in the Contract Documents or as directed by the Engineer.

408.02 MATERIALS.

Grout	902.11(c),(d),(e)
Metals	909
Bolts	A 325 Type 1 unless Type 3 is specified
Nuts	A 563 Grade C, D & EH
Washers	F 436
Bearing Pads	910.02
Epoxy Adhesive	921.04

Nuts, bolts and washers shall be coated to be compatible with the metal being fastened.

408.03 CONSTRUCTION. Unless otherwise specified, all welding and dimensional tolerances shall conform to AWS D1.5.

408.03.01 Working Drawings. The Contractor shall provide working drawings as specified in Section TC-4.01. The Contractor is responsible for the erection of curved girders and if lateral bracing is required for shipping or erection, the details shall be specified on the working drawings.

408.03.02 Work Scheduling. The Contractor shall give a minimum of two weeks notice to the Engineer when and where shop work shall begin. No materials shall be fabricated until directed by the Engineer.

408.03.03 Facilities for Shop Inspection. The Contractor shall furnish all facilities for the inspection of material and workmanship in the shop. The Inspector shall be allowed free access to the required areas of the premises and shall be provided with an approved office area.

408.03.04 Material Identification. The Contractor shall identify main member material by heat number.

408.03.05 Mill Orders. The Contractor shall furnish the Engineer with copies of mill orders and test reports.

408.03.06 Testing. The Contractor shall furnish, without charge, sample specimens as directed by the Engineer.

408.03.07 Defective Material and Workmanship. The acceptance of any material and workmanship by the Inspector will not deter subsequent rejection. Rejected material and workmanship shall be replaced or repaired as directed by the Engineer.

408.03.08 Marking and Shipping. Each member shall be painted or marked with an erection mark for identification. An erection diagram shall be furnished with erection marks clearly delineating the orientation of diaphragms.

Erection marks for the field identification of members and weight marks for members over 6000 lb in weight shall be painted upon surface areas previously painted with the shop coat. Material shall not be loaded for shipment until the shop coat is thoroughly dry and in any case not less than 24 hours after the paint has been applied.

Where unpainted steel is specified for a finished structure, the Contractor shall not place the Contractor's or any other company's name on any of the structural steel. Mark numbers and inspection stamps shall appear only on the top surface of the top flange of all girders, beams, and diaphragms unless otherwise directed.

No painting shall be done after loading of materials for transport.

The Contractor shall furnish the Engineer copies of material orders, shipping statements, and erection diagrams. The weights of the individual members shall be shown on the shipping statements. The loading, transportation, unloading and storing of structural material shall be

conducted so that the metal shall be kept clean and shall not be excessively stressed, deformed or otherwise damaged.

When handling long steel members, handling devices shall be placed at approximately the quarter points. When storing and shipping members, blocking shall be placed at intervals that prevent sag and distortion. All beams and girders shall be stored, shipped and handled in an upright position. Members other than beams and girders shall be handled, hauled and stored with the stronger axis vertical to resist gravity.

All girders having stiffeners the full height of the web on both sides of the web shall be adequately blocked before shipment. This blocking shall be located at the quarter points and midpoint of the girder and at additional locations to assure that the maximum interval between blocking does not exceed 25 ft.

Members too long to fit inside a truck or trailer shall not cantilever beyond the bed more than 1/4 of its length. Members too long to comply with this requirement shall be supported on dollies, additional vehicles, or other vehicles that fully support the long pieces as approved by the Engineer.

408.03.09 Storage of Material. Fabricated material shall be stored off the ground and protected as far as practicable from surface deterioration by exposure to conditions producing rust. These materials shall be kept free of dirt accumulation, oil or other deleterious matter.

408.03.10 Changes and Substitutions. No changes or substitutions shall be made in any approved drawing unless approved in writing by the Engineer.

408.03.11 Fabrication. Fabrication and construction shall be bolted or welded as specified in the Contract Documents or as directed by the Engineer.

When curved girder bridges are to be curved by the heat shrinkage method, the proposed method shall be submitted to the Engineer for approval.

408.03.12 Holes.

(a) Punched Holes. The diameter of the die shall not exceed the diameter of the punch by more than 1/16 in. Holes requiring enlargement shall be reamed. Holes shall be clean cut with no torn or ragged edges. Holes punched full size or sub-punched shall be punched so that after the steel is assembled and before any reaming is done, a cylindrical pin 1/8 in. smaller in diameter than the nominal size of the punched hole shall be entered perpendicular to the face of the member, without drifting, in at least 75 percent of the contiguous holes in the same plane. If this requirement is not met, the nonconforming punched pieces will be rejected. Holes not passing a pin 3/16 in. smaller in diameter than the nominal size of the punched hole will be rejected. Drifting done during assembling shall be only to bring the parts into position and not sufficient to enlarge the holes or distort the material. If the required accuracy cannot be obtained otherwise, holes for connections shall be sub-punched and reamed with the members assembled instead of being punched full size.

(b) Reamed or Drilled Holes. Holes shall be cylindrical, perpendicular to the member, and not more than 1/16 in. larger than the nominal diameter of the bolts. Where practical, reamers shall be directed by mechanical means. Burrs on the surface shall be removed. Poor matching of holes will be cause for rejection. Reaming and drilling shall be done with twist drills. If required by the Engineer, assembled parts shall be taken apart for removal of burrs caused by drilling. Connecting parts requiring reamed or drilled holes shall be assembled and securely held while being reamed or drilled and shall be match marked before disassembling. When holes are reamed or drilled, 85 percent of the holes in any contiguous group shall, after reaming or drilling, show no offset greater than 1/32 in. between adjacent thicknesses of metal.

(c) Sub-punching and Reaming. Holes in all field connections and field splices of main truss or arch members, continuous beams, plate girders and rigid frames shall be sub-punched and reamed while assembled in the shop unless otherwise specified. The assembly, including camber, alignment, accuracy of holes and milled joints shall be acceptable to the Engineer before reaming is started.

All holes for floor beam and stringer field end connections shall be sub-punched and reamed utilizing a template or reamed while assembled.

If additional sub-punching and reaming is required, it will be specified in the Contract Documents. The accuracy of sub-punched holes shall be the same as required for punched holes.

408.03.13 Shop Assembly. Clean all surfaces of metal that will be in contact after assembling. The parts of a member shall be assembled, well-pinned and firmly drawn together with bolts before reaming or tightening of fasteners is started. The member shall be free from twists, bends and other deformations. Material that has been punched full size shall be reamed, if necessary, prior to tightening of fasteners. Refer to Section 408.03.12(c).

Parts not completely fastened in the shop shall be secured by bolts insofar as practicable to prevent damage in shipment and handling. Members assembled in the shop for reaming of field connections shall remain assembled until the Engineer's shop inspection.

408.03.14 Camber Diagram. A camber diagram shall be furnished to the Engineer showing the camber at each panel point for each truss, taken from actual measurements during truss assembly. A camber diagram shall be furnished to the Engineer showing the camber at all splice points, points of dead load inflection, and any other points designated by the Engineer for all beams and girders.

Stringers shall be cambered to the dimensions specified in the Contract Documents. The camber specified shall mean the camber as measured after all shop welding has been completed. The maximum tolerance for camber shall be zero (0) under to ½ in. over.

Full provisions shall be made for dead load deflections, fabricating tolerances, and irregularities at all points along all stringers so that the superstructure concrete may be placed to match the profile grade line.

408.03.15 Match Marking. Connecting parts assembled in the shop for the purpose of reaming holes in field connections shall be matched marked, and a diagram showing these marks shall be furnished to the Engineer.

408.03.16 Use of High Strength Bolts and Lock-Pin and Collar Fasteners. High strength bolts and lock-pin and collar fasteners shall be used unless otherwise specified in the Contract Documents. Unfinished bolts or machine bolts may be used for the temporary erection of structural steel and shall be replaced with high strength bolts, lock-pin and collar fasteners or welding for final erection. Turned bolts shall only be used when specified. The heads, nuts, and washers shall be drawn tightly against the work. Where bolts or lock-pin and collar fasteners are used in beveled surfaces, beveled washers shall be provided to give full bearing to the head, nut, or collar except as otherwise specified in Section 408.03.17. Where high strength bolt assemblies are used for joint connections, the Contractor shall also perform the additional testing specified in Section 408.03.17(e).

408.03.17 High Strength Bolt Joint Requirements.

(a) Only one grade of bolts, nuts and washers shall be used in a structure. Bolts may be supplied from various manufacturers provided that each bolt of a given length and diameter shall be made by the same manufacturer. Nuts and washers may be supplied from different manufacturers provided that the same manufacturers make all the respective nuts and washers to be used throughout the structure on all bolts having the same diameter. All bolts used with A 709, Grade 50W steel shall conform to A 325.

(b) The slope of surfaces of bolted parts in contact with the bolt head and nut shall not exceed 1:20 with respect to a plane normal to the bolt axis. Where an outer face of the bolted parts has a slope of more than 1:20 with respect to a plane normal to the bolt axis, a smooth beveled washer shall be used to compensate for the lack of parallelism. When assembled, bolted parts shall fit solidly together and shall not be separated by gaskets or any other interposed compressible material. The holes shall be truly cylindrical and at right angles to the surface of the metal so that both head and nut will bear squarely against the metal. When assembled, all joint surfaces including those adjacent to the bolt heads, nuts or washers, shall be free of scale (except tight mill scale), dirt, burrs, and other deleterious material and defects that would prevent solid seating of the parts. Contact surfaces within joints shall be free of oil, lacquer, or rust inhibitor. For contact surfaces to be painted refer to Section 413A.03.06.

(c) When all bolts in the joint are tight, every bolt shall conform to the minimum bolt tension that is equal to the proof load specified in A 325. When field conditions prevent tightening at the nut, bolts may be tightened at the head, provided that the nut is prevented from turning. All bolts shall have a washer under the element (nut or bolt head) turned in tightening. Threaded bolt connections shall be tightened by the turn-

of-nut method. If impact wrenches are used, they shall be of adequate capacity and have a sufficient supply of air to perform the required tightening of each bolted connection.

(d) To provide the bolt tension specified in Section 408.03.17(c), there shall first be enough bolts brought to a "snug tight" condition to insure that the parts of the joint are brought into full contact with each other. Snug tight is defined as the tightness attained by a few impacts of an impact wrench or the full effort of a man using an ordinary spud wrench. Bolts shall be placed in any remaining holes in the connection and brought to snug tightness. All bolts in the joint shall then be additionally tightened with tightening progressing systematically from the center of connection plates of the joints to the free edges. During this operation there shall be no rotation of the part not turned by the wrench.

After all bolts in the joint have a snug fit, the joint shall be additionally tightened by the applicable amount of nut rotation specified in the Nut Rotation From Snug Tight Condition table below. All bolt assemblies in the completed structure shall have full thread engagement that is accomplished when the end of the bolt is flush with or extends beyond the outer face of the nut.

NUT ROTATION FROM SNUG TIGHT CONDITION
DISPOSITION OF OUTER FACES OF BOLTED PARTS

Bolt length (as measured from underside of head to extreme end of bolt	Both faces normal to bolt axis	One face normal to bolt axis and other face sloped not more than 1:20 (beveled washer not used)	Both faces sloped not more than 1:20 from normal to bolt axis (beveled washer not used)
Up to and including 4 diameters	1/3-turn	1/2-turn	2/3-turn
Over 4 diameters but not exceeding 8 diameters	1/2-turn	2/3-turn	5/6-turn
Over 8 diameters but not exceeding 12 diameters	2/3-turn	5/6-turn	1-turn

NOTE 1: This table is for coarse thread, heavy hexagon structural bolts of all sizes and lengths and heavy hexagon semi-finished nuts.

NOTE 2: Nut rotation is rotation relative to bolt regardless of the element (nut or bolt) being turned. Tolerance on rotation: ±30 degrees for bolts installed by 1/2 turn or less, and ±45 degrees for bolts installed by 2/3 turn or more.

(e) Inspection. The Engineer will be present during the installation and tightening of bolts to determine that the tightening procedure is properly followed and all bolts are properly tightened.

The Contractor shall provide a sufficient number of safe working platforms at splices where high strength bolts will be checked for torque requirements. Platforms shall be maintained at splices until all checking is complete and the splice is acceptable to the Engineer.

The Contractor shall provide a calibrated torque wrench to be used as the inspection wrench and a calibrated bolt tension calibrator. Both have to be approved by the Engineer.

The Contractor shall conduct the following inspections unless otherwise specified in the Contract Documents. Bolts, nuts, and washers that were previously torqued to proof load shall not be reused in the structure.

(1) Three bolts of the same size, length, and condition as those under inspection shall be placed individually in the bolt tension calibration device. There shall be a washer under the part turned in tightening each bolt.

(2) Each of the three bolts shall be tightened in the calibration device by any convenient means to the proof load specified for its size. The inspecting wrench shall then be applied to the tightened bolt, and the torque necessary to turn the nut or head 5 degrees approximately 1 in. at 12 in. radius in the tightening direction shall be determined. The average torque measured in the tests of three bolts shall be taken as the job inspecting torque to be used in the manner specified in paragraph (3).

(3) Bolts represented in the sample above which have been tightened in the structure shall be inspected by applying, in the tightening direction, the inspecting wrench and its job inspecting torque to 10 percent of the bolts but not less than two bolts selected at random in each connection. If no nut or bolt head is turned by this application of the job inspecting torque, the connection will be accepted as properly tightened. If any nut or bolt head is turned by the application of the job inspecting torque, this torque shall be applied to all bolts in the connection; and all bolts whose nut or head is turned by the job inspecting torque shall be tightened and re-inspected. Alternatively, the fabricator or erector may opt to retighten all of the bolts in the connection and then resubmit the connection for the specified inspection.

408.03.18 Lock-Pin and Collar Fastener Requirements.

(a) Lock-pin and collar fasteners shall conform to Section 408.03.17 for one manufacturer, weathering characteristics, sloped surfaces and applicable inspection.

(b) A representative sample of not less than three sets of lockpin and collar fasteners of each diameter, length and grade shall be checked at the job site in a device capable of indicating bolt tension. The test assembly shall include flat hardened washers, if required in the actual connection, arranged as in the actual connections to be tensioned. The calibration test shall demonstrate that each assembly develops a tension not less than 5 percent greater than the tension required for the comparable A 325 or A 490 bolt. Manufacturer's installation procedure shall be followed for installation of bolts in the calibration device and in all connections. Periodic retesting shall be performed when required by the Engineer.

(c) Fasteners shall be installed in all holes of the connection and initially tightened sufficiently to bring all plies of the joint into firm contact but without yielding or fracturing the control or indicator element of the fasteners. All fasteners shall then be further tightened, progressing systematically from the most rigid part of the connection to the free edges in a manner that will minimize relaxation of previously tightened fasteners. In some cases, proper tensioning of the bolts may require more than a single cycle of systematic partial tightening prior to final twist off of the control or indicator element of individual fasteners.

408.03.19 Welding. Welding of structures shall conform to the Contract Documents and AASHTO/AWS Bridge Welding Code D1.5 unless otherwise specified. The provisions contained herein shall apply to both shop and field welding.

The Engineer shall approve all welders, welding machine operators and tackers employed to work on structures for the County.

(a) Qualification Testing. Welders will be approved based on Qualification Testing conforming to AASHTO/AWS Bridge Welding Code D1.5. Qualification testing will be conducted by an AISC-certified facility.

(b) Qualifications from Outside Sources. Welders having certifications from outside sources in conformance with the AASHTO/AWS Bridge Welding Code D1.5 may submit that certification for approval to the Engineer.

All field welders approved by the Engineer shall have certification of qualification testing acceptable to the Engineer in accordance with (a) or (b) available at all times for inspection by the Engineer.

Unless otherwise specified by the Engineer in writing, only submerged arc welding will be permitted on members carrying primary stress. Members carrying primary stress include but are not limited to the following: rolled beams, cover plates on rolled beams, welded splices, girders and connection material of the members and other parts as specified in the Contract Documents.

After fabrication, no welding will be permitted on tension flanges for attachments such as metal forms and tie screws, except for steel stud shear developers specified in the Contract Documents.

Welding transversely across the tension flanges of beams or girders is prohibited and is cause for rejection unless otherwise specified in the Contract Documents.

408.03.20 Inspection of Fabricated Metal Structures. Fabricated metal structures shall conform to AASHTO/AWS Bridge Welding Code D1.5. Quality control inspection shall be the responsibility of the Contractor.

The Contractor shall have on file with the Engineer a current approved quality control plan prior to receiving source approval. This plan shall specify the frequency, method of inspection and provide for documentation. The inspection frequency shall be at least the minimum specified in AASHTO/AWS D1.5. The County requires 30 days to review quality control plans not previously on file.

The Contractor shall also keep complete and current records that shall be available to the County's representatives at all times.

When work is completed, the documentation for all quality control tests and inspections shall become the property of the County.

408.03.21 Planing. The top and bottom surfaces of steel slabs, base plates, and cap plates of columns and pedestals shall be planed or the plates or slabs shall be hot straightened. Parts of members in contact with them shall be faced. In planing the flat surfaces of expansion bearings, the cut of the tool shall be in the direction of expansion.

408.03.22 Abutting Joints. Abutting joints in compression members and in tension members where specified in the Contract Documents shall be faced and brought to an even bearing. Where joints are not faced, the opening shall not exceed 1/8 in.

408.03.23 End Connection Angles. Floor beams, stringers, and girders having end connection angles shall be built to exact length back-to-back of connection angles. If end connections are faced, the finished thickness of the angles shall not be less than specified in the Contract Documents.

408.03.24 Main Members. Principal portions of main members carrying primary stress (refer to Section 909.01) shall be fabricated so that the direction of stress and rolling are the same.

408.03.25 Web Plates. At web splices, the clearance between the ends of the web plates shall not exceed 3/8 in. The clearance at the top and bottom ends of the web splice plates shall not exceed 1/4 in.

408.03.26 Bent Plates. Unwelded, cold bent, load carrying, rolled steel plates shall be taken from the stock plates so that the bend line will be at right angles to the direction of rolling, except that cold bent ribs for orthotropic deck bridges may be bent in the direction of rolling if permitted by the Engineer and shall conform to the following:

(a) Bending shall be so that no cracking of the plate occurs. Minimum bend radii, measured to the concave face of the metal shall conform to the following:

MINIMUM COLD-BENDING RADII				
A 709 Grades	Thickness, in. (t)			
	Up to 3/4	Over 3/4 to 1, incl.	Over 1 to 2, incl.	Over 2
36	1.5t	1.5t	1.5t	2.0t
50	1.5t	1.5t	2.0t	2.5t
50W	1.5t	1.5t	2.0t	2.5t
HPS70W	1.5t	1.5t	2.5t	3.0t
100	1.75t	2.25t	4.5t	5.5t
100W	1.75t	2.25t	4.5t	5.5t

(b) For brake press forming, the lower die span should be at least 16 times the plate thickness. Multiple hits are advisable.

(c) If a shorter radius is essential, the plates shall be bent at a temperature not greater than 1200 F. Hot bent plates shall be taken from stock so that the bend line will be at right angles to the direction of rolling.

(d) Before bending, the corners of the plate shall be rounded to a radius of 1/16 in. throughout the portion of the plate where the bending is to occur.

408.03.27 Erection Plan. The Contractor shall submit for approval, an erection diagram plan outlining erection procedure of the main members. The plan shall conform to Section TC-4.01 and shall be submitted for approval to the Engineer a minimum of 30 days prior to beginning erection. This plan shall include the numbers and types of equipment to be used including crane capacity, location of crane for lifting, falsework when required, and main member erection sequence and weight.

All wheels and outriggers of a crane or wheels of a structural steel delivery truck shall be at a minimum distance from the rear face of an abutment equal to the vertical distance from the top of a spread footing or to the original groundline if the footing is on piles. No other heavy construction equipment shall be operated within this minimum distance from the rear face of abutments.

The Contractor shall erect bridges with continuous main members in a manner providing the proper reactions, and avoiding overstressing main members.

The Contractor when preparing erection plans and procedures shall take into account the restrictions imposed by the Water Resources Administration relative to pollution or disturbance of existing waterways.

408.03.28 Falsework. The Contractor shall comply with the provisions specified in Section TC-4.01. The falsework shall be built and maintained in conformance with the approved falsework plans. Any changes subsequent to initial approval shall be proposed through the Contractor's Professional Engineer and be approved by the Engineer.

Before permitting any loads to be placed on falsework, the Engineer shall receive written certification by the Contractor's Professional Engineer that the falsework system has been assembled in conformance with the approved falsework drawings. A Certificate of Compliance stating that all manufactured materials and assemblies fully comply with the falsework design and plans shall accompany this certification. The Engineer may either accept the certificate or invoke any provision of Section GP-5.08. All tests required shall be made by and at the expense of the Contractor.

In addition to protective measures shown on the falsework plans, the Engineer may direct the Contractor to provide further protection of falsework against accidental collision by highway or construction traffic and equipment, traffic vibration, flood waters or high winds, etc., that are necessary for public safety and protection of the work.

408.03.29 Damaged or Defective Material. The correction of damaged or defective material shall not begin until a written procedure prepared by the Contractor is approved by the Engineer. Correction of damaged or defective material shall be by methods that do not produce fracture or injury. All damaged or defective material will be inspected by the Engineer before and after correction. Corrections shall be conducted in the presence of the Engineer.

408.03.30 Assembling Steel. Material shall be carefully handled and no parts shall be bent, broken, or otherwise damaged. Bearing surfaces and those to be in permanent contact shall be cleaned before the members are assembled. Before beginning the field bolting and welding, the structure shall be adjusted to correct grade and alignment and the elevations of panel points (ends of floor beams) properly regulated. Splices and field connections shall have one half the holes filled using bolts and cylindrical erection pins (40 percent bolts and 10 percent pins) before torquing high strength bolts. Splices and connections in members carrying traffic during erection shall have three fourths of the holes filled before torquing. Cylindrical erection pins shall be 1/32 in. larger than the diameter of the fasteners.

408.03.31 Anchor Bolts. Per Section 909.06. Do not cast anchor bolts in the concrete. Create a template to locate the anchor bolt holes and use it to shift the reinforcement prior to placing the concrete to eliminate conflicts between the reinforcement and the anchor bolt holes.

Set anchor bolts in round holes drilled or cast in the concrete. Accurately position bolts by using templates set to correct location and alignment to ensure proper span lengths, and carefully set tops of bolts to proper elevation. Unless otherwise noted, install bolts plumb or normal to the finished bearing surface of the masonry.

Bolts shall have the portion below the bridge seat swedged. Drill or cast holes to a diameter at least 1 in. larger than the bolt diameter.

Do not paint anchor bolts, nuts, and washers.

After anchor bolts are finally and correctly positioned, completely fill the holes with grout; however, do not grout until all structural steel is set in its final position. After the masonry plates or shoes are set, use the same grout to fill the space between the bolts and the round holes of fixed plates and shoes. Do not fill slotted holes in expansion devices unless specified.

Maintain an air temperature of at least 40 F around the mortar surface for a period of three days unless otherwise recommended by the manufacturer.

When mortar filling is used, first check the depth of the hole by inserting and withdrawing the bolt. Partially fill the hole with mortar, and immediately insert the bolt by forcing with uniform pressure or light blows from a hammer (flogging and running is prohibited) so that excess mortar is pushed out at the top of the hole. Remove excess mortar.

Set the bolt to project approximately 1/2 in. above the nut and ensure that it is threaded to approximately 1/2 in. below the nut in their final position.

Set rockers or expansion plates with slotted holes with the proper tilt or offset as determined by the temperature prevailing at the time and so that they will be in their midway position at 68 F or as specified.

408.03.32 Maintenance of Concrete. The Contractor is responsible for keeping all exposed concrete surfaces free from stains and discoloration. The Contractor shall prevent staining of the finished concrete surfaces where unpainted structural steel is specified. Any stains shall be removed and the concrete restored to its original color.

408.03.33 Safety Hazards. The Contractor shall be responsible for gas detection in and ventilation of confined spaces.

408.04 MEASUREMENT AND PAYMENT. The payment will be full compensation for all material, labor, equipment, tools, and incidentals necessary to complete the work. Measurement and Payment shall be in accordance with one of the following as specified in the Contract Documents:

408.04.01 ***Fabricated Structural Steel*** will not be measured for payment but will be paid for at the Contract lump sum price.

408.04.02 ***Fabricated Structural Steel*** will be measured and paid for at the Contract unit price per pound computed on the theoretical weight.

Where measurement and payment of ***Fabricated Structural Steel*** is based on weight, the weight will be computed on the basis of the net finished dimensions of the parts as shown on the approved working drawings, deducting for copes, cuts, clips, and all open holes.
Computations will be made on the basis of the following:

Material	Pounds /Cu Ft
Aluminum, cast or wrought	173.0
Bronze, cast	536.0
Copper alloy	536.0
Copper, sheet	558.0
Iron, cast	445.0
Iron, malleable	470.0
Lead, sheet	707.0
Steel, rolled, cast, copper bearing, silicone, nickel and stainless	490.0
Zinc	450.0

The weights of rolled shapes will be computed on the basis of their nominal weight per foot as specified in the Contract Documents or listed in the handbooks.

The weights of rolled shapes will be computed on the basis of their nominal weight for their width and thickness as specified in the Contract Documents, plus an estimated overrun computed as one half the permissible variation in thickness and weight as tabulated in A 6.

The weight of all shop weld metal (not included in weighed unit) and field weld metal will be computed on the basis of the theoretical volume from dimensions of the welds.

The weight of temporary erection bolts, shop and field paint, boxes, crates and other containers used for shipping, and materials used for supporting members during transportation and erection will not be included in the payment weight.

Structural members, materials that fail to meet the requirements of tests, and all materials rejected as a result of these tests will not be measured nor paid for under any method of payment.

408.04.03 When a pay item for ***Fabricated Structural Steel*** is not specified in the Contract Documents, the Fabricated Structural Steel will not be measured but the cost will be incidental to other pertinent items.

408.04.04 Rotational capacity testing for high strength bolt assemblies will not be measured but the cost will be incidental to the Contract price for the ***Fabricated Structural Steel*** item or other pertinent items specified in the Contract Documents.

SECTION 409 – STEEL STUD SHEAR DEVELOPERS

409.01 DESCRIPTION. This work shall consist of furnishing, fabricating and installing, complete in place, steel stud shear developers as specified in the Contract Documents or as directed by the Engineer.

409.02 MATERIALS.

Steel Stud Shear Developers	909.05

409.03 CONSTRUCTION. All structural steel in a particular span of a bridge shall be erected and have forming and decking complete in place in that particular span before shear developers are attached to the structural steel. Shear developers shall be installed as specified in AWS D1.5. After welding is completed, an inspection of all studs will be made by the Engineer prior to placing of concrete. All defects shall be corrected at the Contractor's expense.

409.04 MEASUREMENT AND PAYMENT. The payment will be full compensation for all material, labor, equipment, tools, and incidentals necessary to complete the work. Measurement and Payment shall be in accordance with one of the following as specified in the Contract Documents:

409.04.01 ***Steel Stud Shear Developers*** will not be measured but will be paid for at the Contract lump sum price.

409.04.02 ***Steel Stud Shear Developers*** will not be measured but the cost will be incidental to other pertinent items specified in the Contract Documents.

409.04.03 ***Steel Stud Shear Developers*** will be measured and paid for at the Contract unit price per each.

SECTION 410 – EXPANSION JOINTS IN STRUCTURES

410.01 DESCRIPTION. Furnish, fabricate, and install preformed joint fillers, preformed elastomeric joint seals, troughs, structural steel, and metal plates to be utilized in providing expansion and contraction capabilities in structures.

410.02 MATERIALS.

Hardware for Drainage Troughs	909.06
Preformed Joint Fillers	911.02

Preformed Polychloroprene Elastomeric Compression Joint Seals	911.04
Lubricant Adhesive	911.04.03
Troughs	911.11
Structural Steel	A 709, Grade 36

All structural steel for drainage troughs shall be hot dip galvanized to meet A 123 and A 153.

Ensure that troughs meet the thickness requirements for the type of material supplied. Place joints and splices for drainage troughs only where specified.

410.02.01 Paint. Refer to Section 413.

410.03 CONSTRUCTION. Store expansion joint material delivered to the bridge site under cover on platforms at least 4 in. above all types of surfaces and vegetation. Protect it at all times from damage and when placed ensure that it is free from dirt, oil, grease, or other foreign substances. All welding shall meet AWS D1.1 unless otherwise specified. All material and installation methods shall be approved prior to installation of any expansion joint material.

Provide the longest possible lengths of the preformed material with a minimum of joints. Lengths less than 4 ft shall be one piece. Cut material to a clean, true edge. Ensure straight lines at the joint.

When installing the seal, do not use any type of equipment that will damage the seal. Remove and replace damaged seals.

Drainage Troughs. Refer to MdSHA Office of Structures Standard Plate No. BR-SS(7.17)-95-313 Sheets 1 through 5 (*Drainage Trough Catch Basin – General Notes, Location Details, Type A, Type B and Type C Details*) and Standard Plate No. BR-SS(7.02)-79-64, Sheets 1 and 2 (*Compression Seal Roadway Joints at Abutments* and *Neoprene Trough Details for Compression Seal Roadway Joints at Abutments*).

Cleaning And Painting. Refer to Section 413.

Joint Replacement and Modification. Where the Contract Documents specify replacement or modification to existing expansion joints on bridges on which traffic will be maintained, have available a supply of steel plates at least 4 x 8 ft and 1 in. thick. Place these plates over the joints if traffic has to be restored before the concrete has cured and at any time the unfinished work will interfere with traffic.

Where the Contract Documents specify modification to existing expansion joints, remove the concrete as specified in Section 402.03.

Where the Contract Documents only specify replacement of existing roadway joint seal, the work shall include cleaning and painting the joint.

Thoroughly clean existing drainage troughs to remain of all debris. Clean and paint all exposed metal where noted on the Plans or as directed.

All angles shall be cut with a saw. All holes and slots shall be drilled. Do not cut with a torch.

Power tool clean to bare metal and paint any areas where the existing steel coating is damaged due to the installation of new troughs.

After the joints are complete in place and just prior to placing the compression seal, remove the masking tape and residue, and install the seal. Then apply the finish coat to the exposed portion of the angles above the seal.

Joint Seals in Bridge Decks. Place transverse compression seals in one piece for the entire length of the roadway joint. Shop and field splices are prohibited. Use the longest compression seal pieces as practicable for longitudinal bridge joints.

Apply the lubricant adhesive according to the manufacturer's recommendations. If the seal is stretched in excess of 5 percent, remove and reinstall the seal as directed.

410.03.01 In-Place Testing. Subject the completed joint to a water test to detect any leakage. Conduct the test at least five days after completing the joint. Provide all facilities required for the Engineer's inspections of the underdeck areas. Cover the roadway section of the joint from curb to curb, or parapet to parapet, with at least 1 in. of water. If this is not possible, perform the water test in part section along the joint. When testing subsequent part sections, overlap at least 1 ft of the joint previously tested.

Maintain the ponding for a period of five hours for the entire roadway or each section of joint being tested. During and at the conclusion of the test, examine the underside of the joint for leakage. The expansion joint seal will be considered watertight if no obvious wetness is visible. If the joint system exhibits evidence of water leakage at any point, locate and repair all leaks.

When repairs are required, perform a subsequent water test.

If the joint leaks after the second test, remove, replace, and retest the seal.

410.04 MEASUREMENT AND PAYMENT. The payment will be full compensation for furnishing, fabricating, and placing structural steel, roadway seals, drainage troughs, catch basins, downspouts, cleaning, painting, and all material, labor, equipment, tools and incidentals necessary to complete the work.

410.04.01 Joints in structures will not be measured but the cost will be incidental to the pertinent Superstructure Concrete item.

410.04.02 When an item for ***Modifying Existing Bridge Roadway Joints*** is included in the Contract Documents, the cost of furnishing, fabricating, and placing new structural steel, new roadway seals, modifying existing joints on bridge roadway including saw cutting and removal of existing concrete, new concrete, steel plates, cutting of existing steel, welding, drainage troughs, catch basins, downspouts, etc., shall also be included in the Contract unit price per linear foot for the item. The measurement will include the horizontal distance from the inside face to inside face of parapets plus the vertical distance of the curb faces and parapets.

410.04.03 When an item for ***Drainage Trough for Bridge*** is included in the Contract Documents, the furnishing and placing of drainage troughs including catch basins, downspouts, structural steel, and hardware will be measured and paid for at the pertinent Contract unit price per linear foot. This price will include cutting of angles, cleaning, painting, drilling of concrete, expansion bolts, etc. The measurement will be along the centerline distance from end to end of the installed drainage trough fabric.

410.04.04 Cleaning existing drainage troughs and cleaning and painting metal attachments will not be measured but the cost will be incidental to other pertinent items.

SECTION 411 – BEARINGS

411.01 DESCRIPTION. Furnish and install bearings.

411.02 MATERIALS.

Steel Plates	909.02
Bronze or Copper Alloy Bearing and Expansion Plates	910.01
Elastomeric Bearing Pads	910.02.01
Pre-formed Fabric Pads	910.02.03
Epoxy Adhesives	921.04

411.03 CONSTRUCTION.

411.03.01 Storage and Handling. Store all types of bearings at the site under cover and on suitable blocking or platform at least 4 in. above all types of surfaces and vegetation. Protect from damage at all times and, when placed, keep them dry, clean, free of dirt, oil, grease, and other foreign substances.

411.03.02 Installation. Place preformed fabric pad on surfaces meeting the requirements specified in Section 414.03.07(c) prior to installing the masonry bearing plate.

Ensure that all bearings and pedestals of truss, stringer spans, and the center and end bearing of swing spans are rigidly and permanently located to correct alignments and elevations.

Refer to the applicable portions of Section 408 for the attachment of bearings or plates to steel superstructures.

411.03.03 Steel, Bronze, or Copper Bearings. When steel, bronze, or copper alloy bearings are specified, thoroughly clean the machined bearing surfaces immediately before installation. As soon as practicable after installation, apply one prime coat to all unpainted exposed surfaces of the bearings scheduled for painting. Proceed with the application of the specified field coats.

411.03.04 Elastomeric Bearing Pads. Prior to installation, give the pads and abutting surfaces a final cleaning to ensure that they are free of dust, dirt, oil, grease, moisture, and other foreign substances. Use an approved solvent that is compatible with the adhesive prior to application of the epoxy adhesive. Mix and apply the epoxy adhesive according to the manufacturer's recommendations.

When elastomeric pads are used without masonry bearing plates, grind the masonry bearing surfaces to remove all laitance before applying the adhesive. Apply the adhesive to the surfaces of the masonry bearing areas that will be in contact with the bearing pads and to the full contact area of the bearing pad. After the pads are in place, use blocking or other approved mechanical methods to secure the pads in their final position until the adhesive sets.

Surface temperatures and predicted ambient air temperature for the next four hours shall be 50 F or higher at the time of application unless otherwise specified or recommended by the epoxy adhesive manufacturer and approved.

411.04 MEASUREMENT AND PAYMENT. Bearings will not be measured. The cost will be incidental to other pertinent items specified.

SECTION 412 – BRIDGE MOUNTED SIGN SUPPORTS

412.01 DESCRIPTION. Furnish and construct bridge mounted sign supports and sign luminaire supports. This work does not include sign panels, electrical work, or luminaires.

References to Grade 50W structural steel shall be construed to include similar structural steel having weathering characteristics.

412.02 MATERIALS.

Epoxy Grout	902.11(d)
Structural Steel	909.01

Anchor Bolts, Nuts and Washers	909.06
High Strength Bolts, Nuts and Washers	909.07
Paint	912.05, Paint System B

On new structures, construct the sign support using the same structural steel and fasteners used for the fabrication of the structure. When A 709, Grade 50W structural steel is used, make the vertical supports from material meeting A 709, Grade 36 or 50.

On existing structures, use structural steel meeting A 709, Grade 36 or 50 for the sign support. When the existing structure consists of A 709, Grade 50W structural steel, construct the sign support from steel meeting A 709, Grade 50W, except make the vertical supports from steel meeting A 709, Grade 36 or 50. Use fasteners meeting the requirements of Section 909.07 and use Type 3 when used with A 709, Grade 50W.

Vertical supports for the sign panels shall be galvanized per A 123. All bolts, nuts, and similar fasteners in contact with the galvanized material shall be mechanically or hot dipped galvanized meeting the thickness, adherence, and quality requirements of A 153.

412.03 CONSTRUCTION. Construct the sign support according to the applicable portions of Section 408. Paint according to Section 413, except as specified herein.

Set the anchor bolts by epoxy grouting or casting in place when applicable.

On new structures, clean and paint the non-galvanized portions of the sign support using the same system specified for the structure. Portions of the sign support mounted on structures constructed with Grade 50W steel shall also be cleaned and painted where attached to areas designated for painting.

On existing structures not constructed with Grade 50W steel, either the entire sign support may be galvanized or those areas not designated to be galvanized may be painted. Refer to Section 413 for cleaning and painting non-galvanized portions of the sign support. Blast clean to a surface condition of Near White SSPC-SP 10 prior to painting. Unless otherwise specified, refer to Section 413B.03.25 for repair of damaged coatings on existing structures.

Portions of the sign support mounted on existing structures constructed with Grade 50W steel and attached to areas that are painted shall also be cleaned and painted.

412.04 MEASUREMENT AND PAYMENT. ***Bridge Mounted Sign Supports*** will not be measured but will be paid for at the Contract lump sum price. The payment will be full compensation for all material, labor, equipment, tools and incidentals necessary to complete the work.

SECTION 413 – CLEANING AND PAINTING STRUCTURAL STEEL

PART 413A – CLEANING AND PAINTING NEW STRUCTURAL STEEL

413A.01 DESCRIPTION. Clean and paint new structural steel used for work such as new construction, deck widening, and repairs that require installation of new structural steel. When the existing steel is not scheduled for repainting, this work will include repairing existing coatings damaged during the Contractor's operations and areas where new steel ties into existing steel. When the existing steel is scheduled for repainting, refer to Section 413, Part B. When the new or existing steel is prepared by abrasive blast cleaning in the field, refer to Section 413, Part B for containment and environmental monitoring requirements.

413A.01.01 Areas to be Coated. Areas of shop cleaning and priming, and field cleaning and painting pertain to the following surfaces:

(a) Nonweathering Steel - All surfaces. Refer to Section 413B.01.01(a).

(b) Weathering Steel.

(1) The outside facing surfaces of the fascia stringers for all structures over roadways and for structures over water that contain curb openings. For dual structures, this includes the median fascia. These surfaces include the underside of the top flange, the web facing away from the structure, the top of the bottom flange, the outside edge of the bottom flange, the underside of the bottom flange, the inside edge of the bottom flange, and the top of the bottom flange on the inside facing surface up to and including the fillet weld. A sharp well defined transition between the new paint on the flange and the bare steel above the fillet is not required. Overspray onto the web is acceptable. All attached bearings are included in the cleaning and painting.

(2) At abutments, the end 10 ft of all stringers and all other structural steel within the 10 ft area (e.g., stiffeners, cross bracing, and bearings).

(3) At piers, 10 ft in each direction from the center line of the pier (giving a total length at each pier of 20 ft) and all other structural steel within the area.

(4) At bolted field splices, 12 in. beyond the longest splice plate for each particular splice and all splice material.

(c) Roadway Joints.

(1) **New Roadway Joints.** Prior to any shop painting operations, clean all surfaces of the expansion dam and backwall angles. Apply the prime coat in the shop to the entire area of the backwall and expansion dam angles including those areas in

contact with concrete, except the portion that is masked to receive adhesive for the seal.

(2) **Existing Roadway Joints and New Portions.** Prior to any painting operations on existing expansion joints and new steel used to modify them, all surfaces of the expansion dam angles and backwall angles to be painted or receive adhesive for the seal shall be thoroughly cleaned. The area that will be in contact with the seal shall then be completely masked for full length and depth of seal.

The backwall and expansion dam angles shall have all coats applied to the entire area that will be exposed in the finished structure, both above and below the seal.

413A.01.02 General. Refer to Section 413B.01.02.

413A.01.03 Minimum Contracting Requirements for Field Painting. Refer to Section 413B.01.03.

413A.01.04 Definition of Bridge. Refer to Section 413B.01.04.

413A.02 MATERIALS.

Paint Systems	413A.02.01 and 912.05

413A.02.01 Paint Systems. Refer to Section 413B.02.01.

New Steel (Includes New Structures, Repairs, and Widenings). The paint shall meet Paint System B. Touch up paint for the shop primer prior to Coats II and III shall conform to Coat I of Paint System C as approved by the coating manufacturer.

Existing Coatings Damaged Due to Steel/Deck Repairs or New Connections. Use spot coats of Coat I of Paint System H, and Coats II and III of Paint System B.

Bolts and Field Welds. Prime all bolts and field welds with Coat I of Paint System C prior to the application of Paint System B, Coats II and III.

Roadway Joints. The color of the finish coat shall conform to Federal Standard 595, Color No. 26440.

(a) **New Roadway Joints.** Section 912.05, System B.

(b) **Existing Roadway Joints and New Portions.** Section 912.05, System E.

413A.02.02 Abrasives. Refer to Section 413B.02.02.

413A.03 CONSTRUCTION.

413A.03.01 Submittals. Refer to Section 413B.03.01.

413A.03.02 Inspection Equipment. The shop and field Contractor shall provide for the exclusive use of the Engineer, the equipment for the QA observations of the Contractor's cleaning and painting operations. Refer to Section 413B.03.04.

413A.03.03 Paint Quality Assurance (QA) Inspector Notification.

(a) **Field.** Refer to Section 413B.03.05.

(b) **Shop.** Notify the Engineer at least 5 working days prior to beginning cleaning and painting.

413A.03.04 Floodlighting. Refer to Section 413B.03.06.

413A.03.05 Shop Priming of New Steel. Solvent clean, abrasive blast clean, and prime all new structural steel in the shop with Coat I of Paint System B. Perform blast cleaning and painting after all shop fabrication is complete.

413A.03.06 Field Cleaning and Painting. Solvent clean, pressure wash, and hand/power tool clean the surfaces of the shop primed steel after it is erected. Follow with touch up using Coat I of Paint System C. Apply Coats II and III of Paint System B to all exposed structural steel in the completed structure.

When new steel is added to existing steel and the existing steel is not scheduled for repainting, repair the existing coating at new steel connection points and at locations where the existing coating is damaged by the steel installation work. Solvent clean and hand/vacuum-shrouded power tool clean the surfaces. Follow with the spot application of the penetrating sealer of Paint System H and the spot application of Coats II and III of Paint System B.

413A.03.07 Painting Sequence. Refer to Section 413B.03.08.

413A.03.08 Surface Preparation. Prepare surfaces as specified in Sections 413B.03.10(a) through (h), the pertinent SSPC Specifications, and the Contract Documents. Surface conditions shall meet the pertinent SSPC-VIS Standards. Surface preparation performed in the shop shall also meet the requirements of Section 413A.03.12.

413A.03.09 Methods of Cleaning. Methods shown in the following table apply to both shop and field cleaning, and shall be performed in the order shown. The methods are invoked based on the paint system specified. Refer to Section 413B.03.10 for methods of cleaning.

SUBSTRATE CONDITION	PAINT SYSTEM	METHODS OF CLEANING
Abrasive Blast Cleaned Steel	B (Coat I, II, and III)	Shop coating - (a) and (h) Shop touch up of damaged primer: Damage extending to substrate - (f) Damage not extending to substrate - (d) and (e) Field coating of shop primed steel - (a) and (b), followed by localized repair of damage: Damage extending to steel substrate - (f) Damage not extending to substrate - (d) and (e)
Bolts and Field Welds	C (Coat I) B (Coat II and III)	Field - (a) followed by (d) and (e)
Existing Coatings Damaged Due to Steel Repair, New Connection, or Contractor's Operations.	H (Coat I) B (Coat II and III)	Field - (a) followed by (d) and (e)
Existing Roadway Joints and Modified Portions	E (Coat I, II, and III)	Field - (a) followed by (f) or (h)

413A.03.10 Base Metal Readings (BMR). BMR shall be obtained in the fabrication shop on the bare steel in conformance with SSPC-PA 2. Report this reading along with the dry film thickness readings from the shop for the shop-applied coatings. If not obtained or reported, field inspectors will assume a 1.0 mil BMR in conformance with SSPC-PA 2.

413A.03.11 Repair of Surface Imperfections. Refer to Section 413B.03.13.

413A.03.12 Surface Condition Prior to Painting. Refer to Section 413B.03.15.

413A.03.13 Paint Storage and Mixing. Refer to Section 413B.03.16.

413A.03.14 Paint Representative. Refer to Section 413B.03.17.

413A.03.15 Shop Priming and Field Finish Painting. Meet SSPC-PA 1 for painting application and Sections 413A.03.16 thru .21.

413A.03.16 Time Restrictions for Field Painting. Do not apply field paint between December 15 and April 15. Apply shop paint at any time provided it is done indoors under controlled environmental conditions and in conformance with the manufacturer's recommendations.

413A.03.17 Weather Restrictions for Painting. Refer to Section 413B.03.20.

413A.03.18 Shop Application of Prime Coat. Apply the prime coat in the shop from agitated containers and as recommended by the manufacturer in a single application

employing multiple spray passes. Apply the dry film thickness specified in Section 912.05, except reduce the thickness to approximately 1.0 mil within the areas of field welding and on the top and both edges of the top flange where steel stud shear developers will be attached. Measurements shall be according to SSPC-PA 2.

Remove all dry spray, runs, mud cracking, and damaged primer. Feather the area prior to touch up so that the repainted surface has a reasonably smooth appearance. Use organic zinc primer to touch up the inorganic zinc primer coat in the shop and field unless otherwise approved by the manufacturer and the Engineer. Ensure that touch ups have the same dry film thickness as the coat being repaired. Organic zinc may be applied by brush.

413A.03.19 Field Application of Prime, Intermediate, and Finish Coats. Prior to field coating, pressure-wash the surfaces of the steel with potable water as specified in Section 413B.03.10(b) to remove dirt and contaminants as described in Section 413B.03.15.

Unless otherwise specified, apply Coats II and III after all field welded areas, bolted areas, and damaged primer coatings are cleaned and primed as specified or as directed.

Apply all paint according to the manufacturer's recommendations except the dry film thickness shall conform to the requirements of Section 912.05. Spray painting will be permitted provided the Engineer approves the location and method of spray application. Paint all areas adjacent to machinery and mechanical components, etc., by brush application unless the Engineer approves spray application. Surfaces inaccessible for painting by regular means shall be painted using sheepskin daubers or by other means as necessary to ensure coverage of the proper coating thickness.

The thickness measuring instruments shall be maintained, calibrated, adjusted, and measurements taken in conformance with SSPC-PA 2. Stripe coat all edges, outside corners, crevices, welds (including welds of fabricated members), rivets, bolts, nuts, and washers. Apply a stripe coat of the intermediate coat prior to the application of the full intermediate coat. Apply a stripe coat of the finish coat prior to the application of the full finish coat. Apply stripe coats by brush, dauber, or roller.

Ensure that each coat is free of shadow-through, skips, misses, and thin or heavy coating thickness. Repair defects prior to the application of the next coat. Keep the surface to be coated dust free during painting operations, and protect newly coated surfaces from the cleaning operations. If a previously cleaned area becomes soiled, contaminated, or rusted, re-clean the area to the specified condition and completely recoat at no additional cost to the County.

Apply the finish coat within 30 days after the intermediate coat unless approved in writing by the paint manufacturer. If the recoat window is exceeded, re-clean the surface as approved by the paint manufacturer and the Engineer.

413A.03.20 Bolts and Field Welds. Do not shop coat bolts for field assembly. After field welding and prior to applying Coat II (first field coat) clean these bolts, field welds, and

adjacent areas. Cleaning shall be as specified in 413A.03.09. Apply the first field coat (Coat II) within 24 hours of cleaning. Before Coat II is applied, solvent clean any prime coat stained from rusted bolts according to SSPC-SP 1.

413A.03.21 Control of Overspray and Spills. Refer to Section 413B.03.22.

413A.03.22 Caulking. Refer to Section 413B.03.23.

413A.03.23 Defective Work. Refer to Section 413B.03.24.

413A.03.24 Repair of Coatings. Refer to Section 413B.03.25.

413A.03.25 Final Identification. Refer to Section 413B.03.26.

413A.03.26 Field Cleaning Waste Containment. Refer to Section 413B.03.27.

413A.03.27 Field Cleaning Containment System Plan Guidelines. Refer to Section 413B.03.28.

413A.03.28 Containment System Requirements by Method of Preparation. Refer to Section 413.03.29.

413A.03.29 Worker Protection. Refer to Sections 413B.03.30 and 413B.03.31.

413A.03.30 Environmental Protection. Refer to Section 413B.03.32.

413A.03.31 Environmental Protection Plan of Action. Refer to Section 413B.03.33.

413A.03.32 Methods for Assessing Emissions. Refer to Section 413B.03.34.

413A.03.33 Field Cleaning Waste Disposal. Refer to Section 413B.03.35.

413A.03.34 Waste Handling Plan of Action. Refer to Section 413B.03.36.

413A.03.35 Waste Sampling and Analysis. Refer to Section 413B.03.37.

413A.03.36 Hazardous Waste Transportation and Disposal. Refer to Section 413B.03.40.

413A.03.37 Nonhazardous Waste Disposal. Refer to Section 413B.03.41.

413A.04 MEASUREMENT AND PAYMENT. The Contract unit price for the item specified will be full compensation for all cleaning and painting, scaffolding, platforms, containment systems, permits, working drawings, daily quality control records, Professional Engineer's services used for containment, industrial hygienist services, air monitoring, sampling and testing of materials for toxic metal content, including any revisions and

resubmissions that may be required during the execution of the work, providing safe access for inspections, hand wash station/clean up area, floodlighting, test plates, drums, collection and storage at the temporary storage site, hauling and disposal at an approved industrial waste site or hazardous waste site, removing and replacing planking, removal of debris, and all material, labor, equipment (including test equipment), tools, and incidentals necessary to complete the work.

413A.04.01 Cleaning and painting new structural steel will not be measured but the cost will be incidental to the pertinent Fabricated Structural Steel item.

413A.04.02 All costs associated with repair of existing coatings due to new connections and existing coatings damaged during steel/deck repairs will not be measured but will be incidental to the pertinent Repair, Structural Steel, or Cleaning and Painting items.

PART 413B - CLEANING AND PAINTING EXISTING STRUCTURAL STEEL

413B.01 DESCRIPTION. Clean and paint existing structural steel, and repair existing coatings damaged during repairs or by the Contractor's operations. Refer to Section 413A for cleaning and painting new structural steel.

413B.01.01 Definitions of Areas to be Cleaned and Painted. The following terms designate the specific areas to be cleaned and painted:

(a) **All Steel Surfaces.** Steel superstructure elements including but not limited to steel beams, girders, rockers, bearing assemblies, trusses, floor beams, stringers, joists, purlins, cross-bracings, lateral-bracings, diaphragms, sway-bracings, scupper downspouts, and support brackets for utilities, light poles, and sidewalks. It does not include substructure elements, railings, sign structures, utilities, or light poles.

(b) **Outside Facing Surfaces of Beams.** The exterior/fascia beams of the structure, including the underside of the top flange and the web facing away from the structure, the top of the bottom flange, the outside edge of the bottom flange, the underside of the bottom flange, the inside edge of the bottom flange, and a portion of the top of the bottom flange on the inside facing surface. The transition between the existing and new coating on the top of the bottom flange shall occur approximately half way between the edge of the flange and the fillet. A sharp well-defined transition between the new and existing coating is not required, but the existing coating shall be feathered. Clean and paint all attached bearings.

(c) **Inside Facing Surfaces of Beams.** Beams adjacent to longitudinal joints including the underside of the top flange and the web facing toward the longitudinal joint, the top of the bottom flange, the inside edge of the bottom flange, the underside of the bottom flange, the outside edge of the bottom flange, and a portion of the top of the bottom flange on the outside facing surface. The transition between the existing and

new coating on the top of the bottom flange shall occur approximately half way between the edge of the flange and the fillet. A sharp well-defined transition between the new and existing coating is not required, but the existing coating shall be feathered. Clean and paint all attached bearings.

(d) **Bearings and Beam Ends.** Bearing assemblies and structural steel for the specified distance from the ends of the beams at the abutments, and the specified distance in each direction from the center-line of the piers for a total of twice the specified distance.

(e) **Roadway Joints.** All roadway joint steel on the outside, top, and inside surfaces of the parapets, and from the parapet to the first pavement marking.

The paint system, finish coat color, and areas to be cleaned and painted for each structure shall be as specified in the Cleaning and Painting Table included in the Contract Documents.

413B.01.02 General. Perform the work according to SSPC Standards and the manufacturer's recommendations.

Notify the Engineer of structural defects including cracks, missing bolts or rivets, and deterioration detected during cleaning and painting.

Protect utility pipes, conductors, light fixtures, and conduits from these operations. Do not clean and paint them unless specified.

Perform Quality Control (QC) inspections to ensure that each phase of the work meets Specification requirements.

All maintenance of traffic required for corrective action shall be at no additional cost to the County. When a railroad is included in the project, all railroad fees shall be as specified, except that any additional impact on the railroad and associated fees due to corrective actions or additional inspections shall be at no additional cost to the County.

Ensure that all operations meet the requirements of OSHA, including exposure to lead, arsenic, and cadmium. Comply with 29 CFR 1926 construction standards and the applicable Federal, State, and local laws, including COMAR 26.16.01.

Existing paint systems and abrasives used for blast cleaning may include toxic metals such as lead, arsenic, cadmium, and chromium. Consider them as hazardous waste when removed, unless tests conducted as specified in the Toxicity Characteristic Leaching Procedure (TCLP), EPA Method 1311 prove otherwise.

Prior to bidding, become familiar with the current environmental regulations and safety procedures. In accordance with the EPA's RCRA regulation, the County shall be considered the "Waste Generator" of the paint wastes generated by the work on existing structures.

The Contractor shall be considered the "Hazardous Waste Generator" of all other waste associated with the work. These include wastes produced such as petroleum waste, solvent related waste, unapplied waste paints, used rags, used protective clothing, and other personal protective clothing (PPE) determined to be wastes. Obtain an EPA Hazardous Waste Generator ID Number, and dispose of waste under manifest as required by RCRA (Title 40 CFR parts 260 thru 265, and 271).

Prevent waste from entering into the environment by containing, collecting, storing, testing, and disposing of all waste in accordance with Federal, State, and local regulations.

413B.01.03 Minimum Contracting Requirements for Field Painting. The Contractor/subcontractor removing or applying paint shall be certified as specified in (a) below. When the paint being removed contains toxic metals, the Contractor/subcontractor removing the paint shall be certified as specified in (b) below. All certificates shall be effective prior to Award of Contract and shall remain in effect for the duration of the Contract. Refer to Section 413B.03.01.

(a) **SSPC-QP1.** Standard Procedure for Evaluating Qualifications of Painting Contractors: Field Application to Complex Structures.

(b) **SSPC-QP2, Category A**. Standard Procedure for Evaluating Qualifications of Painting Contractors to Remove Hazardous Paint.

413B.01.04 Definition of Bridge. The definition of the word "Bridge" as defined in Section GP-1.05 does not apply to this Specification. References to "Bridges" in this Specification shall mean any structure carrying traffic, regardless of their length.

413B.02 MATERIALS.

Paint Systems	912.05

413B.02.01 Paint Systems. All coats within the paint systems specified herein shall be from the same manufacturer. When multiple paint systems are used, all overlapping paint systems shall be from the same manufacturer. The color of the touch up finish coat on existing steel shall match the existing finish coat. The color of the finish coat shall be as specified.

413B.02.02 Abrasives. Abrasive media shall produce blasted surfaces having a surface profile height of 1.5 to 4.0 mils as determined according to D 4417, Method C. Provide material safety data sheets (MSDS) for the abrasives and a letter from the abrasive supplier indicating that expendable abrasives meet SSPC-AB 1, and recyclable abrasives meet SSPC-AB 3. Verify the cleanliness of recycled abrasives according to SSPC-AB 2.

413B.03 CONSTRUCTION.

413B.03.01 Submittals. Submit the following drawings, plans, and information for accomplishing the work. Except for (e) below, submit six copies on company letterhead to the Baltimore County Bureau of Engineering and Construction. Do not proceed with the work until the submittals are approved by the Engineer.

(a) **Copy of SSPC-QP Certification.** Refer to Section 413B.01.03.

(b) **Personnel Qualifications.** Provide applicable personnel qualifications to the Project Engineer prior to using the personnel on site. Refer to Section 413B.03.02.

(c) **Quality Control (QC) Plans.** Refer to Section 413B.03.03 for detailed submittal requirements for shop and field Quality Control Plans. Send all shop QC Plan submittals to the Engineer. Submittals shall meet the requirements of Sections 900.01 and 912.01. Submit all field QC Plans as specified herein.

(d) **Paint Manufacturer Certifications and Letters.** Submit the following information per Sections 900.01 and 912.01 to the Engineer:

(1) When detergents or additives are proposed for incorporation into the water used for washing, provide MSDS and a letter from the coating manufacturer that approves the use of the detergents with their coating.

(2) The manufacturer shall provide a letter that approves any proposed solvents for use in solvent cleaning prior to painting or between coats. Provide MSDS for the solvents.

(3) Provide the paint manufacturer's application and thinning instructions, MSDS, and product data sheets.

(4) When caulking is used, provide a letter from the coating manufacturer identifying the recommended caulking material, the application sequence for integrating the caulking into the coating system between Coats II and III, and the minimum cure time prior to paint application.

(5) If the only portion of bridge to be painted is the roadway joint, the paint need not be tested if, prior to use, a copy of the certified test results has been furnished to the Engineer specifying that the paint conforms to Section 912.

(e) **Containment Plans.** Refer to Sections 413B.03.28 and .29. Make submittals as specified in Section 499.

(f) **Worker Protection Compliance Program.** Required when abrasive blast cleaning is conducted in the field or paint containing toxic metals is being disturbed. Refer to Section 413B.03.31.

(g) **Environmental Protection Plan of Action.** Required when abrasive blast cleaning is conducted in the field or paint containing toxic metals is being disturbed. Refer to Section 413B.03.33.

(h) **Waste Handling Program.** Required for the handling of all hazardous waste regardless of the presence of toxic metals. The Waste Handling Program shall also include disposal of unused paint and solvent. Refer to Section 413B.03.36. A written program is not required for the handling of non-hazardous waste.

Do not construe approval of the submittals to imply approval of any particular method or sequence for conducting the work, or for addressing health and safety concerns. Approval of the proposed plans shall not remove the responsibility to conduct the work in accordance with Federal, State, or local regulations, this Specification, or to protect the health and safety of all workers involved in the project and any members of the public who may be affected by the project. The Contractor remains responsible for the adequacy and completeness of the programs and work practices, and adherence to them.

413B.03.02 Personnel Qualifications and Responsibilities. Provide documentation that all applicable project personnel meet the training and accreditation requirements of COMAR 26.16.01.

(a) **QC Inspectors.** A QC inspector shall be on site full time during cleaning and painting operations. Provide documentation that personnel performing quality control related functions are experienced and qualified to perform the work, and have completed the training specified for SSPC-QP1, and when paint containing toxic metals is being disturbed, SSPC-QP2.

(b) **Competent Person.** A competent person as specified in SSPC-QP2 shall be on site full time when paint containing toxic metals is being disturbed. This person shall perform all quality control related functions involving the oversight of worker and environmental protection, containment performance, and waste handling. Provide documentation of qualifications, including experience and records of training as specified in SSPC-QP2. This person shall hold a current SSPC C3 Competent Person Certificate or current C5 refresher, a certificate of completion of 29 CFR 1926.62(l) Lead in Construction Training, and shall be accredited in accordance with COMAR 26.16.01.

(c) **Certified Industrial Hygienist (CIH).** Provide the services of a CIH when the work involves the disturbance or removal of paint containing toxic metals. Provide evidence that the CIH has the following qualifications and insurance requirements:

(1) Certification by the American Board of Industrial Hygiene.

(2) Field sampling and oversight experience involving removal of paint that contains toxic metals from structures.

(3) $1,000,000 errors and omissions insurance coverage for this type of work.

All field sampling and testing shall be performed by the CIH or by an employee working under the direct supervision of the CIH, and shall be witnessed by a representative of the County. Notify the Baltimore County Bureau of Engineering and Construction, Design Division – Structural Design Section at least 24 hours prior to sampling and testing.

The CIH shall review all results of sampling and testing performed on the project. The CIH, or a person working under the direction of the CIH, shall prepare written reports interpreting these results for compliance to the applicable regulations. Submit a copy of all reports, analysis, etc., to the Engineer within five working days after sampling.

Submit a written certification within five days after the end of each month stating that the Contractor has complied with the Plans of Action and Compliance Programs specified within this Specification for worker protection, environmental protection, and waste handling; and has addressed any deficiencies found. The certification shall be prepared and signed by the CIH or a person working under the direction of the CIH.

413B.03.03 Quality Control (QC) Plan, Inspection Procedures, and Recording Systems. Submit a Quality Control Plan for providing daily job quality control per SSPC-QP1 for surface preparation and painting operations. The Quality Control Plan shall include the following:

(a) Records of standards and specifications for coating inspection work and their utilization.

(b) System for filing inspection reports.

(c) Demonstration that inspection equipment and calibration standards and procedures for calibrating the inspection equipment are available.

(d) Procedures to stop nonconforming work.

(e) Procedures for verifying proper coating application.

(f) Procedures to ensure that each major operation is inspected and the inspection results documented. Contractor QC inspections shall include:

(1) Effectiveness of protective coverings to control project debris, paint spatters, overspray, drips, paint spills, etc., while painting over roadways, waterways, machinery areas, and areas in the vicinity of abutments and private properties.

(2) Ambient conditions.

(3) Compressed air cleanliness and, if required, acceptability for breathing.

(4) Surface preparation (solvent cleaning, pressure washing, hand/ power tool or abrasive blast cleaning, etc.).

(5) Coating application (specified materials, mixing, thinning, and wet film thickness).

(6) Dry film thickness per coat.

(7) Recoat times and cleanliness between coats.

(8) Coating continuity and coverage (free from runs, sags, overspray, dryspray, pinholes, shadow-through, skips, etc.).

Maintain on site copies of the Contractor's daily job quality control records and make them available to the Engineer at any time. Submit records from on site audits.

413B.03.04 Inspection Equipment. Provide for the exclusive use of the Engineer, the following equipment for the QA observations of the cleaning and painting operations. Maintain, calibrate, and verify the equipment in a condition that is satisfactory to the Engineer. The equipment will remain the property of the Contractor at the conclusion of the Contract.

(a) The latest editions of SSPC-Vis 1, SSPC-Vis 3, or SSPC-Vis 4, as applicable to the project, or other approved visual standards.

(b) SSPC Manual Volumes 1 and 2 (Latest Editions).

(c) Spring Micrometer with Coarse and Extra Coarse Surface Profile Replica Tape.

(d) Electric or Sling Psychrometer, F.

(e) U.S. Weather Bureau Psychrometric Tables.

(f) Surface Thermometer, 0 to 150 F.

(g) Probe Thermometer for Paint Temperature.

(h) High/Low Thermometer for Paint Storage Area.

(i) Wet Film Thickness Gauge.

(j) Digital Magnetic Dry Film Coating Thickness Gauge capable of transferring data to a computer (SSPC-PA 2, Type 2).

(k) Plastic Calibration Shims for Digital Magnetic Dry Film Thickness Gauge.

(l) Inspector's Mirror.

(m) Wind Meter.

(n) Clean, White, Lint-Free, Absorbent Rags.

(o) Light Meter for measuring light intensity during surface preparation, painting, and inspection work.

(p) Putty Knife at least 40 mils thick and 1 to 3 in. wide.

(q) Blotter Paper.

413B.03.05 Paint Quality Assurance (QA) Inspector Notification. Notify the Baltimore County Bureau of Engineering and Construction, Design Division – Structural Design Section at least five working days prior to beginning field cleaning and painting of new and existing steel. A paint inspector will be provided to assist the Engineer in performing the QA observations of the cleaning and painting portion of the work. Failure to comply with this notification shall be cause for not accepting the work performed. The County reserves the right to require removal and re-application of paint applied without QA acceptance at no additional cost to the County. Any test to determine acceptance shall be at no additional cost to the County. Do not perform additional work until a determination has been made.

413B.03.06 Floodlighting. Provide floodlighting, including power sources, to supply adequate illumination to all surfaces being prepared, painted, or inspected, including the underside and inside of the containment system, when containment is employed. Floodlighting shall meet SSPC-Technology Guide No. 12, be maintained in good working condition, and be of an approved design. Adjust the floodlighting to avoid glare to marine and vehicular traffic.

413B.03.07 Field Cleaning and Painting. Refer to the Contract Documents for the appropriate cleaning and painting requirements.

413B.03.08 Painting Sequence. Do not paint the outside facing surfaces of beams until all concrete has been placed and parapet form brackets removed. However, the primer coat may be applied to these areas prior to placing the form brackets provided that it is properly touched up prior to placing the next coat of paint. Protect concrete from being stained by painting operations. Restore painted or stained concrete surfaces to originally intended color without damaging the concrete.

Proceed with cleaning and painting by sections, bays, or other readily identifiable part of the work as approved.

Start the work at the top and proceed toward the bottom.

413B.03.09 Surface Preparation. Prepare surfaces as specified in the pertinent SSPC Specifications and the Contract Documents. Surface conditions shall meet the pertinent SSPC-VIS Standards, and the test plates/sections specified in Section 413B.03.11.

413B.03.10 Methods of Cleaning. Methods shown in the following table apply to both shop and field cleaning and shall be performed in the order shown. The methods are invoked based on the Paint System specified.

PAINT SYSTEM	SUBSTRATE	METHOD OF CLEANING
C & D	Abrasive blast cleaned steel	Existing Paint to be Removed – Localized (a) and (b) and complete (h)
E, F, & H	Overcoating existing paint	Existing Paint to be Overcoated – Localized (a) and complete (c) followed by (d) and (e)

(a) **Solvent Cleaning.** Use solvents, emulsions, cleaning compounds, steam cleaning, or similar approved materials and methods in accordance with SSPC-SP 1 to remove grease, oil, diesel smoke residue, soot, and similar surface contaminates. Use soap steam cleaning for steel open grid decks and walkways and machinery areas of drawbridges. Before it evaporates, remove contaminated solvent by wiping or rinsing with clean solvent to prevent a film of contaminants from remaining on the surface. Solvent wiping may be required between coats. Use solvent approved in writing by the paint manufacturer.

(b) **Low Pressure Water Cleaning (LPWC).** Use potable water on all bearings, transverse and longitudinal joints, and beam ends prior to abrasive blast cleaning to remove salts, bird droppings, dirt, and debris. At beam ends, wash to the limits defined in Section 413B.01.01(d). Use LPWC as necessary between coats to remove surface contamination.

Perform LPWC per SSPC-SP 12, except use a nozzle pressure of 2000 to 2500 psi together with a rotating tip 12 to 18 in. from the surface. The pressure washer shall be equipped with easily accessible gauges and a pressure regulator. Perform LPWC no more than 96 hours prior to blast cleaning. Use this method to remove concrete spatter, dirt, debris, salt contaminants, grease, oil, and similar surface interference material from newly coated structures prior to the application of additional coats. Should the surface not be blast cleaned within 96 hours after LPWC, the Engineer will determine if additional preparation is required.

When the water is to be recycled and the coating being cleaned contains toxic metals, test for toxic metals before reuse. Do not reuse water that exceeds the threshold value for any toxic metal.

(c) **High Pressure Water Cleaning (HPWC).** Use potable water prior to hand and power tool cleaning in preparation for overcoating to remove loose paint, loose rust, loose mill scale, salts, bird droppings, dirt, debris, grease, oil, hydrocarbons, diesel smoke residue, soot, chalk, and similar surface interference material.

Perform HPWC per SSPC-SP 12, WJ-4, except use nozzle pressures of 4000 to 6000 psi and a rotating tip. A biodegradable detergent may be added to the water for the removal of grease, oil, and hydrocarbons if approved. The pressure washer shall be equipped with easily accessible gauges and a pressure regulator. Perform the cleaning at close range to the surface, approximately 6 in., using a pattern of overlapping drops followed by cross-hatching with the same overlap. At the end of cleaning, ensure that the swirling patterns created by the rotating tip are not visible on the surface. Perform the HPWC within 96 hours of applying the first coat. Should the surface not be painted within 96 hours, the Engineer will determine if additional preparation is required.

When the water is to be recycled, and the coating being cleaned contains toxic metals, test for toxic metals before reuse. Do not use water that exceeds the threshold value for any toxic metal.

(d) **Power Tool Cleaning.** Perform per SSPC-SP 3 and as depicted in SSPC-Vis 3. The use of 40-grit sanding discs are recommended. Refer to (e) for inaccessible areas.

(e) **Hand Tool Cleaning.** Perform per SSPC-SP 2. The use of 60-grit sanding paper is recommended.

Restrict the use of this method to areas that are inaccessible for power tool cleaning.

(f) **Power Tool Cleaning to Bare Metal.** Perform per SSPC-SP 11 and as depicted in SSPC-Vis 3, with a surface profile of at least 1.0 mil.

(g) **Brush Off Blast Cleaning.** The end surface condition shall meet SSPC-SP 7, Brush Off Blast Cleaning and as depicted in SSPC-Vis 1. Ensure that abrasives are dry and free of oils, grease, and other harmful materials such as lead dust, at the time of use.

(h) **Near White Metal Abrasive Blast Cleaning.** Do not use steel shot in the field. When using steel shot in the shop, add a sufficient amount of steel grit. Maintain the mixture to produce an etched surface texture, as opposed to the peened surface texture that results when blast cleaning with shot alone. The end surface condition shall meet SSPC-SP 10, Near White, and as depicted in SSPC Vis 1. Ensure that abrasives are

dry and free of oils, grease, and other harmful materials such as lead dust at the time of use.

413B.03.11 Test Plates/Sections. When abrasive blast cleaning is specified, furnish two 12 x 12 x 1/4 in. steel test plates and clean them to meet SSPC VIS Standards and the Contract Documents. Apply a clear protective coating to these standard test plates and use them as a job sample standard for cleaning operations. When approved as an alternative to the test plates, portions of an actual work piece may be used in order to reach agreement on the degree of cleaning before production surface preparation begins. When the SSPC VIS Standards accurately depict the agreed upon degree of cleaning on the test section, the prepared section does not have to be sealed and retained for future reference. When the SSPC VIS Standards do not accurately depict the degree of cleaning, the test section shall be sealed and retained, or the test plates utilized. For the production cleaning operations, the written requirements of this Specification, the SSPC definitions, the test plates, and the SSPC VIS Standards shall be used in that order for determining compliance with the Contractual requirements.

413B.03.12 Removal of Vegetation, Planking, and Signage. Prior to surface preparation, remove vegetation overhanging or fouling the structure.

When the structure has planking (timber or plywood) between the beams, carefully remove it in the areas of work operations. Store and maintain the planking in good condition. Dispose of all debris on the planking. Unless otherwise directed, the planking will not have to be reinstalled until cleaning and painting operations are complete. The Engineer may direct that portions of the planking be reinstalled prior to opening any lane to traffic during the same working day. The Engineer may also direct that planking be reinstalled during periods of work stoppage.

When the fascia webs of the structure contain street identification signs, remove them prior to beginning cleaning operations in the area. Clean and paint areas exposed by the sign removal, including bolt holes. Whenever a sign is removed, notify the Engineer. The Engineer will notify the Baltimore County Bureau of Traffic Engineering. Street signs may be reinstalled by the Baltimore County Bureau of Traffic Engineering utilizing the Contractor's maintenance of traffic. They will coordinate this work with the Contractor.

413B.03.13 Repair of Surface Imperfections. Regardless of the method of cleaning, remove surface imperfections such as sharp fins and slivers, rust scale, weld spatter, and pack rust by a combination of cleaning procedures such as using hand or power impact tools (chipping hammers or scaling hammers), blast cleaning, etc., without scarring good steel.

413B.03.14 Feathering and Removal of Defects in Existing Coating. For projects involving the touch up or overcoating of newly installed steel or existing coatings in the field, regardless of the method used for cleaning, feather the edges of old paint permitted to remain. Remove portions of paint on previously painted surfaces that are chalky, powdered, cracked, or otherwise unacceptable. Remove runs and sags in the existing paint on the

outside facing surfaces of fascia beams over highways. Ensure a smooth appearance after application of the new coating.

413B.03.15 Surface Condition Prior to Painting. Remove residual dust, dirt, and grease from the surface as the final procedure prior to painting and between coats whenever the coating is contaminated. Cleaning includes the removal of all dust, puddles, grease, oil, exhaust from trucks, debris, concrete spatter, and other foreign matter on the surfaces being painted. Also remove debris on surfaces adjacent to those being painted. Concrete spatter stains that discolor the primer need not be removed provided material is not dislodged when wiping the surface with a cloth. Cleaning involves vacuuming, solvent cleaning, hand/power tool cleaning, and pressure washing as appropriate. Should an area of previously cleaned steel become soiled, contaminated, or rusted, re-clean the area prior to painting at no additional cost to the County.

Prior to the application of paint in the shop and field, the QC personnel shall inspect the surfaces and establish that they have been prepared according to the Specifications. Upon QC acceptance, obtain approval that the surfaces to be painted during that day have been cleaned as specified.

413B.03.16 Paint Storage and Mixing. Store paints and thinners in well ventilated areas that are not subject to excessive heat, open flames, electrical discharge, and direct rays of the sun. Adhere to the manufacturer's recommendations. Store materials in heated areas when necessary. Use materials on a rotating stock basis, and leave containers closed until used. Do not use paints that cannot be stirred to normal consistency. Store paint in tightly covered containers at an ambient temperature of at least 45 F. Maintain containers in a clean condition, free of foreign materials and residue.

Remove and discard thin skins formed in the container. Do not use material that is livered, gelled, thick-skinned, or otherwise questionable.

Mix paints per manufacturer's instructions and as approved. Do not thin the paint unless authorized by the paint manufacturer and approved. The Engineer shall be present whenever the paint is thinned. Do not use materials that are beyond their pot life or shelf life. For multiple component paints, only complete kits shall be mixed and used. Partial kit mixing is prohibited.

Remove waste chemical solutions, oily rags, and other waste daily. Take precautionary measures to ensure protection of workers and work areas from fire hazards and health hazards resulting from handling, mixing, and applying materials.

413B.03.17 Paint Representative. The representative shall be a technical representative of the paint manufacturer and shall be present during the initial execution of the work to approve with the Engineer the degree of cleanliness prior to painting, and the method of application of the coating system. The Engineer may stop paint operations for failure to meet this requirement regardless of the reason for the failure. Areas cleaned prior to ceasing paint operations shall be re-cleaned if required.

413B.03.18 Field Painting. Meet SSPC-PA 1 for painting application and Sections 413B.03.19 thru .22.

413B.03.19 Time Restrictions for Field Painting. Do not perform field painting between December 15 and April 15.

413B.03.20 Weather Restrictions for Painting. All surfaces to be painted shall be sound and cleaned per the Contract Documents. Do not paint when:

(a) There is rain, snow, fog, or mist dampening the surface.

(b) The relative humidity exceeds the maximum humidity specified by the paint manufacturer.

(c) The ambient air temperature in the shade is below 40 F.

(d) The surface temperature is below the minimum temperature specified by the paint manufacturer; however, paint shall not be applied when the surface temperature is below 35 F.

(e) The surface temperature is expected to drop to 32 F or below before the paint has cured the minimum time and temperature for recoat specified by the manufacturer.

(f) The surface temperature is less than 5 F above the dew point.

(g) The surface temperature exceeds the value recommended by the manufacturer.

Whenever it is suspected that moisture is condensing upon the surface, the psychrometer will be used to check dew point, etc. If the conditions measured by the psychrometer are marginal, the Engineer may permit a well-defined area of the surface to be lightly moistened with a damp cloth and observed. If the dampness evaporates in 15 minutes, the surface will be considered satisfactory for the application of paint. Regardless of any environmental test results, when fresh paint is damaged by the elements, replace or repair the paint at no additional cost to the County.

Schedule the operations so that all cleaned surfaces are painted within 24 hours. If rust bloom appears or the air or steel temperature falls below five degrees above the dew point after cleaning and prior to application of the primer coat, re-clean the affected areas to the satisfaction of the Engineer at no additional cost to the County.

413B.03.21 Application of Prime, Intermediate, and Finish Coats. All surfaces shall meet the specified degree of preparation prior to the application of the paint system.

Apply all paint according to the manufacturer's recommendations except the dry film thickness shall conform to the requirements of Section 912.05. Spray painting will be

permitted provided the Engineer approves the location and method of spray application. Paint all areas adjacent to machinery and mechanical components, etc., by brush application unless the Engineer approves spray application. Surfaces inaccessible for painting by regular means shall be painted using sheepskin daubers or by other means as necessary to ensure coverage of the proper coating thickness.

The thickness measuring instrument shall be maintained, calibrated, adjusted, and measurements taken in conformance with SSPC-PA 2. Stripe coats shall be applied using brush, dauber, or roller to all edges, outside corners, crevices, welds, rivets, bolts, nuts, and washers prior to application of coatings in conformance with the following schedule:

SYSTEM	COAT
B	II & III
C	I* & II
E	I & II
F	II & III
H	II & III

*Striping of Coat I is permitted after the application of Coat I if the stripe coat is tinted per manufacturer's recommendation.

Ensure that each coat is free of shadow-through, skips, misses, and thin or heavy coating thickness. Repair defects prior to application of the next coat. Keep the surface to be coated dust-free during painting operations, and protect newly coated surfaces from the cleaning operations. When a previously cleaned or painted area becomes soiled, contaminated, or rusted, re-clean the area to the specified condition and completely re-coat at no additional cost to the County.

Apply each coat within 30 days after the prior coat, unless approved in writing by the paint manufacturer. If the re-coat window is exceeded, re-clean the surface as approved by the paint manufacturer and the Engineer.

413B.03.22 Control of Overspray and Spills. Protect the environment from paint droplets, overspray, and spills by providing containment for the paint application area. Assume responsibility for any damage resulting from wind and cleaning and painting operations. Up to 2 in. of overspray will be permitted onto the adjacent surface of the bridge deck next to the top flange. No other overspray will be permitted. Whenever the method of protection fails to function at the required level of efficiency, immediately suspend all operations except those associated with minimizing adverse impact to the environment. Do not resume operations until modifications have been made to correct the cause of the failure. Use fire retardant containment screens, curtains, and tarpaulins.

The Engineer may stop paint operations due to windy conditions. However, operations shall stop if the wind velocity exceeds 20 mph, unless specific and approved precautions are taken to prevent the escape of paint droplets and over-spray.

413B.03.23 Caulking. Caulk the following areas with a material approved by the paint manufacturer. Install caulking between the intermediate and finish coats:

(a) Areas of plate delamination that are 1/8 in. or greater that cannot be cleaned and sealed during the application of the coatings.

(b) Gaps between steel members that are 1/8 in. or greater that cannot be cleaned and sealed during the application of the coatings.

(c) Interface between the steel and concrete surfaces where through-girders penetrate the concrete. Apply caulking to the surfaces above the deck only. Do not caulk surfaces below the deck.

(d) Gaps at the interface of steel and concrete surfaces that cannot be cleaned and painted.

413B.03.24 Defective Work. Neither conditions during application nor County acceptance of paint shall remove the responsibility of obtaining a satisfactory paint system. When rusting occurs or a paint coat lifts, blisters, wrinkles, or shows evidence of having been applied under unfavorable conditions, the workmanship is poor, impure or unauthorized paint has been used, or for any other reason the painting is unsatisfactory, remove the affected paint and thoroughly clean the steel and repaint. Ensure that there is a uniform appearance throughout the structure.

413B.03.25 Repair of Damaged Coatings due to Contractor Operations. Notify the Baltimore County Bureau of Engineering and Construction, Design Division – Structural Design Section to determine the methods of cleaning and painting to be used.

413B.03.26 Final Identification. When the final coat of paint is dry, stencil a legend on the structure indicating the type of paint used in each coat, and the month and year in which each application was completed. The letters shall be 2 to 2-1/2 in. high and be applied with black paint to the inside surface of a fascia beam near the abutment at a location selected by the Engineer. Stencil paint shall be compatible with the paint system applied. Apply additional stencils when more than one paint system is used.

413B.03.27 Field Cleaning Waste Containment. Meet the SSPC Guide 6 containment levels specified in Sections 413B.03.28 and .29. Applicable portions of these requirements apply to shops when existing steel coated with hazardous material is cleaned in the shop. With the exception of paint removal on the top flanges of members in preparation for deck replacement, provide a written Containment System Plan per Section 413B.03.28 unless otherwise directed.

413B.03.28 Field Cleaning Containment System Plan Guidelines. Unless otherwise directed, the following submittal requirements apply when a containment system is specified, regardless of the presence of toxic metals. Even if a written Containment Plan is not required,

meet the technical requirements listed below when containment is used. Provide all submittals to the Engineer. Provide the following:

(a) Working drawings of the proposed containment system, showing the design of the paint removal, containment, rigging, and ventilation system (if applicable), including all calculations and assumptions. The working drawings shall:

(1) Indicate which structures are covered by the plans submitted. Show the containment system in plan and elevation views, including details of clips and hangers.

(2) Identify all containment system components on the plan sheets.

(3) Indicate the type and size of scaffolding or rigging to be used.

(4) Indicate sizes of the containment areas, and when ventilation is specified, the capacity of the dust collectors, equipment data sheets, and types of airflow systems to be provided including volume of air from ventilation fans and minimum velocity of air movement.

(b) The containment system and equipment shall not encroach upon the minimum structure clearances specified.

(c) Secure all curtains, screens, and tarpaulins used for containment. Make connections to the steel work of the structure with clamps or other approved devices. Do not drill holes into the existing structure or weld to the existing steel work. Do not make permanent attachments or fastenings to the structure. Do not attach any load to the structure railings unless details and calculations showing loading have been approved.

(d) Use fire retardant containment curtains, screens, and tarpaulins.

(e) Indicate maximum waste load permitted on the containment system, expressed in inches of debris.

(f) Indicate all restrictions on the structure, and if it is posted.

(g) When the containment or rigging system or methods of erection will apply a load to the structure (e.g., suspended platform) the submittals shall include an analysis of the load that will be added to the existing structure, including blast waste. When vehicles containing surface preparation materials or waste will be stationed on the structure, indicate allowable load and location. The load analysis shall be performed, signed, and sealed by a Professional Engineer registered in the State of Maryland. The analysis shall ensure that the system will not affect the structural integrity of the structure.

When the containment or rigging system does not impose a load to the structure (e.g., tarpaulin materials suspended from the structure at an abutment or cables and picks used for access), a Professional Engineer analysis and review of the drawings is not required.

(h) All drawings requiring a Professional Engineer review and seal as defined in (g) above shall be prepared and submitted per Section 499. Drawings not requiring a Professional Engineer review and seal can be provided on standard paper. Submit 10 copies of each drawing. When a Professional Engineer stamp is required, each sheet shall be signed and sealed by the Professional Engineer. The submittal letter shall be on company letterhead. At least one copy of the submittal shall have an original seal.

(i) When the structure is over water, show a skimming boom for emergency backup.

413B.03.29 Containment System Requirements by Method of Preparation. Refer to Section 413B.03.10.

(a) Washing. When pressure washing newly installed steel coated only with inorganic zinc primer, the surfaces may be washed without any containment or collection of the water. Prevent spray and runoff water from entering traveled areas such as roadways, walkways, and railroads.

Whenever pressure washing is being performed on other painted surfaces, prevent paint chips from falling into rivers, streams, wetlands, wetland buffers, or other bodies of water, and when specified, from falling onto the ground. Should inadvertent spills or releases of paint chips occur, clean them up before the end of the shift, or immediately if directed.

(1) When pressure washing paint containing toxic metals or inorganic zinc/vinyl systems, the containment shall meet SSPC Class 2W. All wash water and debris shall be collected and disposed of per the applicable regulations and Sections 413B.03.27 and .35, respectively. Prevent paint chips from falling onto the ground.

(2) When pressure washing all other systems (systems other than inorganic zinc, inorganic zinc/vinyl, or systems that contain toxic metals), collect all dislodged paint chips, but the water need not be captured. When dislodged chips are collected on suspended containment screens, the maximum mesh opening shall be 17 mils. When working over ground, chips may be collected from the ground in lieu of utilizing containment screens, provided all chips are collected before the end of the shift. Dispose of collected paint chips and debris per applicable regulations and Section 413B.03.35.

(b) Power Tool and Hand Tool Cleaning. Prevent paint chips from falling onto the ground or into rivers, streams, wetlands, wetland buffers, or other bodies of water.

Clean up any inadvertent spills or releases of paint chips before the end of the shift, or immediately if directed.

(1) If paint system contains toxic metals, the containment for open power tool cleaning shall meet SSPC Class 2P. Dispose of collected paint chips and debris per the applicable regulations and Section 413B.03.35.

(2) If paint system does not contain toxic metals, the containment for open power tool cleaning shall meet SSPC Class 3P. Dispose of collected paint chips and debris per the applicable regulations and Section 413B.03.35.

(3) For roadway joints and other small areas approved by the Engineer, High Efficiency Particulate Air (HEPA) filter vacuum shrouded power tools may be used in lieu of containment in areas of paint containing toxic or nontoxic metals. Vacuum-shrouded power tools may eliminate the need for containment if it can be demonstrated that all paint chips and debris are sufficiently collected by the vacuum.

(c) Spot Abrasive Blast Cleaning or Brush Off Blast Cleaning. Prevent paint chips from falling onto the ground or into rivers, streams, wetlands, wetland buffers, or other bodies of water. Clean up any inadvertent spills or releases of abrasives or paint chips before the end of the shift, or immediately if directed.

With the exception of new steel installed with inorganic zinc primer, the containment for spot abrasive blast cleaning or brush off blast cleaning (regardless of the presence of toxic metals) shall meet SSPC Class 2A. Dispose of collected paint chips and debris per the applicable regulations and Section 413B.03.35.

Containment for spot abrasive blast cleaning or brush off blast cleaning of newly installed inorganic zinc primer shall meet SSPC Class 3A. Dispose of collected paint chips and debris per the applicable regulations and Section 413B.03.35.

(d) Total Paint Removal by Abrasive Blast Cleaning. Prevent paint chips from falling onto the ground or into rivers, streams, wetlands, wetland buffers, or other bodies of water. Clean up any inadvertent spills or releases of abrasives or paint chips before the end of the shift, or immediately if directed.

When totally removing any coatings by abrasive blast cleaning (regardless of the presence of toxic metals), the containment shall meet SSPC Class 2A. Dispose of collected paint chips and debris per the applicable regulations and Section 413B.03.35.

Meet ambient air and worker exposure requirements established by the Maryland Department of the Environment and MOSH.

Maintain containment systems while work is in progress. Do not deviate from the approved working drawings. Deny public access to all rigging, scaffolding, containment systems, and work sites at all times.

When cleaning structures over water, provide a skimming boom for emergency backup consisting of a float with a skirt or other approved system that shall be employed immediately to collect floating debris. Clean the skimming boom at least once a day. Upon completion of the project, clean the skimming materials or if cleaning is not possible or practical, dispose of as hazardous or non-hazardous waste as applicable.

413B.03.30 Worker Protection and Exposure Monitoring. In addition to complying with all applicable OSHA and MOSH regulations, when the project involves coatings that contain toxic metals, provide the services of a CIH per Section 413B.03.02(c) and submit a Worker Protection Compliance Program per Section 413B.03.31. The CIH, or a technician working under the direction of the CIH shall monitor worker exposures during paint disturbance operations at each structure and provide worker protection oversight.

Regardless of the presence of toxic metals, provide a hand wash station with soap and towels at each work site. As dictated by the monitoring results and the applicable OSHA standards, provide a clean up area with a shower, soap, hot and cold potable pressurized water; a change area with a locker; and an approved container for collecting and disposing of waste at each work site. The hand wash and shower facilities shall be available for Contractor and County personnel. Hygiene facilities shall meet 29 CFR 1926.51, Sanitation Standard.

413B.03.31 Worker Protection Compliance Program. A Worker Protection Compliance Program is not required when the coatings being disturbed do not contain toxic metals.

The program shall be on company letterhead and meet OSHA and the MOSH - Lead in Construction Standards, and other applicable toxic metal standards. The Compliance Program shall be reviewed and signed by the CIH and at least one copy of the submittal shall have an original CIH seal. The program shall include a commitment for the CIH, or a person working under the direction of the CIH, to provide written certification each month that the Contractor has complied with the Worker Protection Compliance Program, including biological monitoring. The letter shall be provided to the Contractor within five working days after the end of the month, and the Contractor shall provide the Engineer with a copy of the letter the following workday.

413B.03.32 Environmental Protection. At the end of the shift each day and upon completion of all project activities, the surrounding property and the entire project area shall be cleaned free of visible debris from the cleaning and painting activities.

413B.03.33 Environmental Protection Plan of Action (EPPA). An EPPA confirming that the environment is protected from contamination is required when the coatings are being abrasive blast cleaned (regardless of the presence of toxic metals), or the coating being disturbed contains toxic metals (regardless of the method of preparation). When an EPPA is

required, it shall be reviewed and sealed by a CIH and shall include procedures for monitoring air, soil, and water.

Include a location plan showing the type and location of high volume ambient air monitors if applicable, and the procedures that will be followed for visible emissions assessments and inspections of the soil, water, surrounding property and structures, and pavement. Submit six copies of each plan signed and sealed by the CIH. All submittals shall be in writing and on company letterhead. At least one copy shall have an original seal. Address the proposed procedures that will be implemented for the following as defined in Section 413B.03.34:

(a) For any paint disturbance using dry methods of preparation, address the daily visual emissions observations that will be performed and the corrective action that will be implemented in the event emissions or releases occur.

(b) When paint containing toxic metals is being disturbed, address the provisions for high volume ambient air monitoring (TSP-Monitoring); monitor citing, calibration, and operation; filter handling and shipping; and laboratory analysis, including the name and qualifications of the laboratory. Test results shall be reviewed and summarized by the CIH, and provided to the Contractor within five days of sample collection. Provide copies to the Engineer on the next work day following receipt.

(c) For any paint disturbance, address the visual assessments for soil/water/sediment that will be undertaken each day and upon project completion, together with the proposed clean up activities.

(d) Include a commitment from the CIH or a person working under the direction of the CIH, that within five days after the end of the month a written certification will be furnished certifying that the Contractor has complied with the EPPA. Provide a copy of the letter to the Engineer on the next work day following receipt.

413B.03.34 Methods for Assessing Emissions. Unless otherwise specified, the following requirements apply to all projects, regardless of the presence of toxic metals:

(a) SSPC Level 1 Visible Emissions. The following Level 1 visible emissions criteria apply when any paint is disturbed by dry methods such as blast cleaning or power tool cleaning.

Level 1 Emissions are defined as random visible emissions of a cumulative duration of no more than 1 percent of the workday or approximately five minutes in an eight-hour day. Level 1 is required for all structures. The Contractor's QC person, or Competent Person in the case of toxic metals projects, shall perform at least two 15 minute documented observations during each work shift. In addition to the 15-minute observations, all Contractor personnel shall be directed to routinely observe the work area and to report unacceptable emissions to QC or supervisory personnel, or to the Competent Person. When unacceptable emissions are detected, locate and

immediately correct the source of the emissions. Retain the records on site, and make them available to the Engineer.

The visible emissions criteria are not required when the paint is cleaned or disturbed using water. When water is used on existing coatings that contain toxic metals or on inorganic zinc/vinyl systems, all water shall be collected and emissions are prohibited. When water is used to clean all other coating systems, the water need not be collected and emissions are not restricted.

(b) Ambient Air Monitoring. Unless otherwise directed, ambient air monitoring is required when the coatings being disturbed contain toxic metals, and whenever the paint removal operations are located within 500 ft of houses, schools, parks, playgrounds, shopping areas, or similar areas of public exposure.

(1) Abrasive Blast Cleaning. Daily ambient air monitoring at each structure being abrasive blast cleaned shall begin one day prior to beginning work and during the first 10 days of productive abrasive blast cleaning operations. When the results indicate that the containment is controlling emissions, full time monitoring may be discontinued unless otherwise directed. However, monitoring shall be repeated for two consecutive days every month thereafter during the work shift while blast cleaning or other dust producing operations are underway.

When the results of the original 10 days of monitoring or the periodic monthly tests are unacceptable, monitoring shall continue full time. Monthly monitoring may be initiated or resumed only when approved, and only after the results of the testing indicates that the containment is controlling emissions.

Full time monitoring shall also be resumed when unacceptable visible emissions or residues are observed on the ground or water.

(2) Hand and Power Tool Cleaning. Begin daily ambient air monitoring at each structure one day prior to beginning work and during the first five days of hand tool cleaning and power tool cleaning. When the results indicate that the containment is controlling emissions, full time monitoring may be discontinued, unless otherwise directed. Resume monitoring when visible residues are observed on the ground or in the water, or visible dust is observed exceeding the Visible Emissions criteria established above.

(3) Monitor Placement and Reporting. Place total suspended particulate (TSP) monitors in areas of potential public exposure (e.g., adjacent to homes, businesses, parks, or pedestrian walkways) that are within 500 ft of each project site during cleaning operations in conformance with Method D of SSPC Guide 6. The CIH shall provide for Engineer acceptance, the proposed monitoring locations in advance, together with the rationale for the selection of each site. Monitoring shall be conducted at least seven hours per work shift. All TSP

monitoring samples shall be analyzed using Method 40 CFR 50 Appendix B and G by a laboratory approved by the American Board of Industrial Hygiene.

The CIH shall use an Adjusted Daily Allowance (ADA) as described in SSPC Guide 6 (not an average daily allowance) for evaluating the TSP monitoring results. The CIH, or a person working under the direction of the CIH, shall provide the Contractor with a written report and analysis of monitoring results, including the relevant acceptance criteria based on the ADA, within five days of sample collection. Provide the results to the Engineer on the next work day following receipt.

(c) Removal of Visible Project Debris. At the end of the shift each day and upon completion of all project activities, the surrounding property, structures, and the entire project area shall be cleaned free of visible project debris.

Prevent paint chips, abrasives, dust, and debris from being deposited onto surrounding property, vehicles, concrete, pavement, slope protection, soil, water, sediment, etc. When there are spills or releases of such material, immediately shut down the operations producing the emissions and clean up the debris. Change work practices, modify the containment, or take other appropriate corrective action as needed to prevent similar releases from occurring in the future. Contain and collect water used for washing paint containing toxic metals or existing inorganic zinc/vinyl systems. Water used to wash all other paint systems need not be contained and may contact the ground and water.

413B.03.35 Field Cleaning Waste Disposal. Store all project waste, regardless of the presence of toxic metals, in roll-offs or sealed 55-gallon drums. Containers shall be labeled with the structure number, Contract number, Contractor's name, contents, and the date. Refer to Sections 413B.03.36 thru .41.

When the waste is hazardous, comply with SSPC Guide 7. Each day, collect clothing and other waste material and seal them in approved containers. When drums are used, they shall be sealed 55-gallon open head type drums meeting Interstate Commerce Commission Specification 17-H. All containers shall be in new condition.

413B.03.36 Waste Handling Plan of Action. Required for the handling, storage, and disposal of all hazardous waste, regardless of the presence of toxic metals. When the project involves the removal of paint containing toxic metals, the program shall be signed and sealed by the CIH. At least one copy of the submittal shall have an original seal.

The Plan of Action shall address the following:

(a) Names, addresses, and licenses for the proposed hazardous waste transporters and disposal facilities.

(b) Hazardous waste handling and storage procedures.

(c) Waste and waste water sampling and analysis procedures.

(d) Provide all test results to the Engineer within five days of sample collection.

413B.03.37 Waste Sampling and Analysis. When the project involves hazardous waste, the CIH, or an employee working under the direct supervision of the CIH, shall take at least four samples of the accumulated residues of each waste stream collected at each structure or a sample from every third drum, whichever is greater. All sampling shall be random and representative.

The samples shall be analyzed for TCLP as outlined in COMAR 26.13.02 and the EPA Test Procedure Manual, SW-846 for all RCRA 8 Metals. Waste shall not accumulate for more than 30 days before sampling. The representative samples collected shall be analyzed by an approved laboratory and the results returned to the Engineer within five working days of collection. Additional samples may be required if the average test results exceed 3.5 mg/l for lead, or exceed the threshold levels for other toxic metals allowed by COMAR and EPA procedures. The disposal method will be based on the results of these analyses, except that waste generated using steel abrasives shall be handled, stored, and disposed of as hazardous waste regardless of the test results.

413B.03.38 Temporary Waste Storage Site. Obtain an approved temporary storage site, and haul the waste material away from the work site at the end of each working day. Ensure that the storage site prevents the migration of the contaminated material into the environment and that it is protected from vandalism and unauthorized access by the general public. Remove the waste from the temporary storage site within 75 days from the initial date of accumulation or before the completion of work, whichever comes first. When the Contract Documents specify that the waste containers shall be stored at a particular facility owned by the County, contact that facility to schedule delivery.

413B.03.39 Waste Water Disposal. Test the waste water collected from bridge washing and hygiene facilities for toxic metals. Tests shall be performed using EPA Method 6010 by a laboratory approved by the American Board of Industrial Hygiene.

Provide the Engineer with the test results and written plans for the disposal of the water, including the name and address of the licensed transporter and disposal facility. If Baltimore County authorizes the disposal of the water down the sanitary sewer system, provide a letter from Baltimore County authorizing the disposal.

413B.03.40 Hazardous Waste Transportation and Disposal. Maryland law provides that when samples tested using TCLP exceed the threshold value (5 mg/l for lead), they shall be considered hazardous waste and be removed under manifest by a licensed hazardous waste transporter to a permitted disposal facility. When tested waste material is determined to be hazardous waste, request through Baltimore County an EPA identification number as specified in COMAR 26.13.03.03. Provide the Engineer with written plans for the

transportation and disposal of the waste, including the name and address of the licensed transporter and disposal facility.

Waste containing less than the threshold value by the TCLP test, including the confidence interval, shall be disposed of in accordance with Section 413B.03.41 for RCRA 8 Metals.

Prepare a manifest for hazardous waste to be transported from the approved temporary storage site. The manifests shall be prepared and contain the information stipulated in COMAR 26.13.03.04 and as otherwise required by State regulations. Forward the manifests to the Engineer.

Drums of other wastes, such as solvent contaminated rags, disposable protective clothing, disposed dust collector filters, and other contaminated substances shall be sampled individually and tested appropriately.

COMAR 26.13.03.05 stipulates the "Pre-Transport" requirements and the amount of time permitted for the accumulation of hazardous waste. A certified waste hauler shall transport waste to a landfill permitted to accept this material.

Obtain a list of certified haulers and other information regarding handling and disposal of blast waste by contacting the Department of Environment, Hazardous Waste Administration.

413B.03.41 Nonhazardous Waste Disposal. Waste containing less than the threshold value (refer to Section 413B.03.40) by the TCLP test, including the confidence interval, may be disposed of as an industrial waste at a landfill permitted to accept this material. Dispose of all waste in accordance with local regulations.

Waste containers/dumpsters shall be covered when not in an active filling process.

413B.04 MEASUREMENT AND PAYMENT. The Contract unit price for the item specified will be full compensation for all cleaning and painting, scaffolding, platforms, containment systems, permits, working drawings, daily quality control records, Professional Engineer’s services used for containment, industrial hygienist services, air monitoring, sampling and testing of materials for toxic metal content, including any revisions and resubmissions that may be required during the execution of the work, providing safe access for inspections, hand wash station/clean up area, floodlighting, test plates, drums, collection and storage at the temporary storage site, hauling and disposal at an approved industrial waste site or hazardous waste site, removing and replacing planking, removal of debris, and all material, labor, equipment (including test equipment), tools, and incidentals necessary to complete the work.

413B.04.01 ***Cleaning and Painting Existing Structural Steel*** will not be measured but will be paid for at the Contract lump sum price.

413B.04.02 All costs associated with repair of existing coatings due to new construction, structural repairs, and damage caused by Contractor's operations will not be measured but will be incidental to the pertinent Repair, Structural Steel, or Cleaning and Painting items included.

SECTION 414 – PORTLAND CEMENT CONCRETE STRUCTURES

414.01 DESCRIPTION. Furnish, place, finish, and cure concrete bridges, culverts, and miscellaneous structures including cofferdams, forms, and falsework.

414.02 MATERIALS.

Curing Materials	902.07
Form Release Compound	902.08
Concrete Mixes	902.10 and 414.02.04
Grout	902.11
Linseed Oil	902.12
Drains, Downspouts, Weep Holes, and Pipes	905
Reinforcement	908.01
Cast Iron Scuppers	909.04
Anchor Bolts	909.06 and 909.07.01
Steel Forms Which Remain In Place	909.10
Joint Sealer	911.01
Preformed Joint Fillers	911.02
Preformed Polychloroprene Elastomeric Compression Joint Seals	911.04
Water Stops and Flashing	911.08 and 913.05
Production Plants	915
Fusion Bonded Epoxy	917.02
Water	921.01
Epoxy Adhesives	921.04

414.02.01 Admixtures. Do not use calcium chloride or other admixtures containing chloride salts in concrete placed on steel bridge deck forms.

414.02.02 Requirements for Accessories. Ensure that accessories such as inserts and ties that will remain in completed superstructures within the top 5 in. of final deck slab concrete

are either epoxy coated or made of material other than aluminum that will not rust. These same requirements pertain to accessories that will remain in parapets, sidewalks, or other portions of the structure designated to have epoxy coated reinforcing steel. Do not use inserts in the top half of slabs exposed to vehicular traffic unless specified.

414.02.03 Precast Reinforced Concrete Box Sections. Meet M 259 or M 273 including concrete design strength. All details shall be as specified. Construction joints between the walls and the bottom and top slabs are optional. Certify as specified in Section 305.03.06.

414.02.04 Composition of Concrete Mixes for Slip Form. For construction of parapets and median barriers on bridges, use Mix No. 6 with a 1 in. maximum slump. Measure the slump at the placement point as the concrete is charged into the slip form machine. Use crushed stone meeting M 43, size number 7 for the coarse aggregate, proportioned to be 63 percent of the total aggregate in the mix. Other size coarse aggregate may be used provided the slip form results are acceptable.

414.03 CONSTRUCTION. Produce concrete at the work site or away from the work site by an approved central mixing plant, or by approved truck mixing as specified in Section 915.

When specified, remove portions of existing parapets or end posts as specified in Section 402.03.

414.03.01 Equipment. Use equipment of sufficient capacity to complete any unit or section of concrete between construction joints in one continuous operation consistent with approved placement operations.

With written approval, hand mixing may be permitted for small volumes of concrete used in isolated portions of the structure where structural integrity is not critical and the volume does not exceed 1 cu.yd.

414.03.02 Forms.

(a) Design Criteria.

(1) Design Loads. Per AASHTO LRFD Bridge Construction Specifications, Temporary Works. Assume the lumber in the forms to weigh 50 lb/cu.ft..

(2) Design Stresses.

Timber Design. Per ACI Standard Recommended Practice for Concrete Formwork (ACI 347). Deflections for form members shall not exceed 1/270 of the span or 1/4 in. Unit stresses stipulated in AASHTO for treated timber may be increased by 25 percent, but shall not exceed the values listed below.

Compression Perpendicular to Grain	450 psi
Compression Parallel to Grain	1600 psi

Flexural Stress	1800 psi
Horizontal Shear	
Beams up to 6 in. deep	200 psi
Beams over 6 in. deep	150 psi
Axial Tension	1200 psi

Plywood. For plywood without backing, calculate the strength of plywood based on the grain of the face plies running parallel to its span. Install the plywood in this manner.

Steel Members for Forms. Per AASHTO LRFD Design Specifications and AASHTO LRFD Bridge Construction Specifications. For design where no dynamic loading is involved, the AISC Standard Manual of Steel Construction, Allowable Stress Design may be used as the accepted design code.

Steel Forms Which Remain in Place. The maximum deflection shall not exceed 1/180 of the span and not in excess of 1/2 in. Do not use camber to compensate for deflection in excess of these limits. The design spans of the form sheets shall be the clear distance between beam or girder flanges less 2 in.

The unit working stress in the steel sheet and supporting members shall not be more than 0.725 of the specified minimum yield strength of the material furnished but not to exceed 36,000 psi. Compute physical design properties in accordance with the American Iron and Steel Institute Specification for Design of Cold Formed Steel Structural Members.

(b) Working Drawing Approval. Submit detail, form, falsework, and centering plans and design loads for approval as specified in Section 499. Working drawings for forms shall include all members proposed for use as well as form ties and bracing. Do not submit details for form ties separately; incorporate them in the general working drawings submittal. The rate of placing concrete shall be noted on the working drawings. Approval of the working drawings does not relieve the Contractor of responsibility as specified in Section TC-4.01. The provisions of Section 408.03.28 also apply when working drawings are submitted for falsework and centering.

(c) Forms at Construction Joints and Corners. Provide ties or bolts 3 to 6 in. from each side of construction joints for tightening the forms against the hardened adjacent concrete prior to placing fresh concrete. At joints where forms have been removed and reconstructed, extend the form over the concrete already in place and draw tightly against the previously placed concrete. Provide fillets at all sharp corners, except when otherwise specified, and provide a bevel or draft in the case of all projections. Chamfer all exposed corners of concrete with 3/4 x 3/4 in. milled chamfer strips, except on unexposed footings or where specified.

(d) Form Scaffolds and Platforms. Build form scaffolds and platforms along the outside of bridge deck fascias during construction of forms for bridge decks. Design and

construct them as integral parts of the form supports. Furnish separate design calculations with the working drawing submission. Assume the responsibility of Section TC-4.01 even after approval of the working drawings.

(e) Forms for Unexposed Surfaces. Ensure that sheathing, studs, and bracing are of sound material, and that studs and wales are straight, true, and surfaced on two edges to a uniform width. Ensure that the inside faces of the forms are constructed sufficiently smooth so that the resulting concrete surfaces are accurately formed.

(f) Forms for Exposed Surfaces. Unless otherwise specified in the Contract Documents, support the bridge deck concrete between stringers with steel forms which remain in place, except in panels where a longitudinal deck construction joint is located between stringers. Ensure that forms that are used for widening and rehabilitation provide exposed finished concrete surfaces that match the existing structure.

(1) Lined Forms for Exposed Surfaces. Use approved composition board, sanded plywood, or metal for contact surfaces of lined forms for surfaces exposed to weather or view. Ensure that all studs are surfaced two edges to a uniform width. The studs and backing shall be solid, straight, and free of detrimental defects. However, the backing need not be of the quality used for contact forms for unexposed surfaces.

Sheathing for form backing shall be surfaced two sides to a uniform thickness of at least the dimension approved on the working drawings. Ensure that form sheathing is built solidly, securely nailed to studs, and placed to prevent any bulging of the lining.

(2) Unlined Forms for Exposed Surfaces. Use five ply sanded plywood of the specified thickness for surfaces exposed to weather or view. Use plywood manufactured especially for concrete formwork using waterproof glue. All studs and wales shall be surfaced two edges to a uniform width.

Use full size sheets of plywood except where smaller pieces cover an entire area. Solidly back joints to prevent leakage, and nail the edges of abutting sheets to the same stud or blocking with sixpenny nails not more than 8 in. apart. Where rustication occurs, construct horizontal plywood joints behind a rustication strip. Otherwise, place horizontal joints at the same respective elevations in all portions of the structure. Where vertical rustication occurs, construct vertical joints in the lining behind a rustication strip. Otherwise, keep vertical joints to a minimum, butted tightly together and sealed with crack filler as the plywood is nailed in place.

(g) Steel Forms Which Remain in Place.

(1) Installation. The surface in contact with concrete shall be smooth and free of surface irregularities. Ensure that working drawings specify the grade of steel, the physical and sectional properties, and a clear indication of where the forms are supported by steel beam flanges subject to tensile stresses.

Do not weld form supports to flanges of steel that are not considered weldable or to portions of flanges that are subject to tensile stresses.

Welding and welds per AWS Bridge Welding Code pertaining to fillet welds.

Unless otherwise specified, use steel forms between stringers to support bridge deck concrete, except where a longitudinal deck construction joint is located between stringers.

(2) Procedure Check and Inspection. Remove at least one section of the forms at a location and time selected by the Engineer from each span of each bridge in the Contract. If the bridge has a longitudinal joint, remove a form on each side of the joint from each span. Do this as soon after placing the concrete as practical to provide visual evidence that the concrete mix and the placement procedures are obtaining the desired results. Remove an additional section if the Engineer determines that there have been any changes in the concrete mix or in the placement procedures that warrant additional inspection.

At locations where sections of the forms are removed, replacement of the forms will not be required, but the adjacent metal forms and supports shall be repaired to present a neat appearance and ensure their satisfactory retention. As soon as the form is removed, the concrete surfaces will be examined for cavities, honeycombing, and other defects. If the Engineer finds irregularities but determines that the irregularities do not justify rejection of the work, repair the concrete as directed.

Give the concrete an ordinary surface finish as specified in Section 414.03.07(a). If the concrete where the form is removed is unsatisfactory, remove additional forms, as necessary, to inspect and repair the slab. Modify the method of construction as required to obtain satisfactory concrete. Remove all unsatisfactory concrete and replace or repair as directed.

Provide facilities required for the safe and convenient conduct of the Engineer's inspection procedures.

(h) Steel Forms Which Do Not Remain in Place. The contact surface shall be smooth and free of bolts, bolt heads, nuts, rivet heads, welding seams, and surface irregularities. Forms that produce unacceptable results will be rejected, and shall not be reused.

(1) For Round Columns and Piers. Use steel forms that are at least 10 gauge, have a minimum number of horizontal joints, and are column height.

(2) For Pier Caps and Crash Walls. Prefabricated girder type steel forms may be used for forming pier caps or crash walls. Use one piece where practical for each element of these forms including side, bottom, and end. Arrange splices to provide a symmetrical pattern.

(3) For Reinforced Concrete Box Culverts and Rigid Frames. Use steel forms or forms constructed of wood or composition wood panel sheathing set in metal frames. Steel forms for box culverts and rigid frames shall be at least 10 gauge.

(i) Fiber Column Forms. Fiber column forms shall only be used for round columns. The forms shall produce columns truly round and straight. Protect forms from dampness before concrete is placed. Do not splice fiber forms.

(j) Release Agents. Apply form release compound immediately before placing concrete.

(k) Temporary Supports. Build temporary supports used for centering and falsework on good firm foundations. Unless otherwise provided, ensure that they bear upon strata at or below the frost line unless rock is available. Where required, drive piling for support. Ensure that the strength and bracing of the temporary supports will provide a completed structure having the shape specified. Use jacks or hardwood wedges in connection with the temporary supports to take up settlement either before or during placing of concrete. Set temporary supports to give the structural camber specified, and allowance for shrinkage and settlement. If during construction, any weakness, settlement, or distortion develops, stop the work and remove any masonry affected. Strengthen the temporary structures before resuming. Construct centering to permit gradual and uniform lowering.

(l) Defective Forms. Use an approved device for removing or modifying steel forms which remain in place. Burning is prohibited.

(m) Form Ties. Use approved form ties. Ensure that ties leave no metal closer than 2 in. from the surface. They shall not be fitted with lugs, cones, washers or other devices that act as spreaders within the form or for any purpose that leaves a hole larger than 7/8 in. diameter. When prefabricated steel girder forms are used, use tapered ties no greater than 1-1/2 in. diameter. Ensure that ties are clean and free of rust. When ties are removed, pressure-grout the holes with a non-shrink mortar mixed to match the color and texture of the concrete.

Coat the removable portions of ties with a clear lubricant or other approved material.

During removal of form ties, avoid spalling the concrete on the exposed surface. Do not cut the ties back from the surface.

(n) Form Support Brackets or Devices. Devices attached to previously placed concrete may be used, provided all parts are acceptable. No metal part of an insert, threader, or anchor that remains in the concrete shall be within 2-1/2 in. of the surface. Do not attach brackets or other devices until the concrete is cured and it has attained a compressive strength of at least 3000 psi. All voids left in the concrete after removal of brackets and other devices shall be no greater than 2 in. diameter. Fill them with mortar and finish the surface as specified in Section 414.03.07(a).

(o) Form Removal. For determining the time when falsework and forms may be removed, backfill placed, and when loads may be applied to structures, make an adequate number of concrete test specimens in addition to those required to check the quality of the concrete being produced. After meeting all formwork requirements, remove and dispose of all forms except those specified to remain in place.

Do not use methods of form removal likely to cause overstressing of the concrete. Do not remove forms and their support without approval. Remove supports in a manner that permits the concrete to uniformly and gradually take the stresses due to its own weight.

(p) Year Built Marking. Supply the correctly sized forms and molds, and cast the year of completion into each structure, as determined by the Engineer.

414.03.03 Anchor Bolt Placement. Place anchor bolts as specified in Section 408.03.31.

414.03.04 Concreting. Clean forms before placing concrete. Ensure that temporary struts, stays, and braces holding the forms in correct shape and alignment are not buried in the concrete. If faces of completed or proposed excavated footing areas are disturbed prior to concreting, extend the footings to bear on acceptable undisturbed faces at no additional cost to the County.

Place all concrete (except tremie concrete) in the dry.

(a) Foundations. Assume responsibility for any reinforcement fabricated prior to approval of foundations. If bearing material varies more than assumed in design, the Engineer may direct the footing be lowered, raised, or deepened; sub-foundation placed; piles used; or a combination of these methods used to best obtain bearing. If planned footings are changed vertically, revise reinforcing steel as required. Use plain non-reinforced Concrete Mix No. 1 to construct sub-foundation concrete for bridges, retaining walls, and wing walls of box culverts or rigid frames. This concrete need not be vibrated, and the usual curing and cold weather requirements may be reduced to three days. Selected backfill using No. 57 aggregate may be used for sub-foundation for box culvert barrels, headwalls, and miscellaneous structures.

(b) Concrete Placement. Avoid segregation of the material and the displacement of the reinforcement. The use of troughs, chutes, and pipes for conveying concrete more

than 15 ft from the mixer to the forms will be permitted only when approved. Open troughs and chutes shall be metal or metal lined. Where segregation occurs due to steep slopes, equip chutes with baffles.

Where placing operations involve dropping the concrete more than 5 ft, deposit it through a tube made of sheet metal, canvas, or other approved material. Do not use aluminum hoppers or tubes. Keep lower ends as close as possible to the newly placed concrete but not more than 3 ft above the concrete. All tubes shall be at least 6 in. diameter unless otherwise directed. Do not disturb the forms after initial set of the concrete, and do not place any strain on the projecting ends of the reinforcement.

Place concrete in horizontal layers not more than 12 in. high except as provided herein. When less than the complete area of a layer is placed in one operation, terminate it in a vertical bulkhead. Place and vibrate each layer before the preceding layer has taken initial set.

Place concrete in columns and walls in one continuous operation unless otherwise directed. Allow concrete to set at least 12 hours before placing the caps.

Where walls, piers, columns, struts, and posts have horizontal construction joints, do not place succeeding lifts until the lower placement has set for 12 hours.

Prior to subsequent placement, clean all accumulations of mortar splashed upon the reinforcement. Avoid damaging the concrete seal bond near and at the surface of the concrete while cleaning the reinforcing steel.

(c) Superstructure Placement.

(1) Grade Controls for Bridge Deck Slabs. Place bridge deck slabs supported by new stringers to the specified line and grade. Take all necessary precautions, including a check on all new bridge seat elevations as the last order of work before setting stringers. Complete any adjustments resulting from this check before starting additional work. After the structural steel is set, make a final check of elevations of all the steel stringers at points corresponding to those for dead load deflection and finished roadway elevations. Make computations and have them approved. Set controls at proper elevations to produce finished tops of concrete bridge decks that will be true to the planned line and grade of the roadway.

Perform grade control for bridge deck slab replacements as specified in Section 402.03.02.

(2) Superstructure Placement Restrictions. Do not erect the superstructure until the substructure forms have been sufficiently stripped to determine the character of the concrete in the entire substructure. In all spans, use plywood forms to cast the concrete bridge deck slabs outside of the stringers.

Unless otherwise specified, pump concrete for deck slabs whenever the volume of concrete in the pour exceeds 50 cu.yd.

Place all superstructure concrete according to the following schedule:

SUPERSTRUCTURE CONCRETE PLACEMENT SCHEDULE		
DATES	BEGIN CONCRETE PLACEMENT AFTER	FINISH BURLAP PLACEMENT BEFORE
May 15 - June 15	7:00 PM	11:00 AM
June 16 - Aug. 14	9:00 PM	7:00 AM
Aug. 15 - Sept. 15	7:00 PM	11:00 AM
Sept. 16 - May 14	No time restrictions	

Do not place or work superstructure concrete in any manner when the temperature in an unshaded location at the placement site is above 80 F. Use floodlighting when existing light is less than 20 average horizontal foot-candles over the construction area.

Submit a Situation Plan showing the locations and aiming of floodlights. After reviewing this plan, the Engineer will witness a test of the floodlighting system at the proposed construction area. The floodlighting system shall be capable of maintaining 20 foot-candles without producing a glare on traffic. Floodlighting systems shall be as approved. When portable generators are used, have an emergency backup system available at all times on the job site.

(3) Rate of Concreting for Bridge Deck Slabs. Make provisions to ensure that the placement rate of concrete is at least 35 cu.yd./hour per crew. Under special circumstances, the Engineer may give written approval to lower this requirement.

Submit evidence of an adequate source of concrete and placing and finishing equipment capable of meeting the minimum rate of placement while providing the intended quality finish. Submit this evidence at least one week prior to the proposed placement of the bridge deck slab.

Place concrete in slab spans in one continuous operation and in one layer for each span.

Do not mound concrete on forms supported by beams, stringers, or girders. Distribute the concrete to a depth not exceeding the planned slab thickness plus 6 in. before spreading, consolidating, and finishing.

Follow the placing sequence in the numerical order specified without modification. Allow at least 40 hours between the completion of one placement and the start of the next numbered placement.

(d) Box Culverts. If the top slab is the riding surface of the roadway, place as specified in Section 414.03.04(c). Construct box culverts by casting in place or use precast reinforced concrete box culvert sections. Whichever method is indicated in the Contract Documents, the alternate method may be used unless otherwise specified. However, all time constraints such as maintenance of traffic, curing, and completion date shall be met.

If precast sections are used, at least 15 ft of all box culvert ends and all footings, wing walls, headwalls, and toe walls shall be cast in place. Additionally, terminate the precast sections at least 1 ft from footings and toe walls. Show lifting devices on the working drawings. Fill lifting holes with nonshrink grout after the precast units are in place. Set the precast reinforced concrete box sections tightly together, and seal the joints per the manufacturer's recommendations.

Place the bottom slabs of cast in place concrete box culverts for their full depth in one mass or layer and allow to set at least 12 hours before performing any additional work.

Do not place the top slab on single cell box culverts spanning in excess of 10 ft and on multiple cell box culverts until the concrete in the sidewalls has set for at least 12 hours. Construction joints at the top of sidewalls may be omitted in some cases provided the top slabs are placed as follows:

(1) For single cell box culverts spanning 10 ft or less, the sidewall construction joint may be omitted and the top slab placed on the sidewalls, provided the concrete in the sidewalls is allowed to set for approximately two hours before starting to place the top slab.

(2) Regardless of size or number of cells, a written request may be made to place the top slab on the walls of box culverts per (1) above. Submit the proposed plan, including rate and method of placement, and type and size of equipment. With initial approval, the first section of the structure will serve as a demonstration to confirm that there is no excessive cracking or any other detriment, and that satisfactory results will be obtained. After receiving final approval, continue placing the remainder of the box culvert. If at any time the Engineer determines that the results are no longer satisfactory, revert to placing the concrete with the 12 hour delay as specified above.

(e) Forming Concrete Parapets and Median Barriers on Bridges. Either the slip form method or conventional fixed form method may be used. However, do not use the slip form method on bridges maintaining traffic or on parapets when railing is specified.

If the slip form method is proposed, demonstrate ability to produce acceptable results. If the demonstration is unacceptable or acceptable results are not maintained during production, stop the slip form operation, remove the unacceptable work, and modify the construction methods. If construction modifications do not produce acceptable results, use the fixed form method. No additional compensation will be made, and no increase will be made in any Contract price. Nor will any revisions be made to the amount of time to complete the Contract as a result of any required removals, modifications, or changes in the method of placing parapets or barriers.

Notify the Engineer in writing of the proposed method of constructing the parapets and median barriers prior to beginning superstructure work.

The following shall apply to the consideration of slip forming:

(1) Submit evidence of being capable of producing high quality slip formwork. Prior to beginning any slip form construction, submit a detailed work plan. Include the type of equipment, materials, and procedures to be used, subcontractors involved in the construction, key personnel who will be performing the work (names, training, experience, etc.), as well as detailed information on the proposed process to satisfactorily complete the work.

(2) When possible, include reference in the work plan to at least three other similar projects completed in the State of Maryland or surrounding states. As far as practical, these projects shall have been built using the same equipment, personnel, material, and procedures proposed for the project. The Engineer may visit these completed projects to evaluate the acceptability of the finished product.

    If the Engineer determines that satisfactorily slip formed parapets or median barriers have been demonstrated at the locations submitted in the work plan, the requirements of the off bridge test site specified below may be waived, and the first 50 ft of slip forming on the bridge will be considered the test section for the structure. This test section shall be completed and approved prior to placing the remaining portions of parapet or bridge median barrier.

(3) Do not begin any slip forming operation without written approval of the work plan.

    Any proposed revisions or deviations to the approved work plan shall be submitted and approved prior to making the change.

    If (2) above is not met, complete an acceptable off bridge test section prior to placing any portion of the parapet or bridge median barrier. Place the appropriate test section of parapet or median barrier using the same equipment, sensor line, support spacing, material, personnel, and procedures described in the work plan. This test section shall match the structure’s horizontal curve as much as practical,

be at least 50 ft long, and be placed at a location selected by the Contractor near the bridge site.

Place the off bridge test section with vertical irregularities varying upward and downward at least 3/4 in. Demonstrate that the method of slip forming can compensate for this deviation and provide a top of parapet or median barrier that is true to the proposed line and grade and not necessarily parallel to top of bridge deck. This necessitates that the equipment provide for variations in height of vertical face of parapet where it intersects the top of deck slab.

Position, support, and space the sensor line in the same manner that will be used on the bridge decks, with no stakes, holes, etc., used to support it. Use the sensor support spacing recommended by the slip form machine manufacturer and as necessary to maintain the planned line and grade. Use the same rate of slip forming proposed for the bridge. Saw cut joints in the test section at the same approximate spacing and in the same manner as proposed for the finished bridge. The Engineer will evaluate the procedure, material, equipment, and appearance of the test section.

Take three test cores from the test section at directed locations to determine the concrete quality. Honeycombing, sags, tears, or other evidence of poor quality concrete will be cause for rejection of the test section. If the test section is rejected, either place additional test sections until approved, or use the fixed form method.

Do not remove the accepted test section until all parapets or median barriers on the bridges are complete. The slip forming on the bridges will be compared to the approved test section to ensure that similar acceptable structures are being achieved. Following completion and acceptance of all bridge parapets and median barriers, remove and dispose of the off bridge test section.

The entire testing procedure, including removing and disposing of test units, regardless of whether the procedure is approved or rejected, shall be at no additional cost to the County.

When dual bridges are separated by a joint, construct the two parapets that make up the median barrier in separate operations; not simultaneously. Allow the first median parapet section to cure for at least 40 hours prior to constructing the second section of median parapet. The Contractor shall place additional reinforcing steel to brace the parapet against displacement during the extrusion process. A detail will be included in the Contract Documents. The alignment and rigidity of the reinforcing steel will be strictly enforced to ensure that the minimum clearances specified for concrete cover are maintained.

Ensure that an uninterrupted flow of concrete is provided to the slip form machine. Once the slip form machine is set in motion, keep it advancing until it

reaches the proposed stopping point. Organize and schedule the operations in a manner that the next concrete truck will be able to move into position at the slip form machine as soon as the previous truck pulls away without interrupting the machine's uniform advancement. Under no circumstances may the slip forming be operated in a manner that requires removal of a concrete truck from the bridge before moving another truck into place.

Except for the slip form machine and its concrete supply trucks, do not allow vehicular traffic on the bridge while slip forming operations are in progress.

After setting up the slip form machine and placing the sensor wire, perform a dry run of the equipment in the presence of the Engineer. Demonstrate that the parapet or median barrier will envelop preset embedded obstacles and will meet with flush surfaces such as pull boxes, expansion joint plates, etc.

Use concrete of a consistency that the shape of the structure is maintained without support after extrusion. The surface shall be free of surface pits larger than 3/16 in. diameter. Finish the concrete with a light brushing with water only. Finishing with brush applications of grout is prohibited.

If a tear occurs at the top of the parapet or median barrier during the slip forming operation, remove it immediately. Make the repair using acceptable concrete practices. Blend the repair into the barrier to the extent that there is no distinguishable difference in the wall face or top. The rate at which the slip form machine is advanced shall be the same as used on the approved test section.

The shape of the finished parapet or median barrier shall conform to the dimensions specified. The vertical face at the bottom of the concrete safety shaped parapets and median barriers shall not exceed 3-1/2 in. Ensure that the finished parapet or median barrier does not deviate from the proposed grade and alignment in excess of 1/4 in. per 10 ft.

Use a diamond blade to saw cut joints in the finished parapet or median barrier. Make cuts and space joints as specified. The trapezoidal shaped control joints on the outside of parapets will not be required if slip forming is used. Terminate slip form placements only at a parapet control joint. Saw cut the joints as soon as possible after initial concrete set and after the concrete has set sufficiently to preclude raveling during the sawing. Complete the sawing the same day the concrete is extruded and before any shrinkage cracking occurs. Do not leave concrete overnight without saw cutting the joints.

When portions of the bridge are superelevated, produce the configuration specified, i.e., level top surface, wall normal to deck surface, etc.

(f) Temperature Controls. Ensure concrete temperatures meet the requirements specified in Section 902.10. Heat concrete below these temperatures by one of the following methods:

(1) When the method of heated mixing water is used, do not introduce water above 170 F into the mix.

(2) When the method of heated aggregates is used, heat aggregates containing frozen lumps separately. Do not allow materials containing frozen lumps, ice, or snow to enter the mixer. Heat aggregates by steam coils or other dry heat but do not discharge live steam or hot water into them. Do not use a flamethrower or any direct flame.

When the ambient air temperature is below 40 F, raise the temperature of the air in contact with the reinforcement to 40 F prior to placing concrete. When the ambient air temperature is above 70 F and the reinforcement or steel forms are exposed to the direct rays of the sun, cool the reinforcement and forms to 70 F or less by means of a water spray prior to placing concrete.

Do not place superstructure concrete during any period for which abnormal wind or storms are forecast locally by the National Weather Service.

(g) Pumping. Provide approved equipment that is suitable and adequate in capacity for the work. Arrange the equipment so that no vibrations result that might damage freshly placed concrete. Do not use pumps or discharge lines containing parts made of aluminum.

(h) Use of Conveyors. Concrete may be moved from the mixer to its final position by conveyors. Use conveyors in sections, by which concrete is deposited from one conveyor belt onto the next through a hopper. Limit the maximum rise on any individual section of the conveyor to 30 degrees from the horizontal. For concrete slumps less than 2 in., limit the belt travel speed to 900 ft/minute. Decrease this speed for slumps exceeding 2 in. Conveyers used for placement of decks shall be supported by main load carrying members. Place polyethylene or other acceptable material under the conveyor line to contain any spillage.

414.03.05 Depositing Concrete Under Water. Refer to Section 404.03.04. Do not deposit concrete in water or expose it to the action of water before setting, unless specified or approved. Use a tremie pipe that is at least 10 in. diameter and equipped with a watertight plug.

Equip the bottom of the pipe with a baffle or deflector plate. The number and location of pipes will be dependent on the size of the pour. Do not disturb the tremie concrete after placement, nor place successive layers on top until the previously placed concrete has developed the necessary strength as determined by the Engineer. Do not deposit concrete in water that is less than 35 F. When concrete is deposited in water 36 to 45 F, heat the concrete

and place it at a temperature of 60 to 80 F. Do not pump water during concrete placement. Regulate the consistency of the concrete to prevent segregation. Cut down portions of tremie concrete that project more than 6 in. above the top of the as-planned elevation.

(a) Cofferdams. Where cofferdams are used, construct separate forms within the cofferdams except where footing concrete is to be placed against a base of undisturbed material and where the cofferdam is to remain in place and act as the concrete form. In the space between form and cofferdam, keep the water level below the bottom elevation of concrete for at least 12 hours.

(b) Concrete Seals. When feasible, concrete seals for parts of structures under water shall be placed continuously from start to finish to avoid horizontal construction joints. Keep the surface of the concrete as nearly horizontal as practicable at all times to ensure thorough bonding. In these cases, place each succeeding layer of the seal before the preceding layer has taken its initial set. Maintain the slump of tremie concrete between 4 and 8 in. but as close to 4 in. as possible. After dewatering and prior to placing any succeeding layers of concrete, thoroughly clean the top of the foundation seal (tremie concrete).

(c) Concrete Exposed to Saline Water. Do not allow saline water to come in direct contact with the concrete until it conforms to the following table:

CONCRETE IN SALINE WATER	
SALINE CONTENT OF WATER BY WEIGHT IN PARTS PER THOUSAND	SALINE WATER SHALL NOT CONTACT CONCRETE UNTIL FOLLOWING MINIMUM TIME IN DAYS HAS ELAPSED AFTER INITIAL SET*
0 to 10	0
10+ to 15	7
15+ to 20	14
20+ to 25	21
Over 25	30
* The Engineer may approve a waiver in writing.	

Unless otherwise specified, wet cure the concrete for at least seven days while being maintained at 50 F or above.

414.03.06 Consolidation. Except for concrete deposited under water, consolidate concrete by means of internal vibrators. These provisions also apply to precast members or units.

Apply vibration at points uniformly spaced and not further apart than twice the radius over which the vibration is visibly effective.

(a) Internal Vibration. Internal vibrators shall be of an approved type and design. The intensity of application shall visibly affect a mass of concrete of 1 in. slump over a radius of at least 18 in. and have a frequency of vibration of at least 4500 impulses per minute.

(b) External Vibration. External vibrators shall be of an approved type and design. Use external vibration as directed for the following sections: very thin, very heavily reinforced, numerous inserts, or where form surfaces are sharply inclined or battered. For steel grid floors, consolidate filler concrete by applying external vibration to the steel grid.

414.03.07 Finishing Concrete Surfaces. Concrete surfaces shall be finished using one of the following types. However, use an ordinary surface finish as described in (a) below unless otherwise specified.

(a) Ordinary Surface. Immediately following the removal of forms, remove all fins and irregular projections from all surfaces except those that are not to be exposed or not to be waterproofed. On all surfaces, thoroughly clean broken corners or edges and cavities. After having kept them thoroughly moist, point and true them with a mortar of cement and fine aggregate mixed in the proportions used in the grade of the concrete being finished. Remove any excess mortar, and cure the mortar patches as specified in Section 414.03.09. Carefully tool and clean construction and expansion joints. Ensure that joint filler is exposed for its full length with clean and true edges. Resulting surfaces shall be true and uniform. If the surface cannot be repaired in an acceptable manner, apply a special surface finish as described in (b) below.

(b) Special Surface. Remove fins and projections. Then saturate the surface with water and keep it wet for at least two hours. Thoroughly rub a grout mix of the same proportions as the concrete onto the surface by section using burlap pads or cork floats completely filling all voids, pits, and irregularities. After this grout has dried sufficiently, wipe off the excess using dry, clean burlap. Cure the surface as specified in Section 414.03.09(f), except use a colorless liquid curing compound. Apply this finish to the exterior faces of cast-in-place superstructures and end posts for bridges over highways, and all interior faces of cast-in-place parapets, bridge median barriers, and end posts. Do not apply this finish to members constructed by the slip form method.

(c) Horizontal Surfaces. Finish all upper horizontal surfaces such as the tops of parapets, copings, and bridge seats by placing an excess of concrete material in the forms and striking off even with a wood template. Apply a steel trowel finish to the tops of handrail (posts and caps), headwalls, parapets, wing walls, and barriers.

Finish the bridge seat bearing areas of the substructure masonry to the elevations specified. Check the elevation of each bearing area prior to finishing to ensure conformance. Ensure that each area is level in all directions, and make adjustments prior to the setting of the concrete. Steel trowel the area. Grind bearing areas that are not flat after final finishing to achieve an acceptable surface.

Bearing areas will be rejected whenever the elevation is below that of the surrounding masonry.

(d) Bridge Deck Slabs. Use an approved power operated cylinder or roller finishing machine. Set the finishing machine and transverse construction joints parallel to the nearest support lines (abutment or pier). If the skew angle changes at supports, adjust the angle of the screed accordingly as the finishing machine progresses across the deck slab. Place the concrete so that the front edge of the newly placed concrete is as nearly as possible parallel to the skew of the finishing machine. Place the concrete uniformly but not more than 10 ft ahead of the finishing machine, and not more than 6 in. above the top elevation of the finished deck slab.

Do not span the finishing machine greater than the length recommended by the manufacturer. Combine machines or use two machines in which both use a common rail. The proposed method and the location and anchorage of accessories that will remain in the completed superstructures as a result of this requirement are subject to the approval of the Engineer and shall meet the requirements of Section 414.02.02.

After the concrete has been struck off, check the surface with a long handled 10 ft straightedge operated in a position parallel to the centerline of the structure. The straightedge shall be as light weight as possible to avoid distortion of the slab surface, and have a working face no more than 2 in. wide.

To locate any irregularities in the surface, progress longitudinally in overlapping 5 ft increments and transversely in 2 ft increments.

Finish the concrete surface with a full width strip of burlap, mechanically or manually dragged across the surface.

(1) Slab Grooving. Groove all bridge decks including slab bridges and box culverts built to grade. Start the grooving operation after the bridge deck slab has been cured as specified in Section 414.03.10, and attained a minimum compressive strength as specified in Section 414.03.15. Groove the bridge deck perpendicular to the center line.

Use a mechanical saw device to cut grooves that are 1/8 in. wide, 3/16 ± 1/16 in. deep, and variably spaced from 5/8 to 7/8 in. apart. Extend the grooves across the slab to within 1 ft of the gutter lines. Do not cut across armored joints or any joint in which an existing joint seal may be damaged; stay clear by 2 ± 1 in. on each side. On joints skewed 70 degrees or less, make one pass parallel to the armored joint unless otherwise directed. Remove the residue resulting from grooving operations from all surfaces in an acceptable manner. Leave all surfaces in a washed, clean condition.

(2) Deck Slab Tolerances. Any slabs found to have deficient thickness may be rejected. Limit surface deviation in a transverse or longitudinal direction to 1/8 in. per 10 ft

from a straight line. For vertical curves, limit deviation (from the curve specified) to 1/8 in. per 10 ft in a longitudinal direction. Do corrective work prior to grooving.

(e) Sidewalks and Safety Curbs. Use an approved screed to strike off the concrete to the elevation and slope specified. Wood float the concrete to give a gritty surface free from depressions or high spots. Then edge the joints with the appropriate edging tool. Strip curbs and finish as soon as possible.

(f) Culvert Slabs. When the tops of culvert slabs are the roadway riding surface, finish them according to (d) above. If invert slabs and the tops of culvert slabs are not part of the roadway, or when they are to be overlaid with hot mix asphalt, screed them by hand or machine and apply a float finish. Maintain the surface within 1/4 in. of the grade specified.

The contractor does not need to straightedge culvert inverts if the culvert has a span less than 10 ft.

414.03.08 Curing. These requirements apply to curing of all concrete surfaces except bridge deck slabs or top surfaces of culverts with integral wearing surfaces, which shall be cured as specified in Section 414.03.10.

Start curing as soon as the concrete has set sufficiently.

Keep the surfaces wet, even in areas where there is no ready water supply.

(a) Cure culvert invert slabs and all footings for five days using the method specified in Sections 414.03.09(a),(b),(c), or (d).

(b) Cure vertical surfaces in the forms for seven days. However, the forms may be removed after 24 hours for structural elements 6 ft or less in height, or after 48 hours for structural elements greater than 6 ft high, with the provisions specified herein. Cure the surface as specified in Section 414.03.09(d) for the remainder of the seven day curing period. Do not remove the forms when cold weather protection is required. Forms carrying loads shall remain in place for at least seven days and until the concrete has attained a compressive strength of 3000 psi. Internal bulkheads may be removed after the concrete has been in place for 24 hours, if it is necessary to do so to continue the work without interruption. When a higher strength concrete than specified is used, forms carrying loads shall remain in place for at least three and a half days and until the concrete has attained a compressive strength of 3000 psi.

Fiber column forms may be removed at times specified above, but no later than 10 days after placing concrete.

When parapets or median barriers on structures are formed by the slip form method, begin curing as specified in Section 414.03.09(f) using a fugitive dye liquid membrane-forming compound immediately after the concrete is finished. Immediately after each

joint is saw cut, cure the concrete surfaces for the remainder of the seven days of cure as specified in Section 414.03.09(d).

(c) Cure tops of end walls, end support walls, headwalls, etc., for three days with burlap or cotton mats as specified in Sections 414.03.09(b) or (d), respectively.

(d) Cure horizontal surfaces for seven days as specified in Sections 414.03.09 (b),(c),(d), or (e).

414.03.09 Curing Methods.

(a) Flooding. Structure units that will be below water in the completed structure may be gradually flooded when approved after the concrete is 12 hours old, provided the curing water meets the requirements of Section 921.01. Maintain the water at 35 F or above for the specified curing duration.

(b) Burlap. Use two layers. Overlap successive strips at least 6 in. Place the second layer at least 45 degrees to the first layer, or in lieu of this, the 6 in. overlap of the second layer may be placed midway between the first layer. Thoroughly saturate by immersion in curing water for at least 24 hours prior to placement, and keep it saturated throughout the specified curing duration.

(c) White Opaque Polyethylene Backed Nonwoven Fabric. Use one layer. Overlap successive strips at least 6 in. Thoroughly saturate by immersion in curing water for at least 24 hours prior to placement and keep it saturated throughout the specified curing duration.

(d) Cotton Mats. Use one layer thoroughly saturated with curing water prior to placement and kept saturated throughout the specified curing duration. Keep the material in tight contact with the concrete.

(e) White Opaque Burlap Polyethylene or White Opaque Polyethylene Film. The Contractor shall place white opaque burlap polyethylene sheeting, with the burlap side of the sheeting facing down, on at least one layer of wet burlap. When white opaque polyethylene film is used, place it on at least two layers of wet burlap. Only one layer of cotton mats is required in any usage. These materials may only be used atop the wet burlap or cotton mats on unobstructed flat and reasonably level surfaces.

Lap adjacent mats or sheets at least 1 ft. Bring the ends down around the sides of the concrete being cured and securely fasten to make an airtight seal.

Leave both of these materials in place for the same length of time as required for burlap or cotton mats. These protective coverings need not be wetted down; however, keep the covered burlap or cotton mats wet for the specified duration.

(f) Liquid Membrane. Apply this material according to the manufacturer's recommendation or as directed. Apply by sprayers and keep it thoroughly agitated before and during use.

(g) Water-based Cure and Seal Compounds shall be applied in conformance with manufacturer's recommendations or as directed by the Engineer. The material shall be applied with a sprayer and shall be thoroughly agitated before and during use. Apply two coats to ensure proper surface coverage.

414.03.10 Bridge Deck Slabs. Cure bridge deck slabs and culvert top slabs with integral wearing surfaces, including sidewalks, as specified herein.

Have misting equipment available. Prior to placing concrete, operate the misting equipment for the Engineer to verify that the equipment and procedure are capable of misting the entire placement area without damaging the fresh concrete. Do this at the location of proposed use each day that a deck placement is to be made. Keep ample spare parts, water, fuel, etc. readily available. Keep an approved unit available for backup.

Cover the finished concrete with wet burlap as specified in Section 414.03.09(b). Progress by covering the concrete immediately after the concrete has been finished, but do not leave any portion of the concrete uncovered for more than 45 minutes after placement. Use mist spraying when directed and when the concrete is not covered with wet burlap within 30 minutes after placement. Misting does not relieve the requirement for covering the concrete within the 45 minutes after placement. Once misting is started, continue until wet burlap is complete in place.

After the concrete is covered with wet burlap, cure it as specified in Section 414.03.09(b) for the remainder of the seven day period. Keep the two layers of burlap continuously and uniformly saturated throughout the curing period. White opaque burlap polyethylene sheeting and white opaque polyethylene film or clear polyethylene film shall not be used over wet burlap except when approved for cold weather protection. Use a sufficient quantity of soaker hoses to meet these requirements. Take immediate action to remedy improper saturation of any area throughout the entire curing period.

Provide a sufficient number of experienced personnel and necessary equipment to ensure proper placement, protection, and curing of the concrete according to these Specifications.

Provide temporary troughs, dams, etc., necessary to keep runoff water from reaching any traveled roadway, shoulder, or sidewalk. Submit the proposed methods of controlling runoff water in these areas. Include locations of all troughs and dams, as well as the proposed methods of attaching them to any portions of the structure. Do not weld or drill holes in any portion of a permanent member of the structure.

The approved procedure will be evaluated after it is underway. If any areas are not functioning in an acceptable manner, modify them to satisfy the requirements for retaining and directing the flow of water.

In rehabilitation construction, where the full use of temporary troughs, dams, etc., is not practical, make approved modifications to the provisions for controlling the runoff water.

414.03.11 Construction Joints. Construction joints are permitted only where specified or authorized in writing.

Clean the surface of the hardened concrete and keep it moist until the additional concrete is placed. Use a grade strip to level the top surface of concrete. At chamfers, steel trowel the top surface of the concrete adjacent to the chamfer.

Where a featheredge might be produced at a construction joint, as in the sloped top surface of a wing wall, use an inset form to produce a blocked-in addition to the preceding placement. Ensure that the inset form will produce at least a 6 in. edge thickness of concrete in the succeeding placement.

Place epoxy bonding compound on the surface areas of concrete that existed prior to the beginning of the Contract that will be in contact with new concrete. Apply epoxy bonding compound to the entire face of all deck slab construction joints. Ensure that the surfaces to be coated are clean, sound, and dry. Mix and apply the bonding compound in accordance with the manufacturer's recommendations.

414.03.12 Linseed Oil Protective Coating. Apply to the integral concrete bridge deck slabs, box culvert wearing surfaces, and sidewalks on bridges and box culverts, when the pertinent Linseed Oil Protective Coating item appears in the Contract Documents.

Prior to the application of the linseed oil protective coating, ensure that the concrete surfaces to be treated are cured, dried, and thoroughly cleaned of all dust, dirt, and deleterious material; and that required permanent paint or tape lane markings have been applied on the structures.

If the concrete is wet, allow it to dry for one to two days at a temperature of at least 60 F. If the concrete surfaces are extremely dry, take the following actions as directed, and at no additional cost to the County:

(a) Wet the concrete thoroughly and allow it to dry for one or two days.

(b) Apply a third protective coating at the same rate per gallon as the second coat.

Ensure that the ambient temperature at the time of application is at least 50 F. Ensure that the ambient air temperature following the second application is at least 40 F. Apply two coats on all top surfaces that are not grooved. Apply the first coat at a rate of 40 sq yd/gal. Apply the second coat at a rate of 67 sq yd/gal. On bridge decks and top slabs of box culverts that are grooved, apply the first coat at a rate of 25 sq yd/gal. Apply the second coat at a rate of 45 sq yd/gal. Do not apply the second coat until the first coat is dry. If additional coats are

required, allow at least 24 hours between them. The drying time may be increased as the ambient temperature falls below 70 F.

414.03.13 Cold Weather Protection. Protect and heat concrete after it has been placed when the air temperature in the shade and away from artificial heat drops to 40 F or lower at the time of placing or at any time within the number of days specified herein. Provide protection and heating as follows:

(a) Protect ordinary concrete and maintain a temperature of at least 50 F for at least seven days following placement.

(b) Do not heat concrete to more than 100 F. At the end of the heating period, cool the concrete surfaces to the temperature of the outside air by slowly reducing the artificial heat at a uniform rate until the temperature of the outside air is reached within a 24 hour period.

Have tarpaulins, insulating devices, and other suitable materials at the site to enclose or protect portions of the concrete requiring protection. Have materials as close as possible before placing the concrete, and install them as rapidly as possible to keep exposure to cold weather to a minimum. Where heating is required, completely enclose the spaces to be heated and use approved heaters to keep the temperature at required levels.

Provide a sufficient number of maximum/minimum thermometers to record temperatures in each concrete placement undergoing cold weather protection.

The curing period for all structure concrete requiring cold weather protection shall meet the cold weather protection period except when the normal curing period is longer.

414.03.14 Underpinning Old Foundations. If underpinning is required, perform the work as directed. Restore or lower the old foundations with Mix No. 6 concrete having a maximum slump of 1-1/2 in. Perform excavation and underpinning operations in part section, so as not to remove more than 10 percent of the supporting area under the old foundation at one time. When directed, install underpinning by hand, pneumatic, or pumping processes. The usual curing and cold weather requirements will be deleted for the underpinning with other provisions for curing and protection improvised on the job as may be directed.

414.03.15 Loads on Concrete Structures. Refer to Section 402.03.05. Do not erect structural steel or concrete superstructures on concrete substructures until curing is complete, all forms are removed, and substructure concrete has reached a compressive strength of 3000 psi.

Do not apply loads to any new portion of bridge deck or box culvert built to grade until the final section of that unit of the deck has completed its specified curing period. No vehicles, including heavy construction equipment, will be permitted on any new portion of bridge deck or box culvert built to grade until the concrete cylinder breaks for the final section of that unit of the deck has attained a compressive strength of 4500 psi.

Do not place backfill on any new portion of box culverts not built to grade until the final section of that unit of the slab has completed its specified curing period and the concrete in that section has attained a compressive strength of 3000 psi.

414.03.16 Prevention and Removal of Stains on Concrete. Prevent rust from structural steel, and staining by asphalt materials or any other substance from discoloring any portion of the concrete. Use construction procedures that prevent staining of any of the concrete. Where unpainted structural steel is specified, protect the pier caps, columns, and abutments with a wrapping of reinforced polyethylene or similar material, and leave it in place to prevent staining until after the structure is completed. If any portion of the concrete is stained, remove the stain and restore the original color without damaging the concrete. Do the work as directed and at no additional cost to Baltimore County. Do not use chemical solvents without approval.

414.03.17 Safety Hazards. Perform gas detection in and ventilation of confined spaces as directed by the Engineer.

414.03.18 Defective Work. Within 24 hours of removing the forms, remove and repair defective work as directed.

(a) At the edges of material remaining in place, make a cut perpendicular to the finished surface to the full depth of the material removed, but not less than 1 in. If the removal of defective concrete affects the structural requirements, remove and replace the member as directed.

(b) Clean defective areas.

(c) Coat defective areas with an epoxy bonding compound.

(d) Patch defective areas with concrete mortar or epoxy matching the color, contour, and texture of surrounding concrete as close as possible.

414.04 MEASUREMENT AND PAYMENT. Portland cement concrete structures will be measured and paid for as specified. The payment will be full compensation for all forms and form removal, reinforcement steel, curing and misting, scuppers, grooving, mechanical, and electrical work, all cost incidental to the conducting of tests for oxygen content and presence of gases and applying mechanical ventilation to confined spaces, year built markings, and all material, labor, equipment (including safety equipment), tools and incidentals necessary to complete the work.

The construction of drainage and weep holes, any pipe necessary, expansion material, flashing, dampproofing, membrane waterproofing, epoxy bonding compound, joints and their placement will not be measured but the cost will be incidental to the concrete item. No

deduction in concrete quantities will be made for pipes or conduits having diameters less than 8 in., reinforcement steel, anchors, or any other appurtenances.

414.04.01 Portland cement concrete for ***Footing Concrete***, ***Subfoundation Concrete***, and ***Tremie Concrete*** will be measured and paid for at the Contract unit price per cubic yard.

414.04.02 Portland cement concrete for ***Substructure Concrete for Bridge***, ***Superstructure Concrete for Bridge***, and ***Reinforced Concrete Box Culverts*** will not be measured but will be paid for at the Contract lump sum price. When an Epoxy Coated Reinforcing Steel Bars item for the pertinent structure is included in the Contract Documents as part of a Special Provision, the cost for epoxy protective coated reinforcement steel will be excluded from the Contract lump sum price for ***Superstructure Concrete for Bridge***. When a bridge deck rehabilitation project, other than bridge widenings, requires modification to the backwalls and wing walls and there is no substructure concrete item, the concrete will be incidental to the ***Superstructure Concrete for Bridge*** item.

414.04.03 Wing walls and footings for reinforced concrete box culverts will not be measured but the cost will be incidental to the ***Reinforced Concrete Box Culvert*** item.

414.04.04 Parapets (including end posts) on bridges, wing walls, reinforced concrete box culverts, and retaining walls; or concrete median barriers on bridges and top slabs of reinforced concrete box culverts will not be measured but will be paid for at the Contract lump sum price for the pertinent ***Concrete Parapet*** or ***Concrete Median Barrier*** items.

414.04.05 Parapet and end post modifications on bridges, wing walls, reinforced concrete box culverts, and retaining walls; or concrete median barriers on bridges and top slabs of reinforced concrete box culverts will not be measured but will be paid for at the Contract lump sum price for the pertinent ***Parapet Modification*** item. The payment will also include saw cutting, removal of portions of the existing parapet or end post, drilling, and grouting.

414.04.06 Floodlighting for placement of superstructure concrete will be measured and paid for at the Contract unit price per night used for the pertinent ***Floodlighting*** item. The payment will also include fuel, backup generator, setup, relocation, and removal.

414.04.07 Linseed oil protective coating will be measured and paid for at the Contract unit price per square yard for the pertinent ***Linseed Oil Protective Coating*** item. The payment will be full compensation for all coats including time and cost when a third coat or the application of water is required on dry surfaces.

414.04.08 Cofferdams, temporary supports, or piling will not be measured but the cost will be incidental to the formwork.

414.04.09 Retaining walls will be measured and paid for as specified in Section 450.04, Retaining Walls.

SECTION 415 – LIGHTWEIGHT SUPERSTRUCTURE CONCRETE

415.01 DESCRIPTION. Furnish and install lightweight concrete.

415.02 MATERIALS.

Lightweight Concrete	902.10, Mix 10

415.03 CONSTRUCTION. Conform to Section 414.03 and as specified herein.

Handle lightweight aggregates in a manner that provides a thorough sprinkling of the aggregates during the stockpiling to produce damp aggregate. Sprinkle to obtain uniform distribution of moisture and then permit the aggregates to drain as long as necessary to produce uniform moisture content. Maintain the moisture content as much as practical until the aggregate is used. Add the admixtures to the mix according to the manufacturer's recommendations.

415.03.01 Existing Structures. Remove existing bridge decks according to Section 402.03.01. Note that the deck replacement material may be lighter than the existing deck and the deflection caused by the lighter material will be less than the material removed. Therefore, compute modified rebound figures to be used in lieu of dead load deflections to establish grade controls to produce finished tops of concrete bridge decks that will be true to as planned line and grade.

415.04 MEASUREMENT AND PAYMENT. Lightweight concrete structures will be measured and paid for as specified. The payment will be full compensation for all forms and form removal, reinforcing steel, curing and misting, scuppers, mechanical and electrical work, all cost incidental to the conducting of tests for oxygen content and presence of gases and applying mechanical ventilation to confined spaces, year built markings, and for all material, labor, equipment (including safety equipment), tools, and incidentals necessary to complete the work.

The construction of drainage and weep holes, any pipe necessary, expansion material, flashing, dampproofing, membrane waterproofing, epoxy bonding compound, joints and their placement will not be measured but the cost will be incidental to the lightweight concrete item. No deduction in lightweight concrete quantities will be made for pipes or conduits having diameters less than 8 in., reinforcing steel, anchors, or any other appurtenances.

415.04.01 ***Lightweight Superstructure Concrete*** will not be measured but will be paid for at the Contract lump sum price unless otherwise specified.

415.04.02 Lightweight concrete parapets and median barriers will not be measured but will be paid for at the Contract lump sum price for the pertinent ***Lightweight Concrete Parapet*** or ***Lightweight Concrete Median Barrier*** items.

415.04.03 ***Floodlighting*** will be measured and paid for as specified in Section 414.04.06.

415.04.04 ***Linseed Oil Protective Coating*** will be measured and paid for as specified in Section 414.04.07.

SECTION 416 – REINFORCING STEEL

416.01 DESCRIPTION. Furnish and place uncoated and epoxy coated reinforcing steel.

416.02 MATERIALS.

Grout	902.11(c)
Deformed Steel Bars	908.01
Plain Round Steel Bars for Column Spirals	908.02
Wire Mesh	908.05 and .06
Fusion Bonded Epoxy Powder Coating for Steel and Touch Up System	426 and 917.02
Galvanizing	A 153

416.02.01 Supports. Use approved coated metal, plastic, plastic tipped, or galvanized material. Aluminum is unacceptable. All materials are subject to approval.

For epoxy coated steel, use wire supports completely covered with 1.5 to 9.0 mils of adherent epoxy coating except for minimum necessary contact marks. Hold the reinforcing steel in place with plastic coated tie wires fabricated for this purpose.

Steel bars used as supports for epoxy coated steel shall be coated in the same manner as reinforcing steel.

416.03 CONSTRUCTION.

416.03.01 Working Drawings. Submit working drawings for approval prior to the start of any fabrication, unless otherwise specified. Refer to Section 499.

416.03.02 Plan Dimensions. All dimensions related to reinforcing steel are out to out measurement except the spacing is measured center to center.

416.03.03 Cutting and Bending. Cut and bend reinforcing bars at the mill or shop to the shapes specified before shipment to the job site. Bending shall not be performed in the field except to correct errors, damage by handling and shipping, or minor omissions in shop bending.

Saw or shear epoxy coated reinforcing bars on skewed bridges and in other locations that are specified to be cut in the field; flame cutting is prohibited.

Ensure that all bending conforms to the tolerances specified in the Contract Documents.

416.03.04 Shipping, Handling, and Protection of Material. Ship reinforcing steel bars in standard bundles; tagged and marked in accordance with the provisions of the Code of Standard Practice of the Concrete Reinforcing Steel Institute. Keep bundles intact, undamaged, and properly identified until ready for use.

Bundle coated steel together for shipment using excelsior or other approved materials, and banded using plastic or padded metal bands. Perform all lifting with a lifting beam and multiple supports consisting of a sufficient quantity of straps or slings to prevent abrasion within the bundle from excessive bending or distortion.

Store bundles at the site on suitable blocking or platforms at least 4 in. above any type of surface and vegetation. Keep free from vegetation growth, accumulations of dirt, oil, or other foreign material. Keep blocking sufficiently close to avoid bending and distortion of the bars. Correct any distortion of the bars or damage to epoxy coating as directed. Touch up any damage to the epoxy coating as specified in Section 426.03. Adequately cover epoxy coated bars for protection from ultraviolet rays from the time of delivery when they are to be stored outside for more than 90 days.

416.03.05 Placing and Fastening. Accurately place all reinforcing steel, including dowel bars, in the position specified in the Contract Documents or working drawings, and hold firmly during the depositing and setting of the concrete. Do not insert into the plastic concrete.

Tie all intersections, except alternate intersections need not be tied where spacing is less than 1 ft in each direction. On bridge decks and the top slabs of box culverts, tie all intersections in the top mat of reinforcing. Do not bend reinforcing steel bars after embedment in concrete.

Before placing concrete, clean all mortar from the reinforcing. Do not place concrete until the reinforcing bars are inspected and approved. Approval shall not relieve the Contractor of the responsibility for correcting problems caused by any shifting of the bars during the placement of concrete.

Support reinforcing bars and maintain their distances from faces of forms by using approved templates, blocks, ties, hangers, or other supports. Support bars in the bottom of footings on approved precast concrete blocks with embedded tie wires or suspend in place. Support bars in the tops of footings by using approved supports.

Do not use metal, metal with plastic tipped legs, or plastic chairs against formed surfaces that will be exposed in the finished structure.

The Engineer will perform a final visual inspection of epoxy-coated steel at the construction site after the steel is in place and immediately prior to placing the concrete. Patch designated repair areas using epoxy as specified in Section 426.03. Do not place concrete on a patched area until the patching material has cured for one hour. Allow four hours of normal working time after the reinforcing and forms are in place for the inspection.

416.03.06 Splicing. Furnish bars in the lengths and spliced as specified in the Contract Documents and approved working drawings. Do not perform additional splicing without approval. Make lap splices with the bars in contact and wired together.

Do not weld reinforcing steel or attachments thereto without authorization.

416.03.07 Tying New Concrete into Existing Concrete. On all projects where portions of existing structures are to be used in the finished structure and existing concrete is to be removed, straighten, clean, and protect the existing reinforcing steel to be incorporated in the final structure.

For exposed existing reinforcing steel that is to be incorporated into the final structure:

(a) Cut out any that has lost 20 percent or more of its original cross sectional area as determined by the Engineer. Provide and place a new bar of the same diameter so as to have the minimum required lap at each end of the new bar, or modified as per (c).

(b) Where the required bar lap length is available, use it as a dowel.

(c) Where the required bar lap is not available or limits of concrete removal to achieve bar lap are too great, make a welded or approved mechanical splice.

When existing reinforcing steel extends into an area in which epoxy coated reinforcing steel is required, abrasive blast clean and epoxy coat using the touch up system. Refer to Section 426.

If expected reinforcing steel is missing, or a pattern differing from that shown on the existing Contract Documents is uncovered, contact the Engineer for evaluation.

Where dowel bars are required to tie new concrete into an existing structure, install as specified in Section 403.03.

416.03.08 Substitution. Substitute different size bars only when approved by the Engineer. There will be no additional compensation for substituting larger size bars in lieu of the bars specified.

416.04 MEASUREMENT AND PAYMENT. The payment will be full compensation for cleaning, coating, and for all material, labor, equipment, tools, and incidentals necessary to complete the work. Measurement and Payment shall be in accordance with one of the following as specified in the Contract Documents:

416.04.01 Reinforcing steel bars or epoxy coated reinforcing steel bars will not be measured but the cost will be incidental to other pertinent items specified unless a ***Reinforcing Steel Bars*** or ***Epoxy Coated Reinforcing Steel Bars*** item appears in the Contract Documents.

416.04.02 ***Reinforcing Steel Bars*** or ***Epoxy Coated Reinforcing Steel Bars*** will not be measured but will be paid for at the pertinent Contract lump sum price.

416.04.03 ***Reinforcing Steel Bars*** or ***Epoxy Coated Reinforcing Steel Bars*** will be measured and paid for at the Contract unit price per pound based on the original approved overall lengths of bars computed on the basis of the nominal unit weight per linear foot.

416.04.04 Incorporating existing reinforcing steel in the final structure including straightening, bending, splicing, and removal and replacement will not be measured but the cost will be included in the pertinent Concrete item.

SECTION 417 – DAMPPROOFING AND MEMBRANE WATERPROOFING

417.01 DESCRIPTION. Furnish and apply dampproofing and waterproofing to concrete surfaces.

417.02 MATERIALS.

Asphaltic Materials	913.01
Asphalt Primer	913.02
Fabric Saturated with Asphalt for Waterproofing	913.03
Dampproofing and Waterproofing Membrane	913.04

417.03 CONSTRUCTION. Apply dampproofing and waterproofing using asphaltic materials, primers, and fabric; or by the roll or sheet method as specified in Section 417.03.07.

417.03.01 Storage. Store waterproofing fabrics and membranes in a dry protected place. Keep containers of asphalt materials closed when not in use.

417.03.02 Surface Preparation. Do not apply dampproofing or membrane waterproofing until curing is complete and surfaces are protected from the cold. Ensure that all surfaces are dry, smooth, and free from projections and holes.

When dampproofing and membrane waterproofing are both specified for application, apply the membrane waterproofing first. Do not apply dampproofing or membrane waterproofing when the temperature is less than 40 F.

417.03.03 Dampproofing. If asphaltic coatings are used for dampproofing, use two prime coats and one seal coat. Apply dampproofing to the following concrete surfaces that will be in contact with backfill:

(a) Rear face of abutments and abutment wing wall stems.

(b) Rear faces of headwalls and wing walls for pipes 36 in. in diameter or larger and for culverts.

(c) Rear face of retaining wall stems.

(d) The following areas pertain to reinforced concrete box culverts:

(1) Top of top slabs when not built to grade.

(2) Entire outside surfaces of side walls.

(3) Additionally, bottom of bottom slabs of precast units.

417.03.04 Waterproofing. If asphaltic coatings are used, use a prime coat, three mop coats, and two layers of fabric.

Apply waterproofing to construction joints that are next to backfill above normal water surface when backfill is on one side and atmosphere on the other side. Apply a width of at least 16 in., centered on the joint.

417.03.05 Application of Dampproofing. Confine coatings to the areas to be covered. Prevent coating of parts of the structure exposed to view in the completed structure. Apply dampproofing to the full face of all contraction joints.

Apply the dampproofing according to the manufacturer's recommendations. When no recommendations are provided, apply the dampproofing material to the cured, cleaned, and dry surfaces as follows:

(a) Paint with two coats of primer for absorptive treatment at a rate of 1/8 gal/sq yd per coat. Do not apply the second coat until the first coat has thoroughly dried. Do not heat this material.

(b) After the second prime coat has thoroughly dried, apply one seal coat by brush or roller at a rate of 1/8 gal/sq yd. When necessary, this material may be heated, but not in excess of 150 F.

417.03.06 Application of Membrane Waterproofing. Coat the cured, cleaned, and dry surfaces with a prime coat. Cover with mop coats and layers of fabric.

Coating Procedure. Coat with a primer at a rate of 1/8 gal/sq yd. Apply the prime coat 24 hours in advance of applying any mop coats and ensure that it is dry before applying the first mopping. Do not heat the primer.

Heat asphalt for mop coats to a temperature between 300 and 350 F. Stir frequently to avoid local overheating. Provide heating kettles equipped with thermometers.

Begin the waterproofing at the low point, so that water will run over and not against or along the laps.

Make the first strip of fabric half width. Make the second full width, lapping the full width of the first sheet. Make the third and each succeeding strip thereafter full width and lapped so that there will be two layers of fabric at all points and three layers with laps not less than 2 in. wide at edges of strips. Make all laps at ends of strips at least 12 in. wide. Thoroughly seal down the cloth at all laps.

Beginning at the low point, mop a section 20 in. wide for the full length of the surface with the hot asphalt. Immediately after the mopping, press the first strip of fabric into place eliminating all air bubbles. Mop this strip and an adjacent section of the surface to a width equal to slightly more than half the width of the fabric, and press a full strip and a full width of the fabric into place as before. Mop the forward or upper half of this second strip and mop an adjacent section of the concrete surface with hot asphalt. Apply the third strip of fabric shingled on so as to lap the first strip at least 2 in. Continue this process until the entire surface is covered. Give the entire surface a final mopping of hot asphalt. Ensure that there is a complete coating of asphalt between all layers of fabric.

In all cases, ensure that the mopping on concrete covers the surface so that no gray spots are visible, and on cloth is sufficiently heavy to conceal the weave. Apply asphalt at the rates of 1.2 gal/sq yd on horizontal surfaces and 1.4 gal/sq yd on vertical surfaces. Regulate the work so that at the close of a day's work, all cloth in place has received the coatings required for that stage of completion.

417.03.07 Roll or Sheet Waterproofing Membrane. An alternate system of waterproofing or dampproofing consisting of rolls or sheets of membrane material may be used in lieu of the above coatings. Apply the rolls or sheets according to the manufacturer's recommendations.

417.03.08 Membrane Care. At the edges of the membrane and at points punctured by appurtenances such as drains or pipes, flash it in an acceptable manner to prevent water from getting between the waterproofing and the waterproofed surface. Repair any damage to the membrane. Extend repairs beyond the outermost damaged portion, and extend the second ply at least 3 in. beyond the first.

417.04 MEASUREMENT AND PAYMENT. Dampproofing and membrane waterproofing will not be measured but the cost will be incidental to other pertinent items specified.

SECTION 418 – PNEUMATICALLY APPLIED MORTAR

418.01 DESCRIPTION. Remove deteriorated concrete, and furnish and place pneumatically applied mortar.

418.02 MATERIALS.

Curing Materials	902.07
Reinforcing Steel	908.01, 908.02, and 908.08
Anchor Bolts	909.06
Water	921.01

Use Type II cement meeting the requirements of Section 902.03, and furnish in the original 94 lb paper sacks supplied from the cement manufacturer.

Use fine aggregate meeting the Fine Aggregate-Portland Cement Concrete requirements of Section 901.01. Ensure that the maximum moisture content does not exceed 6 percent by weight.

Pneumatically applied mortar shall have a 28 day compressive strength of 5000 to 9000 psi. Ensure that all mixes are approved prior to starting work.

418.02.01 Test Panels. When specified, prepare and cure test panels of various mix combinations, admixtures, and materials. Prepare one test panel for every 100 cu.ft. of mortar in place. Prepare additional test panels as directed. Panels shall be 36 in. square and 8 in. deep. Include the same reinforcing as the structure in at least half of each panel. Each application crew shall fabricate a separate panel using the equipment for each mix design, and in each shooting position encountered.

Core each test panel and deliver the cores to the Laboratory for testing. Cores shall have a diameter of at least 4 in. and be at least 8 in. long. Cores will be tested in compression at 7, 14, and 28 days. Core strength correction will be per T 24.

The Engineer will examine the cut surface of each specimen. Expose additional surfaces by sawing or breaking the panel when necessary to check soundness and uniformity of the material. All cut or broken surfaces that are not dense and free from lamination and sand pockets will be rejected.

418.03 CONSTRUCTION. Submit the proposed methods of protecting the public against injury and damage from demolition operations. When required protective shields shall meet the requirements of Section 402.03.01.

Provide safe access to all areas of the existing structure to be repaired. Prior to the start of any repair work, conduct a thorough inspection in the presence of the Engineer. The purpose of this inspection will be to identify the location and extent of concrete deterioration and repair. The Engineer will establish the extent of removal and determine when sound concrete is encountered.

Restrictions. Wait at least 72 hours after completing repairs to a section of a stringer or pier before chipping on any section that has a common side or point.

If at any time an area is identified as having deteriorated concrete beyond the following limits, immediately stop work in these areas. The Engineer will notify the Bureau of Engineering and Construction, Design Division, Structural Design Section. Do not resume work until after obtaining approval from the Structural Design Section:

(a) More than 6 in. beyond the original finish surface.

(b) More than 3 in. beyond the reinforcing steel.

(c) More than 1 in. beneath the bearing.

418.03.01 Equipment. Ensure that all equipment is calibrated and capable of thoroughly mixing all material.

Use a self-cleaning mixer capable of discharging all mixed material without any carry over from one batch to the next. Clean the mixing equipment at least once a day.

Ensure that the air compressor has ample capacity to maintain a supply of clean, dry air adequate to provide the required nozzle velocity for all parts of the work, while simultaneously operating a blowpipe for cleaning away rebound.

Ensure that the air and water pressure are constant and do not pulsate.

418.03.02 Storage. Store and handle cement as specified in Section 902.01. Store sand to prevent segregation or contamination of the material.

Store all reinforcing bundles at the site on suitable blocking or platforms at least 4 in. above all type of surfaces and vegetation. Keep the reinforcing free of dirt, oil, grease, paint, and other foreign matter.

418.03.03 Surface Preparation. Remove deteriorated areas of concrete to sound concrete with no more than a 30 lb chipping hammer. Continue chipping to at least 1 in. behind the reinforcing steel and until there is no sudden change in the depth of the cavity. Provide a ½ in. deep saw cut perimeter having a shoulder perpendicular to the surface of the structure for a depth of at least 1 in.

After the Engineer has determined that it is sound, abrasive blast the cavity surface. Just prior to applying the mortar, thoroughly clean all surfaces followed by wetting and damp drying.

Contain all blast waste and loose concrete, and promptly remove it to an approved disposal site. Keep blast waste and loose concrete out of waterways.

418.03.04 Reinforcement. If sound concrete is encountered before the reinforcing steel is exposed, remove sound concrete to a depth of 1 in. behind the reinforcing steel. If sound concrete is found within 3-1/2 in. of the proposed finished surface, stop the removal and dowel additional No. 4 reinforcing bars installed at 12 in. center to center horizontally and vertically, 2 in. clear of proposed finished surface. Dowel per Section 403 except use any type grout specified in Section 902.11.

Abrasive blast all exposed existing reinforcing steel that will be incorporated in the new work to a near white finish to remove all rust, dirt, scale, and loose concrete. Cut out reinforcing bars that have lost 20 percent or more of their original dimension. Weld new bars in their place. Dual bars of equivalent or greater section may be used. Weld new reinforcing steel to existing reinforcing steel as specified. The Engineer will establish if reinforcing steel is to be reused or replaced.

In addition to the reinforcing steel, reinforce repaired areas with wire mesh.

For anchoring reinforcing to masonry surfaces, set at least 3/8 in. diameter expansion bolts in drilled holes, or set plain round No. 4 bars in approved dry packed mortar tightly driven in drilled holes. Ensure that drilled holes are at least 3 in. deep. All bolts and bars shall be set in solid masonry (not in mortar, joints, or cracks) and have heads or hooks on their outer ends. Where approved, mesh may be wired to existing reinforcing without the use of expansion bolts.

Cut mesh in sheets of proper size. Bend the separate sheets over templates to follow the outlines of the member or surface to be covered. Securely hold in a uniform position by tying to the bolts or bars with 14 gauge black annealed wire. Space ties at no more than 12 in.

Overlap adjacent sheets of mesh at least two squares. Tie them together with a 14 gauge black annealed wire at intervals not exceeding 18 in.

418.03.05 Guides. Use sufficient guides to obtain the full thickness of mortar specified and to ensure uniform and straight lines.

418.03.06 Mixing and Screening. Uniformly dry mix the cement and sand in a batch-mixing machine. Discard mixed materials not applied within one hour. After the materials are dry mixed and before being charged into the placing machine, pass the mixture through a 3/8 in. screen.

418.03.07 Application. Build up each layer by several passes of the nozzle over the working area. Ensure that the mixture emerges in a steady, uninterrupted flow. Should the flow

become intermittent for any cause, direct it away from the work until it becomes constant. Hold the nozzle perpendicular to the application surface, and at a distance from the work as required for obtaining best results for the conditions. When shooting through reinforcement, hold the nozzle at a slight angle from perpendicular to permit better encasement.

For vertical surfaces, begin application at the bottom. Ensure that the first layer completely embeds the reinforcement.

Do not work rebound back into the construction, nor salvage it to be included in later batches.

Do not permit rebound and overspray to fall into waterways. Dispose of this material in an approved disposal site at no additional cost to the County.

When a layer of pneumatically applied mortar is to be covered by a succeeding layer, ensure that it has taken its initial set prior to proceeding. Then remove all laitance, loose material, and rebound by brooming. Use abrasive blasting to remove any laitance that has taken final set, and clean the surface with an air water jet. In addition, the Engineer will sound the surface with a hammer for hollow sounding areas that indicate rebound pockets or lack of bond.

418.03.08 Curing and Cold Weather Protection. Refer to Section 414. Keep mortar continuously wet for at least seven days after application. Liquid membrane forming compound will be permitted with prior approval.

418.03.09 Finishing. Finish the area of repair to match the existing structure.

418.04 MEASUREMENT AND PAYMENT. ***Pneumatically Applied Mortar*** will be measured and paid for at the Contract unit price per cubic foot of mortar in place. The payment will be full compensation for inspections, removal of existing concrete, abrasive blasting, and furnishing all cement, sand, water, test panels, drilled holes, reinforcing bars and wire mesh, mortar, expansion bolts, cores, storage, and for all material, labor, equipment, tools, and incidentals necessary to complete the work.

SECTION 419 – LATEX MODIFIED CONCRETE OVERLAY FOR BRIDGE DECKS

419.01 DESCRIPTION. Remove the specified amount of the existing bridge deck mechanically or through hydromilling, remove additional areas of deteriorated concrete, clean surface areas to be overlaid, replace deteriorated reinforcing steel, and place latex modified concrete (LMC).

Restrictions. Do not place LMC between December 1 and April 30. Do not remove any portion of existing bridge deck that will not be overlaid and cured in accordance with these restrictions.

419.02 MATERIALS.

Fine Aggregate	901.01
Coarse Aggregate	901.01, Size No. 7
Portland Cement Type I	902.03
Concrete for Patching	902.10
Latex Modified Concrete	902.13
Reinforcement	908
Water	921.01

419.03 CONSTRUCTION. Dispose of removed material at an approved spoil area.

419.03.01 Equipment. Ensure that all proposed equipment meets the requirements specified herein, and is approved.

Deck Removal Equipment.

(a) Existing Wearing Surface Removal. This equipment is only required when the existing bridge contains a hot mix asphalt wearing surface. Provide equipment that is capable of removing the wearing surface without damaging armored joints that are to remain or the existing concrete surfaces beyond the specified minimum removal depth. When pavement breakers are proposed, use broad faced chisel blades operated at a slight angle with the horizontal to peel the wearing surface off.

(b) Deck Surface Removal. Power operated mechanical type and high pressure water jet type equipment shall be capable of uniformly removing the specified minimum depth from the existing concrete surface.

(1) Mechanical Type. This equipment is limited to depths not closer than 1/2 in. from the top of the existing reinforcement.

When additional removal is required, use high-pressure water jet, power driven hand tools, or hand tools.

(2) High Pressure Water Jet. This equipment may be used to any depth above and below the reinforcing steel. Control the runoff water to keep it from reaching any traveled roadway, waterway, or any other designated area. Insufficient means of controlling runoff water or the concrete removal depth may be cause for rejection of this equipment. When this is the case, revert to the mechanical type, power driven hand tools, or handchipping at no additional cost to the County. However,

only revert to the mechanical type equipment for removal of the specified minimum depth when the specified minimum depth is at least 1/2 in. above the existing reinforcement.

(c) Power Driven Hand Tools. Use this equipment for removal of unsound concrete and for removal deeper than 1/2 in. above the top of existing reinforcement. This equipment is permitted with the following restrictions:

(1) Do not use pavement breakers heavier than nominal 30 lb class.

(2) Do not operate pavement breakers or mechanical chipping tools at an angle greater than 45 degrees measured from the surface of the deck.

(3) Do not use chipping hammers heavier than a nominal 15 lb class for concrete removal beneath any reinforcing bars.

(d) Hand Tools. Use hand tools such as hammers and chisels for removal of remaining particles of unsound concrete from beneath any reinforcing bar or to achieve the required depth.

(e) Abrasive Blasting. Provide equipment capable of removing rust scale and old concrete from reinforcing bars and of removing small chips of concrete partially loosened by the removal operation.

LMC Proportioning and Mixing Equipment. Equipment used for mixing shall be self-contained, mobile, continuous mixing, and shall be:

(a) Self-propelled and be capable of carrying sufficient unmixed dry bulk cement, sand, coarse aggregate, latex modifier, and water to produce at least 6 cu yd of concrete. Do not store aggregate in the mixing equipment overnight.

(b) Capable of positive measurement of cement being introduced into the mix, have a recording meter visible at all times, and be equipped with a ticket printout that indicates the quantities being mixed.

(c) Calibrated to accurately proportion the mix. Certification of the calibration by an approved testing authority will be accepted as evidence of the accuracy if the yield is shown to be true within a tolerance of 1.0 percent in conformance with MSMT 558.

(d) Capable of providing positive control of the flow of water and latex emulsion into the mixing chamber. Water flow shall be indicated by flow meter and be readily adjustable to provide for minor variations in aggregate moisture.

(e) Capable of being calibrated to automatically proportion and blend all components of indicated composition on a continuous or intermittent basis as required by the finishing operation. It shall discharge mixed material through a conventional chute directly in front of the finishing machine.

(f) Capable of spraying water over the entire placement width as it moves ahead to ensure that the surface is wetted to receive the LMC.

Placing and Finishing Equipment. The combination of labor and equipment for proportioning, mixing, placing, and finishing LMC shall meet the following minimum requirements except when otherwise specified:

TOTAL OVERLAY AREA PER BRIDGE sq.yd.	MINIMUM OVERLAY RATE PER HR cu.yd.
0-328	1.0
329-492	1.5
493-656	2.0
over 656	2.5

(a) Placing and finishing equipment includes hand tools for placement and brushing in freshly mixed LMC mortar and for distributing it to approximately the correct level for striking off with the screed.

(b) Use an approved finishing machine for finishing all areas of work. The finishing machine shall be self-propelled and capable of forward and reverse movement under positive control. Provisions shall be made for raising all screeds to clear the screeded surface for traveling in reverse. Use a rotating cylinder type finishing machine. It shall span the placement transversely, and be equipped with one or more rotating steel cylinders, augers, and vibratory pans.

(c) The finishing machine shall be designed so that when LMC is being mixed and placed under normal operating conditions at the minimum rate, the elapsed time between depositing the LMC on the concrete deck and final screeding does not exceed 10 minutes.

(d) Ensure that construction is supervised by the LMC mixtures representative or as directed by the Engineer.

419.03.02 Deck Removal and Repairs. Remove material to the specified limits. The Engineer will inspect the entire exposed portion of the deck and determine if any repairs are required including the type and extent of the repair. Use power driven hand tools, hand tools, or high-pressure water jet to remove deteriorated areas of deck down to sound concrete. After removing all deteriorated concrete, remove all rust, oil, or other foreign materials detrimental to achieving bond, followed by abrasive blasting, and air blast or vacuum as determined by the Engineer.

Repair any extraneous damage to the existing bridge that the Engineer deems to have been caused by the removal operations, at no additional cost to the County.

If the Engineer determines that the remaining concrete is deteriorated beyond the specified depth of scarification or determines that extraneous material has been removed beyond the specified depth during the scarification process that is not due to Contractor error, make revisions to achieve the new required depth of removal. This additional work will be measured and paid for according to Section 419.04.

Regardless of the depth of removal of existing concrete, place the LMC to the specified elevation and grade.

Existing reinforcing steel utilized in the finished deck shall meet the requirements given in Section 416.03.07, except thoroughly clean these bars by abrasive blasting. Where the bond between existing concrete and reinforcing steel has been destroyed, or where more than half the diameter of the steel is exposed, remove the concrete adjacent to the bar to a depth that will permit concrete bond to the entire periphery of the exposed bar. Ensure that this clearance is at least 1 in. unless lower bar mats make it impractical. Take measures to prevent cutting, stretching, or damaging exposed reinforcing steel.

Keep all areas from which unsound concrete has been removed free of slurry produced by hydromilling of concrete in adjacent areas. Plan the work so that this slurry will drain away from open areas. Remove slurry from prepared areas before proceeding with the surface preparation.

Repair spalled concrete, voids, and other defects that are located within the proposed LMC overlay area according to the methods specified herein. Each repair includes the removal of the additional deck material, all handchipping, and filling the repair area voids with LMC overlay while applying the overlay.

(a) For cavities less than 1 in. deep, no additional work required.

(b) For cavities 1 to 3 in. deep, place wire fabric as specified in Section 418.03.04. Wire fabric is not required for repair areas less than 2 sq ft.

(c) For cavities over 3 in. deep but not full depth, meet the following:

(1) If the repair crosses a proposed construction joint, provide a 1-1/2 x 3 in. keyway at the vertical joint.

(2) Furnish and install temporary protective shields as specified in Section 402.03.01 when the depth of removal reaches half the original concrete deck thickness and deeper removal is anticipated.

(d) For areas where the depth of removal is full depth, meet the following in addition to the requirements of (c):

(1) In large areas, supply forms to enable placement of the LMC overlay and support them by blocking from the stringers.

(2) In small areas, supply forms to enable placement of the LMC overlay. Forms may be suspended from existing reinforcing bars by wire ties.

419.03.03 Surface Preparation. Thoroughly clean the entire surface and abrasive blast before placing the overlay. Use abrasive blasting to clean all reinforcing bars of visible rust and clinging concrete detached from the deck and all areas of concrete against which the overlay is to be placed. Abrasive blasting may be required on the day the overlay is to be placed so that reinforcing bars are free of visible rust, as determined by the Engineer. Abrasive blast within 24 hours of placing the LMC overlay.

Further clean the surface by air blast followed by flushing with water. Prior to placing the LMC overlay, wet the surface and keep it wet for at least one hour. Remove puddles of free water.

419.03.04 Proportioning and Mixing LMC Materials. Mixers shall be clean and the ingredients accurately proportioned.

Mix LMC materials at the site according to the specified requirements for the equipment used. Ensure that the LMC discharged from the mixer is uniform in composition and consistency. Mixing shall enable finishing operations to proceed at a steady pace, with final finishing completed before the formation of the plastic surface film.

419.03.05 Placing and Finishing LMC Overlay. The LMC overlay will be the riding surface of the bridge. Place the top of the LMC overlay to the true as planned line and grade of the roadways. Take all necessary precautions to produce a finished top of LMC overlay that is smooth riding by placing the LMC overlay in a manner that meets the grade of the proposed adjoining portions of the new bridge decks and adjoining roadways.

Place and fasten screed rails in position to ensure finishing the new surface to the required profile. Anchorage for supporting rails shall provide horizontal and vertical stability. Do not treat screed rails with any compound to facilitate their removal.

If not shown on the Contract Documents, the location of longitudinal joints will be determined by the Engineer based on avoiding joints in the vehicular wheel path as much as practical.

Take every reasonable precaution to secure a smooth riding bridge deck meeting the requirements of Section 414.03.07(d). Prior to placement operations, review the equipment, procedures, personnel, and previous results with the Engineer. Inspection procedures will be reviewed to ensure coordination. Include the following precautions:

(a) Completely clean all surfaces for approval prior to placing the LMC overlay.

(b) Brush the LMC mixture onto the wetted, prepared surface. Ensure that all vertical and horizontal surfaces receive a thorough, even coating. Limit the rate of progress so that the brushed material does not become dry before it is covered with additional materials required for the final grade. Remove brushed material that has dried prior to LMC placement, and replace it in an acceptable manner. Dispose of coarse aggregate that accumulates from the brushing operations.

(c) Place the LMC mixture to approximately 1/4 in. above grade and then screed with an approved power operated finishing machine to the specified line and grade. Use a suitable portable lightweight or wheeled work bridge behind the finishing operation. Hand finishing may be required along the edge. Joints shall be edge tooled, except when next to metal expansion dams, curbs, and previously placed lanes.

(d) Separate the screed rails and construction bulkheads from the newly placed material by passing a pointing trowel along their inside face. Make the trowel cut for the entire depth and length of screed rails and bulkheads, after the mixture has stiffened sufficiently. Do not separate metal expansion dams from the overlay.

419.03.06 Curing. Cover the surface of the LMC overlay with a single layer of clean, wet burlap or wet cotton mat as soon as the surface will support it without deformation. Follow immediately with a layer of 4 mil polyethylene film, and cure the surface for 24 hours. After 24 hours, remove the curing material and air cure for an additional 72 hours. With approval, white opaque burlap polyethylene sheeting may be substituted for the polyethylene film, but this material does not replace the wet burlap or wet cotton mat.

419.03.07 Grooving. Groove per the applicable portions of Section 414.03.07(d)(1), but start after the LMC has been cured per Section 419.03.06.

419.03.08 Limitation of Operations. LMC placement includes the applicable deck placement restrictions specified in Section 414.03.04.

No traffic will be permitted on the LMC overlay until the curing of the material is completed and the compressive strength test has reached 3000 psi.

Do not place LMC and concrete adjacent to an LMC surface course less than 96 hours old. This restriction does not apply to a continuation of placement in a lane or strip beyond a joint in the same lane or strip.

Do not grind or chip existing concrete pavement within 6 ft of LMC until the LMC has cured for at least 48 hours.

Do not place LMC at temperatures below 45 F. The LMC may be placed at 45 F, if rising temperature is predicted and anticipated for at least 8 hours.

At temperatures below 55 F, the Engineer will require a longer curing period and conformance with applicable portions of Section 414.03.13.

Remove and replace unsatisfactory LMC at no additional cost to the County. Any day during which the curing temperature falls below 50 F will not be counted as a curing day. When during the curing period the curing temperature falls below 35 F, the work may be considered as being unsatisfactory and rejected.

During delays up to one hour, several layers of wet burlap may be used to protect the end of the placement from drying. If the delay exceeds one hour, construct a dam or install a bulkhead and wait 12 hours before resuming placement operations. However, placement may continue provided a gap of sufficient length for the finishing machine to clear the previously placed LMC overlay is left in the lane or strip.

Protect freshly placed LMC overlays from sudden or unexpected rain. Stop all placing operations when it starts to rain. Remove and replace material damaged by rainfall, as determined by the Engineer, at no additional cost to the County.

Do not place linseed oil on LMC finished deck surfaces.

419.04 MEASUREMENT AND PAYMENT. The payment will be full compensation for all removing and cleaning, abrasive blasting, air blasting, flushing with water, forming, curing, disposal of material removed, and for all material, labor, equipment, tools, and incidentals necessary to complete the work.

419.04.01 ***Removal and Disposal of Existing Wearing Surface from Bridge*** will be measured and paid for at the Contract unit price per square yard for the actual surface area removed from the bridge deck.

419.04.02 Removal to the depth specified in the Contract Documents will not be measured but the cost will be incidental to the pertinent ***Latex Modified Concrete Overlay*** item.

419.04.03 Deck repairs, regardless of the method and depth, will not be measured but the cost will be incidental to the pertinent ***Latex Modified Concrete Overlay*** item.

419.04.04 Furnishing, placing, finishing, and curing of the LMC overlay will be measured and paid for at the Contract unit price per cubic yard for the ***Latex Modified Concrete Overlay*** item. Measurement for the volume of concrete will be based on the meter readings on the mixers dispensing the latex modified concrete excluding the calculated volume of any waste.

419.04.05 ***Repair Bar for Deck Reinforcement*** will be measured and paid for at the Contract unit price per linear foot.

419.04.06 When traffic bearing surfaces are required, supplying and removal of them and any repairs of damage to existing deck will not be measured but the cost will be incidental to other pertinent items specified in the Contract Documents.

419.04.07 Furnishing and installing any formwork required for full depth deck repairs will be measured and paid for at the Contract unit price per square foot for the pertinent ***Formwork for Full Depth Deck Repairs*** item. The measurement will be based upon the exposed opening at the bottom of the deck. The cost for formwork extending beyond these limits will be incidental to the item.

SECTION 420 – PRESTRESSED CONCRETE BEAMS AND SLAB PANELS

420.01 DESCRIPTION. Furnish and place prestressed concrete beams and slab panels, elastomeric bearing pads, bearing plates and other embedded items, all steel strands, jacks, and other required devices. The concrete overlay riding surface for slab panel bridges is included in this work.

420.02 MATERIALS.

Fine Aggregate	901.01
Coarse Aggregate	901.01
Fine Aggregate for Overlay Bonding Grout	901.01, Fine Aggregate/Sand Mortar and Epoxies
Cement	902.03
Admixtures:	
Air Entraining	902.06.01
Retarding	902.06.02 Type D
Water Reducing	902.06.02, .03
Pozzolans	902.06.04, .05
Concrete Overlay	902.10.03, Mix No. 8
Nonshrink Grout	902.11(c)
Reinforcing Steel	908.01
Welded Steel Wire Fabric	908.05
Prestressing Strand	908.11
Elastomeric Bearing Pads	910.02.01
Closed Cell Neoprene Sponge Elastomer	911.10
Fusion Bonded Epoxy Powder Coating for Steel	917.02
Water	921.01
Epoxy Adhesive	921.04
Threaded Tie Rods	A 722

Tie Rod Heavy Hex Nuts	Supplied by tie rod manufacturer; shall provide full tensile strength of tie rod
Concrete Protective Coatings	Contract Documents

420.02.01 Portland Cement Concrete. Ensure that the composition, proportioning, and mixing of concrete produces a homogeneous concrete mixture of a quality that meets the specified material and design requirements.

The required cylinder strength of the concrete at transfer of the tensioning load and the minimum required cylinder strength of the concrete at 28 days will be specified. Include an air-entraining admixture in the concrete mix.

Type G high range water reducing admixtures may only be used if the Engineer determines that the producer can design and show by trial mix that the concrete meets the specified strength requirements and the following:

(a) Slump is not to exceed the admixture manufacturer's recommendation or a maximum of 8 in.

(b) Air content of 5-1/2 ± 1-1/2 percent.

(c) Cement factor of at least 700 lb/cu yd.

(d) Maximum WCM ratio of 0.45.

Testing. The Engineer will take six test cylinders from each member or members cast and cured with the beam as a unit for the purpose of checking the quality of the concrete being produced, for determining the time when forms may be removed, and for determining the time when prestressing forces may be applied to a member.

The manufacturer shall provide metal or plastic molds for all test cylinders. The manufacturer's quality control technician shall make at least three cylinder specimens to be cured under laboratory conditions as specified in R 39 to determine the 28 day compressive strengths. The technician shall make and test the cylinders at the manufacturing site according to T 22 in the presence of the Engineer. A test is defined as the average strength of three companion cylinders.

420.02.02 Reinforcing Steel and Tie Rod Tubes. Except for prestressing strands, all reinforcing steel in and extending from beams and slab panels, and in the concrete overlay shall be epoxy coated.

Tie rod tubes shall consist of corrugated, rigid or semi-rigid type, galvanized steel sheathing, or rigid plastic sheathing.

420.02.03 Debonding Material. Use solid or split plastic sheathing having a thickness of at least 0.025 in. for debonding of pretensioning steel strands.

420.02.04 Joint Sealers. Per the manufacturer's specifications.

420.02.05 Overlay Bonding Grout. Use equal parts by weight of Portland cement and sand, and mix with sufficient water to produce a slurry. Mix to a consistency that provides for application with a stiff brush or broom in a thin, even coating that will not run or puddle.

420.03 CONSTRUCTION.

420.03.01 Working Drawings. Refer to Section 499. Address reinforcing, anchorages, steel strand profiles, lifting inserts, and all other pertinent information.

In cases where methods other than specified are proposed, submit modifications/changes as specified in Section 499. When the Engineer accepts the proposed changes, construct the members accordingly at no additional cost to the County.

420.03.02 Prestressed Concrete Plants. The prestressed concrete manufacturing plant shall be registered and certified under the Precast/ Prestressed Concrete Institute Program. Submit a valid certificate to the Engineer prior to the start of production.

420.03.03 Beds and Forms. Casting beds shall be supported on unyielding foundations. Clean the beds and forms after each use. Prevent accumulation of bond breakers.

Prior to stringing steel strands, inspect the bottom of forms for cleanliness and alignment. Coat the contact surfaces of forms with bond breaker that dries to a surface hardness. Ensure that the coating is dry to prevent contamination of the steel strand.

420.03.04 Meetings. Conduct a pre-pour meeting prior to beginning any prestress concrete work. Ensure a representative of the prestress concrete plant is present.

420.03.05 Protection of Prestressing Steel Strand. Store under shelter and keep it free of deleterious material such as grease, oil, wax, dirt, paint, loose rust, or other similar contaminants. Do not use steel showing corrosion, etching, pitting, or scaling. A light coating of surface rust is acceptable if it can be removed completely from the steel by wiping with a cloth.

Do not store on a surface that contributes to galvanic (or battery-type) corrosion.

Do not use steel strand as a ground for electric welding. Protect it from electric welding sparks.

420.03.06 Reinforcing Steel, Inserts, and Chairs. Place reinforcing steel within the specified tolerances, and secure it to beds and forms using chairs, blocking, or ties. Fabricate cages of bars by tying only. Do not support cages by tensioned strands. Bend tie wire ends into the slab panel. Show the type and placement of inserts on the working drawings.

Except for stainless steel accessories, recess form ties, chairs, and inserts in the concrete by at least 1 in.

420.03.07 Methods of Force Measurement. Use one of the following methods as the primary measuring system. Check it by using one of the other methods as a secondary measuring system:

(a) Curves. Use current stress-strain or elongation curves furnished by the strand manufacturer. An average modulus may be used if acceptable to the Engineer. Provide means for measuring the elongations of the strands to at least 1/8 in.

(b) Pressure Gauges. Use gauges to measure force by the pressure applied to hydraulic jacks. These gauges shall be furnished with dials calibrated with the jacking system.

(c) Dynamometers. Dynamometers connected in tension to the stressing system for the initial force may be used.

Gauging System. Use tensioning systems equipped with accurately calibrated hydraulic gauges, dynamometers, load cells, or other devices for measuring the stressing load to an accuracy of reading within 2 percent. Have a qualified testing laboratory calibrate and issue a certified calibration curve with each gauge. Recalibrate a gauging system whenever it shows erratic results; at intervals not exceeding six months, and when directed. Gauges for single strand jacks may be calibrated by an acceptable and calibrated load cell. Calibrate gauges for large multiple strand jacks, acting singly or in parallel, by proving rings or by load cells placed on either side of the movable end carriage. All jacks and gauges shall be calibrated by an independent laboratory at no additional cost to the County and documentation forwarded to the Engineer.

Provide pressure gauges and dynamometers preferably with full pressure and load capacities of approximately twice their normal working range. Limit loads to within 25 to 75 percent of the total graduated capacity, unless calibration data establishes consistent accuracy over a wider range.

Each gauge shall indicate loads directly in pounds or be accompanied by a chart with which the dial reading can be converted into pounds.

Tensioning systems employing hydraulic gauges shall be equipped with appropriate bypass pipes, valves, and fittings so the gauge reading remains steady until the jacking load is released.

Gauge readings, elongation measurements, and calculations for elongation shall include appropriate allowances for operational losses in the tensioning system due to strand slippage, movement of anchorages and abutments, elongation of abutment anchorage rods, strand rotation, temperature variation, friction, bed shorting, and other forces and influences acting on the strand.

In multiple strand tensioning systems, clean and lubricate the sliding surfaces to minimize friction. Establish a force override (compensatory operational loss correction) for standard strand pattern series.

Thermal Effects. Increase the design prestress force by 0.5 percent for each 5 F ambient temperature below 80 F. No adjustment is required when the ambient temperature is above 80 F. Do not stress steel strands when the ambient temperature is below 40 F. After the steel strands are tensioned, maintain the temperature of the air surrounding the steel strands at 40 F or more until the prestress force is transferred to the concrete.

Control of Jacking Force. Use either manual or automatic pressure cutoff valves for stopping the jacks at the required load. Use automatic cutoffs capable of adjustment to ensure that the jacking load corresponds to the required load. Verify the setting accuracy for the automatic cutoff valves whenever there is reason to suspect improper results and at the beginning of each day's operation.

420.03.08 Stringing Steel Strands. Do not reuse strands containing former vise grip points unless the points are outside the new vise locations. Do not reuse strands that have been draped.

All steel strands shall have the same lay or direction of twist. Use shears or abrasive cutting wheels to cut the ends. Position strands over chairs to eliminate sagging of strands in the bottom rows.

420.03.09 Steel Strand Splices. Only one splice is permitted per strand. For single strand tensioning, the number of strands that may be spliced in each bed is not restricted. For multiple strand tensioning, either splice all strands and adjust the elongation for average slippage, or no splices are permitted.

420.03.10 Steel Strand Vises. Vises shall be capable of anchoring stressing loads positively with minimum slippage and shall be cleaned, lubricated, and inspected between each use. Do not use grips that show wear or distortion, or that allow slippage in excess of 1/4 in. Clean and inspect the full set of vises before starting each prestressing operation.

A maximum permissible time of 72 hours shall be observed for holding tensioned strands in the bed before placing concrete.

420.03.11 Wire Failure in Steel Strands. Remove and replace any seven wire steel strand that contains a broken wire. Check all strands for wire breakage before placing concrete.

420.03.12 Pretensioning. Apply the specified total load to each strand. Apply the load as a total of two loading stages. The initial load shall straighten the strand, eliminate slack, and provide a starting or reference point for measuring elongation.

Limit the initial load to 10 percent of the specified tensioning force. The Engineer shall pre-approve any initial loading exceeding 10 percent (i.e. multiple bed casting). Measure the initial load within a tolerance of ± 100 lb. Do not use the initial elongation measurement to determine the initial force.

In all stressing operations, keep the stressing force symmetrical about the vertical axis; however, in tensioning single strands, the initial and final loads may be applied in immediate succession to each strand.

Use jack mounted pressure gauges as the primary system of force measurement for the final tensioning of straight single strands. Check elongation against pressure gauge readings on all strands. Check vise slippage. The computed elongation, including operational losses and equivalent elongation for the initial tensioning force, shall agree with the pressure gauge reading within 3 percent.

Use jack mounted pressure gauges as the primary system of force measurement for the final tensioning of multiple strands. For uniform application of load to the strands, the position of the face of the anchorage at final load shall be parallel to its position under initial load. Verify parallel movement by measurement of equal movement on opposite anchorage sides and by checking the plumb position of the anchorage before and after final load application. Check vise slippage.

After stressing the steel strands as specified and placing all other reinforcement, cast the concrete member to the specified length. Maintain strand stress between anchorages until the concrete has reached the specified compressive strength.

420.03.13 Steel Strand Tensioning. In all methods of tensioning, measure the stress induced in the strands both by jacking gauges and by elongation.

If any jack or gauge appears to be giving erratic results or gauge pressures and elongations indicate materially different stresses during manufacturing, recalibration will be required. Provide means for measuring elongation to the nearest 1/8 in.

For differences in indicated stress between jack pressure and elongation of up to 5 percent, place the difference so that the discrepancy will be on the side of a slight overstress rather than understress. For discrepancies in excess of 5 percent, carefully check the entire operation and determine the source of the discrepancy before proceeding.

Thoroughly seal split plastic sheathing for debonded steel strands with tape prior to placing concrete.

Cut all pretensioned steel strands flush with the end of the member. Where the end of the member will not be covered by concrete, clean the exposed ends of the strands and the concrete face. Use wire brushing or abrasive blast cleaning to remove all dirt and residue that is not firmly bonded to the metal and concrete surfaces. Coat the strands and the concrete face with a protective coating as specified. Work the protective coating into all voids in the strands.

420.03.14 Surface Finish and Curing. Rough finish the top surface of all members with a rake, wire brush, or other approved means to a full amplitude of 1/4 in. Begin initial curing of all members by fogging, wet burlap, or other approved methods as soon as the concrete is hardened sufficiently to withstand surface damage. Continue the initial curing until the concrete has attained its initial set, but at least three hours; however, when a retarding agent is used, continue the initial curing for at least five hours. Following the initial curing, resume curing using an accelerated curing method.

Accelerated Curing. Use one of the following methods to accelerate curing of the concrete:

(a) Low Pressure Steam Curing. Use a suitable enclosure to contain the live steam and minimize moisture and heat loss. Ensure that the concrete has attained initial set before application of the live steam.

Do not permit live steam to be directed on the concrete or the forms so as to cause localized high temperatures. Maintain the temperature of the interior of the enclosure at 80 to 160 F. During initial application of the steam, increase the ambient air temperature within the enclosure at a rate not to exceed 40 F per hour. Hold the maximum temperature until the concrete has reached the required release strength. Maintain the steam temperature and the curing temperature uniformly throughout the extremities of the prestressed member. At the end of curing, reduce the concrete temperature at an average of 40 F per hour.

Ensure that the producer furnishes at least one recording thermometer for each enclosure. If the enclosure is longer than 300 ft, furnish an additional recording thermometer for each additional 300 ft of length or fraction thereof. The temperature at any point within the enclosure shall not vary more than 10 F from that of the recording thermometer or the average of the recording thermometers if more than one is used.

(b) Radiant Heat Curing. Radiant heat may be applied by means of pipes circulating steam, hot oil, or hot water, or by electric heating elements. Provide a suitable enclosure to contain the heat. Minimize moisture loss by covering all exposed concrete surfaces with plastic sheeting or by applying an approved liquid membrane curing compound to all exposed surfaces. Uniformly maintain the heat application throughout the extremities of the member. Apply the same temperature constraints as outlined for low pressure steam curing.

420.03.15 Detensioning.

(a) Slab Panels. Do not transfer the tension force to the prestress slab panel until the concrete strength as indicated by cylinder strengths meets the specified transfer strength. Except to move to storage, ensure that the design strength is met before handling the slab panel or releasing it for shipment.

Prior to detensioning, remove or loosen forms, ties, inserts, hold downs, and other devices that restrict longitudinal movement along the bed, or use a method and sequence to minimize longitudinal movement.

Release prestressing forces using a method that minimizes sudden or shock loading.

Single strand detensioning may be accomplished by heat cutting the strands. The sequence shall maintain prestressing forces nearly symmetrical around the slab panel's vertical axis.

Eccentricity around the vertical axis shall be limited to one strand. Obtain approval of the cutting pattern prior to use.

Multiple strand detensioning may be accomplished by gradually reducing the force applied to each strand equally and simultaneously.

(b) Beams. The schedule for detensioning of beams having deflected steel strands shall incorporate the following:

(1) The manufacturer's sequence of releasing deflected steel strands and uplift points shall be approved.

(2) All hold down devices for deflected steel strands shall be disengaged, and all hold down bolts removed from the beams.

(3) The manufacturer's sequence of releasing the remaining straight steel strands shall be as approved.

All hold down devices may be released prior to release of tension in deflected steel strands if:

a) The weight of the prestressed beam is more than twice the total of the forces required to hold the steel strands in the low position.

b) The weight or other approved vertical restraints are applied directly over the hold down points to counteract the uplifting forces, at least until the release of deflected steel strands has proceeded to a point that the residual uplifting forces are less than half the weight of the beam.

Follow all procedures for releasing prestressing forces of deflected steel strands. Failure to follow these procedures may result in the rejection of the beams.

Adequately separate all beams in storage immediately following removal from the bed to facilitate the repair of surface blemishes and to allow inspection of the finished surfaces.

420.03.16 Camber. During the period of beam fabrication, select a representative number of beams to be known as "Camber Control Beams", subject to approval.

Clearly and permanently identify them so that the camber readings taken as indicated below can be associated with the proper beam.

Take camber readings as follows:

(a) Just prior to prestressing.

(b) Immediately after prestressing.

(c) At weekly intervals thereafter within the three months after casting.

(d) At biweekly intervals, after the three month period expires.

(e) Just prior to shipment from the casting yard to the job site.

(f) Continue camber determinations at these intervals if the beams are stored or stockpiled at the job site.

Furnish two copies of the camber reports prior to erecting the beam.

420.03.17 Tolerances. The tolerances for each beam or slab panel shall be as shown in Tables 420.03.17 A or B, respectively unless otherwise specified:

TABLE 420.03.17 A

PRESTRESSED CONCRETE BEAM	TOLERANCE
Depth (overall)	±1/4 in.
Width (flanges & fillets)	±1/4 in.
Width (web)	±1/4 in.
Length of Beam	±1/8 in. per 10 ft. or 1/2 in. whichever is greater
Exposed Beam Ends (deviation from square or designated skew)	Horizontal ±1/4 in. Vertical ±1/8 in. per ft. of beam height
Side Inserts (spacing between center of inserts and from the centers of inserts to the ends of the beams)	±1/2 in.
Bearing Plate (spacing from the centers of bearing plates to the ends of the beams)	±1/2 in.
Stirrup Bars Average of all bars Individual bar longitudinal spacing	 ±1/2 in. ±1 in.
Horizontal Alignment (deviation from a straight line parallel to the center line of beam)	1/8 in. per 10 ft., max
Camber Differential between adjacent beams of same type and steel strand pattern	1/8 in. per 10 ft. at time of erection or 1/2 in. max
Center of Gravity of steel strand group	±1/4 in.
Center of Gravity of depressed group steel strand at end of beam	±1/2 in.
Position of hold down points for depressed strand	±6 in.
Camber deviation from plan camber, as measured at release or at beginning of beam storage at the fabricating plant	±50% of plan camber or ±1/2 in. whichever is greater.

TABLE 420.03.17 B

PRESTRESSED CONCRETE SLAB PANEL	TOLERANCE
Depth (Overall)	+1/2 in., -1/4 in.
Width (Overall)	±1/4 in.
Slab Panel Length @ center line (based on Design length specified)	±1/2 in.
Horizontal Alignment (deviation from a straight line parallel to the slab panel center line)	¼ in. max.
Horizontal Misalignment of adjacent form sections	½ in. max.
Camber deviation from specified camber, as measured at prestress transfer or at the beginning of slab panel storage at the fabrication plant	±1/2 in.
Location of each strand	±1/8 in.
Center of Gravity of each strand group	±1/4 in.
Stirrup bars (longitudinal spacing)	±1 in.
Longitudinal Position of handling devices	±3 in.
Concrete Bearing Area (variation from plane surface when tested with a straightedge through middle half of slab panel	±1/8 in.
Tie Rod Tubes (spacing between the tube centers and from tube centers to slab panel ends)	±1/2 in.
Tie Rod Tubes (spacing from tube center to slab panel bottom)	±3/8 in.
Threaded Inserts (spacing between the center of inserts and from center of inserts to ends of slab panels)	±1/2 in.
Skew Ends (deviation from designated skew)	±1/2 in.
Vertical Ends (deviation from specified dimension)	±3/8 in.
Camber deviation from plan camber, as measured at release or at beginning of beam storage at the fabricating plant	±50% of plan camber or ±1/2 in. whichever is greater.

420.03.18 Slab Panel Plant Assembly. Before shipping the slab panel units to the job site, assemble all slab panels for the entire bridge width to ensure that there is no misalignment. Any misalignment of the holes will be cause for rejection of the affected slab panels. Do not drill or core holes into the slab panels.

420.03.19 Marking, Handling, Shipping, and Storage. Mark each member with an erection mark for identification, weight marks for beams 6000 lb or more, and inspection stamps. For beams, paint the erection marks on the top surface of the top flange. Do not place markings of any kind on any surface of a beam that will be visible in the completed structure.

Mark slab panels with an individual, consecutive identification mark at a permanently exposed location. The identification mark shall match that shown on the approved working drawings.

Furnish an erection diagram clearly indicating erection marks that show the position of the member in the structure.

Utilize the cast-in-place lifting devices and a sufficient number of cranes and spreader beams whenever the prestress concrete members are lifted.

Furnish copies of material orders and shipping statements. Show the weight of each individual prestress concrete member.

During shipment, ensure that blocking is placed at intervals that will prevent sag and distortion. Ship all members in the upright position, adequately braced and supported to dampen vibrations during transport as shown on the working drawings. Members too long to fit inside of a truck or trailer shall not cantilever beyond the bed more than one quarter of their length. Support members too long to comply with this requirement on dollies, additional vehicles, or other vehicles that will support the long pieces as approved.

Load restrictions are as specified in Section GP-5.10. Do not ship prestress members until approved, at least five days have elapsed since the prestress transfer, and the minimum 28 day compressive strength has been attained.

Store beams off the ground in an upright position. Protect them as far as practical from surface deterioration, and keep them free of accumulations of dirt, oil, and other deleterious material.

420.03.20 Erection. Refer to Sections 408.03.27, .28, .29, .31, .32, and .33.

Slab Panels. Immediately prior to erecting slab panels, clean the abrasive blasted shear key surfaces with compressed air, stiff bristle fiber brushes, or vacuuming. Pull the slab panels together and field tighten in the transverse direction using tie rods. Perform field tightening by placing the washer and nut on the tensioning end of the tie rod and running them down to the recessed concrete face. Attach a jacking assembly or other type of loading apparatus to the threads extending beyond the nut. Provide the Engineer with certification that the gauge or other load measuring device has been calibrated within one year; however, the Engineer may require the load measuring device to be recalibrated if it appears to have been damaged or mishandled. The loading apparatus shall be capable of applying a load to the tie rod nut equal to 80,000 lb for spans up to 35 ft and 120,000 lb for spans greater than 35 ft. Maintain the load until the tie rod nut is snug tight as defined in Section 408.03.17(d). Do not use a torque wrench to apply the tensioning load. After tightening, grout all tie rod holes.

After field tightening all slab panels, seal the joint below the shear keys using an approved method. Grout the shear keys by overfilling the joints. Drive the grout or compactly tamp it into the keyways; do not vibrate. After a half hour, strike off the excess grout flush with the top of the panels. Follow the manufacturer’s recommendations for grouting in cold or hot weather.

Equipment may be placed on the slab unit prior to placing the concrete overlay if all slab units are in place, the tie rods are tensioned, and the joints have been grouted for at least two days.

420.03.21 Bearing Pads. Store them at the site on suitable blocking or platforms at least 4 in. above all surfaces and vegetation. Keep free from vegetation growth and accumulations of dirt, oil, and other foreign material.

Coat the surfaces of the concrete bearing areas that will be in contact with the bearing pads and the full contact area of the bearing pads with epoxy adhesive. Adhere to the manufacturer's recommendations for mixing and applying the epoxy adhesive material. The surface temperatures when applying epoxy adhesive shall be at least 50 F with a predicted ambient temperature for the next four hours of 50 F or above. Ensure that the surfaces are clean, dry, and sound. Be prepared to use water jets, abrasive blasting, and air blasting, for satisfactorily cleaning the surfaces.

Accurately set the bearing pads in the epoxy adhesive and secure them in place by blocking or other mechanical means until the adhesive sets.

420.03.22 Placing and Finishing Concrete Overlay. Place, cure, groove, protect, etc., the overlay according to Section 420.03 including superstructure placement restrictions.

Place the top of the overlay to the true as planned line and grade of the roadways. Place the overlay in a manner that meets the grade of the proposed adjoining portions of the new bridge decks and adjoining roadways.

Place the entire bridge slab overlay in one continuous pour. No transverse or longitudinal joints will be permitted.

Place the finishing machine's supporting rails outside the overlay. Do not use hold down devices that are shot or drilled into the concrete. Submit plans for anchoring support rails and the concrete placing procedure for approval.

Take precautions to secure a smooth riding bridge deck meeting the requirements of Section 414.03.07(d). Prior to placement operations, review the equipment, procedures, and personnel with the Engineer. The inspection procedures will be reviewed to ensure coordination. Take the following precautions:

(a) Before placing the overlay, thoroughly clean and abrasive blast the entire surface that will be in contact with the overlay. Perform abrasive blasting within 24 hours prior to placing the overlay. Clean the surface by air blast followed by flushing with water. Prior to placing the overlay, wet the surface and keep it wet for at least one hour and remove puddles of water.

No loads, other than construction equipment, will be permitted on any portion of the bridge deck that has undergone preparation prior to placement and curing of concrete overlay.

(b) After cleaning the surface and immediately before placing the concrete overlay, scrub a thin coating of the overlay bonding grout into the prepared surface. Ensure that all parts receive a thorough, even coating and that no excess grout collects in pockets. Control the rate of grout application so that the grout does not become dry before it is covered with the overlay.

(c) Utilize a suitable portable lightweight or wheeled work bridge behind the finishing operation. Hand finishing may be required along the edge of placements.

420.04 MEASUREMENT AND PAYMENT. Prestressed concrete members will not be measured but will be paid for at the Contract lump sum price for the pertinent ***Prestressed Concrete Beams*** or ***Prestressed Concrete Slab Panels*** item. The payment will be full compensation for all concrete, forms, reinforcing, bearing pads, steel strands, sheathing, steel components, steel rods, inserts, tensioning, grout, bearing assemblies, epoxy adhesive, testing, furnishing, and applying concrete protective coatings when specified, transporting, storage, erection, and for all material, labor, equipment, tools and incidentals necessary to complete the work.

420.04.01 Concrete overlay for the precast concrete slab bridge deck will not be measured but will be paid for at the Contract lump sum price for the pertinent ***Superstructure Concrete*** item. The payment will be full compensation for surface preparation, overlay bonding grout, furnishing, placing, finishing, curing and grooving the concrete overlay; fabricating, coating and placing the epoxy coated welded steel wire fabric or reinforcing steel within the concrete overlay, roadway angle, and for all material, labor, equipment, tools, and incidentals necessary to complete the work.

SECTION 421 – RESERVED

SECTION 422 – METAL RAILING

422.01 DESCRIPTION. This work shall consist of furnishing, fabricating, coating, and erecting of all metal railings as specified in the Contract Documents.

422.02 MATERIALS. Materials shall be as specified in the Contract Documents.

422.03 CONSTRUCTION. All railings shall be fabricated and erected as specified in the Contract Documents.

The Contractor shall furnish working drawings for approval by the Engineer.

422.03.01 Production, Handling and Shipment. Metal railings and incidental parts shall be carefully handled and stored on blocking, racks, or platforms to prohibit contact with the ground and shall be protected from corrosion or damage. Materials shall be kept free from dirt, oil, grease, and other foreign matter. Surfaces to be painted shall be carefully protected both in the shop and in the field. Damaged material shall be repaired or replaced as directed by the Engineer at the Contractor's expense.

422.04 MEASUREMENT AND PAYMENT. The payment will be full compensation for all material, labor, equipment, tools, and incidentals necessary to complete the work. Measurement and Payment shall be in accordance with one of the following as specified in the Contract Documents:

422.04.01 ***Metal Railing*** will be measured and paid for at the Contract unit price per linear foot.

422.04.02 ***Metal Railing*** will not be measured but will be paid for at the Contract lump sum price.

422.04.03 ***Metal Railing*** will not be measured but the cost will be incidental to other pertinent items included in the Contract Documents.

SECTION 423 – TIMBER STRUCTURES

423.01 DESCRIPTION. This work shall consist of constructing structures or portions of structures using timber, including fabrication, erecting, treating and coating of the timber elements as specified in the Contract Documents or as directed by the Engineer.

For timber piling refer to Section 407. For structural steel refer to Section 408. For concrete refer to Section 414.

423.02 MATERIALS.

Asphalt Cement	904
Structural Steel	909.01
Gray Cast Iron	909.04
Bolts and Hardware	909.09
Structural Timber	921.05
Preservative Treatments for Timber	921.06
Metal Timber Connectors	Per manufacturer & approved by the Engineer
Galvanizing	A 153
Fire Stops and Galvanized Sheet Metal	A 653, Coating Designation G 90

423.03 CONSTRUCTION.

423.03.01 Storage and Handling. Timber shall be open stacked in piles at least 12 in. above the ground surface in a manner to shed water and prevent warping. It shall be protected from

weather by a suitable covering. The storage site shall be cleared of weeds and rubbish before placing material and throughout the storage period. The site selected shall not be subject to flooding. Timber shall be handled with rope or nylon slings to prevent the breaking of outer fibers, bruising, or penetrating the surface.

423.03.02 Cutting and Boring. When practical, cutting and boring of treated timbers shall be done before treatment. All cuts in treated timbers and all abrasions (after having been carefully trimmed) shall be brush coated with two applications of an approved wood preservative before installing the timber in the structure. Whenever forms or temporary braces are attached to treated timber with nails or spikes, the holes shall be filled by driving galvanized nails or spikes flush with the surface, as directed by the Engineer.

423.03.03 Bolt Holes. Bolt holes bored after treatment shall be filled with asphalt cement applied with a caulking gun or as directed by the Engineer before inserting bolts. Holes that are not to receive bolts shall be plugged with asphalt cement coated plugs.

423.03.04 Coating Untreated Surfaces. In untreated timber structures, all contact surfaces between any members (except adjacent flooring members) shall be coated with two coats of an approved preservative before assembling. The back faces of bulkheads and all surfaces of timber that will come in contact with earth, metal or other timber shall be similarly coated. The ends of timber members shall be coated in the same manner.

423.03.05 Protection of Ends of Caps, Wales and Planks. The ends of all caps, wales and planks shall be covered with resin glass composite shields as approved by the Engineer. The shields shall be applied as follows:

(a) Remove all dirt and other loose material from area to be capped.

(b) Apply the first coat of resin to the top and 4 in. down the side of the member.

(c) Apply precut glass cloth, using a 3 in. grooved aluminum roller to achieve “wet-out” and brass staples for anchorage.

(d) When the initial coat of resin has taken a tack free set, apply a second coat of resin to seal the entire application.

423.03.06 Diameter of Holes. Holes bored in timber structures shall conform to the following:

(a) Round drift bolts, spikes, and dowels - 1/16 in. less than the diameter of the device.

(b) Square drift bolts, spikes, and dowels - equal to the smallest dimension of the device.

(c) Machine bolts - same as the diameter of the bolts.

(d) Rods - 1/16 in. larger than the diameter of the rods.

(e) Lag screws - equal to the diameter of the screw at the base of the thread.

(f) Connector bolts - 1/16 in. larger than the diameter of the connector bolts.

423.03.07 Bolt Assemblies. Bolt heads or nuts which come in contact with the timber shall be fitted with a washer of the size and type specified. After all nuts are adequately tightened, the bolt shall be deburred.

423.03.08 Countersinking. Countersinking shall be done wherever smooth faces are required. In treated timber, recesses formed in horizontal surfaces for countersinking shall be painted with an approved preservative. After the bolt or screw is in place, recesses shall be filled with an approved asphalt coating.

423.03.09 Connectors. Connector holes shall be bored through members to be connected. The bolt hole shall be kept perpendicular to the face of the timber. When spike grids or split ring connectors are specified in the Contract Documents, they shall be installed in conformance with the manufacturer's recommendations.

423.03.10 Framing. All timber shall be accurately cut and framed to provide even bearing over the entire contact surface. When making joints, there shall be no shimming and there shall be no open joints.

423.03.11 Sills. Sills shall have true and even bearing on mud sills or concrete pedestals. All earth shall be removed from contact with sills.

423.03.12 Caps. Timber caps shall be placed to secure an even and uniform bearing over the tops of the supporting posts or piles and to secure an even alignment of their ends. All caps shall be secured by drift bolts or as specified in the Contract Documents. The drift bolts shall be in the center of the post or pile.

423.03.13. Bracing. The ends of bracing shall be bolted through the pile, post, or cap. Intermediate intersections shall also be bolted. Spikes or nails shall be used in addition to bolts. When bracing intersects, filler blocks shall be used with a bolted connection.

423.03.14 Stringers. Stringers shall be placed in position so that knots near edges will be in the top portions of the stringers. Bottom edges of stringers shall be sized to provide uniform depth at bearings.

Outside stringers may have butt joints with the ends cut on a taper, but interior stringers shall be lapped to take bearing over the full width of the floor beam or cap at each end. The lapped ends of untreated stringers shall be separated a minimum 1/2 in. and shall be securely fastened by drift bolts where specified. When stringers are two panels long, the joints shall be staggered.

Cross bridging between stringers shall be toenailed with at least two nails in each end. The lower ends of all bridging and one side of each diaphragm shall be left disconnected and free to move until after the deck above it has been securely fastened to the stringers.

423.03.15 Floor Planking. Floor planking shall, unless otherwise specified, be S1S1E, hit or miss, and the planks shall be of uniform thickness with a maximum tolerance of 1/8 in. Where necessary to maintain traffic, planks shall be laid in half-of-bridge width sections. Timber plank floors shall always be accompanied with suitable hold down devices. Planks shall be spiked to every stringer or joist or nailer using not less than two spikes, and the length of the spikes shall be at least equal to twice the thickness or depth of the plank. Where planks will be under wheel guards or hold down devices, care shall be taken while selecting planks of as near equal thickness as possible. Before any hold down or wheel guard is bolted, treated shims or wedges shall be firmly driven between low planks and hold down and low planks and wheel guard so that all planks shall be held down with equal pressure. The shims shall occupy at least 50 percent of the area between the bottom of the hold down and the top of the plank and between the bottom of the wheel guard and the top of the plank.

423.03.16 Bridge Railings and Wheel Guards. Bridge railings shall meet a minimum of Test Level 1 (TL-1) as specified in the AASHTO LRFD *Bridge Design Specifications*, Railings. All dimensions for timber rail, posts, and spacers shall be the actual dimensions of the timber.

Locate bridge rail and wheel guard splices so that rail and guard members are continuous over at least two posts. Install bridge railings and wheel guards in sections not less than 12 ft long. Splices shall be shiplapped with the lap equal to the larger of either 8 in. or the greater side of the piece.

423.04 MEASUREMENT AND PAYMENT. Piles are excluded. The payment will be full compensation for all timber (treated or untreated) storage and handling, preservative, composite shields, asphalt cement, metal components, drilling holes, and for all material, labor, equipment, tools, and incidentals necessary to complete the work. Measurement and Payment shall be in accordance with one of the following as specified in the Contract Documents:

423.04.01 ***Timber Structures*** will be measured and paid for at the Contract unit price per 1000 board feet (MBM). The computation of quantities will be based on the nominal sizes specified in the Contract Documents and the exact overall net length of pieces remaining in the completed structure. No allowance will be made for waste.

423.04.02 ***Timber Structures*** will not be measured but will be paid for at the Contract lump sum price.

SECTION 424 – BRICK MASONRY

424.01 DESCRIPTION. This work shall consist of brick laid in full beds of mortar and built to the shapes and dimensions and at the locations specified in the Contract Documents or as directed by the Engineer.

424.02 MATERIALS.

Curing Compound	902.07.03
Brick	903
Mortar	903.06

424.03 CONSTRUCTION. All brick masonry shall be laid in level courses with faces plumb, square and true to the dimensions specified. All exposed surfaces shall be smooth.

Brick facing shall be constructed as specified in the Contract Documents.

424.03.01 Bond. Unless otherwise specified, brick masonry shall be laid in common bond having at least one course in every seven composed entirely of headers. Adjoining courses shall be laid to break joints by half brick as nearly as practical.

424.03.02 Bricklaying. All brick shall be sprayed with water to dampen the surface prior to laying. Only fresh plastic mortar shall be used, and it shall be soft and workable when placed on the wall. A layer of mortar shall be spread on the beds and not more than a shallow furrow that can be readily closed by the laying of the brick shall be made in it. All bed and head joints shall be filled solid with mortar. End joints of stretchers and side or cross joints of headers shall be fully buttered with mortar and a shoved joint made so that mortar is squeezed out at the top of the joint. No brick shall be jarred or moved after it has been fully bedded in the mortar. Bricks loosened after the mortar has taken its set shall be removed, cleaned and relaid with fresh mortar. No broken or chipped brick shall be used in the face. No spalls or bats shall be used except where necessary to shape around irregular openings or edges. Full bricks shall be placed at ends or corners where possible and the bats used in the interior of the course. In making closures, bricks shorter than the width of a whole brick shall not be used. Whole brick shall be used as headers.

424.03.03 Joints. All joints shall be slushed with mortar at every course, but slushing alone will not be considered adequate for making an acceptable joint. Exterior faces shall be laid up in advance of backing. Exterior faces shall be back plastered or parged with a coat of mortar not less than 3/8 in. thick before the backing is laid up. Prior to parging, all joints on the back of face courses shall be cut flush. Joints shall not be less than 1/4 in. nor more than 1/2 in. wide. Whatever width is adopted shall be maintained uniformly throughout the work.

424.03.04 Pointing. All exterior head and bed joints shall be tooled with a round tool, slightly larger than the joint, pressed tight against the still plastic mortar so as to provide a concave finish. When nails or line pins are used, the holes shall be immediately plugged with mortar and pointed as soon as the nail or pin is removed.

424.03.05 Cleaning. Upon completion of the work, all exterior surfaces shall be cleaned by scrubbing and washing down with water, or if necessary, cleaning shall be done with a 5 percent solution of muriatic acid which shall then be rinsed off with liberal quantities of clean fresh water.

424.03.06 Curing. After the work has been laid up and pointed, the exposed surfaces of brick masonry shall be cured by one of the following methods:

(a) Brick shall be covered with two layers of burlap and kept wet for three days.

(b) A non-bituminous colorless liquid curing compound shall be applied by means of an approved hand or motor driven spray operated at a pressure between 40 and 60 psi. The liquid compound shall be uniformly applied at a rate of 0.034 to 0.040 gal/sq.yd. The material shall be applied so that the exposed surface is completely coated and sealed in one application. At points where the work shows evidence of insufficient coating, additional material shall be added as directed by the Engineer.

424.03.07 Cold Weather Protection. No brick masonry work or pointing shall be done when there is frost in the brick or when the air temperature is below 50 F, unless the Contractor provides suitable housing, covering and tarpaulins, and heating devices necessary to keep the atmosphere surrounding the masonry at a temperature of not less than 50 F for the curing period.

424.03.08 Backfill. Brick masonry shall not be backfilled before seven days after completion of the section.

424.04 MEASUREMENT AND PAYMENT. The payment will be full compensation for all material, labor, equipment, tools, and incidentals necessary to complete the work. Measurement and Payment shall be in accordance with one of the following as specified in the Contract Documents:

424.04.01 ***Brick Masonry for Structures*** will be measured and paid for at the Contract unit price per square foot. The Engineer may permit the backfilling of masonry structures sooner than specified if traffic or other conditions warrant this. In no case, however, will this operation be permitted until the third day after the completion of all work.

424.04.02 ***Brick Masonry for Structures*** will be measured and paid for at the Contract unit price per cubic yard.

424.04.03 ***Brick Masonry for Structures*** will not be measured but will be paid for at the Contract lump sum price.

424.04.04 ***Brick Masonry Facing*** will be measured and paid for at the Contract unit price per square foot.

424.04.05 ***Brick Masonry Facing*** will not be measured but will be paid for at the Contract lump sum price.

SECTION 425 – EPOXY PROTECTIVE COATINGS FOR CONCRETE

425.01 DESCRIPTION. This work shall consist of furnishing, and applying of epoxy protective coatings as specified in the Contract Documents or as directed by the Engineer.

425.02 MATERIALS.

Sand	901, Table 901 A
Epoxy Protective Coatings	917.01

425.03 CONSTRUCTION. The epoxy protective coating shall not be applied until at least 30 days after forms are removed. All surfaces to be coated shall be blasted. The surface shall be clean, sound, thoroughly dry and free of oil, grease, curing compound and other foreign matter before applying the first epoxy protective coating. Two coats shall be applied to the specified areas of the structure. The application of each epoxy protective coating shall follow a dry weather period of at least two consecutive days. Adjacent areas not to be coated shall be masked or otherwise protected to prevent staining.

425.03.01 Mixing and Application. Mixing and application shall conform to the manufacturer's recommendations. Epoxy coatings shall be applied by brush or roller. Epoxy coatings shall not be applied to concrete piers and abutments until after structural steel masonry plates have been placed.

425.03.02 Coating Requirements. The second coat of epoxy coating on the top surfaces of the pier caps and abutment bridge seat areas between beams pads shall be sprinkled with an excess of sand while the film is still wet. When the film has hardened sufficiently to resist marring, the excess sand not adhering to the coatings shall be removed. Areas to be coated are:

(a) Abutments and piers that are under an expansion device in the deck shall be coated.

(b) For abutments, coatings shall be applied to the entire horizontal surface of the abutment bridge seat areas (between and around the beam pads) and all exposed surfaces of the beam pads, and the entire contiguous vertical faces of the backwalls and cheek walls.

(c) For piers, coatings shall be applied to the entire horizontal surface of pier bridge seat areas (between and around the beam pads), and all exposed surfaces of the beam pads.

425.03.03 Material Precautions. The manufacturer's Material Safety Data shall be used in handling and use of the material.

425.03.04 Repairs. Any portion of the structures damaged by the Contractor's operations in applying the protective coatings shall be repaired as directed by the Engineer, at the Contractor's expense.

425.04 MEASUREMENT AND PAYMENT. The payment will be full compensation for both coats and all material, labor, equipment, tools, and incidentals necessary to complete the work. Measurement and Payment shall be in accordance with one of the following as specified in the Contract Documents:

425.04.01 ***Epoxy protective coatings for concrete*** will not be measured but the cost will be incidental to other pertinent items specified in the Contract Documents.

425.04.02 ***Epoxy Protective Coatings for Concrete*** will not be measured but will be paid for at the Contract lump sum price.

425.04.03 ***Epoxy Protective Coatings for Concrete*** will be measured and paid for at the Contract unit price per square foot.

SECTION 426 – FUSION BONDED POWDER COATINGS FOR METAL

426.01 DESCRIPTION. Furnish and apply electrostatically applied fusion bonded powder coatings to metal surfaces.

426.02 MATERIALS.

Epoxy Powder Coating	917.02 except creep test will not be required
Polyester Powder Coating	917.03

Use polyester powder coating unless otherwise specified.

426.03 CONSTRUCTION. Apply the coating in an environmentally controlled plant that is fully enclosed. The coating system shall have the capabilities of preheating and post baking.

Ensure that the surface is free of oil and mill coatings.

Grit blast the surface to white metal according to SSPC-SP 5 using a mixture of steel shot and grit. Protect cleaned surfaces from high humidity, rainfall, and surface moisture. Surfaces shall not flash rust before coating. Provide a uniform, angular anchor blast profile having a height of 2 to 5 mils. Check anchor pattern with an approved surface profile gauge.

Apply and cure the material as specified by the coating manufacturer. Neither the metal surface nor the oven temperature shall exceed 500 F during any part of the curing process.

Ensure that the cured coating has a uniform color, gloss, and thickness, and is free of blisters, fish eyes, sags, runs, and any other irregularity.

Ensure that the finished coating thickness is 10 ± 2 mils when tested according to SSPC PA-2, except the balls and sockets on steel sheet piling may have a lesser thickness of coating.

Similarly coat new bolts, nuts, and washers to a thickness of 4 to 7 mils. The nuts shall have oversize threads and fit the bolts after both are coated. Restrain the bolt heads from turning during torquing operations.

The coater shall be responsible for all quality control checking including visual inspection and thickness measurements and shall keep the results of each inspection in a form suitable to the Engineer.

The Engineer shall have access to each part of the process and have the right and opportunity to witness or perform any of the quality control tests on a random sampling basis.

Touch Up. Provide a compatible touch up system for repair of defects, all areas damaged during erection, and all visible open areas. Apply touch up as follows:

(a) Surface Preparation. The surface shall be clean, dry, and free of rust and scale. Blast clean to National Association of Corrosion Engineers (NACE) Near White where possible. Use suitable solvents to remove grease, oil, and other contaminates. Apply coating directly to the cleaned surface before oxidation occurs.

(b) Mixing. Mix ratio of Part A to Part B shall be as recommended by the manufacturer. Thoroughly mix the two parts until a uniform color is achieved. If thinning is required, thin each part separately using a thinner recommended by the manufacturer. Discard material not used within the recommended pot life.

426.03.01 Material Precautions. Use the manufacturer's Material Safety Data in handling and use of this material. Refer to Section 416.03.04 for handling and protection.

426.04 MEASUREMENT AND PAYMENT. Fusion bonded powder coatings for metal will not be measured but the cost will be incidental to the pertinent items specified.

SECTIONS 427 Through 449 – RESERVED

SECTION 450 – RETAINING WALLS

450.01 DESCRIPTION. Construct cast-in-place reinforced concrete footings and stems conforming to the AASHTO definitions of rigid retaining walls. When retaining wall mounted noise barriers are specified, the anchorage assemblies are included in the retaining wall. All components shall be as specified unless prior approval for alternatives is obtained from the County.

When piles or drilled shafts (caissons) are specified, refer to Section 407 or Special Provisions, respectively.

450.01.01 Preapproved Alternate Retaining Walls. Alternate retaining walls may only be used when specified. Only those retaining walls specified will be permitted. All other retaining walls, even though they are preapproved or have been previously used on County projects, are prohibited for use. The County will not consider any other alternate retaining walls as a value engineering change proposal.

Enforcement. These requirements will be enforced on all projects.

Preapproved Alternate Retaining Wall List. Alternate retaining walls are selected from the list of Preapproved Alternate Retaining Walls, which is maintained by the MdSHA Office of Structures. Procedures for adding products to the prequalified list may be obtained from the MdSHA Office of Structures.

Alternate retaining walls that have been previously used on County projects without complying with the preapproval requirements shall be formally submitted through these procedures before they will be added to the Preapproved Lists for consideration to be used on future projects. These and other retaining wall systems may be submitted for addition to the Preapproved Lists, but the County will not permit these submittals to be used on an advertised or awarded project.

Deviations. Submit any proposed deviation in materials, post size or shape; panel size or shape; reinforcing type, size, or placement from what is shown in the Contract Documents or from the preapproved alternate retaining wall details on file in the MdSHA Office Structures. All costs for reviews, whether the details are accepted or rejected, shall be borne by the

Contractor. Any fabrication or creation of any retaining wall element that is a deviation and is made prior to written approval of the County shall be at the risk of the Contractor.

Contract Documents for Preapproved Alternates. If electing to use preapproved alternate retaining wall systems, only one type retaining wall may be constructed throughout the Contract. Submit substitute plans, design calculations, and specifications. Plans shall be similar in size and detail to advertised documents. Working drawings from the fabricator are not acceptable as substitute plan submissions. Include drainage details and all revisions required to construct the alternate retaining wall system. All plans, calculations, and specifications shall be prepared, signed, and sealed by a Professional Engineer registered in the State of Maryland, and who has experience in design of the proposed alternate retaining wall system. The substitute plans shall bear the County's title block and be furnished on reproducible paper, linen, or mylar. Contract Documents for construction of alternate retaining walls shall conform to the Procedures of the MdSHA Office of Structures and to the Baltimore County *Design Manual*. These Plans will be issued as a Contract revision replacing the County's Plans and be kept by the County as permanent records. All work pertaining to Contract Documents for preapproved alternates shall be at no additional cost to the County.

After substitute Plans are approved and issued as a redline revision, submit working drawings bearing the fabricator or supplier's title block for review and approval to the County or directly to the consulting engineer as directed by Section 499.

450.02 MATERIALS. Refer to Section 414.02.

Sample Panel. Refer to the Architectural Treatment specifications in the Contract Documents.

Some projects may require a specified surface such as an ashlar stone pattern, or matching a similar structure or stonework in the area. The Contractor may request or the Engineer may direct that the sample of the texture be submitted for approval prior to submission of the sample panel containing the specified stain.

450.02.01 Reinforcement. Reinforcing bars and welded wire fabric in retaining walls that are less than 10 ft from the edge of paved surface (includes shoulders) shall be epoxy coated. Supports for epoxy coated reinforcement shall be coated the same as the reinforcing steel.

450.02.02 Backfill for Preapproved Alternates. Use size No. 57 stone as backfill for all preapproved alternate retaining walls, regardless of the type backfill recommended or specified by the retaining wall manufacturer. Use geotextile when specified.

450.02.03 Concrete Stain. When a color is specified for the exposed surfaces of the retaining wall, select the stain from the Prequalified List of concrete stains maintained by the MdSHA Office of Materials Technology. The color number shall meet Federal Standard 595.

450.02.04 Textures.

(a) Unless otherwise specified, the exposed surfaces of the retaining wall shall receive a special surface treatment as specified in Section 414.03.07(b).

(b) When a special texture is specified, it shall be produced by using an approved form liner.

450.02.05 Preapproved Alternate Retaining Wall. Match the materials and details as approved and on file in the Bureau of Engineering and Construction, Design Division-Structural Design Section.

450.03 CONSTRUCTION. Construct retaining walls as shown on the Plans, as specified in Section 414.03, and herein. Construct alternate retaining walls according to the details and specifications that are on file with the MdSHA Office of Structures. Should any detail or specification change, the retaining wall firm shall submit the revision to the Engineer for review and approval prior to using that revision on County projects. Revisions shall not be submitted for projects that are already bid.

Do not apply any loading to retaining wall concrete until the concrete in that portion has attained a compressive strength of at least 3000 psi. In addition, complete the backfilling prior to placing any loads on the wall.

450.03.01 Concrete Stain. When stain is specified, apply two coats according to the manufacturer's recommendations or as directed. Before application, ensure that all surfaces are structurally sound, clean, dry, fully cured, and free from dust, curing agents, form release agents, efflorescence, scale, and other foreign materials.

450.03.02 Anchor Bolt Assemblies. When required, install as specified. Assemble anchor assemblies and place them at the specified elevation and spacing. Use templates for proper alignment and spacing of all anchor assemblies prior to concrete placement. Ensure that the threads of the anchors are long enough to provide room for a 1-inch concrete encasement, leveling nuts, washers, base plate, and at least a ½ inch protrusion through the top of the top nut when the wall is properly installed.

All holes and welding required in the assemblies shall be done before galvanizing. Keep all assemblies free of oil and mill coatings.

450.04 MEASUREMENT AND PAYMENT. Retaining walls will not be measured but will be paid for at the Contract lump sum price for the pertinent ***Retaining Wall*** item. The payment will be full compensation for all piles, caissons, footings, forms and form removal, architectural treatment, reinforcement steel, concrete, curing, anchorage assemblies, stains and coatings, excavation, sheeting and shoring, drainage systems, backfill (including size No.

57 stone and geotextiles for alternate retaining walls), and for all material, labor, equipment, tools, and incidentals necessary to complete the work.

When specific items for Piles for Retaining Walls are included in the Contract Documents, they will be measured and paid for as specified in Section 407.04.

SECTIONS 451 Through 469 – RESERVED

SECTION 470 – UTILITIES ON STRUCTURES

470.01 DESCRIPTION. Place utility markers to identify utilities when they are newly installed, replaced, or relocated. Place the identification markers as specified herein and as approved.

470.02 MATERIALS. Use decals or stencil high quality black or white print onto the pipe or carrier. Lettering height shall be 1/3 the pipe diameter but not less than 1 in. or more than 4 in. Markers shall include the name of the utility and a description of the contents as shown in the Contract Documents or as directed.

Submit a sample of the proposed markers.

470.03 CONSTRUCTION. Place identification markers within the first and last 50 ft of the structure, and at intervals not to exceed 100 ft.

Ensure that the surface to receive the marker is properly cleaned and prepared prior to the application. Orient the markings for best visibility.

470.04 MEASUREMENT AND PAYMENT. The application of utility markers on structures will not be measured but the cost will be incidental to the pertinent items.

SECTIONS 471 Through 498 – RESERVED

SECTION 499 – WORKING DRAWINGS

499.01 DESCRIPTION. Schedule and distribute working drawings, which are described in Section GP-1.05 and specified in Section TC-4.01. Working drawings shall exhibit good drafting practices and represent the original work of the Contractor, fabricator, or supplier. Duplicated portions of the Plans will not be accepted. When requested by the County or consultant, submit calculations or other information deemed necessary to backup working

drawings. Calculations and other backup material shall be signed and sealed by a Professional Engineer registered in the State of Maryland.

499.02 MATERIALS. Not applicable.

499.03 CONSTRUCTION.

499.03.01 Schedule. As a first order of work, prepare and submit a schedule for the submission of the working drawings as specified in Sections 499.03.02 or 499.03.03. Coordinate the schedule with and in full accord with the Progress Schedule submitted to the procurement officer as specified in Section GP-8.04.

The schedule shall include each type of working drawings (e.g. form plans, structural steel, etc.), approximate number of drawings to be reviewed, estimated date of first submission, and estimated rate of submission of drawings (e.g. 5/wk). Where possible, submit the most crucial drawings first with sufficient time for review so as to minimize delays during construction.

499.03.02 Consultant Engineering Firm. When the Contract Documents specify that a consulting engineering firm is to review the working drawings for the structure, send all working drawings to that firm.

To expedite the checking and distribution of working drawings, fabricators or suppliers may send prints directly to the appropriate consulting engineering firm with copies of all correspondence to the Contractor and the Baltimore County Bureau of Engineering and Construction, Design Division, Structural Design Section. If the Contractor requests that all plans be routed through the Contractor's office, then the establishment of that procedure should be the first order of work so as to avoid possible misunderstandings as to the processing. Be advised that this plan of action will delay the turn around time and will not constitute grounds for complaint or a time extension.

The Contractor, fabricator, or supplier shall furnish to the consultant engineering firm 10 prints each of all working drawings, etc., for primary review.

Once primary review is complete, the Contractor, fabricator, or supplier shall furnish to the consultant engineering firm additional prints (number to be furnished by primary reviewer) for stamping and forwarding to the Baltimore County Bureau of Engineering and Construction, Design Division, Structural Design Section for distribution.

All working drawings for the structures will not be considered accepted until they bear the acceptance stamp of the consulting engineering firm.

499.03.03 Bureau of Engineering and Construction. When no consulting engineering firm is specified, send all working drawings for the structures to the Bureau Chief, Baltimore County Bureau of Engineering and Construction, Attn, Structural Design Section.

To expedite the checking and distribution of working drawings, fabricators or suppliers may send prints directly to the Bureau Chief, Baltimore County Bureau of Engineering and Construction with copies of all correspondence to the Contractor and the Bureau of Engineering and Construction, Division of Construction Contracts Administration. If the Contractor requests that all drawings be routed through the Contractor's office, then the establishment of that procedure should be the first order of work so as to avoid possible misunderstandings as to the processing. Be advised that this plan of action will delay the turn around time and will not constitute grounds for complaint or a time extension.

The Contractor, fabricator, or supplier shall furnish to the Bureau Chief, Baltimore County Bureau of Engineering and Construction 10 prints each of all working drawings, etc., for primary review.

Once primary review is complete the Contractor, fabricator, or supplier shall furnish to the Bureau Chief, Baltimore County Bureau of Engineering and Construction additional prints (number to be furnished by primary reviewer) for final review and distribution.

499.03.04 Revisions and Substitutions. All modifications, regardless of whether or not the Contract includes a consulting engineering firm, shall be sent to the Chief, Bureau of Engineering and Construction for acceptance. Any modifications implemented, without written acceptance from the Bureau Chief, Baltimore County Bureau of Engineering and Construction will be subject to the requirements of Section GP-5.02.

499.04 MEASUREMENT AND PAYMENT. This work will not be measured but the cost will be incidental to other pertinent items.

(This page intentionally left blank)

CATEGORY 500
PAVING

SECTION 501 – AGGREGATE BASE COURSES

501.01 DESCRIPTION. This work shall consist of constructing base courses using one of the following as specified in the Contract Documents or as directed by the Engineer:

(a) Graded aggregate without a stabilizing agent.

(b) Plant mixed graded aggregate with a Portland cement stabilizing agent.

(c) Bank run gravel.

(d) Sand aggregate.

501.02 MATERIALS.

Graded Aggregate for Base Course	901.01
Bank Run Gravel for Base Course	901.01
Sand Aggregate Base Course:	
Coarse Aggregate	901.01, Size No.57
Fine Aggregate	916.01.01
Portland Cement	902 Type I or IA
Emulsified Asphalt	904.03
Production Plant	915
Water	921.01
Calcium Chloride	921.02.01
Magnesium Chloride	921.02.02

501.03 CONSTRUCTION. At least 30 days prior to the start of constructing the base course, the Contractor shall submit to the Engineer proposed plants, equipment, and material sources for approval.

The Contractor shall protect the subgrade and base against damage from all causes. Any part of the subgrade or base that is damaged shall be repaired or replaced by and at the Contractor's expense, in a manner acceptable to the Engineer.

501.03.01 Equipment. All equipment, including the production plant and on-site equipment, shall be subject to approval by the Engineer. The plant shall be ready for inspection by the Engineer at least 48 hours prior to the start of construction operations.

501.03.02 Weather Restrictions.

(a) Temperature and Surface Conditions. Graded aggregate stabilized with Portland cement shall be placed only when the ambient air and surface temperature is at least 40 F and rising. Graded aggregate, bank run gravel and sand aggregate base shall be placed only when the ambient air and surface temperature is at least 32 F and rising. No material shall be placed on a frozen subgrade.

(b) Cold Weather Protection. The plant mixed graded aggregate stabilized base shall be protected from freezing during the seven day curing period.

(c) Precipitation. Construction shall not take place during precipitation. When precipitation has occurred during the previous 24 hours, the Engineer will determine if the subgrade is sufficiently dry. Any material en route from the plant to the job site may be placed at the Contractor's risk.

501.03.03 Subgrade Preparation. The approved subgrade set to final line and grade shall be completed at least 500 feet ahead of the base course or as directed by the Engineer before the base course construction begins. The foundation shall be constructed as specified in Sections 204 and 208, the Contract Documents, and as approved by the Engineer. If traffic, including construction equipment, is allowed to use the subgrade foundation or preceding layer, it shall be distributed over the entire width of the course to aid in obtaining uniform and thorough compaction. Remove any ruts that are formed by reshaping and re-compacting the affected area as specified in Section 204.

501.03.04 Stabilized Graded Aggregate Base Mix. The amount of Portland cement shall be determined as specified in MSMT 321.

501.03.05 Bank Run Gravel Base Mix. The Contractor will be permitted to mix or blend materials using chemical additives approved by the Engineer.

501.03.06 Sand Aggregate Base Mix. The mixture shall contain 35 to 40 percent coarse material as measured by dry weight of the total mix.

501.03.07 Transportation. Mixed base materials shall be handled and transported in a manner that minimizes segregation and loss of moisture. All loads shall be covered in conformance with State laws unless hauling is off road and is approved by the Engineer. Dumping stone into piles, hauling over the completed stone base course, and stockpiling of material on the job site is prohibited unless approved by the Engineer.

501.03.08 Spreading. The stone base material shall be uniformly spread without segregating the coarse and fine particles, in layers of approximately equal thickness, to provide the specified planned depth. Shoulders or berms that are 2 feet or more in width shall be built up on each side of the base to the top elevation of each uncompacted layer unless the base is placed against concrete curbs or gutters.

501.03.09 Grade or Finished Surface Control. The surface of the base material shall be brought to line and grade and shaped to the specified cross section. Grades shall be set longitudinally and transversely with fixed controls not to exceed 25 ft spacing. The surface material shall be compacted and smoothed over its full width using a smooth faced steel wheeled roller or, if rolling is not feasible, by mechanical tampers and vibratory compactors as approved by the Engineer. The finished grade shall not deviate more than 1/2 in. from the established grade.

501.03.10 RESERVED.

501.03.11 Compaction. Immediately after placement, the base material shall be compacted to the required density. During compaction operations, the moisture content of the material shall be maintained within 2 percent of the materials optimum moisture. The optimum moisture content and maximum dry density shall be determined as follows:

Sand Aggregate Base and Bank Run Gravel Base	T 180
Graded Aggregate Base and Graded Stabilized Aggregate Base	MSMT 321

Graded Aggregate for Base, Bank Run Gravel Base, and Sand Aggregate Base shall be compacted to a density not less than 97 percent of the maximum dry density. Graded Stabilized Aggregate Base shall be compacted to a dry density not less than 95 percent of the maximum dry density. In-place density shall be measured as specified in MSMT 350 or 352.

Compaction operations, except on superelevated curves, shall begin at the sides of the course, overlap the shoulder or berm at least 1 ft and progress toward the center parallel to the center line of the roadway. Superelevated curve compaction shall begin at the low side of the superelevation and progress toward the high side. The compaction operation shall continue until all compaction marks are eliminated.

501.03.12 Graded Stabilized Aggregate Base Protection and Curing. When Graded Stabilized Aggregate Base is used, the spreading, compacting and shaping shall be completed within three hours after the mixing water, cement and aggregate have come in contact. Any section not conforming to these requirements shall be reconstructed as directed by the Engineer at the Contractor's expense. The surface of the stabilized aggregate base course shall be maintained in a moist condition until the emulsified asphalt seal coat is applied. The emulsified asphalt shall be applied by distributing equipment as specified in Section 503.03.01 at the rate of 0.2 gal/sq.yd. Ponding of the emulsified asphalt shall be avoided. If ponding occurs, the Contractor shall use a sand blotter or an equivalent method as approved by the Engineer.

The stabilized aggregate base course shall be allowed to cure for a period of seven days. During this period the base course shall be closed to all traffic. Any portion of the base course seal coat that is damaged shall be repaired at the Contractor's expense.

501.03.13 Moisture and Dust Control Agents. When specified, add calcium or magnesium chloride at the plant or apply it to the surface of the material at the project site. Apply calcium chloride at the rate of 1 lb/sq.yd. Apply magnesium chloride at the rate of 1 lb/sq.yd or as a solution at the rate of ½ gal/sq.yd.

501.03.14 Maintenance. On capital roadway projects, the Contractor shall be responsible for the protection of the stone base for the duration of the project. Any areas determined to be unsatisfactory shall be restored to the satisfaction of the Engineer.

In Developments, a 60-day maintenance period is required after stone has been placed, and/or prior to any soil cement operations. After the 60-day maintenance period has elapsed, the Developer is responsible to remove any contaminated stone and re-grade the replacement stone to the proper grade. This maintenance period may be waived by following the procedures below.

I. Prior to the pre-construction meeting, provide a testing plan to the Department of Construction Contracts, advising of the intent to seek a waiver to the 60-day maintenance period for a road and/or roads in your subdivision. Include in your letter the proposed testing program to be used and the name of the firm or company which will be monitoring and testing the grading operation, along with the registered Professional Engineer certifying the results.

II. County approval of a testing program which demonstrates that construction procedures meet County specifications; an acceptable program is as follows:

A. Intent

1. The intent of this testing program is to assure proper compaction of trench backfill, structural backfill, embankment, subgrade and stone base course within County ROW and easements.

B. Required Compaction

1. Embankment, trench and structure backfill below top one (1) foot-90% min.
2. Subgrade (12" depth) and stone base-90% min.
3. No correlation from T-99 to T-180 will be accepted.
4. Tech is required to perform and document _____ and moisture content at least once a week or at obvious soil entrances.

C. Personnel

1. Certification of proper earthwork compaction including trench, backfill, embankment, subgrade and pavement base course shall be by a

registered professional engineer experienced in the control of earth structures.

2. A certified (WACEL, NICET, MARTCP or similar) soil technician is to be present at all times that filling, back filling or subgrade preparation is occurring.
    a. Personnel certification shall be submitted as part of the testing plan.

D. Equipment

1. An approved, properly calibrated device for measuring fill density plus other equipment necessary to perform moisture density tests and moisture content, by drying, is to be on the job site at all times that earthwork is occurring.

E. Minimum In Place Density Testing Required

1. The primary means of earthwork inspection by an experienced technician in performed visually. However, testing will be required to document the Contractors performance.

    a) Embankment- 1 test for each 750 cubic yards with a minimum of 2 per day.
    b) Trench Backfill- 1 test for each 3 foot of fill per 150 linear feet of trench (including house connections) with a minimum of 2 per day.
    c) Structure Backfill-1 test for each 3 feet of fill per structure in roadway.
    d) Subgrade-1 test for each 750 linear feet, 12 feet wide, with minimum of 2 per day.
    e) Base Course-1 test for each 2,000 linear feet, 12 feet wide and 8 inches thick with a minimum of 1 per day.
    f) The County may direct additional tests in the other locations where work is questionable.

F. Records

1. All test locations and comments are to be properly referenced to the contract plans as to location and relative elevation.
2. The project technician is to keep a daily log listing earthwork performed and available operating compaction equipment.
3. All tests will be consecutively numbered with a letter code designating the type of construction shown below.

    a) Embankment – E
    b) Trench Backfill – T
    c) Structure Backfill – ST

d) Subgrade – S
e) Base Course – B

4. Re-tests of failing tests are to be so marked.
5. Test results are to be made available to toe Contractor upon completion of test.
6. All field data, including individual test valves and the technician's daily logs, will be submitted with the Certification.

III. Examination of existing soil conditions and determination of suitability for placement of embankment; preparation of existing grade for acceptance of embankment fill.

IV. Certification by a registered professional engineer experienced in soil engineering as to III above and that the roadway embankment is constructed in accordance with the County specifications.

V. Full trench compaction of all utility trenches also included in the certification.

VI. A certified soil technician is to be on site during grading/filling operations with proposed road right-of-way.

VII. Submission of soil test data and results for verification and approval.

VIII. Developer to provide a warranty of roadway construction for a period of one year after acceptance of road construction contract.

IX. Attached you will find a standard form for reporting your test results and a standard form for proctor test results. All results should be reported on these forms.

The County reserves the right to conduct its own tests monthly to verify compaction during or after the filling operation.

If the road embankment and utility trenches are constructed in accordance with the above procedures and there are no obvious deficiencies in the fill or trench backfill, the developer can anticipate receiving a waiver of the 60-day maintenance period. An intervening action prior to placement of stone base or initiation of paving which causes a failure of either the subgrade or stone base must be corrected at the direction of the Engineer prior to proceeding.

501.04 MEASUREMENT AND PAYMENT. The payment will be full compensation for all aggregate, furnishing, hauling, placing, curing, and for all materials, labor, equipment, tools,

and incidentals necessary to complete the work.

501.04.01 ***Graded Aggregate Base Course***, ***Graded Aggregate Base Course Stabilized With Cement***, ***Bank Run Gravel Base Course***, and ***Sand Aggregate Base Course*** will be measured and paid for at the Contract unit price per square yard.

Surface area measurements will be based on the width of the base as specified in the Contract Documents and the actual length measured along the centerline of the base surface.

501.04.02 The Portland Cement stabilizing agent and the emulsified asphalt for seal coat will not be measured but the cost will be incidental to the Contract unit price per square yard for ***Graded Aggregate Base Course Stabilized with Cement***.

501.04.03 Bank Run Gravel Base. Material manipulation or addition of chemical additives will not be measured but the cost will be incidental to the Contract unit price per square yard for ***Bank Run Gravel Base Course***.

501.04.04 ***Calcium Chloride*** or ***Magnesium Chloride*** will be measured and paid for at the Contract unit price per square yard or if specified in the Contract Documents, at the Contract unit price per ton.

501.04.05 The stone base course shall be clean and acceptable to the Engineer prior to beginning paving operations. If the stone base course is contaminated, the Contractor shall remove all of the contaminated stone base course and replace it with new aggregate to the satisfaction of the Engineer prior to commencing paving operations. There will be no compensation to the Contractor for removal and replacement of contaminated stone base course.

SECTION 502 – SOIL-CEMENT BASE COURSE

502.01 DESCRIPTION. This work shall consist of constructing soil cement base course using a combination of soil and Portland cement, uniformly mixed, moistened, compacted, shaped and sealed. Unless otherwise specified in the Contract Documents, the soil, cement and water may be mixed in a plant or mixed in-place, at the Contractor's option.

502.02 MATERIALS.

Portland Cement	902
Emulsified Asphalts	904.03
Production Plant	915
Soil	916.01.01 or 916.01.02; Capping shall not contain aggregate retained on a 3 in. sieve, nor more than 45 percent

	retained on a No. 4 sieve
Water	921.01

502.03 CONSTRUCTION. At least 30 days before beginning construction, the Contractor shall submit information regarding proposed production plants, location of plants with respect to project site, equipment, and material sources to the Engineer for approval.

The Contractor shall protect the subgrade and base against damage from all causes. Any part of the subgrade or base that is damaged shall be repaired or replaced by and at the Contractor's expense in a manner acceptable to the Engineer.

502.03.01 Equipment. All equipment, including the production plant and on-site equipment, shall be subject to approval by the Engineer. The production plant shall be ready for inspection by the Engineer at least 48 hours before the start of construction operations.

502.03.02 Weather Restrictions.

(a) Temperature and Surface Conditions. Soil-cement base course shall be placed only when the ambient air and surface temperature is at least 40 F and rising. No material shall be placed on frozen subgrade.

(b) Cold Weather Protection. The completed base shall be protected from freezing during the 7 day curing period.

(c) Precipitation. Construction shall not take place during precipitation. When precipitation has occurred during the previous 24 hours, the Engineer will determine if the subgrade is sufficiently dry. If precipitation occurs during placement, material en route from the plant to the job site may be placed at the Contractor's risk.

502.03.03 Subgrade Preparation. The approved subgrade set to final line and grade shall be completed at least 500 ft ahead of the base course or as directed by the Engineer before the base course construction begins. The foundation shall be constructed as specified in Sections 204 and 208, the Contract Documents, and as approved by the Engineer. If traffic, including construction equipment, is allowed to use the subgrade foundation or preceding layer, it shall be distributed over the entire width of the course to aid in obtaining uniform and thorough compaction. Remove any ruts that are formed by reshaping and re-compacting the affected area as specified in Section 204.

502.03.04 Design Mix. At least 45 days prior to the start of constructing the base course, the Contractor shall submit to the Engineer, samples of the soil and Portland cement from the proposed material sources. Materials shall be sampled as specified in the MdSHA Materials Manual. The Engineer shall determine the exact proportions of soil and Portland cement, and the optimum moisture content based on these samples. Proportions may be revised during construction to provide for changing conditions as directed by the Engineer. Plant mixed material may be sampled at the plant at the discretion of the Engineer. Mixed in place material

shall be sampled from a 100 ft long control strip constructed on the site by the Contractor.

502.03.05 Transportation. Mixed materials shall be handled and transported to minimize segregation and loss of moisture. All loads shall be covered in conformance with State laws unless hauling is off road and is approved by the Engineer. Dumping into piles, hauling over the completed base course, and stockpiling of mixed material is prohibited unless approved by the Engineer.

502.03.06 Spreading of Plant Mix Material. The approved soil-cement mix shall be uniformly spread over the subgrade in layers of approximately equal thickness, avoiding segregating the coarse and fine particles, to provide the specified planned depth. Build shoulders or berms at least 2 feet wide on each side of the base to the top elevation of each uncompacted layer except when placing the base against concrete curbs or gutters.

502.03.07 Mixed-In-Place Construction. The soil base material shall be pulverized to ensure that, at the completion of moist mixing, 100 percent passes a 1 in. sieve and a minimum of 80 percent passes a No. 4 sieve. Moisture content of soil at the time of cement application shall not vary more than 2 percent from optimum. Portland cement shall then be spread on the soil at the approved spread rate. The Contractor shall use an accurate scale to verify the spread rate in the presence of the Engineer. The pulverized soil and cement shall then be thoroughly mixed. Immediately after the mixing operation is completed, the water shall be sprayed on the mixture at the approved rate using a pressurized distributor. The soil/cement/water combination shall be mixed until it is uniform, as determined by the Engineer.

502.03.08 Grade or Finished Surface Control. The surface of the base material shall be brought to line and grade and shaped to the specified cross section. Grades shall be set longitudinally and transversely with fixed controls not to exceed 25 ft spacing. The surface material shall be compacted and smoothed over its full width using a smooth faced steel wheeled roller, or, if rolling is not feasible, by mechanical tampers and vibratory compactors as approved by the Engineer. The finished grade shall not deviate more than 1/2 in. from the established grade.

502.03.09 Finishing. The surface of the base material shall be shaped to the required lines, grades and cross section specified in the Contract Documents.

502.03.10 Compaction. Immediately after placement, the soil-cement base shall be compacted to a density of not less than 100 percent of the maximum density as determined by T 134. In-place density shall be measured as specified in MSMT 350. When required per Contract, the Contractor shall provide a Portland cement concrete compaction block as specified in Section 204.03.04.

At the start of compaction, the percentage of moisture in the mixture shall not be more than two percentage points above or below the specified optimum moisture content of the soil-cement mixture. Compaction operations, except on superelevated curves, shall begin at the sides of the course, overlap the shoulder or berm at least 1 ft and progress toward the center parallel to the center line of the roadway. Superelevated curve compaction shall begin at the

low side of the superelevation and progress toward the high side. The compaction operation shall continue until all compaction marks are eliminated.

502.03.11 Construction Joints. A straight transverse construction joint shall be formed at the end of each day's construction by cutting back into the completed work to form a vertical face. The base for large, wide areas shall be built in a series of parallel lanes of convenient length and width, complete with longitudinal joints, as approved by the Engineer.

502.03.12 Protection and Curing. All spreading, compacting and shaping shall be completed within three hours after mixing water, cement and soil have come in contact. Any section not conforming to these requirements shall be reconstructed as directed by the Engineer. The surface of the base course shall be maintained in a moist condition until the emulsified asphalt is applied. The emulsified asphalt shall be applied by distributing equipment as specified in Section 503.03.01 at the rate of 0.2 gal/sq.yd. Ponding of the emulsified asphalt shall be avoided. If ponding occurs, the Contractor shall use a sand blotter or an equivalent method as approved by the Engineer.

The soil cement base course shall be allowed to cure for a period of seven days. During this period the base course shall be closed to all traffic. Any portion of the base course that is damaged shall be repaired at the Contractor's expense.

502.03.13 Maintenance. The Contractor shall maintain the base course during construction and after completion of the base course until the surface course is placed. Unacceptable work that cannot be repaired shall be replaced for the full depth of the base course at the Contractor's expense.

502.04 MEASUREMENT AND PAYMENT. The payment will be full compensation for furnishing, hauling, mixing, placing, compacting, watering, control strip, emulsified asphalt, and for all labor, equipment, tools, and incidentals necessary to complete the work.

502.04.01 ***Soil-Cement Base Course*** will be measured and paid for at the Contract unit price per square yard.

Surface area measurements will be based on the width of the base as specified in the Contract Documents and the actual length measured along the centerline of the base surface.

502.04.02 ***Portland Cement for Soil-Cement Base Course*** will be measured and paid for at the Contract unit price per ton.

SECTION 503 – CHIP SEAL SURFACE TREATMENT

503.01 DESCRIPTION. This work shall consist of applying one or two seal coats or a prime coat followed by one or two seal coats as specified in the Contract Documents or as directed

by the Engineer. The seal coat shall consist of applying emulsified asphalt followed by an application of aggregate. The prime coat, when required, shall consist of preparing and treating an existing surface with emulsified asphalt.

503.02 MATERIALS.

MATERIAL	SECTION	APPLI-CATION	SIZE OR GRADE	SPREAD RATE Lb/Sq.Yd	SPRAY TEMP F	SPRAY RATE-SINGLE COAT OR FIRST COAT Gal/Sq.Yd.	SPRAY RATE FOR SECOND COAT (Double) Gal/ Sq.Yd.
Aggregate	901	Single or First Coat	No. 7	25-50	-----	-----	-----
		Second (Double Coat)	No.8	20-35	-----	-----	-----
Cutback Asphalts	904.04	Prime Coat	MC-30	------	75-100	0.1 – 0.5	-----
			MC-70	------	105-175	0.1 – 0.5	-----
Emulsified Asphalts	904.03	Seal Coat	CRS-1	-----	70-140	0.3 – 0.5	0.2 – 0.4
			CRS-2	-----	140-160	0.3 – 0.5	0.2 – 0.4
			RS-1	-----	70-140	0.3 – 0.5	0.2 – 0.4
			RS-2	-----	140-160	0.3 – 0.5	0.2 – 0.4

503.03 CONSTRUCTION. At least 30 days prior to the start of placement of the chip seal surface treatment, the Contractor shall submit to the Engineer for approval a proposed plan, including equipment and material sources.

The Contractor shall protect the treated pavement against damage from all causes. Any part of the pavement that is damaged shall be repaired or replaced by and at the expense of the Contractor.

503.03.01 Equipment. All equipment shall be subject to approval by the Engineer.

(a) Asphalt Distributing Equipment. Asphalt distributing equipment shall bear a current MdSHA inspection and calibration tag. A calibration chart showing the total capacity, in gallons, of the distributor tank, and the fractional capacity for each 1/4 in. of tank depth shall be carried in the unit. The unit shall be capable of uniformly applying the specified material on variable widths of surface at the rates specified in Section 503.02. In addition, the equipment shall include the following:

(1) A fifth wheel tachometer for maintaining uniform speed.

(2) A thermometer graduated in 2 F increments to determine the specified temperature ranges.

(3) Heaters for uniformly heating the materials to the proper temperatures.

(4) Full circulation spray bars that are laterally and vertically adjustable, plus a hand spray.

(5) A calibrated tank to determine the quantity of asphalt in each load and the amount used.

(6) A valve or petcock built into the equipment for sampling the asphalt.

(7) A motor driven pump with pressure gauges to deliver the material to the spray bars. When a variable speed pump and metering system is used, the Contractor shall provide the Engineer with charts prepared by the manufacturer for selecting the proper pump speed for each application.

(b) Aggregate Spreader. The aggregate spreader shall be either self propelled or attached to a truck tailgate.

(c) Rollers. Refer to Section 504.03.01(c).

503.03.02 Weather Restrictions. The chip seal surface treatment shall be placed only when the ambient air and surface temperature is at least 50 F and rising. Pavement shall be clean and dry. When weather conditions differ from these limits, material en route from the plant to the job site may be used at the Contractor's risk. All material en route shall be wasted at the Contractor's expense if the Engineer stops placement of the material.

503.03.03 Foundation Preparation. Prior to placement of the chip seal surface treatment material, the foundation for the chip seal shall be constructed as specified in the Contract Documents and as directed by the Engineer. When paving over existing pavement, ruts and pot holes shall be repaired to provide a smooth surface for the application of the chip seal surface treatment.

503.03.04 Prime Coat. Prior to the application of the prime coat, the surface shall be cleaned of all loose and foreign materials. The prime coat shall be uniformly applied to the surface at the application rate specified in Section 503.02. Excess material in pools shall be removed before the next coat.

503.03.05 First Seal Coat.

(a) A minimum of 24 hours after the application of the prime coat, an emulsified asphalt shall be sprayed on the surface at the application rate specified in Section 503.02.

(b) Immediately following the asphalt application, a dry, dust free aggregate shall be spread on the surface at the application rate specified in Section 503.02. Excess aggregate shall be removed and all areas containing insufficient aggregate shall be corrected.

503.03.06 Rolling. Immediately following the aggregate application, the surface shall be rolled until the aggregate is uniformly embedded into the asphalt. The rolling shall be discontinued if the aggregate begins to crush.

503.03.07 Second Seal Coat. When specified, but no sooner than 24 hours after the first seal coat, a second seal coat shall be applied to the surface, omitting the prime coat. The application rate for emulsified asphalt and aggregate shall be as specified in 503.02. Excess aggregate shall be removed and all areas containing insufficient aggregate shall be corrected. The surface shall then be rolled as specified in Section 503.03.06.

503.03.08 Traffic. Completed sections shall be closed to traffic until the final seal coat has completely cured as directed by the Engineer. The Contractor shall maintain the treated surface after it has been opened to traffic until final acceptance.

503.04 MEASUREMENT AND PAYMENT. The payment will be full compensation for the foundation preparation, furnishing, hauling, preparing, removing excess aggregate, placing materials, and for all labor, equipment, tools, and incidentals necessary to complete the work.

Chip Seal Surface Treatment will be measured and paid for at the Contract unit price for one or more of the items listed below as specified in the Contract Documents.
503.04.01 ***No. 7 Aggregate for Single Coat Chip Seal Surface Treatment*** per ton.

503.04.02 ***No. 8 Aggregate for Second Coat Chip Seal Surface Treatment*** per ton.

503.04.03 ***Emulsified Asphalt for Seal Coat*** per gallon.

The actual number of gallons of cutback asphalt (if specified) and emulsified asphalt distributed will be corrected to the corresponding volume at 60 F as determined by use of conversion tables furnished by the MdSHA.

SECTION 504 – HOT MIX ASPHALT PAVEMENT

504.01 DESCRIPTION. This work shall consist of constructing Hot Mix Asphalt (HMA) pavement as specified in the Contract Documents.

504.02 MATERIALS.

Performance Graded Asphalt Binders	904.02
Emulsified Asphalt Tack Coat	904.03
Hot Mix Asphalt and Superpave Mixes	904.04, Tables 901(C) and 901(D)
Crack Filler	911.01
Production Plant	915

504.03 CONSTRUCTION. A pre-paving Conference shall be held on site before any paving is begun. The Contractor shall make the request sufficiently ahead of time to schedule the pre-paving conference. The Chief Inspector, the Inspector, the Paving Foreman and the Paving Superintendent shall be in attendance at this conference. Before the finish surface course is placed, the Contractor must receive authorization to proceed from the Engineer.

The Contractor shall protect the pavement against damage from all causes. Any part of the pavement that is damaged shall be repaired or replaced by and at the expense of the Contractor to the satisfaction of the Engineer.

504.03.01 Equipment. All equipment, including the production plant and paving equipment, shall be subject to approval by the Engineer. The plant shall be ready for inspection by the Engineer at least 48 hours prior to the start of construction operations.

(a) Hauling Units. Refer to Section 915.02(f).

(b) Pavers. Pavers will be inspected and approved by the Engineer based upon requirements in the manufacturer's specification manual with a copy to be provided by the Contractor. The paver shall be a self-contained, power propelled unit capable of spreading the mixture true to line, grade and cross slope. The paver shall be equipped with a screed or strike off assembly that can produce a finished surface of the required smoothness and texture without tearing, shoving or gouging the mixture. The paver shall have automatic controls for transverse slope and grade. Controls shall be capable of sensing grade from an outside reference line or ski and sensing the transverse slope of the screed to maintain the required grade and transverse slope within plus or minus 0.1 of the required slope percentage.

Manual operation will be permitted to make grade changes or in the construction of irregularly shaped and minor areas, or where directed by the Engineer.

Whenever a breakdown or malfunction of any automatic control occurs, the equipment may be operated manually for the remainder of the work day as directed by the Engineer.

Reference lines or other suitable markings to control the horizontal alignment shall be provided by the Contractor, subject to the approval of the Engineer.

When placing any surface lane greater than 500 feet in length, a ski of 15 feet or greater must be used at each edge subject to approval by the Engineer. The Contractor has the option to use a joint matcher when abutting previous surface paving or gutter pan, or the machine-provided slope control.

(c) Rollers. Rollers shall be self-propelled, reversible, steel-wheeled or pneumatic tired and shall be approved by the Engineer prior to being used on the project. They shall be operated in conformance with the manufacturer's recommendations, in a manner that

does not damage the mat and delivers the optimal combination of densification and ride requirements. Pneumatic tire rollers shall have multiple tires of equal size with smooth tread. Wheels shall be arranged to oscillate in pairs, or they may be individually sprung. Tires shall be inflated uniformly at the operating pressure approved by the Engineer. The Contractor shall furnish the Engineer with a manufacturer's table showing this data. The difference in tire pressure between any two tires shall not be greater than 5 psi. The Contractor shall provide a means for checking the tire pressure on the job at all times.

Vibratory rollers may be used, but shall not be in vibratory mode when operating on bridge decks or on a surface course without the Engineer's prior approval.

(d) Reserved.

(e) Grade References: The Contractor must provide a ten-foot straightedge, stringline, and paint for marking grade references.

(f) Thermometers: The Contractor shall provide a thermometer for measuring the temperature of hot mix in trucks. Trucks must have a sufficient side hole for access to the truck bed. In addition, a probe-type surface thermometer shall be provided for checking mat temperature.

504.03.02 Weather Restrictions. Pavement shall not be placed when the air temperature at the surface is below that indicated for the following courses: 50 degrees Fahrenheit and rising for smooth seal, or any course one inch or less; 40 degrees Fahrenheit and rising for surface course, or any course having a nominal depth of less than 2 inches; or 32 degrees Fahrenheit and rising for any other paving course. The base shall be clean and dry and approved by the Engineer before HMA paving begins. HMA pavement shall not be placed on a frozen base. When weather conditions differ from these limits, material en route from the plant to the job site may be used at the Contractor's risk. If placement of the material is stopped by the Engineer, all material en route shall be wasted at the Contractor's expense.

504.03.03 Preparation for Paving.

A. Foundation Preparation. Prior to the placement of paving material, the foundation shall be constructed as specified in the Contract Documents and approved by the Engineer. When paving over existing pavement, all excess crack filling or patch material shall be removed and all spalls and potholes shall be cleaned, tack coated with emulsified asphalt, filled, and tamped with hot mix asphalt before placement. Manholes, valve boxes, inlets, and other appurtenances within the area to be paved shall be set 1/4 inch below the finished grade of the road surface and the mortar shall be allowed to set a minimum of twelve hours before the surface course is placed. The Contractor shall provide reference lines for horizontal alignment and grade markings for vertical control subject to the approval of the Engineer. This shall include marking with paint the depth of mat needed to achieve the finished surface elevation. Such depth marks shall be made at checkpoints on the surface upon which the paving material is

to be placed.

B. Development Projects. Before surface course construction commences, grades will be checked to assure that the base course is less than 1/4 in. below the proposed grade and that there are no deviations of more than 3/8 inch in 10 ft. to the plane of paving. If the base course does not meet the above tolerances, wedge/level operations will be required.

C. Utilities. To protect against accidental clogging, existing sanitary sewers shall be covered within manholes, as directed by the Engineer, prior to any grubbing or grading operations. The owner of the involved utility shall perform all adjustments to utilities other than those specifically included in the proposal. A qualified Utility Contractor shall perform all adjustments to water services between the meter and the main. Adjustments between the meter and the house must be performed under the supervision of a Registered Master Plumber. Adjustments to sanitary sewers outside of the County right-of-way must be performed under the supervision of a Registered Master Plumber. It shall be the Contractor's responsibility to obtain all permits necessary for the performance of this work.

504.03.04 Emulsified Asphalt Tack Coat. Prior to application of the emulsified asphalt tack coat, the surface shall be cleaned of all loose and foreign materials. The emulsified asphalt tack coat shall be uniformly applied to the surface by full circulation spray bars that are laterally and vertically adjustable and provide triple fanning and overlapping action so that the resulting coating shall be applied at a rate of 0.01 to 0.05 gallons per square yard asphalt emulsion as directed by the Engineer.

504.03.05 Hot Mix Asphalt Placement. HMA shall be placed by the paver. Delivery of the mixture by the hauling units and placement shall be continuous. The temperature of the mixture shall not be less than 225 F at the time of placement. Broadcasting of loose mixture over the new surface will not be permitted.

504.03.06 Compaction. Immediately following placement of the HMA, the mixture shall be compacted by rolling to an in-place density of 92.0 to 97.0 percent of the maximum density. In-place compaction shall be completed before the mixture cools below 185 F, as determined by a probe type surface thermometer, supplied by the Contractor and approved by the Engineer. Price adjustment due to noncompliance with the required density will be as specified in Section 504.04.03.

Rolling shall consist of six separate operations in the following sequence:

(a) Transverse joint.
(b) Longitudinal joint.
(c) Edges.
(d) Initial breakdown rolling.
(e) Second or intermediate rolling.
(f) Finish rolling.

Steel wheel rollers shall be used for the first rolling of all joints and edges, the initial breakdown

rolling, and the finish rolling.

Rollers shall start at the sides and proceed longitudinally toward the center of the pavement, except on superelevated curves. All rolling shall begin at the low side and progress toward the high side. Successive trips of the roller shall overlap by at least one half the width of the roller. If the base widening is too narrow to permit the use of conventional rollers, a power driven trench roller shall be used.

When the trench must be excavated wider than the proposed width of the widening, form an earth berm or shoulder against the base HMA as soon as it is placed. Roll and compact the two materials simultaneously. Roll marks shall not be visible after rolling operations.

After rolling is completed, no traffic of any kind shall be permitted on the pavement until the pavement has cooled to less than 140 F.

Where patches in surface course are made per Section 505.03.11 (see below) payment for a 1/10 lane mile segment of surface pavement shall be made at 85% of the unit cost bid for hot mix asphalt surface. This shall be applied for each repair done in each individual lane, in a 1/10 mile area.

504.03.07 Joints. Both longitudinal and transverse joints in successive courses shall be staggered so that one is not above the other. Stagger transverse joints by the length of the paver. Stagger longitudinal joints at least 6 in., and arrange so that the longitudinal joint in the top course is within 6 in. of the line dividing the traffic lanes. Construct joints in a manner to provide a continuous bond between the old and new surfaces. When constructing longitudinal joints adjacent to existing HMA pavements overlap the existing pavement 1-inch to 1.5-inches. The initial longitudinal roller pass shall be on the un-compacted hot mat and 6-inches to 1-foot from the joint. The successive roller pass shall compact the overlapped material and the 6-inch to 1-foot material simultaneously.

Joints shall be constructed to provide a continuous bond between the old and new surfaces. Joints shall be coated with emulsified asphalt tack coat as directed by the Engineer. In the case of surface course, the edge of the existing pavement shall be cut back for its full depth on transverse joints to expose a fresh surface and the surface shall be coated with emulsified asphalt tack coat material as directed by the Engineer.

All joints shall be well bonded and sealed. Cold joints shall be painted with tack and adjoining material shall be placed so as to overlap contiguous surfaces by one to two inches forming a consolidated lip of material equal to 1/4 the thickness, or depth, of the unrolled surface. This overlapping lip shall be luted back onto the edge of the unrolled surface material creating a blunt ridge that shall be rolled into the new joint. Overlapping material shall not be broadcast onto the hot lane. When lanes are placed simultaneously, with two pavers moving in tandem, the loose depth shall match exactly.

The Engineer's representative may direct the edge of old or previously placed pavement be cut

down to full depth and cut back far enough to expose a fresh surface before joining a new material in order to assure a clean, even, and dense bond. All transverse joints shall be constructed in this manner. At all existing pavement, new material shall be installed to overlap existing paving by one or two inches and luted back onto the edge of the unrolled mix as specified above.

Contact surfaces of curbs, gutters, manholes etc. that will abut or join new material or pavements, shall be painted with a thin, uniform coating of hot tack before the hot mixture is placed against them. After the finishing machine places the hot mixture, sufficient hot material shall be placed to fill any spaces left open. In addition, a sufficient quantity of hot material shall overlap the contact surfaces to allow for a luted ridge that will compact 1/4 inch above gutter edges, manholes, and inlet frames. At reverse gutters the finished edges shall be flush. Finished surfaces that are exposed shall not be stained.

504.03.08 Edge Drop-off. Where HMA paving is being applied to highways carrying traffic, all compacted pavement courses exceeding 2-1/2 in. in depth shall be matched with the abutting lane or shoulder on the same working day. Where compacted pavement courses of 2-1/2 in. or less are placed, the Contractor shall have the option of paving the abutting lane or shoulder on alternate days. Pave the abutting lane or shoulder prior to weekends, holidays and temporary shutdowns, regardless of the depth of the compacted pavement course. When uneven pavement joints exist, place advance warning traffic control devices in conformance with the Contract Documents.

504.03.09 Tie-In. When HMA paving is being applied to the traveled way carrying traffic with a posted speed of 40 mph or less, construct a temporary tie-in at least 4 ft in length for each 1 in. of pavement depth. When HMA paving is being applied to the traveled way carrying traffic with a posted speed greater than 40 mph, construct a temporary tie-in at least 10 ft in length for each 1 in. of pavement depth. Construct temporary tie-ins before traffic is allowed to cross the transverse joint. Construct temporary tie-ins 10 feet or greater using a paver meeting the requirements of Section 504.03.01.

At the final tie-in point, remove a transverse portion of the existing pavement to a depth so the design thickness of the final surface course is maintained. Construct the final tie-in to a length equal to the posted speed per 1 in. depth of the design thickness of the final course, with a length of at least 25 ft per 1 in. depth and a maximum length of 50 ft per 1 in. depth.

504.03.10 Sampling and Testing. The Contractor shall furnish and deliver to the materials testing laboratory designated by the Engineer samples cut from each compacted course at locations designated by the Engineer. The sampling frequency must be approximately one per 200 tons (sub-lot), but not less than two per working day (lot). These cores shall be delivered no later than the next work day after compaction. Laboratory personnel shall determine the unit weight of these samples. The Contractor is responsible for repairs to areas from which samples are cut.

Exceptions: Density test samples are not required on contracts of less than 200 tons, where bituminous concrete is used in non-traffic-bearing areas, or on resurfaced bridge decks.

Should the Contractor fail to submit cores, a minimum of five percent (5%) shall be deducted from the pay factor.

504.03.11 Smoothness Tolerance in Base, Binder and Surface Course. After final compaction, the surface of the pavement shall be true to the established crown and grade, and shall be sufficiently smooth so that when tested with a straightedge placed upon the surface parallel with the centerline, the surface shall not vary more than one-eighth (1/8) inch from a true surface.

The transverse slope of the finished surface shall be uniform to such a degree that when tested with a straightedge placed perpendicular to the centerline, the surface shall not vary greater than three-sixteenth (3/16) inch from a true surface. Transverse joints shall be checked with a straightedge immediately after the initial rolling. Should the surface vary more than one-eighth (1/8) inch from true, the Contractor shall make immediate corrections suitable to the Engineer so that the finished joint surface shall not vary more than one-eighth (1/8) inch from a true surface and the material in all other aspects shall meet these Specifications.

504.03.12 Curbs, Gutters, Etc. Where permanent curbs, gutters, edges, and other supports are planned, they shall be constructed and backfilled prior to placing the HMA, which shall then be placed and compacted against them.

504.03.13 Shoulders. Shoulders abutting the HMA surface course of any two-lane pavement that is being used by traffic shall be completed as soon as possible after completion of the surface course on that lane. Shoulder construction shall be as specified in the applicable portions of Category 600 and the Contract Documents.

504.03.14 Pavement Profile. **Reserved.**

504.03.15 Control Strip. **Reserved.**

504.04 MEASUREMENT AND PAYMENT. ***Hot Mix Asphalt Superpave*** will be measured and paid for at the Contract unit price per ton. For purposes of estimating yield of material, use 160lb/cu.ft. unit weight for the asphalt. The payment will be full compensation for furnishing, hauling, placing all materials including anti-stripping additive, emulsified asphalt tack coat, pot hole and spall repairs, setting of lines and grades where specified, and for all labor, equipment, tools, and incidentals necessary to complete the work.

For temporary tie-ins, placement and removal of the temporary tie-in where hot mix asphalt is being applied to the traveled way carrying traffic will not be measured but the cost will be incidental to the Contract unit price per ton for ***Hot Mix Asphalt Superpave.***

Removal of the existing pavement or structure to heel-in the Hot Mix Asphalt will not be measured but the cost will be incidental to the Contract unit price per ton for ***Hot Mix Asphalt***

Superpave. When the existing pavement is milled, heel-in is not required.

Adjustment of existing visible manholes, valve boxes, inlets, or other structures will be paid on a force account basis unless an item for payment is provided in the Contract.

Protection of sanitary sewer manholes shall not be a separate pay item but will be included in the cost of other bid items.

References to proposal item and payment procedures do not apply to UA and RA contracts; however, all work shall be done as described in this section without regard to type of contract used.

504.04.01 Price Adjustment for Asphalt Binder. A Price Adjustment (PA) will be made to provide additional compensation to the Contractor or a credit to Baltimore County for the fluctuation in the cost of asphalt binder.

For adjustment purposes, the prevailing base index price will be the price specified for PG 64-22 (PG64S-22) at a time of bid opening. Cost differentials between PG 64-22 (PG64S-22) and a binder specified shall be included in the price bid per ton for Asphalt. A historical database will be maintained by Baltimore County DPW&T's Division of Construction Contracts Administration.

The PA will be made when the index price for the month of placement increases or decreases more than five (5) percent of the prevailing base index price. Computations will be as follows:

$$\text{Percent Change} = ((Pp - Pb) / Pb) \times 100$$
$$PA = T \times Q \times ((Pp - (D \times Pb))$$

Where:

PA = Price Adjustment for the current month
T = Design target asphalt content expressed as a decimal
Q = Quantity of asphalt placed for the current month
Pp = Index price for PG 64-22 (PG64S-22) asphalt binder per ton for the month of placement
D = 1.05 for increases over 5 percent; 0.95 for decreases over 5 percent
Pb = Prevailing base index price for PG 64-22 (PG64S-22) asphalt binder per ton

The increased adjustment payment to the Contractor will be paid through a Supplemental Agreement. PA resulting in a decreased payment will be deducted from monies owed the Contractor. There will be no compensation for Overhead and Profit to the Prime Contractor if a Subcontractor is utilized for paving operations. Because this is a price adjustment and not compensation for extra work, there will be no bond increase required.

Materials used under Maintenance of Traffic items including, but not limited to, Stage I Trench Repair, will not be considered for Price Adjustment for Asphalt Binder. To be eligible for

payment, the Contractor must submit to Baltimore County a request that shall include a breakdown of the computations and data involved. Should Baltimore County be entitled to a credit from the Contractor, Baltimore County will be responsible for providing appropriate documentation to the Contractor.

No adjustment will be made for Contracts requiring less than 1,000 tons of asphalt.

504.04.02 RESERVED.

504.04.03 Pavement Density Adjustment. The price adjustment due to noncompliance with the density requirements will be made against the adjusted bid price for hot mix asphalt in conformance with the following table. Price adjustment will be waived for that portion of the pavement where the Engineer determines that inadequate density is due to a poor foundation.

DENSITY PRICE ADJUSTMENT	
Average Compaction, **Percent of Maximum Density**	**Pay Factor** **%**
Greater than or equal to 92%	100%
Greater than or equal to 89% And less than 92%	95%
Greater than or equal to 87% And less than 89%	85%
Greater than or equal to 85% And less than 87%	75%

The price adjustment shall be based on the average of the cores representing that day's production (minimum of 2). Any sub-lot (200 tons) below 85% density will be cause to reject the entire lot (day's production) at the Engineer's discretion.

504.04.04 Price Adjustment for Hot Mix Asphalt Mixture. See MdSHA Standard Specifications for Construction and Materials Section 504.04.02, and as amended by the latest Special Provision Insert.

504.04.05 Thickness Tolerance.

(a) Deficient Thickness: After the pavement is placed and before the final acceptance, the thickness as determined by measuring cores (a minimum of two being required) cut on approximately 300 ft intervals from the pavement must not be below the required thickness by more than 0.5 in (0.2 in for full payment).

(b) Excess Thickness: No payment shall be made for material in excess of 110 percent of the theoretical yield for the required thickness.

(c) Reduced Prices: When a deficiency is indicated, supplementary cores shall be taken to define the area; the cores must have a minimum spacing of 10 ft. Payment will be made at a reduced price as specified in the following table:

Core Thickness Deficiency (D)	**Proportional Part Contract Price Allowed**
0.0 - 0.2 inches	100 %
0.2 - 0.5 inches	75 %
Greater than 0.5 in.	0 %

When the thickness of the pavement is deficient by more than 0.5 inches, the paved area shall be immediately removed and replaced to the specified thickness, or overlaid to the Engineer's satisfaction. Payment shall be allowed only after compliance.

(d) Responsibility for Extra Work: If the work proves satisfactory upon examination, the uncovering, removing, and replacing of material shall be paid as extra work. If the work proves deficient, the removal, replacement, and repair (as well as core drillings) shall be an expense borne by the Contractor.

SECTION 505 – HOT MIX ASPHALT PATCHES

505.01 DESCRIPTION. This work shall consist of repairing rigid or flexible pavement by removing sections of the existing pavement and replacing the removed material using hot mix asphalt (HMA) paving material. The locations of the repairs will be as specified in the Contract Documents or as directed by the Engineer. See also Standard Detail Plates G-22 through G-29, as applicable, when restoring trenches.

505.02 MATERIALS. Materials shall conform to Section 504.02 and the following:

Aggregate for Base Course	901, Table 901 A
HMA	901, Table 901 C and 904.04
Performance Graded Asphalt Binder	904.02

505.03 CONSTRUCTION. The existing pavement shall be removed with a minimum disturbance to the base material and the faces of the remaining pavement shall be square and vertical without ragged edges. The use of equipment that could damage the existing pavement is prohibited.

505.03.01 Weather Restrictions. Refer to Section 504.03.02.

505.03.02 Preparation of Existing HMA Pavement. The existing pavement shall be removed by making a perpendicular saw cut full depth for the full perimeter of the designated area.

505.03.03 Preparation of Existing PCC Pavement. Refer to the applicable portions of Section 522.03.03.

505.03.04 Subgrade Preparation. The Engineer will evaluate the subgrade to determine if it is suitable as a foundation for the patch. If the Engineer determines that the subgrade material is not stable, it shall be compacted as specified in Section 501.03.11 to the satisfaction of the Engineer. If the Engineer determines that the subgrade material is unsuitable, the Contractor shall replace it with aggregate base conforming to Section 501. The replacement aggregate material shall be compacted in layers of 4 in. maximum depth. At the Contractor's option, HMA may be substituted for aggregate base. The Contractor shall immediately haul away from the repair site all existing pavement materials that are removed.

Protection of the subgrade after preparation shall be the responsibility of the Contractor. No payment will be made for removal and replacement of subgrade that was not protected.

505.03.05 Subgrade Drains. The Engineer may direct that subgrade drains be constructed in areas of wet underlying subgrade or areas where, in the Engineer's opinion, there may be a future drainage problem.

For construction, refer to Section 306, Subgrade Drains.

505.03.06 Emergency Filler. The Contractor shall have readily available sufficient graded aggregate to completely fill the void of the repair area. The material shall be subject to the approval of the Engineer and shall be placed and compacted in the void and covered with a steel plate when directed by the Engineer. At the beginning of the next day's work, this material shall be completely removed as directed by the Engineer.

505.03.07 Steel Plates. The Contractor shall have an ample supply of 12 x 14 ft x 1 in. thick steel plates available on the project to cover the emergency filler. Refer to Section 300.03.05.

505.03.08 Patch Construction. Patch construction shall conform to the requirements given in Section 505.03.11 and to the applicable portions of Section 504. Manual operation will be permitted for placement of the HMA. Cores, control strip, and pavement profile measurements are waived. Equipment, placement, compaction, and quality control procedures will be as approved by the Engineer.

505.03.09 Patch Placement. Prior to placing the HMA, the exposed vertical surface of all adjacent pavement shall be thoroughly cleaned and all vertical surfaces shall be tack coated with emulsified asphalt in conformance with Section 504.03.04. Each patch shall be full depth, full lane width and shall be placed in a minimum of two lifts. See chart below. The HMA mixture may be spread by shovel, by rake or other method approved by the Engineer.

Maintain lift thickness in accordance with the following:

HMA Superpave Lift Thickness		
Mix Designation (mm)	Minimum (in.)	Maximum (in.)
9.5	1.0	2.0
12.5	1.5	2.5
19.0	2.0	4.0
25.0	3.0	5.0

HMA shall not be placed on a frozen base.

505.03.10 Testing and Acceptance. Acceptance will be determined by nuclear in-place density test data. The nuclear gauge shall be calibrated in conformance with MSMT 417. The Contractor shall take one, one-minute special calibration nuclear test from each lift of each patch. Test locations shall be randomly selected from within the patch. A special calibration nuclear test is defined as an average of two (minimum) special calibration readings taken at the same location after rotating the nuclear gauge 180 degrees.

Nuclear test in-place density data shall be expressed as a percentage of the maximum specific gravity determined for each day's production. The in-place density of each patch shall be 92.0 percent minimum.

The results of all nuclear density tests from each patch shall be averaged and compliance will be determined on the basis of each patch tested.

505.03.11 Patches in Surface Course

(a) If after the placement of the surface course of bituminous concrete the Contractor must make repairs to adjust structures, trench failures, and settlements, repair pulls or tears or areas of poor workmanship, those repairs shall be made at the Contractor's expense and to the satisfaction of the Engineer.

(b) Unless otherwise directed by the Engineer, those repairs will require the replacement of the surface bituminous concrete on the full width of the lane or lanes involved (paving joint to paving joint) and a minimum length of the same dimension. The actual dimensions will be determined on a case-by case basis. However, in general the length shall extend at least one-half a lane width beyond the limit of the failure(s) or adjustment(s) and the full width of the lane(s) involved.

505.04 MEASUREMENT AND PAYMENT. The payment will be full compensation for steel plates, emergency filler, saw cutting, removal, disposal, and trimming of the existing pavement, subgrade preparation, placing all materials including emulsified asphalt tack coat,

and for all material, labor, equipment, tools, and incidentals necessary to complete the work.

All steel plates and emergency filler, when satisfactorily removed from the project, remain the property of the Contractor.

505.04.01 ***Hot Mix Asphalt Patches*** will be measured and paid for at the Contract unit price per square yard, or if specified in the Contract Documents, at the Contract unit price per ton. For purposes of estimating yield of material, use 160lb/cu.ft. unit weight for the asphalt.

505.04.02 ***Removal of Unsuitable Material and Refill*** (Contingent) will be measured and paid for at the Contract unit price per cubic yard. Payment will also include the costs of excavation and disposal of unsuitable materials, backfilling with aggregate and compaction.

SECTION 506 – RESERVED

SECTION 507 – SLURRY SEAL

507.01 DESCRIPTION. Construct a slurry seal course using a slurry seal (SS), or a latex modified slurry seal (LMSS).

507.02 MATERIALS.

Mineral Filler	901.01
Water	921.01
Aggregate	923.01
Emulsified Asphalt	923.03
Latex Modified Emulsion	923.04

507.03 CONSTRUCTION.

507.03.01 Weather Restrictions. Place slurry seal when the air and surface temperatures are at least 50 F, when it is not raining, and when the local weather forecast does not predict precipitation or the temperature to fall below 40 F within 24 hours from the time the mixture is placed.

Cease placement when the surface or air temperature falls below the specified limits. Any further placement is at the Contractor's risk.

507.03.02 Mixing Equipment. Use a self-propelled, front feed, continuous loading, mixing machine. The unit shall proportion and deliver the materials to a revolving, multi-blade, shafted mixer; and discharge it continuously and uniformly.

The mixer shall have devices that control the proportioning of each material at all times. Either calibrate the mixer for the mix design in the presence of a representative of the County, or submit certified calibration documents for approval of the Engineer. The machine shall have sufficient storage capacity for aggregate, emulsified asphalt, mineral filler, additives, and water to maintain an adequate supply of the materials for the proportioning controls. The proper amount of mineral filler shall be added to the aggregate before introduction into the mixer.

Use mixing machines equipped with water pressure systems and nozzle spray bars to provide a water spray ahead of and outside the spreader box when required.

Truck mounted machines with positive, nonslipping aggregate delivery systems, but without a front feed continuous loading feature, may be used on project segments of less than 15,000 sq.yd. or for spot repairs.

When truck mounted machines are used, have at least two units on the project prior to construction.

507.03.03 Spreading Equipment. Spread the slurry seal uniformly by means of a mechanical squeegee box attached to the mixer and equipped with paddles mounted on an adjustable shaft to continuously agitate and distribute the materials. Use equipment that provides sufficient turbulence to prevent the mix from setting in the box or causing excessive side buildup or lumps. Attach flexible seals where the box contacts the road, front and rear, to prevent loss of the mixture. Do not spray additional water into the spreader box.

507.03.04 Surface Preparation. Apply the emulsified asphalt tack coat and slurry seal to surfaces that are clean, dry, and free of all objectionable materials.

Apply tack coat consisting of one part asphalt emulsion to three parts water to all surfaces. Use the same emulsion type and grade as used in the slurry seal, applied at a rate of 0.05 to 0.10 gal/sq.yd.

507.03.05 Application. Spread slurry seal to repair slight irregularities and to achieve a uniform, skid resistant surface without skips, lumps, or tears.

Use squeegees and lutes to spread the mixture in areas that are inaccessible to the spreader box and areas that require hand spreading.

When hand spreading is necessary, additives may be used to provide slower setting time. Pour the slurry seal in a small windrow along one edge of the surface to be covered, and then spread the material uniformly. Construct a smooth, neat seam where two passes meet. Remove excess material immediately from the ends of each run.

(a) Slurry Seal. Apply SS at the rate of 16 ±2 lb/sq.yd. for Type II Mix and 20 ± 2 lb/sq.yd. for Type III Mix, based on the dry aggregate weight, unless otherwise specified.

(b) Latex Modified Slurry Seal. Apply LMSS in one or two coats as directed.

For roadways specified to receive one application, apply LMSS at the rate of 16 ± 2 lb/sq.yd. for Type II Mix and 22 ± 2 lb/sq.yd. for Type III Mix, based on the dry

aggregate weight, unless otherwise specified. When two applications are specified, apply the material at the combined rate of 28 ± 2 lb/sq.yd. for Type II Mix and 32 ± 2 lb/sq.yd. for Type III Mix.

507.03.06 Certification. Furnish certified weight tickets to the Engineer for the emulsion, latex emulsion, aggregate, and mineral filler. The weight tickets will be used to determine in place application rates.

507.03.07 Sampling and Testing. Sample the mixtures at least once daily during paving. Place each sample in a 1-gallon container. Residual asphalt content, gradation, stability, and flow will be determined per T 30, T 164 and T 245, Modified. Samples and test results shall be available to the Engineer upon demand.

507.03.08 Tie-Ins for Entrances and Connecting Roads. Make tie-ins at entrances and connecting roads as directed.

507.03.09 Traffic. The cure rate for permitting traffic on the pavement without damaging the surface shall be within two hours for SS and one hour for LMSS. Repair traffic damaged slurry seal at no additional cost to the County.

507.04 MEASUREMENT AND PAYMENT. ***Slurry Seal*** and ***Latex Modified Slurry Seal*** will be measured and paid for at the Contract unit price per square yard for one or more of the pertinent items listed below. The payment will be full compensation for furnishing and placing the aggregate, emulsified asphalt tack coat, tie-ins to entrances and connecting roads, mineral filler, emulsion, latex emulsion, and for all material, labor, equipment, tools, and incidentals necessary to complete the work.

507.04.01 ***Slurry Seal Using Type II Mix (One Coat)***.

507.04.02 ***Slurry Seal Using Type III Mix (One Coat)***.

507.04.03 ***Latex Modified Slurry Seal Using Type II Mix (One Coat).***

507.04.04 ***Latex Modified Slurry Seal Using Type III Mix (One Coat)***.

507.04.05 ***Latex Modified Slurry Seal Using Type II Mix (First Coat)***.

507.04.06 ***Latex Modified Slurry Seal Using Type III Mix (Second Coat)***.

507.04.07 Price Adjustment. Material not conforming to these Specifications may be accepted at a reduced price if the Engineer determines that it is not detrimental to the work. The following price adjustment will apply:

(a) The residual asphalt content of samples will be averaged for each day's production per lift and will be compared to the submitted mix design. The Contract unit price per square yard will be reduced 1 percent for each 0.10 percent the asphalt content is out of tolerance.

(b) The Contract unit price per square yard will be reduced 0.5 percent for each gram per square foot of Wet Track Abrasion Test loss between 75 and 100 grams per MSMT 403. Material having a loss greater than 100 grams will be rejected.

(c) For applications less than the specified rate, the Contract unit price per square yard will be reduced 3 percent for each pound per square yard below the specified rate. This adjustment will be determined by comparing the certified delivery tickets with the project Specifications. For applications at more that the specified rate, no increase to the Contract Unit price will be considered.

SECTION 508 – MILLING EXISTING HOT MIX ASPHALT PAVEMENT

508.01 DESCRIPTION. This work shall consist of milling the existing asphalt pavement to the depth and at the locations specified in the Contract Documents, or as directed by the Engineer.

508.02 MATERIALS.

Hot Mix Asphalt (HMA)	904

508.03 CONSTRUCTION. Roadway patching shall be performed before the milling operation. Additional roadway patching may be required after the milling operation to correct pavement defects made visible by the milling operation. Refer to Section 505 for Hot Mix Asphalt Patches.

The machine for removing the asphalt pavement shall be a power operated planing machine or grinder capable of removing, in one pass, a layer of asphalt pavement no less than half the lane width to be removed. The machine shall be capable of accurately establishing profile grade control and shall have positive means for controlling slope elevation. The resultant surface shall be true to the established grade and shall be skid resistant. Unless otherwise directed by the Engineer, a tolerance of ±1/8 in. when using a 10 ft straightedge shall be maintained. The machine shall be capable of preventing dust from escaping into the atmosphere.

Mill one lane at a time. If the milling depth exceeds 2-1/2 in. on highways carrying traffic, mill the abutting lane or shoulder on the same day. Mill the abutting lane or shoulder, regardless of depth, prior to weekends, holidays or temporary shut-downs. Otherwise, if the milling depth is 2-1/2 in. or less, the abutting lane or shoulder may be milled on alternate days. When uneven pavement joints exist, provide adequate advance warning devices in conformance with the Contract Documents.

When HMA paving is being applied to the traveled way carrying traffic with a posted speed of 40 mph or less, construct a temporary tie-in at least 4 feet in length for each 1 inch of pavement depth. When HMA paving is being applied to the traveled way carrying traffic with a posted speed of more than 40 mph, construct a temporary tie-in at least 10 feet in length for each 1 inch of pavement depth. Construct temporary tie-ins before traffic is allowed to cross the transverse joint. Construct temporary tie-ins 10 feet or greater using a paver meeting requirements of Section 504.03.01.

In addition to any other equipment required to remove debris behind the milling operation, a street sweeper equipped with a vacuum shall be used to remove the dust prior to returning the area to traffic.

After the milling operation is complete, all depressions, potholes, and other irregularities shall be filled and any existing water valves, meters, manhole covers, etc., shall be wedged using hot mix asphalt.

508.04 MEASUREMENT AND PAYMENT.

508.04.01 ***Milling Existing Hot Mix Asphalt Pavement*** will be measured and paid for at the Contract unit price per square yard. The square yard measurement will be computed for the actual width and length measured along the area that has been milled. The payment will be full compensation for milling, the disposal of milled material, and for all material, labor, equipment, tools, and incidentals necessary to complete the work.

508.04.02 Filling depressions and potholes, and wedging water valves, meters, etc., using hot mix asphalt will be measured and paid for as specified in Section 106.04.

508.04.03 Hot Mix Asphalt Patches will be measured and paid for as specified in Section 505.04.

SECTION 509 – GRINDING HOT MIX ASPHALT PAVEMENT

509.01 DESCRIPTION. Grind hot mix asphalt (HMA) pavement.

509.02 MATERIALS.

Hot Mix Asphalt (HMA)	904

509.03 CONSTRUCTION. Perform roadway patching before the grinding operation. Additional roadway patching may be required after the grinding operation. Refer to Section 505.

509.03.01 Equipment. Use grinding equipment that has a cutting mandrel with carbide tipped cutting teeth and designed specifically for grinding asphalt surfaces to close tolerances. The equipment shall accurately establish slope elevations and profile grade controls.

Follow immediately behind the grinding machine with a vacuum equipped street sweeper, capable of removing all loose material from the roadway without causing dust to escape into the air.

509.03.02 Control Strip. Grind a control strip at least 500 ft in length with a uniformly textured surface and cross section as approved.

Provide a final pavement surface with a transverse pattern of 0.2 in. center to center of each strike area and with the difference between the high and low of the matted surface not exceeding 1/16 in.

509.03.03 Pavement Grinding. Use the same procedures, settings, speed, and requirements as those used in the control strip.

When necessary to maintain an adequate cross slope for drainage, grind the pavement adjacent to the ground pavement. Grinding will not be required on bridge decks.

Grind one lane at a time. If the grinding depth exceeds 2-1/2 in. on highways carrying traffic, grind the abutting lane or shoulder on the same day. Grind the abutting lane or shoulder, regardless of depth, prior to weekends, holidays or temporary shut-downs. Otherwise, if the grinding depth is 2-1/2 in. or less, the abutting lane or shoulder may be ground on alternate days. Where uneven pavement joints exist, provide adequate advance warning devices in conformance with the Contract Documents.

Furnish an approved 10 ft straightedge for testing the transverse and longitudinal surface after grinding operations. Correct all areas showing high spots greater than 1/8 in. within 10 ft by additional grinding at no additional cost to the County. Straightedge requirements apply to areas across joints and repaired cracks but are not applicable to areas outside the ground area.

After the grinding operation is complete, fill all depressions, potholes, and other irregularities using HMA. Construct an HMA wedge at existing water valves, meters, manhole covers, etc.

509.04 MEASUREMENT AND PAYMENT. ***Grinding Hot Mix Asphalt Pavement*** will be measured and paid for at the pertinent Contract unit price per square yard. The square yard measurement will be computed from the actual width and length measurements of the area that has been ground. The payment will be full compensation for grinding, removal and disposal of ground material, and for all material, labor, equipment, tools, and incidentals necessary to complete the work.

509.04.01 Hot mix asphalt for filling depressions and potholes, and for wedging manholes, valve boxes, inlets, or other structures will be measured and paid for as specified in Section 106.04.

509.04.02 Hot mix asphalt patches will be measured and paid for as specified in Section 505.04.

SECTIONS 510 Through 519 – RESERVED

SECTION 520 – PLAIN AND REINFORCED PORTLAND CEMENT CONCRETE PAVEMENTS

520.01 DESCRIPTION. This work shall consist of constructing plain and reinforced Portland cement concrete pavements as specified in the Contract Documents or as directed by the Engineer.

520.02 MATERIALS.

Portland Cement Concrete and Related Products	902
Reinforcing Steel	908
Joint Materials	911
Portland Cement Concrete Plant	915.03
Epoxy Coating for Reinforcement	917.02

520.03 CONSTRUCTION. At least 30 days prior to the start of paving operations, the Contractor shall submit for approval, a proposed paving plan, including production plants, location of plants with respect to project site, equipment, proposed material sources, and whether the fixed or slip form method shall be used.

The Contractor shall protect the pavement against damage from all causes. Any part of the pavement that is damaged shall be repaired or replaced by the Contractor at his expense.

No concrete shall be mixed, placed, or finished when natural light is insufficient, unless an adequate artificial lighting system approved by the Engineer is operated.

520.03.01 Equipment. All equipment, including the production plant and paving equipment, shall be approved by and acceptable to the Engineer. The plant, including central mixers, batching plant, truck mixers, and hauling equipment shall conform to Section 915. The plant shall be ready for inspection by the Engineer at least 48 hours prior to the start of construction operations. Paving equipment shall be on the job site, ready for inspection, at least 24 hours prior to the start of construction operations.

Slip form pavers shall be self-propelled on crawler tracks, and no other tractive force other than that which is provided and controlled by the paving machine itself shall be applied. The paver shall be capable of being automatically controlled for both alignment and grade.

The equipment and methods used shall provide means of obtaining the prescribed weights within the allowable tolerances to achieve the consistency specified with a minimum amount of water, to achieve proper placement of the mixture in a condition of maximum density with no segregation, and to finish and cure the pavement as specified herein.

520.03.02 Weather Restrictions.

(a) Temperature and Surface Conditions. Concrete placement shall begin only when the ambient air and surface temperature is at least 40 F and rising and discontinued anytime the temperature falls below 40 F. These requirements may be waived for incidental concrete construction. Concrete shall not be placed on a frozen base.

(b) Precipitation. The Contractor shall have on hand sufficient material, approved by the Engineer, to cover freshly placed concrete as protection against precipitation.

(c) Wind. Concrete shall not be placed when the Engineer determines that the wind would have a detrimental effect on the work.

When weather conditions differ from these limits, material en route from the plant to the job site may be used at the Contractor's risk.

If placement of the material is stopped by the Engineer for any other reason, all material en route shall be wasted at the Contractor's expense.

520.03.03 Foundation. Prior to the installation of fixed forms or the use of slip forms on the foundation, the foundation shall be constructed as specified in the Contract Documents and approved by the Engineer. The total width of the foundation shall be the width of the pavement to be placed, and extend a minimum of 4 in. outside the base of the fixed form or the outermost edge of the slip form paver track or wheel. No additional payment will be made for the extended width. Insure that the foundation is approved by the Engineer prior to installing fixed forms or using slip forms.

520.03.04 Forms. Side forms shall be made of steel not less than 7/32 in. thick with a depth equal to the edge thickness of the pavement. Built up forms shall not be used. Forms shall not be warped and shall be of sufficient strength to resist all loads applied in the paving process. Forms shall have a base equal to their height and a flat flanged tread or top surface not less than 2 in. wide. They shall not be less than 10 ft long except for installation along curves with a radius of less than 200 ft. When the curve radius is less than 200 ft, the forms shall not be more than 6 ft long or the forms shall be curved. Stake sockets to accommodate a 1 in. diameter steel stake shall be provided, and there shall be at least three stake sockets in each section of form 10 ft or more in length and at least 2 stake sockets in each section of form less than 10 ft

long.

Forms for keyways shall be rigidly fastened to the road form. Holes shall be provided through both forms and keyways to accommodate tie bars or dowels that may be required.

The forms shall be constructed to a tolerance that will ensure proper concrete placement. The top of the form shall not vary from a true plane more than 1/8 inch in 10 ft, and the face shall not vary from a true plane more than 1/4 inch in 10 ft. The forms shall provide means for locking the ends of abutting sections. Forms shall be clean and coated with a form release compound as specified in Section 902.08. Forms that are bent, deformed, or broken shall be removed or repaired as directed by the Engineer.

Grade controls shall be set at intervals not to exceed 25 ft. Forms shall be set a minimum of 400 ft prior to concrete placement. After the forms have been set to the correct grade, if the foundation has been disturbed, it shall be corrected by the Contractor and approved by the Engineer. The Contractor shall check the alignment and grade of the forms for conformance with the Contract Documents. The Contractor shall check the foundation grade with a measuring device, approved by the Engineer, such as a scratchboard. The Contractor shall make corrections immediately before concrete placement.

Wooden forms may be approved for use in exceptional cases, such as on curves of very short radius or when a nonstandard length of straight form is required.

520.03.05 Slip Form Paving. Minimum width of slip form paving shall be 24 ft. If 24 ft width is impractical, written approval is required from the Engineer. The total foundation width shall be graded using machine methods.

Grade controls shall be set by string lines at intervals not to exceed 25 ft. A foundation, approved by the Engineer set to the final line and grade shall be constructed as specified in Section 520.03.03 and completed at least 1000 ft ahead of the paver before paving begins. Paving shall be stopped and a bulkhead construction joint installed whenever the paving machine comes to within 200 ft from the end of the approved foundation. If the paver will be used for paving adjacent to an existing pavement, the paver shall have wheels with rubber tires or protective pads on crawler treads which shall provide a minimum clearance of 1 ft from the edge of the paver track or wheel to the edge of the existing pavement.

Slip forms shall be of a length sufficient to prevent slumping or sagging of the sides and top edges of the pavement slab. They shall be spaced and braced to a uniform and constant width and shall also be held vertical. Slip form equipment shall be capable of placing and securing embedded tie bars and keyways in proper position in the plastic concrete before the edge of the pavement slab is free of the slip form.

520.03.06 Reinforcement. Reinforcement shall be as specified in the Contract Documents. Reinforcement shall be kept clean and free from foreign material that may prevent proper bonding of the concrete. The Contractor shall secure all reinforcement to prevent movement or displacement.

(a) Dowel bars at joints shall be installed on the approved foundation parallel to the foundation grade, sufficiently ahead of the placement of slab reinforcement and concrete. The longitudinal half of each dowel intended to slip shall be coated with a water insoluble lubricant acceptable to the Engineer. Dowel bars may be machine placed or set on chairs or prefabricated assemblies approved by the Engineer, providing proper alignment, depth and spacing.

(b) Tie bars for longitudinal construction joints may be placed on chairs or machine placed so that upon the initial set of the concrete they shall be at proper alignment, depth and spacing, and shall be at right angles to the center line of the pavement. Chairs or machine placement devices must be approved by the Engineer prior to use.

(c) Fabric and mat reinforcement shall be furnished in flat sheets and shall be kept flat during placement. Reinforcement clearance shall be as specified in the Contract Documents.

(d) When using slip forms, tied reinforcing bars or prefabricated mats may also be installed ahead of the placement of concrete by being supported on chairs set upon the underlying material. Reinforcement installed in this manner shall be in place ahead of the paver at least 500 ft or a two hour run of the paver before any paving may begin. Paving shall be stopped and a bulkhead construction joint shall be installed whenever it comes to within 100 ft of the end of such steel placement. All reinforcement shall be adequately secured against displacement or movement.

520.03.07 Concrete Placement. Before concrete is placed on the foundation, the foundation shall be in a moist condition. In addition, if the concrete is exposed to the direct rays of the sun and the ambient temperature is 70 F and rising, the forms and reinforcement shall be sprinkled with cool water just before placement of the concrete. Concrete shall be deposited on the foundation within the forms and rehandling shall be minimized.

Where concrete is to be placed adjoining a previously constructed lane of pavement, mechanical spreading and finishing equipment may be operated upon the existing lane of pavement only after the existing concrete has reached a compressive strength of 3000 psi conforming to Section 902.10.03. Wheels which rest on the previously completed concrete shall be flat without flanges, and operated far enough from the edge of the slab to preclude spalling or damage. The tread of the wheels shall not be less than 3 in. wide. Sampling for control testing shall be done at the time of concrete placement and shall conform to Section 902.10.08.

The total depth of the slab shall be deposited in a single layer except as otherwise specified herein or approved by the Engineer. Two layer placement shall be used for pavement using bar mat or wire fabric reinforcement unless the Contractor demonstrates that the bar mat or wire fabric can be properly supported on devices approved by the Engineer.

(a) Single Layer Placement. Reinforcement shall be set on chairs to maintain the stability and proper elevation of the reinforcement. Welding of reinforcement to the chairs in lieu of wire ties will be permitted, except for epoxy-coated reinforcement, welding will be permitted only if the epoxy coating is applied after the welding. Any damage to epoxy coating shall be repaired as directed by the Engineer using materials specified in Section 917.02.

(b) Two Layer Placement. The placing of concrete, bar mats or wire fabric reinforcement shall be a continuous operation. Concrete shall first be placed to the specified depth of reinforcement. The reinforcement shall immediately be placed on the freshly deposited concrete. The second layer of concrete shall be placed immediately after the reinforcement is set in place.

520.03.08 Consolidation of Concrete.

(a) Fixed Form Paving. Concrete shall be consolidated by means of immersion type vibrators. The vibrators shall advance with the paving equipment. Vibrator spacing, amplitude and depth shall insure proper consolidation, clear reinforcement by ½ in., and shall be subject to approval by the Engineer. Special care shall be taken to insure thorough consolidation along the faces of all forms and joint assemblies. Vibrators shall not come in contact with the side forms, joint assemblies, or underlying material. Excessive vibration resulting in segregation shall be avoided.

(b) Slip Form Paving. Concrete consolidation systems shall be incorporated in the paving equipment, and shall be approved by the Engineer.

520.03.09 Finishing.

(a) Machine Finishing. The machine shall be equipped with two transverse screeds with provision for adjustment to insure that the concrete is placed to the specified crown and grade. Following the transverse screeds, the concrete shall be screeded longitudinally. The width of the working face of the screeds shall not be less than 6 in. A chevron or "V" type nonreciprocating finishing float, or other type as approved by the Engineer shall be used. The float shall be suspended from a frame that does not ride directly on the forms. Following the finishing float, a scraping straightedge 10 ft long, equipped with a long handle shall be used to bring the pavement to the correct grade. When the finishing machine is operated over concrete that has partially set, provisions shall be made to prevent damage to the concrete by the machine wheels.

(c) Hand Finishing. Where approved by the Engineer, hand finishing may be substituted for machine finishing. Rakes shall not be used for handling concrete.

520.03.10 Slab Surface and Thickness Checks.

(a) Surface Check. After finishing, and before texturing of the concrete, the entire surface of the pavement shall be checked with a 10 ft long metal straightedge approved by the

Engineer. The surface shall not deviate from a straight line or vertical curve transversely or longitudinally more than 1/8 inch in 10 ft.

(b) Thickness Check. The pavement thickness will be checked by the Engineer from cores cut by the Contractor after the pavement is placed, but before final acceptance. Coring shall be as specified in MSMT 552. Cores shall be spaced every 1000 ft for each lane unless otherwise specified or directed by the Engineer. Core holes shall be filled by the Contractor, at his expense. When the thickness of pavement is deficient by more than 1 in., the full section of deficient pavement shall be removed and replaced by and at the expense of the Contractor. Deficiencies up to 1 in. will be subject to reduced payment as specified in Section 520.04.

520.03.11 Texturing and Edging.

(a) Texturing. Following concrete finishing and surface check the roadway surface shall be given a textured finish using a texturing device that produces transverse corrugations 1/8 in. wide by 1/8 in. deep spaced between 5/8 and 7/8 in. A 2 in. space shall be provided between passes of the texturing device and a 3 in. space provided between the last corrugation and the centerline of all transverse joints. Texturing shall begin when the concrete surface is plastic enough to allow texturing to the depth specified but dry enough to prevent the plastic concrete from flowing back into the grooves being formed. Care shall be exercised to avoid overlaps and the tearing of the concrete in the texturing operation. Texturing on open sections shall be uniform for the full width of pavement. On closed sections, the last 12 in. of the roadway adjacent to the curb shall be left untextured to facilitate drainage. The completed textured finish shall be uniform in appearance.

(b) Edging. After the texturing of the surface, and after the concrete has taken its initial set, transverse and longitudinal slabs shall be edged using a tool with a 1/4 in. radius.

520.03.12 Curing. Following texturing and edging, the concrete shall be cured for a minimum of 72 hours. If at any time during the curing period the ambient air temperature falls below 40 F, insulating blankets shall be used to maintain the concrete temperature above 40 F. Insulating blankets shall not be used in lieu of the curing material. The Contractor shall provide a sufficient number of high/low thermometers to monitor the temperature of the concrete. The concrete shall be cured using one of the following methods:

(a) Liquid Membrane Forming Compound and Water Based Cure and Seal Compounds. A liquid membrane forming compound used for curing shall conform to Section 902.07.03 and shall be applied to the surface as soon as the free water has disappeared from the surface. The compound shall be applied by a spraying machine (approved by the Engineer) with drive wheels that straddle the freshly placed concrete. Standby equipment shall be provided nearby in the event of failure of the spraying machine. The spraying machine shall be equipped with an adequate wind guard and shall produce a fine spray of material that covers the surface with a uniform continuous film. The film shall be free of pin holes and other imperfections and shall not check,

crack or peel. Discontinuities in the film shall be corrected by application of an additional coat to the affected area within 30 minutes of the original coat. The compound shall be applied in two applications at a rate of 1 gal/400 sq.ft. for each coat. Sprayed surfaces which are subjected to damaging rainfall within three hours after the second application shall be resprayed at no additional cost to the County.

Vertical surfaces of longitudinal and transverse joints shall be kept free of curing compound by the use of rope or other masking methods approved by the Engineer. Sprayed surfaces shall be protected to prevent disruption of the continuity of the membrane. Application of compound by hand operated spraying equipment in irregular areas shall be as directed by the Engineer.

(b) Burlap Curing. Burlap conforming to Section 902.07.01 shall be placed on the freshly placed concrete as soon as practical, without damaging the concrete. Burlap shall be overlapped to provide a double thickness on the entire surface. The burlap shall be saturated with water before placement and kept continuously wet during the curing period.

(c) Cotton Mat Curing. Cotton mats conforming to Section 902.07.04 shall be placed on the freshly placed concrete as soon as practical, without damaging the concrete. Mats shall be saturated with water prior to placement and kept continuously wet during the curing period.

(d) Sheet Materials. Sheet materials conforming to Section 902.07.02 shall be placed on the freshly placed concrete as soon as practical without damaging the concrete. Sheets shall be lapped at least 1 ft and extend outside the slab. Laps and edges shall be held securely in place to provide continuous contact of the sheet with the pavement surface.

520.03.13 Form Removal of Fixed Form Paving. Unless otherwise directed by the Engineer, forms shall not be removed before concrete has set at least 12 hours. The sides of slabs which are not damaged shall be cured for the remaining 60 hours of the 72 hour curing period. Damaged or honeycombed areas shall be repaired and cured for an additional 72 hours.

520.03.14 Joints. Joints shall conform to the details specified in the Contract Documents and shall be perpendicular to the finished grade of the pavement and shall be sealed as specified in Section 523. Transverse expansion and contraction joints shall be straight and continuous from edge to edge of the pavement.

(a) Transverse Construction Joints. Transverse construction joints shall be installed at the end of each day's placing operations and at any other points within a paving lane when concrete placement is interrupted for 30 minutes or longer. These joints shall be located at a planned joint, except in case of equipment breakdown. When concrete placement cannot be continued, the transverse construction joint may be installed within the slab unit but not less than 10 ft from a planned transverse joint. Transverse construction joints shall be doweled as specified in the Contract Documents.

(b) Expansion Joints. Expansion joints shall be formed by means of a preformed filler material conforming to Section 911.02. The filler shall be securely held in position by means of metal supports, as approved by the Engineer, which shall remain in the pavement. A removable metal channel cap bar shall be used to hold the parts of the joint in proper position and protect the filler from damage during concreting operations. The cap bar shall be removable without damage to the pavement to provide a space for sealing of the joint. Adjacent sections of filler shall be fitted tightly together, and the filler shall extend across the full width of the paving lane in order to prevent entrance of concrete into the expansion space. Expansion joints shall be formed around structures and features that project through, into, or against the pavement, using joint filler of the type, thickness, and width specified in the Contract Documents or as directed by the Engineer.

(c) Contraction Joints. Longitudinal and transverse contraction joints shall be constructed by sawing. If gravel aggregate is used, joints shall be tooled or formed by using an insert approved by the Engineer.

(1) Sawed Joints. Sawed joints shall be constructed by sawing a groove in the concrete with a 1/8-inch blade to the depth as specified in the Contract Documents. The time of sawing shall vary depending on existing and anticipated weather conditions and shall prevent uncontrolled cracking of the pavement. Sawing of the joints shall commence as soon as the concrete has hardened sufficiently to permit cutting the concrete without chipping, spalling, or tearing. The upper portion of the groove shall be widened by sawing to the width and depth specified after expiration of the curing period. The saw blades may be single or gang type, with one or more blades mounted in tandem. At no time shall sawing cut into load transfer devices. Immediately after the joint is sawed, the saw cut and adjacent concrete surface shall be thoroughly flushed with water until all waste from sawing is removed from the joint. Any membrane-cured surface damaged during the sawing operations shall be re-sprayed as soon as the surface becomes dry.

(2) Insert Type Contraction Joints. Insert type contraction joints shall be constructed by installing a preformed insert in the plastic concrete to form a weakened plane to induce cracking. The equipment for installing inserts shall be a machine equipped with a vibratory bar for cutting a groove in the plastic concrete for placement of the insert or for vibrating the insert into place at the prescribed joint location. Installation of the insert shall be to the required depth throughout the full width of the paving lane. Vibration units shall be arranged so that the vibration will be uniformly distributed throughout the bar. The intensity of vibration shall be adjustable as necessary to form a groove of proper size for the filler or for forcing the insert into the plastic concrete and consolidating the concrete around the in-place insert. For concrete placed by slip form pavers, the edges of the plastic concrete shall be supported to prevent slumping during the vibration and placement of inserts. The vibratory float shall be used following placement of the insert material in lieu of hand floating or troweling the finish. The insert shall be installed in the plastic concrete immediately following the final machine finishing with a

maximum of two joint spacings between the finishing machine and the inserter. Additional straightedge and texturing operations shall be accomplished without disturbing the installed insert. Adjacent sections of the joint inserts within each slab unit shall be securely joined together, and the insert shall be thoroughly consolidated against and for the full depth of the insert. The insert shall be perpendicular to the finished grade of the pavement and shall be straight in alignment at the joint locations specified, with the top of the insert flush or not more than 1/8 in. below the pavement surface.

(3) Sawing Inserts. After the expiration of the curing period, the top portion of fiberboard fillers or sawable preformed inserts shall be removed by power sawing approved by the Engineer.

520.03.15 Pavement Profile. Refer to Contract Documents.

520.03.16 Opening to Traffic. The pavement may be opened to vehicular traffic after having attained a compressive strength of 3000 psi. Tests of field samples shall conform to T 23.

520.04 MEASUREMENT AND PAYMENT. ***Plain Portland Cement Concrete Pavements*** and ***Reinforced Portland Cement Concrete Pavements*** will be measured and paid for at the Contract unit price per square yard. The square yard measurement will be computed on the basis of plan width and as-built length measured along the pavement center line. The payment will be full compensation for all concrete, forms, reinforcement steel, chairs, epoxy coating, finishing, curing, joints, joint construction, saw cutting, joint sealing and for all material, labor, equipment, tools, and incidentals necessary to complete the work.

520.04.01 Pavement Thickness Adjustment. Payment in areas that are accepted at a reduced price for deficient thickness will be adjusted by the factors shown in the following table. Deficiencies will be determined by procedures specified in Section 520.03.10. There will be no additional payment for excess thickness.

DEFICIENT THICKNESS PRICE ADJUSTMENT	
DEFICIENCY IN INCHES	PERCENT OF PAYMENT CONTRACT UNIT PRICE
0.00 to 0.20	100
0.21 to 0.30	80
0.31 to 0.40	72
0.41 to 0.50	68
0.51 to 0.75	57
0.76 to 1.00	50
Greater than 1.00 *See Section 520.03.10	0*

SECTION 521 – CONTINUOUSLY REINFORCED PORTLAND CEMENT CONCRETE PAVEMENT

521.01 DESCRIPTION. This work shall consist of constructing continuously reinforced Portland cement concrete pavement on a prepared subgrade as specified in the Contract Documents.

521.02 MATERIALS. Materials shall conform to Section 520.02 and the following:

Reinforcement. The Contractor shall select the type of reinforcement from one of the following:

(a) Deformed steel bar mats conforming to Section 908.07. The longitudinal bars shall be No. 5, Grade 60, and the transverse bars shall be No. 4, Grade 60.

(b) Loose deformed steel bars conforming to requirements given in Section 908.01. The longitudinal bars shall be No. 5, Grade 60, and the transverse bars shall be No. 4, Grade 60. The longitudinal bars shall have a minimum length of 40 ft.

Transverse bars shall be epoxy coated.

(c) Welded deformed steel wire fabric conforming to requirements given in Section 908.06.

521.03 CONSTRUCTION. Construction shall be as specified in Section 520.03 with the following modifications:

521.03.01 Placing Reinforcement. The reinforcement shall be preset on chairs or chair bars with the transverse members placed down. Placement of the longitudinal bars shall be within the tolerances specified in the Contract Documents when measured from the top of the pavement to the bottom of the bar.

Rust, mud, oil or other contaminants that may reduce bonding shall be removed before placing the concrete. The mat or fabric reinforcement shall be flat and free from distortions. Loose steel bars shall be free from kinks or bends that may prevent them from being properly assembled or installed.

Chairs or chair bars shall be designed to support the reinforcement in position without deflection or displacement during the placing and consolidation of the concrete. Chair bases shall have sufficient bearing to prevent overturning or penetration into the subgrade. The design of the chairs shall not impede the placing of the concrete. The Contractor shall obtain the Engineer's approval for the type of chair or chair bar to be used. Welding of chairs to the

transverse bars prior to epoxy coating will be permitted.

If the support system does not hold the reinforcement within the specified tolerances, the Contractor shall increase the number of chairs or take other steps to assure proper positioning of the steel.

521.03.02 Placing Concrete. Concrete shall be placed in one lift, and care shall be exercised to consolidate the full depth.

The concrete shall be internally vibrated over its full width and depth by immersion vibrators mounted at intervals not to exceed 30 in. center to center, across the full width of the slab being placed. The vibrators shall be operated at a frequency and an amplitude sufficient to be perceptible on the surface of the concrete more than 1 ft in any direction and shall be equipped to provide variable controlled frequencies. The battery of vibrators shall advance longitudinally with the paving machinery. The vibrators shall be hinge mounted to facilitate riding over any obstruction and shall be set to clear the reinforcement by approximately 1/2 in.

All screeding and vibrating operations shall stop immediately whenever forward motion of the paving machinery is stopped.

521.03.03 Joints. No transverse expansion or contraction joints will be permitted in continuously reinforced Portland cement concrete pavement. Transverse construction of bulkhead joints shall be formed only at the end of any working period or when necessary to stop concreting operations for more than 30 minutes. They shall be formed with an approved header board in conformance with the cross section of the pavement, placed at right angles to the center line, and perpendicular to the surface. Additional bars shall be furnished and installed as specified in the Contract Documents. The pavement shall be finished to the header board without edging. These joints shall be made with extreme care and the bulkhead kept clean. The roadway reinforcement shall extend continuously through the joint. The reinforcement extending through the joint shall be securely supported on chairs to prevent it from deflecting.

Paving operations shall not resume until the concrete has set as determined by the Engineer. The bulkheads and all debris shall be removed, and the joint shall be cleaned before placing concrete against it.

All joints shall be sealed as specified in Section 523.

521.03.04 Terminal Joints. Terminal joints shall be constructed as specified in the Contract Documents.

521.03.05 Thickness Check. Refer to Section 520.03.10.

521.03.06 Pavement Profile. The pavement profile shall be as specified in the Contract Documents.

521.03.07 Opening to Traffic. Refer to Section 520.03.16.

521.04 MEASUREMENT AND PAYMENT. ***Continuously Reinforced Portland Cement Concrete Pavement*** will be measured and paid for at the Contract unit price per square yard. The square yard measurement will conform to Section 520.04. The payment will be full compensation for all concrete, forms, reinforcement steel, chairs, epoxy coating, finishing, curing, joints, joint construction, saw cutting, joint sealing and for all material, labor, equipment, tools, and incidentals necessary to complete the work.

521.04.01 Pavement Thickness Adjustment. Refer to Section 520.04.01.

521.04.02 Terminal Joints. ***Terminal Joints*** will be measured and paid for at the Contract unit price per linear foot. The payment will be full compensation for all steel beams, stiffener plates, end plates, drilled holes, welding, cutting, styrofoam, joint filler, concrete, reinforcement, bond breaker, and for all material, labor, equipment, tools, and incidentals necessary to complete the work.

SECTION 522 – PORTLAND CEMENT CONCRETE PAVEMENT REPAIRS

522.01 DESCRIPTION. This work shall consist of repairing plain, conventionally reinforced, or continuously reinforced Portland cement concrete pavement as specified in the Contract Documents or as directed by the Engineer. Repairs are either Type I or Type II. Type I repairs are from 6 ft to less than 15 ft in length. Type II repairs are 15 ft and greater in length. The minimum repair length shall be 6 ft. See also Standard Detail Plates G-22 through G-29, as applicable, for additional requirements when trench restoration is required.

522.02 MATERIALS. Materials shall conform to Section 520.02 except as follows:

Graded Aggregate for Base Course	901.01
Crusher Run Aggregate CR-6	901.01
High Range Water Reducing Admixture	902.06.03
Nonshrink Grout	902.11(c)
Epoxy Grout	902.11(d)
Epoxy Adhesive	921.04

522.02.01 Concrete Mix Design (Modified Mix No. 6). Concrete shall be Mix No. 6 as specified in Section 902.10.03, except that the minimum cement factor shall be 800 lb/yd^3, contain a high range water reducing admixture and shall have a minimum compressive strength of 2500 psi in 12 hours. Testing shall conform to Section 902.10.08 except that cylinders shall remain in the molds until tests are conducted.

522.02.02 Field Control. Field control will be by compressive strength, cement content, slump, water/cement ratio and air entrainment. Acceptance will be based on a minimum compressive strength of 3000 psi in 24 hours. If test results fall below the specified value, a new mix design shall be prepared by the Contractor as directed by the Engineer.

522.02.03 Polyester Grout. The Contractor may substitute polyester grout in lieu of epoxy grout providing the grout conforms to the strength requirements of Section 902.11 (d). Cartridge type systems shall be identified with a batch or lot number.

522.02.04 Epoxy Adhesives. Epoxy adhesives shall conform to Section 921.04 and shall be Type IV, Grade 3, Class B and C, and shall be water insensitive.

522.02.05 Reinforcement. Reinforcement, including load transfer assemblies, tie bars, deformed steel bars and longitudinal tie devices shall conform to Section 908 and shall be epoxy coated.

522.03 CONSTRUCTION. The Engineer shall determine areas to be repaired and the type of repair to be used. Prior to the start of repairs, the Contractor shall submit for approval, a proposed repair plan, including equipment, methods and procedures. The Contractor shall protect the repair area against damage from all causes. If any part of the repaired pavement is damaged, it shall be repaired or replaced by and at the Contractor's expense. Repairs shall be made in only one lane at a time for each roadway.

522.03.01 Equipment. Refer to Section 520.03.01.

522.03.02 Weather Restrictions. Weather restrictions shall be as specified in Section 520.03.02 except that the work shall be performed during the months of April through October, unless otherwise permitted, in writing, by the Engineer. When the range in daily temperature is expected to exceed 15 F, concrete placement will be permitted in the late afternoon after the existing pavement has achieved its maximum expansion, unless otherwise directed by the Engineer.

Cold weather protection shall conform to Section 520.03.12, except that insulating blankets shall be used when the ambient air temperature is less than 70 F.

522.03.03 Saw Cuts and Removal of Existing Pavement. Concrete slabs shall be removed by the lift out method in large sections. No other method of slab removal shall be used unless permitted by the Engineer. All areas where the pavement has been removed shall be repaired in the same working day.

If, during removal operations, any portion of adjacent slabs are damaged, the damaged portions shall be repaired by and at the expense of the Contractor.

Saw cuts and pavement removal procedures are as follows:

(a) Plain and Conventionally Reinforced Portland Cement Concrete Pavement. Existing pavement shall be removed by making a perpendicular saw cut, full depth, for the full slab width using a diamond saw blade. Full depth saw cuts shall be spaced a minimum of 2 in. from and parallel to, longitudinal joints between pavement slabs. When repairs are to be made on only one side of an existing transverse joint, the removal shall extend into the adjacent slab a sufficient distance to insure that existing dowels are removed. Saw cuts shall not be made more than one week prior to removal of the concrete slab. Repairs shall be completed in a continuous operation.

(b) Continuously Reinforced Portland Cement Concrete Pavement. Existing pavement shall be removed by making a perpendicular saw cut for the full slab width using a diamond saw blade. Saw cuts shall not be made more than 72 hours prior to removal of the concrete slab. The Contractor shall saw cut to the top of the reinforcement steel. This cut shall be 2 in. minimum depth, for the full width of the lane at the boundaries of the repair without cutting the steel reinforcement. The boundaries shall not be closer than 18 in. from the nearest transverse tight crack for normally spaced tight cracks. However, where cracks are closely spaced, repair boundaries shall not be closer than 6 in. from the nearest crack. The Contractor shall saw cut, full depth, across the full width of the slab a minimum of 22 in. inside each boundary saw cut. Additional full depth saw cuts shall be made along all longitudinal edges not bounded by construction joints. Concrete shall be removed to its full depth within the boundaries of the repair area. Existing reinforcement bars shall not be bent. Damaged epoxy coating on reinforcement shall be repaired in accordance with Section 426 of these Specifications.

The equipment used to remove concrete in the areas between each 2 in. and full depth saw cut shall be restricted to a maximum jackhammer size of 60 lb and hand tools only. The existing pavement edge shall be neatly trimmed and vertical. A minimum of 22 in. of reinforcement shall remain exposed on each side of the repair. The Engineer will require the removal of any pavement breaking equipment from the project that could damage the adjacent concrete pavement.

When the saw cuts close due to temperature prior to removal of the existing slab, full depth, full width saw cuts shall be made to relieve pressure. The material between the narrowly spaced saw cuts or the longitudinal joint and the 2 in. minimum offset longitudinal cut shall be removed, but not by the use of heavy drop hammers or large jackhammers. If air hammers are used to remove the material, they shall not be heavier than 60 lb. Tie bars protruding from the longitudinal offset cut shall be cut flush with the existing concrete. All waste material shall be immediately removed from the repair site.

Any saw blade cuts that extend into adjacent slabs, curbs or gutter shall be sealed as specified in Section 523.

522.03.04 Subgrade Preparation. Following the removal of the existing pavement, the Engineer will evaluate the subgrade to determine if it is suitable as a foundation for the new pavement. If the Engineer determines that the subgrade material is suitable but unstabilized, it shall be compacted as specified in Section 501.03.11 in a manner acceptable to the Engineer. If the Engineer determines that the subgrade material is unsuitable, the Contractor shall replace the unsuitable material with aggregate base material conforming to Section 901, which shall be thoroughly compacted in layers not greater than 4 in. deep. Construction of the base shall conform to Section 501. The subgrade for all types of repairs shall be moistened with water.

522.03.05 Subgrade Drains. The Engineer may direct that subgrade drains be constructed. The work shall conform to Section 306. Additional work shall be as directed by the Engineer.

522.03.06 Forms. The forms used shall conform to Section 520.03.04, or shall be as directed by the Engineer. Forms shall overlap the existing pavement on each side of the patch a minimum of 1 ft and be securely fastened to prevent movement when concrete is placed. To provide space for the forms, the Contractor shall excavate the adjacent shoulder the width of the form plus 6 in. After removal of the form, the excavated shoulder area shall be repaired using the same type of material as used in the original shoulder.

522.03.07 Reinforcement. Reinforcement shall conform to the Contract Documents and Section 520.03.06. Doweled joints shall be located at the slab face closest to the original doweled joint location.

Holes having a diameter 1/4 in. larger than the dowels, load transfer tie bars and longitudinal tie devices shall be drilled into the face of the existing slab at mid depth. After drilling, the hole shall be blown out and allowed to dry. The dowels, load transfer tie bars and longitudinal tie devices shall be grouted or epoxied into place. The alignment of the reinforcement shall be in the direction of the pavement and parallel to the plane of the surface.

A plastic grout retention disk conforming to the Contract Documents shall be placed on each dowel to prevent loss of the bonding material.

Reinforcement steel bars for continuously reinforced Portland cement concrete pavement shall be the same size and spacing as the existing steel and shall be spliced to the exposed steel of the existing pavement by lapping, welding or using a mechanical device that is approved by the Engineer. For lap splices, the steel reinforcement shall be lapped a minimum of 22 in. and secured with tie wires. Longitudinal steel reinforcement bars shall be continuous for the full length of the repair and the amount of steel in the repair area shall be at least equal to the amount of steel in the existing pavement. The reinforcement steel bars shall be supported by chairs or as approved by the Engineer.

For plain and conventionally reinforced pavement, the protruding ends of the dowel bars shall be coated with a water insoluble lubricant approved by the Engineer.

522.03.08 Joints. Joints shall conform to Section 520.03.14 and the Contract Documents. All joints shall be sealed as specified in Section 523.

522.03.09 Concrete Placement. Concrete placement shall conform to 520.03.07. Prior to placing concrete, the exposed vertical surfaces of all adjacent concrete shall be cleaned. Refer to Section 520.03.02 for weather requirements. The temperature of the concrete at placement shall be 50 to 90 F.

Concrete for continuously reinforced Portland cement concrete pavement shall be placed when the air temperature is a minimum 40 F and rising. When the range in daily temperature is expected to exceed 15 F, placement of concrete will be permitted in the late afternoon after the existing pavement has achieved maximum expansion unless otherwise directed by the Engineer.

Plain and continuously reinforced concrete pavement repairs shall be cast in one full depth operation. Conventionally reinforced concrete pavement repairs shall be poured in two equal lifts with the wire mesh laid on the surface of the first lift per Section 520.03.07(b).

All concrete shall be vibrated.

522.03.10 Finishing. Following the concrete placement, the surface shall be struck off to the finished grade by means of an adjustable steel or wooden template and floated to a smooth finish. The repair shall be screeded longitudinally to provide uniformity of ride to adjacent pavement. The final surface shall match the contour of the existing roadway. The Contractor shall provide a metal straightedge and perform surface checks as specified in Section 520.03.10.

522.03.11 Curing. The concrete shall be cured as specified in Section 520.03.12 except that the curing shall continue for 12 hours after placement of the concrete or until the repair is put into service.

522.03.12 Emergency Filler. The Contractor shall have readily available sufficient Crusher Run Aggregate CR-6 to completely fill the void of the repair area. The material shall be placed and compacted in the void and covered with a steel plate when directed by the Engineer. At the beginning of the next day's work, this material shall be completely removed using procedures which shall not disturb the subgrade, dowels, load transfer tie bars, load transfer assemblies or reinforcement that has been previously placed.

522.03.13 Steel Plates. The Contractor shall have an ample supply of 12 ft by 14 ft by 1 in. thick steel plates available on the project to cover emergency filler or be placed over the patch area until the concrete has developed sufficient strength to carry traffic. See Section 300.03.05 of these Specifications.

522.03.14 Unacceptable Repairs. Pavement repairs that have been damaged by traffic or other causes or have not conformed to these Specifications shall be removed and replaced by, and at the expense of, the Contractor.

522.04 MEASUREMENT AND PAYMENT. Portland Cement Concrete Pavement Repairs

will be measured in place and paid for at the Contract unit price for one or more of the items listed below as specified in the Contract Documents. The payment will be full compensation for saw cuts, furnishing, hauling, placing of all materials, removal and disposal of old concrete, grout, drilled holes, chairs, all tie devices, reinforcement, epoxy coating, steel plates, emergency filler, joint sealing, and for all labor, equipment, tools, and incidentals necessary to complete the work.

Steel plates and emergency filler, when satisfactorily removed from the project, remain the property of the Contractor.

522.04.01 ***Plain Portland Cement Concrete Pavement Type I Repairs*** per square yard.

522.04.02 ***Plain Portland Cement Concrete Pavement Type II Repairs*** per square yard.

522.04.03 ***Conventionally Reinforced Portland Cement Concrete Pavement Type I Repairs*** per square yard.

522.04.04 ***Conventionally Reinforced Portland Cement Concrete Pavement Type II Repairs*** per square yard.

522.04.05 ***Continuously Reinforced Portland Cement Concrete Pavement Type I Repairs*** per square yard.

522.04.06 ***Continuously Reinforced Portland Cement Concrete Pavement Type II Repairs*** per square yard.

522.04.07 ***Removal of Unsuitable Material and Refill*** per cubic yard.

522.04.08 ***Subgrade Drains*** will be measured and paid for as specified in the applicable portions of Section 306.

522.04.09 ***Shoulder Repairs*** per square yard. Repairs to existing shoulders necessitated by the placement of forms are also included.

522.04.10 ***Load Transfer Assemblies*** per each.

SECTION 523 – JOINT SEALING OF PORTLAND CEMENT CONCRETE PAVEMENTS

523.01 DESCRIPTION. This work shall consist of cleaning and sealing joints of Portland cement concrete pavements as specified in the Contract Documents or as directed by the Engineer.

523.02 MATERIALS.

Joint Sealers	911.01
Preformed Joint Fillers	911.02

Backer Rod. Backer rod used with joint sealer shall be flexible, compressible, nonshrinkable, have a surface which will prohibit bond with the joint sealer, and be capable of uniformly containing the joint sealer within the desired shape factor. Hard rubber and materials that deform at sealer application temperatures, or swell when wet, shall not be used.

523.03 CONSTRUCTION. Joints shall be sealed the same day they are shaped and prepared. All sealing shall be completed prior to opening the roadway to traffic, unless otherwise directed by the Engineer. If the joints are not sealed the same day, re-clean and dry joints as specified in Section 523.03.02 prior to sealing.

523.03.01 Joint Construction. Joint construction shall be as specified in Section 520.03.14. If the joint is tooled, preformed joint fillers shall not be used.

523.03.02 Joint Preparation. Joints shall be cleaned by one of the following methods as directed by the Engineer:

(a) High pressure water blasting.

(b) Abrasive blasting.

(c) Oil free air blowing at a minimum of 90 psi.

All joint walls and surfaces to which the joint material is to adhere shall be dry prior to installing the joint filler.

All prepared joints will be inspected and approved by the Engineer prior to sealing.

523.03.03 Sealing. Preformed joint filler shall be installed in conformance with the manufacturer's recommendations and the Contract Documents. The Contractor shall insert the backer rod as specified in the Contract Documents.

Silicone sealer shall be applied in conformance with the manufacturer's recommendations.

No backer rod shall be inserted into longitudinal joints.

The ambient air and pavement temperatures shall both be a minimum of 45 F and rising at the time of sealer application.

Sealer that is hot applied shall be heated as specified in the manufacturer's recommendations

in a kettle or other equipment acceptable to the Engineer. The kettle shall have a mechanically operated agitator, recirculation pumps, and a positive thermostatic temperature control. The applicator wand and all connecting hoses shall be insulated. Overheating or direct heating of the sealer will not be permitted.

Filler that has been overheated, subjected to heating for more than four hours, or any amount that remains in the applicator wand at the end of the day's operation shall be withdrawn and disposed of. Prior to the start of each day's operation, the Contractor shall withdraw and dispose of a minimum of one gallon of filler drawn from the container through the applicator wand.

All joints shall be filled with sufficient material that will result in the final surface of the sealer being recessed 1/4 in. below the surface of the pavement. Any joint with the sealer recessed more than 5/16 in. below the surface of the pavement two hours after sealing shall be resealed.

Silicone sealer shall be tooled so that the final surface of the sealer will have a parabolic shape in the surface cross sectional area. The deepest point at the center of the joint shall be 5/16 in. below the pavement surface. The Contractor shall use a tool approved by the Engineer that is capable of obtaining the parabolic shape at the surface of the sealer.

Curing time for silicone material varies with temperature and humidity and therefore may delay opening of the pavement to traffic. The Contractor is advised to consult the manufacturer's recommendations for curing time.

Silicone joint sealer shall be installed in conformance with the manufacturer's recommendations. The Contractor shall remove any excess sealer from the surface of the pavement.

All traffic shall be kept off the pavement surface until the sealer has cured.

Any sealer that pulls loose from the joints or shows excessive bubbling within one week after opening the pavement to traffic shall be replaced by and at the Contractor's expense.

523.04 MEASUREMENT AND PAYMENT. ***Joint Sealing of Portland Cement Concrete Pavement*** will be measured and paid for at the Contract unit price per linear foot of joint unless otherwise specified in the Contract Documents. The payment will be full compensation for cleaning existing joints, furnishing, hauling and placing all materials including preformed joint filler, joint sealer, backer rod, and for all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Joint construction for new Portland Cement Concrete Pavement is not included in this Specification. The cost to construct these joints shall be incidental to the Contract unit price per square yard for the pavement specified in the Contract Documents.

(This page intentionally left blank)

CATEGORY 600
SHOULDERS

SECTION 601 – AGGREGATE BASE FOR SHOULDERS – RESERVED

SECTION 602 – SOIL-CEMENT BASE FOR SHOULDERS – RESERVED

SECTION 603 – CHIP SEAL SURFACE TREATMENT FOR SHOULDERS – RESERVED

SECTION 604 – HOT MIX ASPHALT FOR SHOULDERS – RESERVED

SECTION 605 – EARTH SHOULDERS

605.01 DESCRIPTION. This work shall consist of constructing shoulders using earth as specified in the Contract Documents.

605.02 MATERIALS. Refer to Section 204.

605.03 CONSTRUCTION. Earth shoulders shall be constructed in conformance with Section 204.03.

The Contractor shall provide and employ a shoulder template to ensure uniformity of the shoulder surfaces. The finishing operations shall conform to Section 208.03.02.

605.04 MEASUREMENT AND PAYMENT. Earth shoulders will not be measured but the cost will be incidental to the Contract unit price per cubic yard for the appropriate class of Excavation or Borrow Material.

SECTION 606 – OPEN GRADED FRICTION COURSE FOR SHOULDERS – RESERVED

SECTION 607 – PORTLAND CEMENT CONCRETE PAVEMENT FOR SHOULDERS – RESERVED

SECTION 608 – SLURRY SEAL FOR SHOULDERS – RESERVED

SECTION 609 – CURB, COMBINATION CURB AND GUTTER, AND MONOLITHIC MEDIAN

609.01 DESCRIPTION. This work shall consist of constructing concrete curb, concrete combination curb and gutter, concrete curb openings, concrete monolithic median, concrete valley gutter and Hot Mix Asphalt (HMA) curb as specified in the Contract Documents or as directed by the Engineer. See also Standard Detail Plates G-27 through G-29 for requirements to evaluate curb ramps affected by trench restoration.

609.02 MATERIALS.

Crusher Run Aggregate CR-6	901.01
Aggregate size No. 57	901.01
Selected Backfill	302
Curing Materials	902.07
Form Release Compound	902.08
Concrete Mix No. 2	902.10.03
Concrete Mix No. 6	902.10.03
Hot Mix Asphalt	904
Emulsified Asphalt (Tack Coat)	904.03
Reinforcement Steel	908.01
Joint Sealer	911.01
Preformed Joint Filler	911.02
Borrow Excavation	916.01
3 In. Diameter Plastic Pipe	905

609.03 CONSTRUCTION.

609.03.01 Concrete Curb, Combination Curb and Gutter, Valley Gutter and Monolithic Median.

(a) Excavation. Excavation shall be to the specified depth and to a width that permits installation and bracing of the forms. The subgrade shall be compacted to 92 percent in conformance with T 180, Method C, and trimmed to the proper shape and required grade. All soft and unsuitable material shall be removed and replaced with suitable material approved by the Engineer.

(b) Forms.

(1) Fixed Form Method. Fixed forms shall be steel of an approved design, securely fastened and braced to prevent any movement during the placing of concrete. Forms shall extend to the full depth of the concrete. They shall not be less than 10 ft long. When installation is made along curves where the radius of the curb face is less than 200 ft, flexible or curved steel or wooden forms shall be used that are not more than 6 ft long. Both wooden and steel forms shall be properly designed and acceptable to the Engineer. They shall be installed to prevent buckling or warping. The tolerance shall not exceed 1/4 in. in 10 ft in either the grade or alignment. Forms shall be thoroughly cleaned and coated with form release compound each time they are used.

(2) Slip-Form Method. Slip-form construction shall conform to Section 610.03.01(b)(2).

(c) Concreting. Concrete shall be mixed in conformance with Section 915.03.04. Volumetric batching and continuous mixing will be permitted. When the subgrade is dry, it shall be moistened with as much water as it can absorb. Consolidation of concrete placed in the forms shall be by spading or other methods approved by the Engineer. Except for curb face forms, the forms shall remain in place for a minimum of 12 hours and precautions taken to avoid damaging the concrete. Curb face forms shall be stripped as soon as the concrete will retain its shape.

(d) Depressed Curbs. Curbs shall be depressed at entrances and sidewalk ramps as specified in the Contract Documents or as directed by the Engineer.

(e) Openings. Drainage openings for the purpose of allowing rain spout water or other drainage to outlet shall be provided by constructing insert openings within the curb as directed by the Engineer.

Curb openings shall be provided as specified in the Contract Documents.

(f) Finishing. Concrete shall be struck off to the cross section specified after which it shall be finished, floated smooth and followed with a broom type textured finish. The Engineer may permit other methods of finishing for the purpose of matching adjacent concrete finishes. Plastering will not be permitted. All exposed edges shall be edged with a 1/4 in. edging tool except the face edge of curb shall have a 1 in. radius. When finished, the top surface of curbs and medians as well as the faces shall show no deviation from grade and alignment in excess of 1/4 in. per 10 ft. All honeycombed and damaged areas shall be repaired immediately after the removal of the forms in a manner acceptable to the Engineer.

(g) Joints.

(1) Fixed Form Method. Spacing between joints shall be 10 ft except where shorter spacing is necessary for closures and conformity to expansion and contraction joints in contiguous concrete pavements. No joint spacing shall be shorter than 4 ft. The joints shall be formed by using plate steel templates which are 1/8 to 3/16 in. thick and shall have a width and depth equal to the unit cross section. The templates shall be set perpendicular to the grade and line of the unit. Intermediate templates or sections of templates shall not be used. Where stationary structures such as bridges and inlets are encountered, an expansion joint shall be constructed for the full depth using 1/2 in. preformed expansion joint filler. Expansion joints shall be constructed at a maximum of 100 ft, and at points of curves, tangents and at locations coinciding with adjoining pavement joints. Expansion joints are not required when adjacent to a flexible pavement or away from any pavement.

Extend the expansion joint material to the full depth of the unit cross section. Apply sealer to the entire gutter portion and 1 inch up the face of all joints. In addition, seal the entire expansion joint of monolithic medians.

(2) Slip-Form Method. Slip-form construction shall be as specified in Section 611.03.01(b). Joint spacing shall be as specified in Section 609.03.01(g)(1).

(h) Cold Weather Construction and Curing. Refer to Section 520.03.02 for cold weather construction and to Section 520.03.12 for concrete curing.

(i) Backfill. After curing for at least 72 hours, use approved material to backfill the front and back of the curb, combination curb and gutter, and median to the required elevations. Complete the backfilling before rolling the adjacent roadway.

(j) The Engineer shall approve the scheduling for the forming and placement of **valley gutters** across intersections in order that traffic may be controlled during placement and curing. Normal procedure is construction of the valley gutter across half of the road width at a time, unless full access for traffic on the street to be closed can be maintained via an adjacent intersection. Prior notification of adjacent businesses and homes shall be provided in advance of closures or partial closures of a road for this purpose.

The Engineer shall review and approve the grading of the valley gutter prior to concrete placement. A minimum grade of 0.5% along the line of the valley gutter shall be maintained in all cases and the approved grade shall flow into and from the valley gutter at a slope equal to or greater than the minimum 0.5% slope in order to maintain drainage of the road surface and avoid puddles and icing at intersections.

609.03.02 Hot Mix Asphalt (HMA) Curb. HMA curb shall be placed by a self-propelled machine. The machine shall form curbing that is uniform in texture, shape, density and to a template as specified in the Contract Documents unless otherwise approved by the Engineer.

The base upon which the curb is to be placed shall be clean, dry and stable. It shall be tack coated with emulsified asphalt of the type and amount as directed by the Engineer.

When required, the curb shall be backfilled after it has sufficiently hardened to prevent damage. Consolidate the backfill by tamping or rolling.

609.04 MEASUREMENT AND PAYMENT. The payment will be full compensation for all concrete, Hot Mix Asphalt, forms, excavation, back-fill, disposal of excess material, drainage openings, joint sealer, emulsified asphalt tack coat, and for all material, labor, equipment, tools, and incidentals necessary to complete the work.

609.04.01 ***Curb***, ***Combination Curb and Gutter*** and ***Monolithic Median*** will be measured and paid for at the Contract unit price per linear foot. ***Concrete Curbs*** and ***Hot Mix Asphalt Curbs*** and ***Concrete Combination Curb and Gutter*** will be measured along the front face of the curb. ***Concrete Monolithic Median*** will be measured along the center line of the finished top of median.

When existing curb or combination curb and gutter is removed and replaced with new curb or combination curb and gutter, the cost of the removal will be incidental to the Contract unit price for the new item.

609.04.02 ***Concrete Curb Openings*** or ***Concrete Combination Curb and Gutter Openings*** will be measured and paid for at the Contract unit price per each.

609.04.03 The removal and disposal of unsuitable material in cut sections will be measured and paid for at the Contract unit price per cubic yard for ***Class 2 Excavation***. The replacement with suitable material shall be excavation from other areas, borrow, or select backfill as directed by the Engineer.

609.04.04 When the Engineer authorizes ***Borrow Excavation*** or ***Selected Backfill using No. 57 Aggregate*** or ***Selected Backfill using Crusher Run Aggregate CR-6*** as replacement material for the Class 2 Excavation, it will be measured and paid for at the Contract unit price per cubic yard for the respective items as specified in the Contract Documents.

609.04.05 The cost of building gutters through inlets, where necessary, will be paid at the price bid for ***Combination Curb and Gutter***. The cost of reinforcing steel for inlet gutters will not be paid for directly, but must be included in prices for items bid.

609.04.06 Three-inch diameter plastic pipe for drainage through curbing and under sidewalks will be included in the cost of curb and gutter.

609.04.07 ***Seven (7) Inch Concrete Valley Gutter*** will be measured and paid for at the Contract unit price per square foot, measured complete and in place at the proper grade. The price paid shall include the cost of patching adjacent pavement to match the upper edges of the valley gutter.

SECTION 610 – SIDEWALKS

610.01 DESCRIPTION. Construct hot mix asphalt (HMA) or concrete sidewalks, concrete stairs, railings and sidewalk ramps. Ensure that the sidewalks and sidewalk ramps are constructed in accordance with the most recent accessibility guidelines of the Americans with Disabilities Act (ADA).

610.02 MATERIALS.

Curing Materials	902.07
Form Release Compound	902.08
Concrete Mix No. 2	902.10.03
Hot Mix Asphalt (HMA)	904
Welded Wire Fabric	908
Joint Sealer	911.01
Preformed Joint Fillers	911.02
Roofing Paper	911.07
Railings	Std. Detail Plates G-10, G-11, G-12

610.03 CONSTRUCTION.

610.03.01 Concrete Sidewalks.

(a) Excavation. Refer to Section 609.03.01(a).

(b) Forms.

(1) Fixed Form Method. Fixed forms shall be of steel or wood and shall extend to the full depth of the concrete. All forms shall be straight, free from warp and of sufficient strength to resist the pressure of the concrete without displacement.

Bracing and staking of forms shall be such that the forms remain in both horizontal and vertical alignment until their removal. The forms shall be thoroughly cleaned and coated with a form release compound each time they are used. Forms shall not be stripped until the concrete has set for at least 12 hours, and every precaution shall be taken to avoid damaging the concrete.

(2) Slip-Form Method. Slip-form construction shall conform to the slip-form method specified in Section 611.03.01(b), except that joint construction shall conform to paragraph (e) of this Subsection.

(c) Concreting. Before placing concrete, the subgrade (when dry) shall be moistened with as much water as it can absorb. The concrete shall be mixed in conformance with Section 915.03.04. Volumetric batching and continuous mixing will be permitted. Concrete shall be deposited on the prepared subgrade in successive batches to the full width of the sidewalk. It shall be thoroughly spaded along the edges and shall be tamped to eliminate voids. It shall be struck off, screeded to the elevation of the top of the forms and finished.

(d) Finishing. The surface shall be floated and broom finished. No plastering of the surface will be permitted. All outside edges and all joints shall be edged with a 1/4 in. edging tool.

(e) Joints. Joints shall be placed as specified in the Contract Documents. Dummy joints shall be tooled or sawed a minimum of 3/4 in. deep.

Expansion joint material shall extend the full depth of the concrete. Match adjacent joints in curb and pavement.

(f) Cold Weather Protection and Curing. Refer to Section 520.03.02 for cold weather protection and to Section 520.03.12 for concrete curing. During the curing period, all pedestrian and vehicular traffic shall be prohibited.

610.03.02 Hot Mix Asphalt (HMA) Sidewalks.

(a) Excavation. Excavation, subgrade and forms when required shall conform to Sections 610.03.01(a) and (b).

(b) Placement. HMA Sidewalk shall conform to Section 504.03.05. When the sidewalk is not formed, backfill material acceptable to the Engineer shall be used to form an 18 in. wide earth shoulder for the HMA or as specified in the Contract Documents.

(c) Compaction. Compaction shall be accomplished by means of a roller approved by the Engineer. In areas inaccessible to the roller, a vibrating plate compactor or hand tamping may be used. In any case, the HMA shall be uniformly compacted. Compactive effort shall start as soon as the HMA can be compacted without displacement and shall continue until the material is thoroughly compacted and all marks have been removed.

610.03.03 Backfill. The sidewalk backfill shall conform to Section 210. Suitable backfill materials shall be obtained from excavation for the sidewalk or from other areas, borrow, or selected backfill as directed by the Engineer.

After the forms have been stripped and repairs are satisfactorily completed, backfill the spaces in front and back of the sidewalk to the required elevations using approved material.

610.03.04 Pedestrian Ramps. Wherever sidewalks are built concurrently with bituminous or concrete curbs, the Contractor shall make provisions for pedestrian ramps at all curb returns on intersecting streets in accordance with the most recent ADA guidelines, and as directed by the Engineer.

610.03.05 Concrete Stairs and Stair Railings shall be constructed in accordance with the most recent ADA guidelines and with Standard Detail Plates G-9 through G-12 in locations as specified on Plans, Special Provisions or as directed by the Engineer

610.04 MEASUREMENT AND PAYMENT. The payment will be full compensation for all excavation, backfill, disposal of excess or unsuitable material, forms, joints, sealer, compaction, curing, finishing, and for all material, labor, equipment, tools, and incidentals necessary to complete the work.

610.04.01 ***Concrete Sidewalks***, including sidewalk ramps, will be measured and paid for at the Contract unit price per square foot of finished surface. When the existing sidewalk is removed and replaced with a new sidewalk, the cost to remove the existing sidewalk will be incidental to the Contract unit price for ***Concrete Sidewalk***.

610.04.02 ***Hot Mix Asphalt Sidewalks*** will be measured and paid for at the Contract unit price per ton for the mixture placed.

610.04.03 The removal and disposal of unsuitable material below the subgrade will be measured and paid for at the Contract unit price per cubic yard for ***Class 2 Excavation***. The replacement with suitable material shall be excavation from other areas, borrow, or select backfill as directed by the Engineer.

610.04.04 When the Engineer authorizes ***Borrow Excavation*** or ***Selected Backfill using No. 57 Aggregate*** or ***Selected Backfill using Crusher Run Aggregate CR-6*** as replacement material for the Class 2 Excavation, it will be measured and paid for at the Contract unit price per cubic yard for the respective items as specified in the Contract Documents.

610.04.05 Concrete - Steps & Miscellaneous Structures will be measured and paid for at the Contract unit price per cubic yard of concrete for the concrete mix used per Plans, Special Provisions or the direction of the Engineer.

610.04.06 Ornamental Stair Railings or **Pipe Stair Railings** for use with concrete steps will be measured and paid for at the Contract unit price per linear foot for the type of railing to be installed per Plans, Special Provisions or the direction of the Engineer.

SECTION 611 – CONCRETE TRAFFIC BARRIERS

611.01 DESCRIPTION. Construct concrete traffic barriers.

611.02 MATERIALS.

Crusher Run Aggregate CR-6	901.01
Aggregate	901.01, Size No. 57
Curing Materials	902.07
Form Release Compound	902.08
Concrete Mix No. 2	902.10
Concrete Mix No. 6	902.10
PVC Pipe	905
Reinforcement Steel	908
Preformed Joint Fillers	911.02
Borrow Excavation	916.01
Geotextile	921.09
Reflective Delineators	As approved by the MdSHA QPL

Use concrete mix No. 6 to construct all concrete traffic barriers, end transitions, and footers unless otherwise specified. Before beginning work, construct a sample panel approximately 2 ft x 2 ft x 3 in. using the proposed concrete mix design. After 28 days, the concrete shall match Federal Standard No. 595, Color 37722 or lighter. Keep the approved sample panel at the construction site to be used by the Engineer to compare the color of the concrete barrier to the sample panel for adjustments and approval.

Prepare a sample panel for each source of supply.

611.03 CONSTRUCTION. Use cast-in-place construction. Excavate to the required depth and to a width that will permit the installation and bracing of forms where necessary. Remove all soft and unsuitable material, and replace it with suitable material. Properly shape the subgrade and compact it as specified in Section 208.

611.03.01 Concrete Barriers. Forming of the footer or concrete barrier may be by either the fixed form or the slip-form method. Do not construct the footer and the barrier section monolithically.

(a) Fixed Form Method. Use steel forms with a tolerance in grade and alignment of 1/4 in. in 10 ft. For bifurcated and transition sections, other forming materials may be used as directed.

Thoroughly clean and coat the forms with form release compound each time they are used.

Mix and place concrete as specified in Section 915.03.04 and Section 414, respectively. Volumetric batching and continuous mixing will be permitted. Vibrate concrete using an approved immersion type mechanical vibrator.

Saw or form construction and contraction joints at 20 ft intervals with a minimum of 10 ft. For saw time requirements, refer to Section 520.03.14(c)(1). Place expansion joints where specified or as directed. Ensure that all joints in footers and walls align.

Finish concrete as specified in Section 611.03.03 except apply a broom finish to the surface when forms are stripped in less than 24 hours. Remove the face forms for finishing as soon as the concrete can retain its shape.

After removing the forms, immediately repair all honeycombed and damaged areas.

(b) Slip-form Method. Use approved slip-form equipment. The equipment shall have internal vibrating capability and automatic guidance controls to follow line and grade references. On vertical and horizontal curves, set an additional intermediate support in the field to establish an acceptable reference line. Do not use ski or shoe sensors. This method shall not be used within 5 ft. of either side of a utility junction box. Use the fixed form method.

Mix concrete as specified in Section 915.03.04. Ensure that the consistency of the concrete after extrusion will maintain the shape of the barrier without support. Provide surfaces that are free of pits larger than 3/16 in. diameter and that require no further finishing other than a broomed finish.

Whenever a tear occurs during the operation of the slip-form equipment, repair it immediately or remove and replace as directed.

Saw or form construction and contraction joints at 20 ft intervals in the barrier and footer with a minimum of 10 ft, except in the area of miscellaneous structures 6 ft will be permitted. Saw the joints 1/8 in. wide and at least 2 in. deep. Place expansion joints as specified or as directed.

611.03.02 Curing. Cure and protect concrete as specified in Section 414.

611.03.03 Finished Surface. Finish concrete as specified in Section 414. The completed barriers shall be within 1/4 in. in 10 ft from the specified horizontal and vertical lines. The barrier shall present a smooth, uniform appearance.

611.03.04 Reflective Delineators. Install reflective delineators on the concrete traffic barrier as specified.

611.04 MEASUREMENT AND PAYMENT. The payment will be full compensation for all test panels, excavation, removal of existing hot mix asphalt, disposal of excess or unsuitable material, reinforcement, drilled holes, drainage appurtenances, geotextile, No. 57 aggregate, conduit, boxes and fittings, backfilling, and for all material, labor, equipment, tools, and incidentals necessary to complete the work.

The removal and disposal of unsuitable material will be measured and paid for at the Contract unit price for ***Class 2 Excavation***, which price includes the cost of using suitable excavation as replacement material. When ***Borrow*** or ***Selected Backfill*** is authorized as replacement material, payment will be made at the Contract unit price for the respective items.

The removal of existing concrete traffic barriers will not be measured unless specified elsewhere in the Contract Documents.

611.04.01 ***Concrete Traffic Barriers*** will be measured and paid for at the Contract unit price per linear foot. Measurement will be along the center line of the top of the barrier.

611.04.02 ***Concrete Traffic Barrier End Transitions*** will be measured and paid for at the Contract unit price per each.

611.04.03 ***Reflective Delineators*** will be measured and paid for at the Contract unit price per each.

SECTION 612 – METAL TRAFFIC BARRIERS

612.01 DESCRIPTION. Construct metal traffic barriers.

612.02 MATERIALS.

Brown Polyester Coating	917.03
W Beam	918.01
Metal Posts	918.02
Traffic Barrier Hardware	918.03
Timber Posts	918.04
Wood Offset Blocks	918.04

Wire Rope	918.05
Rub Rail	A 36, Galvanized, A 123
Thrie Beam	M 180, Class A, Type 2
Reflective Delineators	As approved by the Bureau of Traffic Engineering and Transportation Planning
Recycled Composite Material Offset Blocks	As specified by the manufacturer

612.03 CONSTRUCTION.

612.03.01 Post Installation. Drive all posts, unless otherwise approved. Use a method of driving that will not batter or distort the posts. If posts are not driven, set them in holes of sufficient diameter to allow tamping of the backfill. Backfill with approved material. Place backfill in horizontal layers not exceeding 6 in. loose depth and thoroughly compact. When it is necessary to place posts in existing paving, remove all loose material and replace the paving. Prior to installing rail or cable elements, properly align the posts to within 1/4 in. of line and grade. Install all posts plumb.

When rock is encountered at a depth less than the specified footing depth, drill a 12 in. diameter hole 20 in. into the rock or to the planned footing depth, whichever is less. If the 20 in. depth is reached prior to the planned depth, cut the post to the appropriate length. Paint the cut edge with approved galvanizing repair paint. Set the post and backfill with an approved material. Do not use concrete or grout material. Place the backfill in horizontal layers not exceeding 6 in. loose depth and thoroughly compact.

612.03.02 Rail Assembly. Furnish rail elements as specified. Ensure a smooth continuous installation, with laps in the direction of traffic flow. Ensure that all bolts are drawn tight.

612.03.03 Offset Blocks. When installing new traffic barrier W beam, use either wood or recycled composite offset blocks. Do not mix different types of manufactured composite blocks or mix composite and wood blocks. All offset blocks shall be routed or grooved to prevent them from rotating.

When an existing steel offset bracket is damaged, replace it with a new steel bracket.

612.03.04 Brown Polyester Coated Traffic Barrier W Beam Using 6 Foot Post or 8 Foot Post. Ensure that all components are padded and handled with nylon slings during loading, unloading, and installation.

Preserve the integrity of the polyester coating. If the polyester coating is chipped, scratched, blistered, or otherwise separated from the base metal, repair the damaged areas using the manufacturer's repair kit. Complete all repairs to the satisfaction of the Engineer or replace the damaged material at no additional cost to the County.

612.03.05 W Beam Barrier Reflective Delineators. Install reflective delineators as specified.

612.03.06 Remove and Reset Existing Traffic Barrier. When removing and resetting an entire run or a portion of a run of traffic barrier, replace the metal offset brackets with either wood or recycled composite offset blocks. When removing and resetting an entire run, use 8 in. offset blocks. When removing and resetting only a portion of a run, use 6 in. offset blocks. Ensure that the holes in the blocks match the holes in the existing posts. Move the posts at least 1 ft in either direction from the existing location. When resetting the rail, measure the height of the rail to ensure that it conforms to the current height shown in the MdSHA's Book of Standards for Highway and Incidental Structures. Unless otherwise directed, maintain the existing offset distance from the edge of the roadway.

612.03.07 Remove and Reset Existing Median Traffic Barrier W Beam. Refer to Section 612.03.06.

612.03.08 End Treatments. Refer to Section 614.

612.04 MEASUREMENT AND PAYMENT. The payment will be full compensation for all rock excavation, restoration of grassed or paved areas, drilled post holes and for all material, labor, equipment, tools, and incidentals necessary to complete the work.

612.04.01 ***Traffic Barrier W Beam Using 6 Foot Post*** or ***8 Foot Post*** will be measured and paid for at the Contract unit price per linear foot. When a bottom W beam panel is specified for the Traffic Barrier W Beam item it will be measured and paid for at the Contract unit price per linear foot for Traffic Barrier W Beam Panel.

612.04.02 ***Traffic Barrier W Beam Median Barrier*** will be measured and paid for at the Contract unit price per linear foot.

612.04.03 ***Traffic Barrier Thrie Beam*** will be measured and paid for at the Contract unit price per linear foot.

612.04.04 ***Replace 6 or 8 Foot Posts***, ***Install 6 or 8 Foot Posts***, ***Splice Joints***, and ***W-Beam Panel Replacement*** will be measured and paid for at the Contract unit price as specified in the Contract Documents for units with the selected coating.

612.04.05 ***Remove and Dispose of Existing Traffic Barrier W Beam*** and ***Remove and Salvage Existing Traffic Barrier W Beam*** will be measured and paid for at the Contract unit price per linear foot.

612.04.06 ***Remove and Reset Existing Traffic Barrier*** will be measured and paid for at the Contract unit price per linear foot. Offset blocks will not be measured but the cost will be incidental to the item.

612.04.07 ***Remove and Reset Existing Median Traffic Barrier W Beam*** will be measured and paid for at the Contract unit price per linear foot. Offset blocks will not be measured but the cost will be incidental to the item.

612.04.08 ***Traffic Barrier W Beam Median Barrier with Bottom Panel*** will be measured and paid for at the Contract unit price per linear foot.

612.04.09 ***Remove and Reset Existing Median Traffic Barrier W Beam with Bottom Panel*** will be measured and paid for at the Contract unit price per linear foot.

612.04.10 ***W Beam Barrier Reflective Delineators*** will be measured and paid for at the Contract unit price per each.

612.04.11 The application of fusion bonded brown polyester coating to Traffic Barrier W Beam, as well as all special handling and touch up will not be measured but the cost will be incidental to the item to which the coating is applied.

SECTION 613 – RESERVED

SECTION 614 – PERMANENT TRAFFIC BARRIER END TREATMENTS

614.01 DESCRIPTION. Furnish, and install permanent traffic barrier end treatments.

614.02 MATERIALS. Refer to Section 612.02 and the following:

End Treatments and Spare Parts Packages	As specified by the manufacturer
Hazard Marker	As approved by MdSHA QPL
Plastic Barrels	As approved by MdSHA QPL
Sand	901.01
Graded Aggregate Base	901.01
Bank Run Gravel Base	901.01
Common Borrow	916.01.04
Topsoil	920.01
Concrete Mix 2 and 6	902.10

614.03 CONSTRUCTION.

614.03.01 End Treatments.

(a) Type A System. Bury the ends of the traffic barrier, the end anchorage terminal, and the rub rail when required, in a cut slope. Excavate the slope to install these components. Upon installation, backfill the area to match the adjacent slope, compact, seed, mulch, and install soil stabilization matting as directed. For single rail systems, use 6 ft posts throughout the entire end treatment. For double rail systems, use 8 ft posts, except for the last three posts buried in the cut slope.

Construct the end anchorage terminal using either option 1 or 2 from the MdSHA's Book of Standards for Highway and Incidental Structures.

Install traffic barrier W beam as specified in Section 612.03.

(b) Type B System. Install according to the manufacturer's recommendations.

(c) Type C, D, E, and F. Install these systems in a straight line, unless otherwise specified by the manufacturer and approved by the Engineer. Refer to the manufacturer's recommendations for installation methods and procedures.

(d) Nose Section. Reflectorize as approved by the Bureau of Traffic Engineering.

(e) Finish Coat. Traffic barrier end treatments shall have the same finish coat as the W beam traffic barrier to which they are attached.

(f) Sand Filled Plastic Barrels (SFPB). Provide the components and assemble, place in the required configuration, and fill each barrel according to the manufacturer's recommendations or as specified in the Contract Documents. Ensure that each SFPB is watertight and separated from other SFPB by a distance of 3 in. Place the last row of SFPB 12 in. from the shielded object.

Reflectorize the first barrel of the SFPB configuration as specified.

Ensure that all sand is dry and loose. Do not use bags of sand. Add an antifreeze agent to the sand according to the manufacturer's recommendations.

614.03.02 Surface Adjustment. When surface adjustment is required for installation of Type B, C, D, E, and F end treatments, use any class of excavation available on the project. When excavation is not available on the project, use crusher run aggregate CR-6, bank run gravel subbase, borrow, topsoil, or asphalt milling and grindings. Complete the surface adjustment within 48 hours.

614.03.03 Transitions to Existing Structures. When transitions to existing structures or traffic barriers are required, perform the work as recommended by the manufacturer.

614.04 MEASUREMENT AND PAYMENT. The payment will be full compensation for all excavation, removal of the existing end treatment to be replaced, fabrication of all component parts, transitions to barriers, reflectorization, backfill, compaction, restoration of grassed or paved areas, seed and mulch, soil stabilization matting, and for all material, labor, equipment, tools, and incidentals necessary to complete the work.

614.04.01 Type A ***End Anchorage Terminal Either Option*** will be measured and paid for at the Contract unit price per each.

614.04.02 Type B through H, J, and K ***Traffic Barrier End Treatment*** will be measured and paid for at the Contract unit price per each. Type L ***Traffic Barrier Anchorage*** will be measured and paid for at the Contract unit price per each.

614.04.03 Surface adjustment for Types B, C, D, E, and F ***Traffic Barrier End Treatment*** will be measured and paid for at the Contract unit price per cubic yard for the Surface Adjustment for Traffic Barrier End Treatment item. The payment will also include full compensation for furnishing, adjusting, and compacting embankment or aggregate material.

614.04.04 ***Permanent Crash Cushion Sand Filled Plastic Barrels*** will be measured and paid for at the Contract unit price per barrel. The payment will also include full compensation for furnishing and placing sand and antifreeze agent.

614.04.05 Repairs.

(a) ***Traffic Barrier End Treatment Spare Parts Package*** furnished and installed will be measured and paid for at the Contract unit price per each for the type specified. The payment will also include full compensation for the clearing and removal of debris and damaged unsalvageable parts.

(b) Spare parts packages not used will be paid for in conformance with Section GP-9.02. These packages shall be delivered to the Bureau of Highways as directed by the Engineer at which time they will become the property of Baltimore County.

(c) When the County furnishes spare parts packages, ***Repair Traffic Barrier End Treatment*** will be measured and paid for at the Contract unit price per each for the type specified. The payment will also include full compensation for all transportation, reconnection to fixed objects where necessary, and clearing and removal of debris and damaged unsalvageable parts.

(d) Payment will not be made for spare parts packages used for end treatments damaged due to the Contractor's operations.

614.04.06 The application of fusion bonded brown polyester coating, as well as all special handling, will not be measured but the cost will be incidental to the item to which the coating is applied.

SECTION 615 – CHAIN LINK FENCE

615.01 DESCRIPTION. This work shall consist of furnishing and erecting chain link fence as specified in the Contract Documents or as directed by the Engineer.

615.02 MATERIALS.

Concrete Mix No. 2	902.10.03
Fence Fabric	914.01
Tie Wires, Line Post Clips, Tension Wires and Tension Wire Clips	914.02
Posts, Braces, Fittings and Hardware	914.03
Gates	914.04
Barbed Wire	914.05

615.02.01 Type. The height and type of fence shall be as specified in the Contract Documents. When the type of fence is not specified, one of the following types may be used:

(a) Galvanized steel and malleable iron components.

(b) Galvanized steel fabric utilizing galvanized steel posts or aluminum line posts.

(c) Aluminum coated steel fabric utilizing galvanized steel line posts.

(d) Aluminum coated steel fabric utilizing aluminum line posts.

(e) Bonded vinyl coated fabric utilizing galvanized steel or galvanized bonded vinyl coated steel line posts and fittings.

(f) Bonded vinyl coated fabric utilizing aluminum line posts.

615.03 CONSTRUCTION.

615.03.01 General Requirements. The Contractor's activities and operations shall be confined to the area immediately adjacent to the right-of-way lines and within the right-of-way except that permission may be granted by the Engineer for normal construction activities through lands owned by or under control of the County.

In areas where any privately owned fence or other property is within the County's right-of-way, the Contractor shall remove the items and place them on the owner's property as directed by the Engineer. The Contractor shall be held responsible for any undue damage to privately owned items removed.

Fence lines as specified in the Contract Documents are only a guide and the exact location of the fence shall be determined in the field by the Engineer.

The bottom of the fabric shall be placed a nominal distance of 1 in. above the ground line, a maximum clearance of 6 in. will be permitted for a maximum horizontal distance of 8 ft except for special conditions as specified in the Contract Documents.

Any excavation or backfill required in order to comply with the above provisions shall be as approved by the Engineer. For roadway fencing projects the fence fabric shall be placed on the road side of the posts. For storm water management ponds the fabric shall be placed on the outside of the posts or the side farthest from the pond.

The fence shall be true and taut.

All posts shall be plumbed. The posts shall be spaced as uniform as practicable to the spacing as specified in the Contract Documents with a tolerance of minus 2 ft.

Terminal posts shall be installed at all ends, abrupt changes in grade and at changes in the horizontal alignment over 15 degrees. In no case shall the distance between terminal posts exceed 500 ft.

Post lengths shall be adequate in all cases to accommodate the fabricated width of the fence fabric without stretching or compressing the fabric and to obtain, as a minimum, the length required below the bottom of the fabric.

Post caps are required for all round line, terminal, and corner posts.

A tension wire shall be run continuously between terminal posts near the top and bottom of the fabric and attached to the fabric with hog ring fasteners at 18 in. intervals.

Horizontal brace rails with diagonal truss rods and turn buckles shall be installed at all terminal posts. Sufficient braces shall be supplied to permit complete bracing from each terminal post to all adjacent line posts.

Fabric shall be tied to brace rails at 2 ft maximum intervals and to posts at 12 in. maximum spacing. Stretcher bars shall be attached to terminal posts by connectors equally spaced at 16 in. centers maximum. Top and bottom connectors shall be as close as possible to the ends of the fabric.

615.03.02 Concrete Method. Posts shall be centered in the concrete footings. The concrete shall be thoroughly compacted around the post by rodding or vibrating. The finished top surface shall be troweled to a smooth finish slightly above the ground line and uniformly sloped to drain away from the post. The post shall not be disturbed in any manner within 72 hours after the individual post footing is completed.

Hand mixed concrete shall not be used without written permission from the Engineer. When permitted, the hand mixed batch shall not exceed 1/2 cu.yd.

Anchorage for Line Posts and Terminal Posts. Where rock is encountered at a depth less than the specified footing depth, a hole 1 in. larger than the greatest dimension of the post shall be drilled to a depth of 12 in. or to the planned footing depth, whichever is less. After the post has been set, the remainder of the drilled hole shall be filled with grout composed of one part Portland cement and two parts mortar sand by dry loose volume. The space above the rock shall be filled with concrete. The drive anchor blade method will not be allowed in rock areas, where all posts shall be set in concrete.

615.03.03 Drive Anchor Blade Method. This method shall not be used in rock.

(a) The following alternate will be permitted in case of line posts only. After being driven in the ground, the line post shall be held rigidly upright by means of two galvanized steel drive anchor blades. Blades shall be driven diagonally through galvanized steel fittings attached to opposite sides of the post. The approximate spread of the blades at their full depth shall be 39 in. The top of the device shall be a minimum of 3 in. below the finished grade. The device and procedure shall be approved by the Engineer.

(b) The following alternate will be permitted for terminal posts. After being driven into the ground, the terminal post shall be held rigidly upright by means of two anchor units spaced approximately 6 in. apart along the terminal post, and each anchor unit driven in a direction to offset the stresses caused by the tension of the fence wire. Galvanized steel drive anchor blades that are driven through galvanized steel fittings shall be attached to opposite sides of the post. The approximate spread of the blades at their full depth shall be 39 in. The top of the device shall be a minimum of 3 in. below the finished grade. The device and procedure shall be approved by the Engineer.

615.04 MEASUREMENT AND PAYMENT. The payment will be full compensation for all material, labor, equipment, tools, and incidentals necessary to complete the work.

The removal of privately owned fence or other property from within the County's right-of-way will not be measured but the cost will be incidental to the Contract lump sum price for ***Clearing and Grubbing***.

When an item for ***Clearing and Grubbing*** is not specified in the Contract Documents, ***Clearing and Grubbing*** will not be measured but the cost will be incidental to the Contract unit price per linear foot for the pertinent Chain Link Fence item.

615.04.01 ***Chain Link Fence*** will be measured and paid for at the Contract unit price per linear foot for the actual number of linear feet measured to centers of end posts for the height of fence and the mesh coating and color specified.

615.04.02 ***Terminal Posts*** (End, Pull and Corner Post) will be measured and paid for at the Contract unit price per each for the size and type specified.

615.04.03 ***Gates*** will be measured and paid for at the Contract unit price per each as complete units of the size and type specified.

SECTION 616 – WHEEL STOPS

616.01 DESCRIPTION. Furnish and install preformed wheel stops.

616.02 MATERIALS.

Concrete Mix No. 2	902.10
Reinforcement Steel	908.01
Recycled Composite Material	
Wheel Stops	As specified by the manufacturer

Recycled Composite Material. Wheel stops manufactured of recycled composite material shall be as specified by the manufacturer and be insect resistant.

The manufacturer shall furnish certification to the Engineer for approval.

616.03 CONSTRUCTION. Locate and secure wheel stops in place as specified. Only one type of wheel stop is permitted for each project.

616.04 MEASUREMENT AND PAYMENT. ***Wheel Stops*** will be measured and paid for at the Contract unit price per each. The payment will be full compensation for all material, labor, equipment, tools, and incidentals necessary to complete the work.

SECTION 617 – SHOULDER EDGE DROP-OFF GRADING ADJUSTMENT

617.01 DESCRIPTION. This work shall consist of constructing the area adjacent to the outside edge of the shoulder to eliminate the shoulder drop off.

617.02 MATERIALS.

Crusher Run Aggregate CR-6	901.01
Bank Run Gravel Subbase	901.01
Select Borrow	916.01.01
Common Borrow	916.01.04
Topsoil	920.01
Hot Mix Asphalt Millings Or Grindings	Size of individual particles shall be less than 2 inches as visually determined.

617.03 CONSTRUCTION. When the outside shoulder pavement edge exceeds 2-1/2 inches in height above the existing ground line, place the wedge shaped area graded to 4:1 slope and compacted as specified in the Contract Documents or as directed by the Engineer. The grading adjustment shall be completed by the end of the day that the dropoff is created and prior to opening to traffic.

The material, lines, and grades, and the cross section shall be as specified in the Contract Documents.

617.04 MEASUREMENT AND PAYMENT. ***Crusher Run Aggregate CR-6, Bank Run Gravel Sub-base***, ***Select Borrow***, ***Common Borrow***, ***Topsoil*** and ***Hot Mix Asphalt Millings or Grindings for Shoulder Edge Drop-Off*** will be measured and paid for at the Contract unit price per ton, cubic yard or square yard, as specified in the Contract Documents. The payment will be full compensation for furnishing, hauling, placing, compacting, maintaining, and for all material, labor, equipment, tools, and incidentals necessary to complete the work.

When specified in the Contract Documents, turf establishment will be measured and paid for in conformance with Section 705.

SECTION 618 – SHOULDER RUMBLE STRIPS

618.01 DESCRIPTION. Grind or mill depressions into existing hot mix asphalt or Portland cement concrete to form rumble strips.

618.02 MATERIALS. Not applicable.

618.03 CONSTRUCTION. Place rumble strips as specified.

Grind or mill the rumble strips into hot mix asphalt (HMA) at a rate of at least 4000 strips per hour. Grind into Portland cement concrete at a rate of at least 1000 strips per hour.

Equipment. The equipment shall have rotary type cutting heads with a length of 16 in. and an outside diameter not greater than 24 in. The cutting heads shall have the cutting tips arranged in a pattern providing a relatively smooth cut (approximately 1/16 in. between peaks and valleys).

The cutting heads shall be mounted on their own suspension, independent of the power unit, to allow the tool to self-align with the slope of the shoulder and any irregularities in the shoulder surface.

The cutting tool shall be equipped with guides to provide consistent alignment of each cut in relation to the roadway and to provide uniformity throughout the project. The Engineer will randomly check the pattern edge alignment.

Control Strip. Grind a control strip at least 100 ft. in length to demonstrate that the speed of operation, dimensions, and texture are acceptable.

Clean up. Sweep or vacuum the work area before reopening the roadway to traffic. Do not sweep the material to the side of the road.

618.04 MEASUREMENT AND PAYMENT. ***Rumble Strips*** will be measured and paid for at the Contract unit price per linear foot as measured along the shoulder or center line where the rumble strips are actually placed. Payment will be full compensation for all installation of rumble strips, cleaning and disposal of waste material, control strips, and for all material, labor, equipment, tools, and incidentals necessary to complete the work.

SECTION 619 – DETECTABLE WARNING SURFACES

619.01 DESCRIPTION. Furnish and install detectable warning surfaces within sidewalk ramps and at other locations specified on Plans, Special Provisions and as directed by the Engineer. The detectable warning surface shall be in accordance with the most recent accessibility guidelines of the Americans with Disabilities Act (ADA).

619.02 MATERIALS.

Detectable Warning Surfaces	925

Select the detectable warning surface from the prequalified list maintained by the MdSHA. Ensure that detectable warning surface materials meet certification requirements prior to use. Submit the proposed source of supply, the specific product for approval and the means of removal of any existing detectable warning to the Engineer. The Engineer's approval is required prior to commencement of construction involving Detectable Warning Surfaces.

619.03 CONSTRUCTION. The detectable warning system may be either surface applied or cast in place. However, use only Type I, III, or IV detectable warning systems for new or replacement concrete installations. Install the system according to the manufacturer's

recommendations. Unless specifically addressed in the manufacturer's recommendations, remove the existing surface texturing by grinding or other means. At a minimum, prepare the concrete surface in accordance with SSPC-SP 13. Remove all old adhesives and sealants.

The detectable warning surface shall be 24 in. wide in the direction of pedestrian travel and installed for the full width of the curb ramp, landing, or blended transition. Do not bridge or overhang cracks or expansion joints.

Ensure that the vertical edges of the installed system are not more than 0.50 in. above the adjacent surfaces. Place a 2:1 or flatter bevel on edges that are more than 0.25 in. above the adjacent surface. The same edge requirements apply to cut material.

619.04 MEASUREMENT AND PAYMENT. ***Detectable Warning Surfaces*** will be measured and paid for at the Contract unit price per square foot. The payment will be full compensation for removal and disposal of old treatments, including cast-in-place warnings, adhesives and sealants, reapplying, and for all material, labor, equipment, tools, and incidentals necessary to complete the work.

The sidewalk on which the detectable warning surface is placed will be measured and paid for at the Contract price for the pertinent ***Sidewalk*** item.

(This page intentionally left blank)

CATEGORY 700
LANDSCAPING

SECTION 700 – REGULATIONS

700.01 DESCRIPTION. Compliance with applicable laws and regulations.

700.02 MATERIALS. Not applicable.

700.03 CONSTRUCTION. Soil amendments and landscaping work shall be performed in accordance with applicable Maryland and Federal regulations in effect at the time that the landscape work is being performed. The Contractor shall be responsible for:

1. assigning a coordinator for the landscaping portion of the project who is certified and licensed, as applicable, to perform the assigned landscaping work in Maryland;
2. being knowledgeable concerning applicable regulations and their impact upon the landscaping effort;
3. providing materials and equipment that meet or exceed requirements of applicable laws;
4. providing containment measures, as required, that prevent runoff discharges from carrying topsoil, subsoil or soil amendments into surface waters of Baltimore County.

Applicable regulations include the *Maryland Weed Control Law* as amended in 1998, the *Maryland Pesticide Applicator's Law* as enacted in 1975, the Maryland Nutrient Management Law as enacted in 1998, the *Fertilizer Use Act* of 2011, the Maryland Roadside Tree Law and the Forest Conservation Act..

700.04 MEASUREMENT AND PAYMENT. This work shall not be measured. Payment for this work shall be included as part of the cost of applicable landscaping items.

SECTION 701 – TOPSOIL

701.01 DESCRIPTION. Salvage, furnish, and place topsoil.

701.02 MATERIALS.

Salvaged Topsoil	920.01.01
Furnished Topsoil	920.01.02
Limestone	920.02.01

Sulfur	920.02.02
Gypsum	920.02.04
Compost	920.02.05

701.03 CONSTRUCTION.

701.03.01 General.

(a) Schedule. Perform topsoil operations when soil moisture and weather conditions are suitable. Cease operations when conditions are unsuitable.

(b) Nutrient Management Plan (NMP). The Contractor shall recommend soil sampling locations to the Engineer for approval. Soil testing to determine the need for specific soil amendments will be performed. A NMP will be developed by the Contractor and approved by the Engineer based upon the soil testing results. Apply fertilizer and soil amendments as specified in the NMP.

(c) Nutrient Management Reporting. The Contractor shall record the fertilizer analysis, the square yards covered, and the pounds of fertilizer applied as part of the NMP. A copy of these records shall be submitted to the Engineer within 24 hours of application, using the Nutrient Management Reporting Form. The Engineer will make copies of these records available to interested regulatory agencies upon request. The Division of Construction Contracts Administration shall retain a copy of these records as part of project records.

701.03.02 Salvaging Topsoil.

(a) Evaluation of Weeds. Refer to Section 920.01.01. Topsoil will be inspected and shall be free of prohibited weeds before salvaging operations. Prevent the spread of these weeds as directed.

(b) Removal. Mow or remove vegetation from the areas where soil is to be salvaged. Remove topsoil to the depth as specified or directed. Transport soils separately and keep them apart from other materials.

(c) Storage. Construct storage areas on well-drained land, away from streams, drainage areas, and floodplains as specified in Section 308.

Install and maintain silt fence around the edge of the stockpile areas as specified in Section 308.03.29 before placing stockpiles.

Maintain topsoil in neat stockpiles away from other material. Apply temporary mulch or temporary seed immediately after final shaping as specified in Section 704.

(d) Excess. Topsoil is County property. Do not remove soils without written approval of the Engineer.

701.03.03 Placing Salvaged Topsoil.

(a) Reevaluation of Weeds. Soils that contain prohibited weeds will be reevaluated. Do not remove surface debris or transport soil from stockpiles before the reevaluation is completed.

(b) Debris Removal. Remove grass, weeds, brush, and other objectionable material from the surface of stockpiles before transporting soil.

(c) Site Preparation. Ensure the site is uniformly graded true to line and cross section in preparation for placing topsoil.

(d) Reserved.

(e) Placing and Spreading Topsoil. Place and spread topsoil over the designated areas to the specified depth.

When topsoil can be blended with the substrate, till and mix the topsoil into the substrate.

When topsoil cannot be blended with the substrate, roughen the surface of the substrate to provide a bond for the topsoil layer.

(f) Grading Topsoil. Grade the soil to provide a uniform surface true to depth, line, cross section, and elevation to ensure the completed work is as specified after settlement.

Track slopes 4:1 to 2:1 with cleated track equipment operated perpendicular to the slope.

Remove stones and other debris with a length or width greater than 3 in. from the surface of the topsoil when grading is completed.

(g) Amending Topsoil. Apply soil amendments (limestone, sulfur, gypsum, compost) to salvaged topsoil as specified in the NMP.

701.03.04 Placing Furnished Topsoil. Refer to Section 701.03.03 and the following:

(a) Responsibility. Make arrangements and assume responsibility for consents, agreements, and payments with property owners who provide, prepare, or transport soils.

(b) Storage. Construct storage areas and maintain stockpiles as specified in Section 701.03.02(c).

701.03.05 Inspection and Acceptance. Submit a request for acceptance when operations are completed. Inspection will be conducted to verify that operations were completed as specified. Acceptance will be granted at that time.

701.04 MEASUREMENT AND PAYMENT. Topsoil will be measured and paid for at the Contract unit price for one or more of the specified items. The payment will be full compensation for all material, labor, equipment, tools, and incidentals necessary to complete the work.

701.04.01 Salvaging Topsoil will not be measured but the cost will be incidental to the Contract unit price for Class 1 Excavation.

701.04.02 ***Placing Salvaged Topsoil*** will be measured and paid for at the Contract unit price per square yard for the specified depth.

701.04.03 ***Placing Salvaged Topsoil for Grading Adjustment*** will be measured and paid for at the Contract unit price per cubic yard, measured in place.

701.04.04 ***Placing Furnished Topsoil*** will be measured and paid for at the Contract unit price per square yard for the specified depth.

701.04.05 ***Placing Furnished Topsoil for Grading Adjustment*** will be measured and paid for at the Contract unit price per cubic yard, measured in place.

SECTIONS 702 and 703 – RESERVED

SECTION 704 – TEMPORARY SEED AND TEMPORARY MULCH

704.01 DESCRIPTION. Apply temporary seed and temporary mulch.

704.02 MATERIALS.

Fertilizer	920.03
Straw Mulch	920.04.01
Wood Cellulose Fiber Mulch	920.04.02
Seed	920.06
SHA Temporary Seed Mix	920.06.07(c)
Water	920.09.01

704.03 CONSTRUCTION.

704.03.01 General.

(a) Schedule. Apply temporary seed and temporary mulch any time of the year to areas that are not ready for permanent stabilization.

(b) Nutrient Management Plan (NMP). The Contractor shall not apply fertilizer until soil tests approved by the Engineer establish the need for fertilizer. The fertilizer application rate shall be limited to an amount necessary to establish acceptable rates of growth as recommended by the Contractor.

(c) Nutrient Management Reporting. Record the fertilizer analysis, the square yards covered, and the pounds of fertilizer in accordance with Section 701.03.01(c).

704.03.02 Temporary Seed. Prepare the soil and apply seed, fertilizer, mulch, and wood cellulose fiber to areas that will remain undisturbed for 2 to 12 months.

(a) Soil Preparation. Complete grading and shaping operations as directed. Loosen soil surfaces before seeding.

(b) Application Equipment. Refer to Section 705.03.05.

(c) Application Rates. Apply materials according to the following table. Fertilizer shall be applied in accordance with the NMP and shall not be applied again if the area was fertilized within the previous 3 months.

APPLICATION RATES - TEMPORARY SEED		
MATERIAL	**LB PER 1000 SQ.FT.**	**LB PER ACRE**
SHA Temporary Seed Mix	2.9	125
Fertilizer	**Per approved NMP**	
Straw Mulch	91.8	4000
Wood Cellulose Fiber Mulch	17.2	750

(d) Seeding.

(1) Hydroseeders. Apply seed and fertilizer mixtures within two hours of mixing.

(2) Mechanical Seeder. Incorporate seed and fertilizer to a depth of 1/8 to 1/4 in.

(3) After Seeding. Immediately apply straw mulch.

(e) Mulching. Mulch shall cover 90 percent of the soil surface when applied as follows:

(1) Blower. Apply mulch to a loose depth of 3/4 to 2 in.

(2) Manually. Apply mulch to a loose depth of 1-1/2 to 3 in.

(f) Securing Mulch. Immediately after applying mulch secure with wood cellulose fiber. Do not displace the mulch.

704.03.03 Temporary Mulch. Apply straw mulch and wood cellulose fiber to areas that will be re-disturbed within 2 months.

(a) Soil Preparation. Do not disturb or till soil.

(b) Application Equipment. Refer to Section 705.03.05**.**

(c) Application Rates. Apply materials as follows:

APPLICATION RATES - TEMPORARY MULCH		
MATERIAL	**LB PER 1000 SQ.FT.**	**LB PER ACRE**
Straw Mulch	91.8	4000
Wood Cellulose Fiber Mulch	17.2	750

(d) Mulching. Refer to Section 704.03.02(e).

(e) Securing Mulch. Refer to Section 704.03.02(f).

704.03.04 Repairing Defective Areas. Repair Temporary Seed or Temporary Mulch that is defective. Repairs shall be completed before acceptance.

704.03.05 Acceptance. Submit a request for acceptance when operations are completed. Inspection will be conducted to verify completion. Acceptance will be granted when at least 90 percent of the soil surface is covered with secured mulch.

704.03.06 Repairs after acceptance. Repair or replace Temporary Seed or Temporary Mulch, when directed after acceptance, at the Contract unit price as additional work.

704.04 MEASUREMENT AND PAYMENT. Temporary Seed and Temporary Mulch will be measured and paid for at the Contract unit price for one or more of the specified items. The payment will be full compensation for all material, labor, equipment, tools, and incidentals necessary to complete the work.

704.04.01 ***Temporary Seeding*** will be measured and paid for at the Contract unit price per pound of seed.

704.04.02 ***Temporary Straw Mulching*** and ***Temporary Wood Cellulose Mulching*** will be measured and paid for at the Contract unit price per square yard.

SECTION 705 – TURFGRASS ESTABLISHMENT

705.01 DESCRIPTION. Prepare soil and establish turfgrass.

705.02 MATERIALS.

Limestone	920.02.01
Sulfur	920.02.02
Gypsum	920.02.04
Compost	920.02.05
Fertilizer	920.03
Straw Mulch	920.04.01
Wood Cellulose Fiber Mulch	920.04.02
Soil Stabilization Matting	920.05.01
Fasteners	920.05.02
Seed	920.06
SHA Turfgrass Seed Mix	920.06.07(a)
SHA Special Purpose Seed Mix	920.06.07(b)
SHA Temporary Seed Mix	920.06.07(c)
Water	920.09.01

705.03 CONSTRUCTION.

705.03.01 General.

(a) Regional Areas. Maryland is divided into Regions by counties. Baltimore County is part of MdSHA's designated Region 2, as is Baltimore City and all surrounding counties except Anne Arundel County, which is part of MdSHA's designated Region 3.

(b) Seeding Seasons and Seed Mixes. Perform turfgrass establishment when the temperature is above 32 F and the soil is not frozen according to the following schedule:

SEEDING SEASONS AND SEED MIXES			
SEEDING SEASON - MONTH/DAY			
Spring	**Summer**	**Fall**	**Late Fall**
SHA Turfgrass Seed Mix			
3/1 to 5/15	5/16 to 7/31	8/1 to 10/20	10/21 to 11/20
-	Plus Additive A or B	-	Plus Additive C
Plus Additive D when seeding: • Areas 30 ft and greater from the pavement edge • Slopes 4:1 and steeper			
When seeding areas within 4 miles of a State airport: • Areas flatter than 4:1 - Use no Additives • Slopes 4:1 and steeper - Use SHA Special Purpose Seed Mix in lieu of SHA Turfgrass Seed Mix			
Additives A = Weeping Lovegrass C = SHA Temporary Seed Mix B = Foxtail Bristlegrass D = Sericea Lespedeza			

(c) Nutrient Management Plan (NMP). The Contractor shall perform soil testing and develop a NMP. Replace application rates of Section 705.03.06 as required by the NMP. See Section 704.03.01(b).

(d) Nutrient Management Reporting. See Section 704.03.01(c).

705.03.02 Grade Repair. Ensure that soil meets specified grades. Repair any gullies, washes, or disturbed areas that develop before preparing soil or seedbed.

705.03.03 Preparing Soil. Loosen the soil as follows:

(a) Topsoiled Areas 4 in. Thickness and Greater. Loosen topsoil immediately before seeding by disking, raking, or roto-tilling to a depth of at least 3 in.

(b) Topsoiled Areas 2 in. Thickness. Loosen topsoil as specified in (a) to a depth of 2 in.

(c) Non-topsoiled Areas. Loosen subsoil as specified in (a) to a depth of 1 in.

(d) Slopes 4:1 to 2:1. Refer to Section 701.03.03(f).

(e) Serrated Cut Slopes. Do not loosen soil.

705.03.04 Preparing Seedbed. Till the seedbed so that it conforms to the specified finished grade and provides a uniform and porous surface that is free of weed and plant growth.

(a) Areas Flatter than 4:1. Remove cleat marks and debris from the soil surface as follows:

(1) Within 15 ft of Pavement Edge. Remove clods, stones, and debris with a length or width greater than 1-1/2 in.

(2) Within 15 feet of Commercial or Residential Property. Refer to Section 705.03.04(a)(1).

(3) All Other Areas. Remove stones and debris with a length or width greater than 2-1/2 in.

(b) Slopes 4:1 and Steeper. Remove clods, stones, and debris with a length or width greater than 3.0 in. from the soil surface.

705.03.05 Application Equipment. Use hydroseeders, spreaders, drills, mulch blowers, or other approved machinery. Calibrate equipment before application. Apply materials accurately and uniformly to avoid misses and overlaps.

Hydroseeders shall be equipped with an agitation system able to keep solids in suspension, and have a gauge to show fill levels and tank capacity. Operate hydroseeders and spinner spreaders during non-windy weather. Do not allow materials to blow onto sensitive areas or structures.

Direct hydroseeding mixtures so the droplets produce a uniform spray. Do not allow materials to run off or cause erosion. Mechanical seeders shall be capable of placing seed and other materials at the specified rate.

705.03.06 Application Rates. Refer to Section 705.03.01(b) and include seed additives as specified. Apply materials as follows:

APPLICATION RATES		
MATERIAL	**LB PER 1000 SQ.FT.**	**LB PER ACRE**
LIMESTONE Limestone	0 to 200 [a]	0 to 8700 [a]
SULFUR All Areas	0 to 30 [a]	0 to 1300 [a]
GYPSUM All Areas except Serrated Cut Slopes	0 to 92 [a]	0 to 4000 [a]
COMPOST All Areas except Serrated Cut Slopes	0 to 1.4 cu. yd compost per 24 cu.yd. of topsoil [a]	
SEED MIXES		
SHA Turfgrass Seed Mix Areas less than 30 ft from the pavement edge flatter than 4:1, and at facilities	4.6	200
SHA Turfgrass Seed Mix & Sericea Lespedeza Areas 30 ft and more from the pavement edge, and slopes 4:1 and steeper SHA Turfgrass Seed Mix Sericea Lespedeza	 2.3 0.46	 100 20
SHA Special Purpose Seed Mix Slopes 4:1 and steeper within four miles of a State airport	4.6	200
ADDITIVE SEED		
A = Weeping Lovegrass B = Foxtail Bristlegrass C = SHA Temporary Seed Mix D = Sericea Lespedeza	0.046 0.23 0.57 0.46	2 10 25 20
FERTILIZER AT SEEDING	per approved NMP	
MULCH Straw Mulch Secured with Wood Cellulose Fiber Wood Cellulose Fiber Mulch	 92 34	 4000 1500
MULCH BINDER Wood Cellulose Fiber	17	750
REFERTILIZING	per approved NMP	

Note: [a] The NMP will specify the application rate.

705.03.07 Incorporating Soil Amendments. Incorporate amendments (limestone, sulfur, gypsum, compost) into the soil as follows:

(a) Topsoiled Areas Flatter than 4:1.

(1) Topsoil Depth of 2 to 4 in. Incorporate to a 2 in. depth.

(2) Topsoil Depth 4 in. and Greater. Incorporate to 3 in. depth.

(b) Topsoiled Areas 4:1 and Steeper. Apply limestone, sulfur, and gypsum immediately before or after tracking. Incorporate compost into topsoil in a separate operation before spreading topsoil.

(c) Nontopsoiled Areas and Serrated Cut Slopes. Apply the amendments to the soil surface after completing soil loosing operations.

Fertilizer may be incorporated into the soil with soil amendments.

705.03.08 Fertilizing and Seeding. Apply fertilizer and seed to previously prepared areas. On slopes 4:1 and steeper, including serrated cut slopes, apply seed, fertilizer, and mulch in 15 ft maximum vertical increments.

(a) Hydraulic Seeding. Apply fertilizer and seed mixtures within two hours after mixing.

Inoculate sericea lespedeza seed with 10 times the amount of inoculant specified on the inoculant package label for dry seeding. Apply seed within one hour of inoculation, or reinoculate and apply seed within one hour of reinoculation.

(b) Mechanical Seeding. Incorporate seed and fertilizer to a depth of 1/8 to 1/4 in. below the soil surface.

Dampen sericea lespedeza seed with water, and add the amount of inoculant specified on the package label before mixing with other seed. Apply seed within 24 hours of inoculation, or reinoculate and apply seed within 24 hours of reinoculation.

705.03.09 Mulching. Apply mulch immediately after seeding in all seasons except as allowed in (b) and (c).

(a) Mulch Cover. Cover at least 90 percent of the soil surface with mulch as follows:

(1) Mulch Blower. Apply mulch to a loose depth of 3/4 to 2 in.

(2) By Hand. Apply mulch to a loose depth of 1-1/2 to 3 in.

(b) Wood Cellulose Fiber Mulch. Wood Cellulose Fiber Mulch may be approved as a replacement for straw mulch on slopes 1-1/2:1 and steeper where straw application equipment is impractical.

Apply at least 70 percent of the wood cellulose fiber mulch after and separately from the seed and fertilizer during the Summer Seeding Season.

(c) Summer Seeding Season. In medians flatter than 4:1 open to traffic, install Type A Soil Stabilization Matting in lieu of straw mulch over seed and fertilizer as specified in Section 709. Keying-in shall not be performed within curbed medians.

705.03.10 Securing Mulch. Secure straw immediately after the completion of mulching operations by applying Wood Cellulose Fiber Mulch uniformly without displacing the mulch.

705.03.11 Seeding Phase Acceptance. Submit a request for Seeding Phase acceptance when operations are completed. Inspection will be conducted to verify completion. Seeding Phase acceptance will be granted following acceptable completion.

705.03.12 Establishment Phase. The Establishment Phase will begin upon Seeding Phase acceptance.

705.03.13 Overseeding and Reseeding. When turfgrass establishment is not acceptable, perform overseeding and reseeding as directed. Do not apply additional fertilizer or soil amendments unless directed.

(a) Overseeding Thin Turf. Overseeding consists of seeding and mulching areas where turfgrass coverage is 40 to 94 percent.

(1) Methods. Cut the turfgrass to a height of 3 to 4 in. and remove debris that will interfere with seeding. Do not apply herbicide or till soil. Apply seed mixtures, seed additives, mulch, and secure mulch as specified in Sections 705.03.01 and 705.03.05 through .10.

(2) Coverage. Ensure at least 90 percent of the soil surface is covered with mulch or turfgrass when overseeding is completed.

(b) Reseeding Failed Turf. Reseeding consists of tilling, seeding and mulching areas where turfgrass coverage is less than 40 percent.

Grade, prepare soil and seedbed, seed, mulch, and secure as specified in Sections 705.03.01 through .10.

705.03.14 Final Acceptance. The Engineer and the Contractor shall walk the entire planted area as a prerequisite to preparation of an inspection report of turfgrass height, color, and percent coverage. When it is not possible to perform this inspection, Final Acceptance will be delayed until Inspection is possible. The Contractor shall prepare the inspection report following the field inspection and present the report to the Engineer for approval. A copy of the approved inspection report signed as approved by the Engineer shall be given to the Contractor with the original retained as part of project records.

Final Acceptance will be granted when the turfgrass seedlings have grown at least 4 in., exhibit dark green color, and percent coverage as follows:

TURFGRASS ESTABLISHMENT COVERAGE		
AREAS	**SHA TURFGRASS SEED MIX or SHA SPECIAL PURPOSE SEED MIX**	**OTHER DESIRABLE VEGETATION**
	Seedling Coverage	
Areas flatter than 4:1; and slopes 4:1 and steeper not tracked with cleated equipment	at least 95% *	up to 5%
Slopes 4:1 and steeper tracked with cleated equipment	at least 50% *	up to 50%

***** Includes coverage of additive seed species when included**.**

705.03.15 Mowing. Mow as follows:

MOWING HEIGHT				
AREAS	**TRACTOR CUTTING**		**HAND CUTTING**	
	Max Height Before Mowing In.	**Height of Cut In.**	**Max Height Before Mowing In.**	**Height of Cut In.**
General Areas	18	4 - 5	10	3 – 4
In Medians or adjacent to Commercial or Residential Areas	12	4 - 5	8	3 – 4

705.03.16 Refertilizing. Refertilizing shall be performed only as directed by the Engineer in accordance with the NMP following soil testing demonstrating a need for refertilization.

REFERTILIZING TURFGRASS AREAS		
AREAS	**NUMBER OF APPLICATIONS**	**TIMING**
Topsoiled	1	April or September
Nontopsoiled and Serrated Cut Slopes	1	April or September

705.04 MEASUREMENT AND PAYMENT. Turfgrass Establishment will be measured and paid for at the Contract unit price for one or more of the specified items. The payment will be full compensation for all material, labor, equipment, tools, and incidentals necessary to complete the work.

705.04.01 Turfgrass Establishment. ***Turfgrass Establishment*** including preparing soil, preparing seed bed, applying fertilizer, seed mixes, seed additives, overseeding, reseeding, mulching, securing mulch, and repairing unacceptable areas will be measured and paid for at the Contract unit price per square yard.

(a) Payment Schedule. Payments will be made according to the following Schedule when construction requirements are met:

PAYMENT SCHEDULE		
CONSTRUCTION REQUIREMENTS	**PERCENT OF TOTAL CONTRACT PRICE**	**PAYMENT FOR COMPLETED WORK**
Sections 705.03.01 through .11	80	At Seeding Phase acceptance
Sections 705.03.12 through .14	20	At Final Acceptance
Total Payment	**100%**	

(b) Forfeiture. Failure to complete operations as required in conformance with the Payment Schedule will result in forfeiture of that percentage of payment.

705.04.02 ***Applying Limestone to Salvaged Topsoil and Nontopsoiled Areas*** per ton.

705.04.03 ***Applying Sulfur to Salvaged Topsoil and Nontopsoiled Areas*** per ton.

705.04.04 ***Applying Gypsum to Salvaged Topsoil and Nontopsoiled Areas*** per ton.

705.04.05 ***Applying Compost to Salvaged Topsoil and Nontopsoiled Areas*** per cubic yard.

705.04.06 ***Applying Ureaform Fertilizer to Nontopsoiled Areas*** per pound.

705.04.07 ***Refertilizing*** per pound.

705.04.08 ***Tractor and Hand Mowing*** per hour.

705.04.09 ***Overseeding*** per SY.

705.04.10 Amending furnished topsoil will not be measured but the cost will be incidental to the Contract unit price for Placing Furnished Topsoil.

SECTION 706 – RESERVED

SECTION 707 – MEADOW ESTABLISHMENT AND WILDFLOWER SEEDING

707.01 DESCRIPTION. Perform meadow establishment and wildflower seeding.

707.02 MATERIALS.

Limestone	920.02.01
Sulfur	920.02.02
Compost	920.02.05
Fertilizer	920.03
Straw Mulch	920.04.01
Wood Cellulose Fiber Mulch	920.04.02
Meadow Forb Seed	920.06 and 920.06.06(d)
Meadow Grass, Sedge and Rush Seed	920.06 and 920.06.06(e)
Wildflower Seed	920.06 and 920.06.06(f)
SHA Special Purpose Seed Mix	920.06 and 920.06.07(b)
Water	920.09.01
Seed Carrier	920.09.02
Pesticides	920.09.03

707.03 CONSTRUCTION. For meadow establishment, complete the requirements of Sections 707.03.01 through .15. For wildflower seeding, complete the requirements of Sections 707.03.16 through .29.

707.03.01 Meadow Establishment - General.

(a) Regional Areas. Refer to Section 705.03.01.

(b) Seeding Seasons. Perform seeding when the temperature is above 32 F and the soil is not frozen from February 15 to April 15 and from September 1 to October 15.

(c) Pesticide Application. Refer to Section 710.03.01(c).

(d) Pesticide Application Reporting. Refer to Section 710.03.01(d).

(e) Nutrient Management Plan (NMP). See Section 701.03.01(b).

(f) Nutrient Management Reporting. See Section 701.03.01(c).

707.03.02 Submittals. Submit the following items:

(a) Seeding Schedule. Develop a Schedule that provides dates for completing major operations of the Contract, including nonselective herbicide application, mowing, tilling, and seeding. Submit the written Schedule at least 14 days before beginning operations. The Schedule will be reviewed by the Engineer for completeness and feasibility, and will be approved or returned for correction.

(b) IPM Program and Establishment Schedule. Develop an IPM Program that includes methods of pest monitoring for weed control, pesticide selection, application rates, and scheduling. The Establishment Schedule shall include dates for meadow maintenance operations such as mowing.

Submit the IPM Program and Establishment Schedule when seeding operations are completed. The Program and Schedule will be forwarded to the Engineer for review and comment before approval is granted.

707.03.03 Marking. Mark areas to be seeded, and obtain approval before applying herbicide, mowing, or beginning seeding operations.

707.03.04 Non-Selective Herbicide Application. Apply non-selective herbicide to eliminate undesirable vegetation when directed. Apply herbicide in water with wetting agent and dye in conformance with the IPM Program at least 10 days before seeding as follows:

NONSELECTIVE HERBICIDE APPLICATION	
MATERIAL	**RATE PER ACRE**
Glyphosate Herbicide	5 lb of active ingredient
Marking Dye	6 to 15 oz
Water	40 to 50 gal

707.03.05 Mowing. Mow vegetation to a height less than 4 in. before seeding when directed by the Engineer. Do not perform mowing within 10 days of non-selective herbicide application. Disperse or dispose of excessive clippings prior to seeding.

707.03.06 Preparing Soil Before Seeding.

(a) Broadcast Seeding. Roto-till the soil to a depth of 1 in. and remove stones and other debris with a length or width greater than 2-1/2 in. from the soil surface.

(b) Drill Seeding. When using a drill seeder, no soil preparation is required.

707.03.07 Seed Delivery, Weighing, and Mixing.

(a) Delivery. Seed shall be delivered unmixed.

(b) Weighing and Mixing. Test seed as specified in Section 920.06.05 before weighing and mixing.

Use a scale with 0.01 oz accuracy to verify application rates and quantities of seed. Mix and apply seed separately or with other specified seed.

707.03.08 Application Rates. Apply materials as follows:

TABLE 1 - MEADOW ESTABLISHMENTAPPLICATION RATES		
MATERIAL	**LB PER 1000 SQ.FT.**	**LB PER ACRE**
LIMESTONE	0 to 50 [a]	0 to 2,000 [a]
SULFUR	0 to 13 [a]	0 to 550 [a]
COMPOST	1.4 cu.yd. Compost per 24 cu.yd. of Topsoil [a]	
UPLAND MEADOW SEED	Refer to Table 2 Upland Meadow Seed	Refer to Table 2 Upland Meadow Seed
LOWLAND MEADOW SEED	Refer to Table 3 Lowland Meadow Seed	Refer to Table 3 Lowland Meadow Seed
WET MEADOW SEED	Refer to Table 4 Wet Meadow Seed	Refer to Table 4 Wet Meadow Seed
SHA SPECIAL PURPOSE SEED MIX Include with Upland & Lowland Meadow Seed	0.50	25
SEED CARRIER	2 to 6	85 to 260
FERTILIZER[a]	Per approved NMP	
MULCH		
Straw Mulch	66	3000
Wood Cellulose Fiber Mulch Binder	23	1000

Note: [a] The NMP will specify the application rate.

TABLE 2 - UPLAND MEADOW SEED					
FORBS	**PURE LIVE SEED ***		**GRASSES**	**PURE LIVE SEED ***	
	Oz per 1000 Sq.Ft.	**Lb per Acre**		**Oz per 1000 Sq.Ft.**	**Lb per Acre**
Select 8			**Include All**		
blackeyed Susan	0.18	0.5	Broomsedge	0.36	1.0
browneyed Susan	0.18	0.5	Deertongue	0.73	2.0
eastern purple coneflower	0.44	1.2	Little Bluestem	0.73	2.0
gray goldenrod	0.07	0.2	Purpletop	0.73	1.0
lanceleaf tickseed	0.51	1.4	Note: Seed Upland Meadow Seed with SHA Special Purpose Seed Mix * Seeding rates shall be calculated on the basis of Pure Live Seed per 1000 sq.ft. or acre.		
Maryland senna	0.11	0.3			
partridge pea	0.44	1.2			
smooth blue aster	0.07	0.2			
sundial lupine	0.51	1.4			
talus slope penstemon	0.07	0.2			
wild bergamot	0.07	0.2			

TABLE 3 - LOWLAND MEADOW SEED					
FORBS	**PURE LIVE SEED ***		**GRASSES**	**PURE LIVE SEED ***	
	Oz per 1000 Sq.Ft.	**Lb per Acre**		**Oz per 1000 Sq.Ft.**	**Lb per Acre**
Select 8			**Include All**		
common boneset	0.04	0.1	big bluestem	2.0	0.73
eastern purple coneflower	0.44	1.2	gamagrass	2.0	0.73
evening primrose	0.07	0.2	Indiangrass	2.0	0.73
lanceleaf tickseed	0.55	1.5	switchgrass	1.0	0.36
Maximilian sunflower	0.18	0.5	Note: Seed Lowland Meadow Seed with SHA Special Purpose Seed Mix * Seeding rates shall be calculated on the basis of Pure Live Seed per 1000 sq.ft. or acre.		
New England aster	0.07	0.2			
New York ironweed	0.07	0.2			
showy tickseed	0.04	0.1			
stiff goldenrod	0.11	0.3			
swamp verbena	0.26	0.7			
trumpetweed or spotted trumpetweed	0.07	0.2			

TABLE 4 - WET MEADOW SEED					
FORBS	**PURE LIVE SEED ***		**GRASSES, SEDGES and RUSHES**	**PURE LIVE SEED ***	
	Oz per 1000 Sq.Ft.	**Lb per Acre**		**Oz per 1000 Sq.Ft.**	**Lb per Acre**
Select 8			**Include All**		
Allegheny monkeyflower	0.07	0.2	common rush	0.29	0.8
crimsoneyed rose mallow	0.07	0.2	fox sedge	0.18	0.5
flat-top goldenrod	0.07	0.2	longhair sedge	0.11	0.3
king of the meadow	0.07	0.2	rattlesnake mannagrass	0.18	0.5
New York Aster	0.07	0.2	shallow sedge	0.11	0.3
New York Ironweed	0.07	0.2	woolgrass	0.11	0.3
seedbox	0.07	0.2	* Seeding rates shall be calculated on the basis of Pure Live Seed per 1000 sq.ft. or acre.		
swamp milkweed	0.04	0.1			
swamp sunflower	0.11	0.3			
swamp verbena	0.26	0.7			
trumpetweed or spotted trumpetweed	0.07	0.2			

707.03.09 Seeding Equipment. Use approved drill seeders equipped with 3 seed boxes, or broadcast seeders.

707.03.10 Seeding Methods. Operate **s**eeders as follows:

(a) Drill Seeding. Mix and place seed in the seed boxes A (small seed), B (medium seed), or C (fluffy seed) as recommended by the seeder manufacturer, or as specified or directed. Seed carrier may be mixed with seed.

Drill seed into the soil to a 1/4 in. depth. When soil is disturbed to a greater depth or is not in a firm condition at the time of seeding, firm the soil with a roller. Rollers shall weigh approximately 40 lb per ft of width.

(b) Broadcast Seeding. Uniformly mix seed with seed carrier. Spread seed and carrier in two directions at right angles, and then lightly rake or drag seed into the soil to a 1/4 in. depth before firming the soil with a roller as described above.

707.03.11 Mulching. Immediately after seeding, apply mulch over bare soil to cover at least 90 percent of the surface. Do not apply mulch after operating a drill seeder through dead vegetation. Apply mulch as follows:

(a) Mulch Blower. Apply mulch to a loose depth of 1/2 to 1-1/2 in.

(b) By Hand. Apply mulch to a loose depth of 1 to 2 in.

707.03.12 Securing Mulch. Secure mulch immediately after application by applying wood cellulose fiber uniformly without displacing the mulch.

707.03.13 Seeding Phase Acceptance. Submit a request for Seeding Phase acceptance when operations are completed, and provide the IPM Program and Establishment Phase Schedule as specified in Section 707.03.02(a). Inspection will be conducted to verify completion. Seeding Phase acceptance will be granted at that time.

707.03.14 Establishment Phase. The Establishment Phase begins upon Seeding Phase acceptance as follows:

(a) Period of Maintenance. Maintain meadows for 12 months after seeding.

(b) Weed Control. Monitor and promptly implement the IPM Program to control weeds in conformance with the IPM Program, or when notified of problems in consultation with the Engineer. Remove dead weeds over 18 in. tall.

(c) Inspection. The Engineer will inspect meadow establishment on or about the 15th of January, March, May, July, September, and November.

707.03.15 Final Acceptance. The Engineer and the Contractor shall walk the entire planted area as a prerequisite to preparation of an inspection report of seedling height, color, and percent coverage. When it is not possible to perform this inspection, Final Acceptance will be delayed until Inspection is possible. The Contractor shall prepare the inspection report following the field inspection and present the report to the Engineer for approval. A copy of the approved inspection report signed as approved by the Engineer shall be given to the Contractor with the original retained as part of project records.

Final Acceptance will be granted when the seedlings have grown at least 4 in., exhibit dark green color, and percent coverage as follows:

MEADOW ESTABLISHMENT COVERAGE		
AREAS	**SHA SPECIAL PURPOSE SEED MIX, SHA TEMPORARY SEED MIX, and MEADOW SEED**	**TOTAL VEGETATION COVER**
	Seedling Coverage	
Areas flatter than 4:1; and slopes 4:1 and steeper not tracked with bulldozer	at least 70%	at least 95%
Slopes 4:1 and steeper tracked with bulldozer	at least 45%	at least 95%

707.03.16 Wildflower Seeding.

(a) Regional Areas. Refer to Section 705.03.01(a).

(b) Seeding Seasons. Refer to Section 707.03.01(b).

(c) Pesticide Application. Refer to Section 710.03.01(c).

(d) Pesticide Application Reporting. Refer to Section 710.03.01(d).

(e) Nutrient Management Plan (NMP). Refer to Section 701.03.01(b).

(f) Nutrient Management Reporting. Refer to Section 701.03.01(c).

707.03.17 Seeding Schedule. Develop a Schedule that provides dates for completing major operations of the Contract, including non-selective herbicide application and seeding.

Submit the proposed Schedule at least 14 days before beginning operations. The Schedule will be reviewed by the Engineer for completeness and feasibility, and will be approved or returned for correction.

707.03.18 Marking. Mark areas to be seeded, and obtain approval before applying herbicide, mowing, or beginning seeding operations.

707.03.19 Non-Selective Herbicide Application. Refer to Section 707.03.04.

707.03.20 Mowing. Refer to Section 707.03.05.

707.03.21 Seed Delivery, Weighing, and Mixing.

(a) Delivery. Wildflower seed shall be delivered unmixed.

(b) Weighing and Mixing. Refer to Section 707.03.22, Table 6. Test seed as specified in Section 920.06.05 before weighing and mixing.

Weigh wildflower seed before uniformly pre-mixing and placing it into the seed boxes of the seeder. Use a scale with 0.01 oz accuracy to verify application rates and quantities of seed.

Mix and apply seed separately or with other specified seed.

707.03.22 Application Rates. Apply materials as follows:

TABLE 5 - WILDFLOWER SEEDING APPLICATION RATES		
MATERIAL	**LB PER 1000 SQ.FT.**	**LB PER ACRE**
LIMESTONE	0 to 50 [a]	0 to 2,000 [a]
SULFUR	0 to 13 [a]	0 to 550 [a]
COMPOST	0 to 1.4 cu.yd. Compost per 24 cu.yd. of Topsoil [a]	
WILDFLOWER SEED	Refer to Table 6 Wildflower Seed	Refer to Table 6 Wildflower Seed
SEED CARRIER	2 to 6	85 to 260
FERTILIZER	Per approved NMP	
MULCH		
Wood Cellulose Fiber Mulch Binder	23	1000

Note [a] The NMP will specify the application rate.

TABLE 6 - WILDFLOWER SEED						
SPECIES **Include All (11)**	**SMALL SEED**		**MEDIUM SEED**		**FLUFFY SEED**	
	Oz per 1000 Sq.Ft.	**Lb per Acre**	**Oz per 1000 Sq.Ft.**	**Lb per Acre**	**Oz per 1000 Sq.Ft.**	**Lb per Acre**
blackeyed Susan	0.18	0.5				
corn poppy	0.37	1.0				
golden tickseed	0.37	1.0				
lemon beebalm	0.18	0.5				
Moroccan toadflax	0.18	0.5				
Siberian wallflower	0.55	1.5				
doubtful knight's-spur			0.18	0.5		
garden cornflower			0.37	1.0		
garden cosmos 'Sensation'			0.11	0.3		
sulphur cosmos 'Bright Lights'			0.11	0.3		
firewheel					0.18	0.50

707.03.23 Seeding Equipment. Use approved drill seeders equipped with 3 seed boxes.

707.03.24 Seeding Methods. Refer to Section 707.03.10(a).

707.03.25 Mulching and Securing Mulch. Refer to Sections 707.03.11 and .12.

707.03.26 Seeding Phase Acceptance. Submit a request for Seeding Phase acceptance when operations are completed. Inspection will be conducted to verify completion. Seeding Phase acceptance will be granted at that time.

707.03.27 Establishment Phase. The Establishment Phase will begin upon Seeding Phase acceptance.

707.03.28 Final Acceptance. The Engineer and the Contractor shall walk the entire planted area as a prerequisite to preparation of an inspection report of seedling height, color, and percent coverage. When it is not possible to perform this inspection, Final Acceptance will be delayed until Inspection is possible. The Contractor shall prepare the inspection report following the field inspection and present the report to the Engineer for approval. A copy of the approved inspection report signed as approved by the Engineer shall be given to the Contractor with the original retained as part of project records.

Final Acceptance will be granted when the seedlings exhibit dark green color and percent coverage as follows:

WILDFLOWER SEEDING COVERAGE		
AREAS	**WILDFLOWER SPECIES**	**TOTAL VEGETATION COVER**
	Seedling Coverage	
Areas flatter than 4:1; and slopes 4:1 and steeper not tracked with bulldozer	at least 70%	at least 95%
Slopes 4:1 and steeper tracked with bulldozer	at least 45%	at least 95%

707.03.29 Mowing. Mow meadow or wildflower foliage to a height of 6 to 8 in. when directed by the Engineer.

707.04 MEASUREMENT AND PAYMENT. Meadow Establishment and Wildflower Seeding will be measured and paid for at the Contract unit price for one or more of the specified items. The payment will be full compensation for all material, labor, equipment, tools, and incidentals necessary to complete the work.

707.04.01 Upland Meadow Establishment. ***Upland Meadow Establishment***, including preparing soil, applying fertilizer, meadow seed, SHA Special Purpose Seed Mix, mulch, and securing mulch will be measured and paid for at the Contract unit price per square yard.

(a) Payment Schedule. Payments will be made according to the following Schedule when construction requirements are met:

MEADOW ESTABLISHMENT PAYMENT SCHEDULE			
CONSTRUCTION REQUIREMENTS		**PERCENT OF TOTAL CONTRACT PRICE**	**PAYMENT FOR COMPLETED WORK**
Sections 707.03.01 through 707.03.13	Seeding Phase and Seeding Acceptance	80	At Seeding Phase Acceptance
Sections 707.03.14 and .15	Establishment Phase Weed Control and Final Acceptance	20	Pro-Rated at Each Bi-Monthly Inspection and Final Acceptance
Total Payment		**100%**	

(b) Forfeiture. Failure to complete operations as required in conformance with the Payment Schedule will result in forfeiture of that percentage of payment.

707.04.02 Lowland Meadow Establishment. ***Lowland Meadow Establishment***, including preparing soil, applying fertilizer, meadow seed, SHA Special Purpose Seed Mix, mulch, and securing mulch will be measured and paid for at the Contract unit price per square yard.

Payment Schedule. Refer to Section 707.04.01(a).

Forfeiture. Refer to Section 707.04.01(b).

707.04.03 Wet Meadow Establishment. ***Wet Meadow Establishment***, including preparing soil, applying fertilizer, meadow seed, mulch, and securing mulch will be measured and paid for at the Contract unit price per square yard.

Payment Schedule. Refer to Section 707.04.01(a).

Forfeiture. Refer to Section 707.04.01(b).

707.04.04 Wildflower Seeding. ***Wildflower Seeding***, including applying fertilizer, wildflower seed, and mulch will be measured and paid for at the Contract unit price per square yard. Payment will be made according to the Payment Schedule when construction requirements are met.

Payment Schedule. Payments will be made according to the following schedule when construction requirements are met:

WILDFLOWER SEEDING PAYMENT SCHEDULE			
CONSTRUCTION REQUIREMENTS		**PERCENT OF TOTAL CONTRACT PRICE**	**PAYMENT FOR COMPLETED WORK**
Sections 707.03.16 through 707.03.26	Seeding Phase and Seeding Acceptance	80	At Seeding Phase Acceptance
Sections 707.03.27 and .28	Establishment Phase and Final Acceptance	20	At Final Acceptance
Total Payment		**100%**	

Forfeiture. Refer to Section 707.04.01(b).

707.04.05 ***Non Selective Herbicide Application*** per square yard.

707.04.06 ***Tractor and Hand Mowing*** per hour.

707.04.07 ***Selective Grass Herbicide Application*** per square yard.

707.04.08 ***Selective Broadleaf Herbicide Application*** per square yard.

707.04.09 ***Applying Limestone to Salvaged Topsoil and Nontopsoiled Areas*** per ton.

707.04.10 ***Applying Sulfur to Salvaged Topsoil and Nontopsoiled Areas*** per ton.

707.04.11 ***Applying Compost to Salvaged Topsoil and Nontopsoiled Areas*** per cubic yard.

707.04.12 Amending furnished topsoil will not be measured but the cost will be incidental to the Contract unit price for ***Placing Furnished Topsoil***.

SECTION 708 – TURFGRASS SOD ESTABLISHMENT

708.01 DESCRIPTION. Prepare soil and establish turfgrass sod.

708.02 MATERIALS.

Limestone	920.02.01
Sulfur	920.02.02
Gypsum	920.02.04

Compost	920.02.05
Fertilizer	920.03
Turfgrass Sod	920.06.03
Fasteners	920.05.02
Water	920.09.01

708.03 CONSTRUCTION.

708.03.01 General.

(a) Regional Areas. Refer to Section 705.03.01(a).

(b) Installing Season and Sod Species. Install sod from August 15 to May 31 when the sod is not frozen.

Install tall fescue sod.

(c) Nutrient Management Plan (NMP). See Section 701.03.01(b).

(d) Nutrient Management Reporting. See Section 701.03.01(c).

708.03.02 Grade Repair. Ensure that soil meets specified grades. Repair any gullies, washes, or disturbed areas that develop before preparing soil, incorporating soil amendments, or placing turfgrass sod.

708.03.03 Preparing Soil. Immediately before installing turfgrass sod, loosen the soil with roto-tillers, disks, rakes or other approved equipment to a depth of 3 in. Amendments may be incorporated into the soil during this operation.

When soil preparation is completed, remove clods, stones, and debris with a length or width greater than 1-1/2 in. and ensure the soil provides a uniform and porous surface, conforms to the specified grade, and is free of weed and plant growth.

708.03.04 Application Equipment. Use spreaders or other approved machinery that is calibrated before application. Apply materials accurately and uniformly to avoid misses and overlaps.

Operate spinner spreaders during non-windy weather. Do not allow materials to blow onto sensitive areas or structures.

708.03.05 Application Rates.

APPLICATION RATES		
MATERIAL	**LB PER 1000 SQ.FT.**	**LB PER ACRE**
LIMESTONE	0 to 200 [a]	0 to 8700 [a]
SULFUR	0 to 30 [a]	0 to 1300 [a]
GYPSUM	0 to 92 [a]	0 to 4,000 [a]
COMPOST	0 to 1.4 cu.yd. Compost per 24 cu.yd. of Topsoil [a]	
FERTILIZER [a]	Per approved NMP	

Note: [a] The NMP will specify the application rate.

708.03.06 Incorporating Soil Amendments. Mix soil amendments into the upper 3 in. of soil after application.

708.03.07 Transporting and Handling. Transport and install turfgrass sod within 48 hours after harvest. Handle sod without excessive breaking, tearing, or loss of soil.

708.03.08 Placing. Place turfgrass sod with closed joints. Do not overlap or leave gaps between strips. Unless otherwise specified, sod shall be placed on a minimum of 2 inches of topsoil.

(a) Slopes 2:1 and Steeper. Place sod strips with the long edges following the contour, not up and down the slope. Begin at the bottom of the slope and stagger the joints between strips.

(b) Ditches. Place sod strips with the long edges following the flow of water, not across the ditch. Center the lowest strip on the centerline of the ditch.

708.03.09 Securing. Secure turfgrass sod in ditches and slopes 2:1 and steeper with at least two fasteners per strip spaced no more than 2 ft apart. Drive the fasteners through the sod and firmly into the soil below so there is no gap at the top of the fastener.

708.03.10 Firming. Tamp or roll turfgrass sod after placing and stapling to tighten the joints between the sod strips, and to press the sod firmly into the soil. Hand tampers shall weigh approximately 15 lb with a flat surface of approximately 100 sq. in. Rollers shall weigh approximately 40 lb per ft of width.

708.03.11 Initial Watering. Perform the first watering within four hours after placing turfgrass sod. Wet the soil to a depth at least 3 in. below the sod.

708.03.12 Installation Acceptance. Submit a request for Installation Phase acceptance when operations are completed. Inspection will be conducted to verify completion. Installation Phase acceptance will be granted at that time.

708.03.13 Establishment Phase. The Establishment Phase will begin upon Installation Phase acceptance. Monitor the soil moisture and water needs of the sod. Promptly provide water when needed or when directed.

708.03.14 Final Acceptance. The Engineer and the Contractor shall walk the entire planted area as a prerequisite to preparation of an inspection report of turfgrass sod height, color, and percent coverage. When it is not possible to perform this inspection, Final Acceptance will be delayed until Inspection is possible. The Contractor shall prepare the inspection report following the field inspection and present the report to the Engineer for approval. A copy of the approved inspection report signed as approved by the Engineer shall be given to the Contractor with the original retained as part of project records.

Final Acceptance will be granted when the turfgrass sod has grown at least 4 in., exhibits dark green color, has at least 99 percent coverage, and is firmly rooted into the soil.

708.04 MEASUREMENT AND PAYMENT. Turfgrass Sod Establishment will be measured and paid for at the Contract unit price for one or more of the specified items. The payment will be full compensation for all material, labor, equipment, tools, and incidentals necessary to complete the work.

708.04.01 Turfgrass Sod Establishment. ***Turfgrass Sod Establishment***, including preparing soil, applying fertilizer, placing sod and fasteners, and initial watering will be measured and paid for at the Contract unit price per square yard.

(a) Payment Schedule. Payments will be made according to the following schedule when construction requirements are met:

PAYMENT SCHEDULE		
CONSTRUCTION REQUIREMENTS	**PERCENT OF TOTAL CONTRACT PRICE**	**PAYMENT FOR COMPLETED WORK**
Sections 708.03.02 through 708.03.12	80	At Installation Phase Acceptance
Sections 708.03.13 and 708.03.14	20	At Final Acceptance
Total Payment	**100**	

(b) Forfeiture. Failure to complete operations as required or directed in conformance with the Payment Schedule will result in forfeiture of that percentage of payment.

708.04.02 ***Applying Limestone to Salvaged Topsoil and Nontopsoiled Areas*** per ton.

708.04.03 ***Applying Sulfur to Salvaged Topsoil and Nontopsoiled Areas*** per ton.

708.04.04 ***Applying Gypsum to Salvaged Topsoil and Nontopsoiled Areas*** per ton.

708.04.05 ***Applying Compost to Salvaged Topsoil and Nontopsoiled Areas*** per cubic yard.

708.04.06 Amending furnished topsoil will not be measured but the cost will be incidental to the Contract unit price for ***Placing Furnished Topsoil***.

708.04.07 Topsoil. Topsoil shall be paid for under item Section 701.04 as appropriate.

708.04.08 Additional Watering of sod shall not be measured and shall be paid for as part of ***Turfgrass Sod Establishment***.

SECTION 709 – SOIL STABILIZATION MATTING

709.01 DESCRIPTION. Install soil stabilization matting (SSM) in conjunction with seeding.

709.02 MATERIALS.

Topsoil	920.01
Soil Stabilization Matting	920.05.01
Fasteners	920.05.02
Water	920.09.01

709.03 CONSTRUCTION.

709.03.01 Soil Preparation and Seeding. Perform operations for the SSM type as follows:

(a) Type A and B. Prepare soil and perform Turfgrass Establishment as specified in Section 705, but do not apply mulch. Install SSM immediately after seeding as specified in Sections 709.03.02 through .05.

(b) Type C. Install Type C SSM as specified in Sections 709.03.02 through .05. Infill with soil and immediately perform Turfgrass Establishment as specified in Section 705, but do not till or apply mulch. Complete matting installation over seeded area as specified in Section 709.03.06.

(c) Type D. Prepare soil and perform seeding as specified. Install Type D SSM immediately after seeding as specified in Sections 709.03.02 through .05.

709.03.02 Unrolling. Unroll SSM in the direction of the flow of water. Lay matting smoothly in firm, uniform contact with the soil surface, without stretching or tenting.

709.03.03 Overlapping. Overlap SSM with the upslope portion on top. Overlap edges at least 2 in., and ends at least 6 in.

709.03.04 Keying-in. Keying-in consists of the following operations:

(a) Trenching. Trench into the soil perpendicular to the flow of water to at least 6 in. depth.

AREAS OF MATTING TO KEY-IN	
MATTING TYPE	**AREA OF MATTING**
A, B	Uppermost or leading-edge.
A, B	Edges adjacent to catch basins and structures.
B	Lowermost or toe-edge.
C, D	All edges
C	Folds of matting perpendicular to water flow every 20-25 ft.

(b) Fastening. Install fasteners through SSM into the bottom of the trench.

(c) Backfilling. Backfill the trench with firmly tamped soil.

709.03.05 Fastening. Refer to Section 920.05.02 and secure SSM with fasteners driven perpendicular to the soil grade, and flush with the surface of the matting as follows:

(a) Fastener Selection. Use fasteners of the shape and length approved for the matting type as follows:

FASTENER SELECTION					
MATTING TYPE	**FASTENER SHAPE**	**APPROVED FASTENERS**			
		6 in. Length	**8 in. Length**	**12 in. Length**	**18 in. Length**
A	U-Shaped Staple	X	X		
	Circle-Top Pin	X	X		
	Round Head Pin	X	X		
	T-Head Pin	X			
	Wood Peg	X			
B, C, D	U-Shaped Staple		X	X	
	Fabric Pin			X	X

(b) Placement of Fasteners. Install fasteners at the specified distance apart as required for the area of matting and the matting type as follows:

FASTENER PLACEMENT		
AREA OF MATTING	**MATTING TYPE**	**MAXIMUM DISTANCE BETWEEN FASTENERS In.**
Uppermost or Leading-Edge of Matting	A, B, C, D	6
Overlapping Edges of Matting	A, B, C, D	18
Center of Ditch	A, B, C, D	18
Lowermost or Toe-Edge of Matting	A, B, C, D	18
Throughout Matting	A, B, C, D	24
In Folds Every 20 to 25 ft	C	12

709.03.06 Infilling and Seeding Type C SSM. Perform the following operations after installing Type C SSM.

(a) Infilling. Infill the matting with topsoil to provide a depth equal to twice the thickness of the matting. This shall be sufficient for a graded 24 in. tapered area beyond the outside edges of the matting.

(b) Seeding. Firm the soil with a roller as specified in Section 708.03.10 and perform Turfgrass Establishment over the infilled matting and tapered area.

(c) Covering. Install Type B SSM immediately after seeding to cover the seeded area. Secure the matting with 12 in. U-shaped staples, or 12 in. or 18 in. fabric pins.

709.03.07 Watering. Gently water SSM with a sprinkler or water-breaker nozzle within 48 hours of installation to bond the matting to the soil. Apply water at the rate of 300 gal per 1000 sq.ft. to wet the soil to a minimum 2 in. depth below the matting.

709.03.08 Installation Phase Acceptance. Inspection will be conducted to verify that operations were completed as specified. Installation Phase acceptance will be granted at that time.

709.03.09 Establishment Phase. The Establishment Phase will begin upon Installation Phase acceptance.

709.03.10 Final Acceptance. Final Acceptance will be granted when the SSM is secure and the turfgrass or other vegetation seedlings have grown at least 4 in., exhibit dark green color and minimum percent coverage.

Turfgrass establishment will be accepted as specified in Section 705.03.14. Other vegetation seeding will be accepted as specified.

When turfgrass establishment or other vegetation seeding is not acceptable, remove Type A, B, or D SSM. Remove Type C matting when directed.

Prepare soil, reseed, and install new matting unless the original matting is approved for reuse. Apply additional fertilizer or soil amendments as directed.

709.04 MEASUREMENT AND PAYMENT. ***Soil Stabilization Matting*** will be measured and paid for at the Contract unit price per square yard for one or more of the specified items. The payment will be full compensation for all material, fastening, labor, equipment, tools, and incidentals necessary to complete the work.

(a) Payment Schedule. Payments will be made according to the following schedule when construction requirements are met:

PAYMENT SCHEDULE		
CONSTRUCTION REQUIREMENTS	**PERCENT OF TOTAL CONTRACT PRICE**	**PAYMENT FOR COMPLETED WORK**
Sections 709.03.01 through .08	80	At Installation Phase Acceptance
Sections 709.03.09 and .10	20	At Final Acceptance
Total Payment	**100**	

(b) Forfeiture. Failure to complete operations as required in accordance with the Payment Schedule will result in forfeiture of that percentage of payment.

709.04.01 ***Type A Soil Stabilization Matting*** per square yard.

709.04.02 ***Type B Soil Stabilization Matting*** per square yard.

709.04.03 ***Type C Soil Stabilization Matting*** per square yard.

709.04.04 ***Type D Soil Stabilization Matting*** per square yard.

SECTION 710 – TREE, SHRUB, AND PERENNIAL INSTALLATION AND ESTABLISHMENT

710.01 DESCRIPTION. Install and establish trees, shrubs, perennials, vines, and grasses.

710.02 MATERIALS.

Limestone	920.02.01
Sulfur	920.02.02
Iron Sulfate	920.02.03
Compost	920.02.05
Fertilizer	920.03
Shredded Hardwood Bark (SHB) Mulch	920.04.03
Plant Materials	920.07
Marking and Staking Materials	920.08
Water	920.09.01
Pesticides	920.09.03
Marking Dye	920.09.04
Spray Adjuvant and Wetting Agent	920.09.05

710.03 CONSTRUCTION.

710.03.01 General.

(a) Planting Seasons. Install plants during the following Planting Seasons unless a Modification Request is approved:

PLANTING SEASONS					
SEASON	**DECIDUOUS TREES, SHRUBS, VINES**		**EVERGREEN TREES, SHRUBS, VINES**		**PERENNIALS, GRASSES**
	Balled & Burlapped, Bare Root	**Container Grown**	**Balled & Burlapped**	**Container Grown**	**Container Grown**
Spring	2/15 – 4/30	3/1 – 6/15	3/15 – 4/30	3/15 – 6/15	4/15 – 6/30
Fall	10/15 – 12/15	8/15 – 12/15	9/1 – 11/15	8/15 – 11/15	9/1 – 10/30

(b) Modification Request. Submit a written Modification Request to perform installation out-of season, or to install plants of different species, cultivars, sizes, growth habits, or planting stock type.

The Engineer (with assistance from the Design Division and the Department of Environmental Protection and Sustainability) will evaluate the Request. If granted, a Notice of Approved Modification will be returned within 14 days afterwards.

(c) Pesticide Application. Apply pesticides in conformance with the Maryland Pesticide Applicator's Law and the manufacturer's recommendations. The Contractor shall recommend treatment areas locations to the Engineer for approval in writing based upon an inspection of the project area by the Contractor's representative and the Engineer. The proposed treatment plan shall be specific regarding the pests observed

within the project area and the treatments proposed for pest elimination. The types and amounts of chemicals to be applied shall be specified as part of the treatment plan. The Contractor shall receive written approval by the Engineer before treatment is begun.

The Contractor shall possess a Maryland Department of Agriculture Commercial Pesticide Business License and a Pesticide Applicator Certificate for the pertinent pesticide application Category: (2) Forest; (3-A) Ornamental Plant Exterior; (3-C) Turf; (5) Aquatic; (6) Right-of-Way and Weed.

A Maryland Certified Pesticide Applicator, or a Registered Pesticide Applicator under the supervision of a Certified Pesticide Applicator shall apply all pesticides.

(d) Pesticide Application Reporting. The Contractor shall record the location, acreage treated, the pesticide name and the quantity applied as part of the treatment plan. A copy of these records shall be submitted to the Engineer within 24 hours of application, using the Pesticide Application Reporting Form. The Engineer will make copies of these records available to interested regulatory agencies upon request. The Division of Construction Contracts Administration shall retain a copy of these records as part of project records.

(e) Nutrient Management Plan (NMP). See Section 701.03.01(b).

(f) Nutrient Management Reporting. See Section 701.03.01(c).

(g) Plant Storage and Handling. Refer to Section 920.07.05.

(h) Seeding of wetland areas using ***Wetmix Seeding*** shall be performed in accordance with the manufacturer's recommendations as included in the Contract Special Provisions.

710.03.02 Submittals and Inspection. Submit the following items:

(a) Breakdown List of Contract Prices. Refer to Section 710.04.01 and develop a Breakdown List of Contract Prices for each plant in the Contract. Include the cost of all installation and establishment operations in the per plant price.

Submit the written Breakdown List within 14 days after Award of Contract. The Breakdown List will be reviewed by the Engineer for completeness and balance, and will be approved or returned for correction.

(b) Installation Phase Schedule. Develop a Schedule with dates for completing the requirements of Sections 710.03.01 through .15, including:

OPERATIONS IN INSTALLATION PHASE SCHEDULE	
1	Layout, utilities review and marking.
2	Undesirable vegetation removal and herbicide application.
3	Planting pit excavation, soil preparation, and plant installation.
4	Planting beds roto-tilling and soil preparation, applying shredded hardwood bark (SHB) mulch, and plant installation.
5	Applying fertilizer solution after installation, and cleanup.

Submit the written Schedule at least 30 days before beginning landscape work. The Schedule will be reviewed by the Engineer for completeness and feasibility, and will be approved or returned for correction.

(c) Plant Material Inspection and Approval. The Engineer, accompanied by the Contractor or his representative, shall conduct the Inspection as specified in Section 920.07.02.

(d) Establishment Phase Schedule & IPM Program. Develop a Schedule with dates for completing the requirements of Section 710.03.22. Include an Integrated Pest Management (IPM) Plan with methods of pest monitoring (weeds, diseases, insects, mammals, etc.), pesticide selection, application rates, and scheduling.

Submit the written Establishment Phase Schedule & IPM Program at the Installation Phase Inspection.

The Schedule will be reviewed by the Engineer and will be approved or returned for correction.

710.03.03 Utilities Marking, Layout, and Inspection.

(a) Utilities Marking. Contact 'Miss Utility' or another approved service to identify and mark utilities in the rights-of-way.

(b) Conflicts. Notify the Engineer of conflicts that may involve design changes. Conflicts will be reviewed and resolved within 14 days after notice.

(c) Planting Layout. Provide the necessary materials and lay out the locations of planting pits and planting beds specified in the Contract Documents, or as adjusted by the Engineer.

(d) Inspection. At least 7 days notice will be required to schedule each stage of a layout inspection in consultation with the Engineer. Proceed with operations after layout approval.

710.03.04 Preparing Planting Pits. Perform the following operations when preparing planting pits for individual plants:

(a) Undesirable Vegetation. Eliminate undesirable vegetation as follows:

(1) Non-Selective Herbicide. Apply non-selective herbicide in water with wetting agent and dye at least 14 days before plant installation as follows:

NON-SELECTIVE HERBICIDE APPLICATION	
MATERIAL	**RATE PER ACRE**
Glyphosate Herbicide	5 lb of active ingredient
Marking Dye	6 to 15 oz
Water	40 to 50 gal

Cut and remove dead vegetation or debris that interferes with soil preparation, plant installation or future maintenance.

(2) Manual Vegetation Removal. Remove undesirable vegetation within Bioretention Facilities manually without the use of herbicides.

(b) Excavation. Excavate planting pits to the depth required for the placement of root collars as specified in Section 710.03.09(c). Retain the excavated soil for preparation as backfill soil. Remove excess soil from the site, or spread it as directed.

(c) Pit Diameter, Compost, and Water. Use the following table to determine the diameter of the planting pit based upon the container or root ball diameter, the volume of compost or peat moss to be mixed into the backfill soil, and the amount of water to be used per watering event.

PREPARING PLANTING PITS AND BACKFILL SOIL					
Container or Root Ball Diameter In.	**ANSI Z60 Container Size**	**Planting Pit Diameter In.**	**Compost or Peat Moss Cu.Ft.**	**14-14-14 Granular Fertilizer Oz.**	**Water per Event Gal.**
3	#SP3	6	0.02	0.10	0.15
5	#SP4	10	0.02	0.12	0.2
6	#SP5 or #1	12	0.03	0.18	0.3
8	#2	17	0.09	0.30	0.5
10	#3	21	0.18	0.55	1.0
12	#5	24	0.28	0.75	1.5
14	#7	28	0.44	1.0	2.3
16	#10	32	0.65	1.3	3.5
18	#15	36	0.94	1.6	5.0
20	#20	40	1.27	2.0	6.8
24	#25	48	2.20	3.0	12
30	-	60	4.30	4.5	23
36	#45	72	7.40	6.5	40
42	#65	84	11.80	8.8	60

(1) Container Grown (CG) and Balled and Burlapped (BB). Add 14-14-14 fertilizer to each planting pit during installation unless other rates are specified in the NMP.

(2) Bare Root (BR). Excavate planting pits to accommodate roots when spread in natural position. Add 14-14-14 fertilizer to each planting pit during installation based upon the pit diameter unless other rates are specified in the NMP.

(d) Compost or Peat Moss. Mix compost into the backfill soil as specified in Section 710.03.04(c) when installing all plants except Ericaceous species, which shall be amended with the same volume of peat moss.

(e) pH Adjustment. Adjust soil pH to 6.0 to 6.5 for all plants except Ericaceous species, which shall be adjusted to pH 5.0 to 5.5. Use limestone to raise soil pH and iron sulfate to lower soil pH as specified in the NMP.

(f) Fertilizer. At the time of installation, mix 14-14-14 fertilizer into the backfill soil of trees, shrubs, vines, perennials and grasses.

Use a scale with 0.01 oz accuracy to calibrate measures and verify application rates of 14-14-14 fertilizer.

710.03.05 Preparing Planting Beds. Perform the following operations when preparing planting beds:

(a) Undesirable Vegetation. Eliminate undesirable vegetation as specified in Section 710.03.04(a). Cut or mow dead vegetation to a height of 1 in. and remove the debris.

(b) Fertilizer and Soil Amendments. Uniformly apply fertilizer and soil amendments (limestone, iron sulfate, compost, peat moss) at rates specified in Section 710.03.04(c) unless other rates are specified in the NMP. Mix 14-14-14 fertilizer into the backfill soil of each planting pit within the planting bed. Refer to Section 710.03.04(f) and the following:

(1) Areas Flatter than 4:1. Apply compost to the soil surface of the bed to a 2 in. depth.

(2) Slopes 4:1 and Steeper. Mix compost or peat moss into the backfill soil of each planting pit within the bed.

(c) Roto-tilling. Roto-till the soil of the bed as follows:

(1) Areas Flatter than 4:1. Roto-till to a depth of 6 in. to thoroughly mix compost and specified fertilizer or soil amendments into the soil.

(2) Slopes 4:1 and Steeper. Do not roto-till.

(3) Bioretention Soil Mixture. Do not roto-till.

(d) Debris Removal. Remove debris, stones, and soil clods with a length or width greater than 2 in. that are uncovered during roto-tilling.

(e) Leveling. Level the soil surface after roto-tilling, and leave it in a condition ready for shredded hardwood bark (SHB) mulching and plant installation.

710.03.06 Plant Acclimation. Ensure that container-grown plants are acclimated to prevailing weather conditions before installing. Install bare root plants while dormant when soil and air temperatures are above freezing.

710.03.07 Plant Care. Begin plant care at the time each plant is installed, and continue until Installation Phase Acceptance is granted.

710.03.08 Pruning. Prune to preserve the natural appearance of trees and shrubs. Remove water sprouts manually with pruners.

Remove damaged or undesirable wood of deciduous trees taller than 6 ft before installation. Prune deciduous trees and shrubs 6 ft or shorter at the time of installation.

710.03.09 Installing. Install plants vertically in planting pits and beds prepared as specified in Sections 710.03.04 and .05, and as follows:

(a) Removing Containers, Burlap, Wire Baskets. Remove synthetic fabric, plastic, and metal containers before installing plants.

Remove twine and natural burlap from the tops of root balls to a depth at least 6 in. below the surface of the backfilled planting pit.

Cut and remove the tops of wire baskets from the upper half of the rootball.

(b) Preparing Roots. Carefully remove the containers of container grown plants, and loosen the soil mass to eliminate girdling roots.

Spread the roots of bare root plants in a natural position, and work amended soil around the roots.

(c) Placing Root Collar. Place the root collar of plants at or above the average soil surface grade outside the planting pit as follows:

ROOT COLLAR PLACEMENT	
SOIL CONDITIONS	**HEIGHT OF ROOT COLLAR**
Normal, Well Drained	Place collar at same level to 1 in. above average surface grade.
Compacted	Place collar at 1 to 2 in. above average surface grade.
Poorly Drained or Wet	Place collar as needed to ensure 25% of root mass is above average surface grade.

(d) Backfilling. Remove clods, stones and other foreign material with a length or width greater than 2 in. from soil used for backfilling.

Place backfill soil that has been fertilized and amended as specified in Sections 710.03.04 and .05 under and around roots to stabilize plants in upright position and restore the grade.

Lightly compact backfill soil to reduce air pockets. Avoid excessive compaction of Bioretention Soil Mixture (BSM).

710.03.10 Soil Berming. Form a 4 in. high berm of backfill soil around planting pits and planting beds as follows:

(a) Planting Pits. On areas flatter than 4:1, form the berm around the entire planting pit.

On slopes 4:1 and steeper, take soil from the upslope rim of the pit and place it on the downslope rim to form the berm.

(b) Planting Beds. On slopes 4:1 and steeper, form the berm as a shoulder at the lower edge of the bed.

Berm individual trees and shrubs installed within beds on slopes 4:1 and steeper as described in (a) above.

710.03.11 Edging. Cut edging at a steep angle into the mulched area to a 3 in. depth into the soil. On slopes 4:1 and steeper, cut edging outside of the bermed area on the lower edge of berm. Remove and discard excess soil.

(a) Planting Pits. Edge entirely around all planting pits except planting pits within planting beds.

(b) Planting Beds. Smoothly cut edging around all planting beds to the shapes specified.

710.03.12 Staking and Guying. Stake and guy trees the same day they are installed.

(a) Installation. When two or three stakes are specified for trees, install two stakes parallel to the direction of traffic, or as directed. Drive stakes vertically to a depth of 10 in. below the bottom of the pit, and 5 to 8 in. away from roots as follows:

STAKING AND GUYING				
TREE TYPE	**CALIPER In.**	**HEIGHT Ft**	**SUPPORT**	
			No. of Stakes	**Length, ft**
Shade	Under 1	6 and 8	2	6
	1 to 2	-	2	8
	2-1/2 to 3-1/2	-	3	10
	4 and over	-	-	3 guy wires attached to tree anchors
Flowering	3/4 to 2-1/2	-	2	5-8
	3 and over	-	-	3 guy wires attached to tree anchors
Evergreen	-	5 and 6	2	5-6
	-	7, 8 and 9	3	7-8
	-	10 and over	-	3 guy wires attached to tree anchors

(b) Maintenance. Promptly straighten trees that become crooked after installation. Repair or replace stakes, guys, and other support materials as needed.

710.03.13 Mulching. Spread SHB mulch uniformly over the soil surface to a 3 in. depth. Promptly repair damage caused by washouts or construction activities.

(a) Planting Pits. Spread SHB mulch the same day that plants are installed. Mulch around the base of each plant to cover the soil of the planting pit to its outside edge, including the soil berm. Do not allow mulch to touch the bark or main stem of the plant.

(b) Planting Beds. SHB mulch may be spread before or after installing plants. Spread mulch over the entire bed and rake it to an even surface, including berms and shoulders. Ensure that mulch does not cover plants.

(1) Roto-tilled Beds. Spread mulch the same day after roto-tilling.

(2) Non-Roto-tilled Beds. Spread mulch within 3 days after plant installation.

When installation is completed, ensure that mulch uniformly covers the soil to a uniform 2 in. depth.

710.03.14 Fertilizing and Watering after Installation.

(a) Application Equipment. Fertilizer and watering equipment shall consist of sprinklers or hoses equipped with water breaker nozzles so the materials are applied with care to prevent damage to plants and minimize disturbance to SHB mulch.

(b) Fertilizer Solution. Fertilization after installation shall be done only if a need is established and shall be in accordance with Section 701.03.01(b)

(c) Nutrient Management Reporting. Refer to Section 701.03.01(c).

(d) Follow-Up Watering. Monitor and apply water during the Installation Phase to supply plant needs. Do not mix fertilizer with the irrigation water during the Installation Phase after the initial watering unless directed.

710.03.15 Cleanup. Remove grower's tape, plant stakes, pot markers, field tags, and similar materials at the time of installation. Ensure that the Inspection Approval markings and plant tags remain on trees and shrubs until the end of the Establishment Phase.

Keep turfgrass areas, paved surfaces, and sidewalks clean. Promptly remove excess and waste materials. Take precautions to avoid damage to existing structures, plants, and turfgrass. Repair damage caused to surrounding areas during installation, and fill ruts and reestablish turfgrass as necessary.

710.03.16 Relocating Plants. Begin plant relocation operations within 7 days after notice to relocate, and continue until work is completed. Remove plants installed in undesirable locations as directed by the Engineer, and reinstall these plants as specified herein.

710.03.17 Abandoned Planting Pits. Backfill abandoned planting pits when directed with excavated soil or approved backfill. Compact the backfill in 8 in. layers to the finished grade. Establish turfgrass as specified in Section 705.

710.03.18 Unacceptable Plants and Replacement Plants. Promptly remove and replace plants that are unacceptable at any time during the Installation Phase as specified in Section 920.07, or when requested.

Plants that are determined to be missing, dead, dying, damaged, diseased, deformed, underdeveloped, damaged by pesticides, or not true to species, cultivar, size or quality shall be replaced.

Refer to Section GP-5.09 regarding removal of defective work and materials, and Section GP-7.16 regarding Contractor responsibility for work, theft, damage, and loss.

(a) Criteria. The following criteria will be used to identify unacceptable plants:

CRITERIA FOR UNACCEPTABLE PLANTS			
Item	**Plant Type**	**Condition**	**Unacceptable**
1	Tree, Shrub, Vine, Perennial Grass	Death or Absence	Any dead or missing plant, any cause.
2	Tree, Shrub, Vine, Perennial Grass	Defoliation	More than 25% of leaf area dead, lost or dropped.
3	Tree, Shrub, Vine	Bark Wound	More than 15% of bark circumference or 2 in. length.
4	Shrub or Vine	Height Die-back	More than 25% of the shrub or vine height.
5	Tree	Leader Die-back	More than 10% of tree height.
6	Tree	Branch Die-back	More than 6 in. on 75% of branches.

(b) Replacement Plants. Replacement plants shall be true to species, cultivar, size, and quality as specified in the Contract Documents unless a Substitution Request is approved.

Install replacement plants as soon as feasible during the current Planting Season, or if between Planting Seasons, during the next Planting Season.

Promptly submit a Modification Request as specified in Section 710.03.01(b) when it is not possible to obtain plants that meet specifications.

Replacement plants shall meet the specifications of Section 920.07, and be installed and established as specified in Section 710 for 24 months, until Final Acceptance.

710.03.19 Installation Phase Inspection. Submit a request for Installation Phase Inspection when operations are completed, and provide the Establishment Phase Schedule as specified in Section 710.03.02(d).

The Installation Phase Inspection will be scheduled by the Engineer at the project with the Contractor to verify completion. At least 14 days notice will be provided before the scheduled Inspection so that it may be completed in the company of the Contractor.

710.03.20 Installation Phase Punch List. The Engineer in consultation with the Contractor will develop the Installation Phase Punch List and list of plants to be replaced. Complete the Punch List requirements and replace plants as required.

710.03.21 Installation Phase Acceptance. Re-inspection will be performed as needed. Installation Phase Acceptance will be granted when the Punch List and all Installation Phase requirements are completed.

The following list includes key Installation Phase requirements:

REQUIREMENTS FOR INSTALLATION PHASE ACCEPTANCE		
Item	**Requirement**	**Section**
a	Submittals are accepted and Inspections are completed.	710.03.01(b), 710.03.02, 920.07
b	Damaging pests are controlled.	710.03.02(c)
c	Layouts are inspected and approved.	710.03.03
d	Fertilizer and soil amendments are applied.	710.03.04 and 710.03.05
e	Planting pits and planting beds are weed free.	710.03.04(a) and 710.03.05(a)
f	Trees and shrubs are pruned.	710.03.08
g	Trees are installed vertically and straightened.	710.03.09
h	Planting pits and beds are bermed and edged.	710.03.10 and 710.03.11
i	Staking and guying are repaired or replaced.	710.03.12
j	SHB mulch is uniformly spread to the specified depth.	710.03.13
k	Washouts in planting pits and beds are repaired.	710.03.13
l	Plants are watered and fertilized.	710.03.04 and 710.03.14
m	Clean up is completed, plant tags and ribbons are removed.	710.03.15
n	Plants are relocated to approved locations.	710.03.16
o	Abandoned planting pits are filled and seeded.	710.03.17
p	Unacceptable plants are replaced.	710.03.18
q	Damage repairs and Installation Punch List is completed.	710.03.20
r	Pesticide Application and Nutrient Management Reporting Forms are completed.	710.03.01(d) and (f)
s	Plants are properly installed and successfully transplanted.	710.03.01 through .18
t	Establishment Phase Schedule & IPM Program is accepted.	710.03.02 (d)

710.03.22 Establishment Phase. The Establishment Phase begins upon Installation Phase acceptance. Maintain plants as specified in Sections 710.03.01 through 0.21, and as follows:

(a) Period of Maintenance. Maintain plants for 24 months after installation, until Final Acceptance.

(b) Plant Watering. Monitor the soil moisture and water needs of plants. Promptly apply water as specified in Section 710.03.04(c) to planting pits, and 600 gal of water per 1000 sq.ft. to planting beds when needed or when directed.

(c) Pest Management. Monitor and promptly control weeds, insects and other pests in conformance with the IPM Program, or when requested. Control weeds in mulched areas in preparation for inspection on or about the 15th of each month from March 15th to November 15th. Remove dead weeds taller than 6 in. Refer to Section 710.03.01(d) and complete the Pesticide Application Reporting Form.

(d) Unacceptable Plants and Replacement Plants. Refer to Section 710.03.18. Promptly remove and replace plants that have become unacceptable during the Establishment Phase as needed or as directed.

(e) End-of-Season Foliage Removal. Remove the aboveground parts of perennials and grasses that have declined during the months of November and March respectively, or as directed.

(f) Refertilizing. Refertilizing shall be performed only as directed by the Engineer in accordance with the NMP following soil testing demonstrating a need for refertilization.

(g) Removing Supports. Remove tree supports, hoses wires, guys and Inspection Approval markings in the final 30 days of the Establishment Phase. Pull stakes from the soil or cut them to ground level.

(h) Establishment Phase Inspection and Punch List. Refer to Sections 710.03.19 and .20. The Inspection will be scheduled and the Establishment Phase Punch List will be developed. Perform repairs, replacements and other work as specified in the Contract Documents and Punch List.

710.03.23 Final Acceptance. Refer to Section 710.03.21. Final Acceptance will be granted when the Punch List and all Establishment Phase requirements are completed.

The following list includes key establishment requirements:

REQUIREMENTS FOR ESTABLISHMENT PHASE & FINAL ACCEPTANCE		
Item	**Requirement**	**Section**
1	Water sprouts are manually pruned and removed.	710.03.08
2	Trees are straightened.	710.03.09
3	Staking and guying are repaired or replaced.	710.03.12
4	Washouts in planting pits and beds are repaired.	710.03.13
5	Plants are relocated to approved locations.	710.03.16
6	Abandoned planting pits are filled and seeded.	710.03.17
7	Plants are successfully established for 24 months.	710.03.22(a) and (b)
8	Damaging pests are controlled.	710.03.22(c)
9	Planting pits and planting beds are weed free.	710.03.22(c)
10	Unacceptable plants are replaced.	710.03.22(d)
11	Annual foliage dieback of perennials and grasses is cut and removed.	710.03.22(e)
12	Plants are refertilized.	710.03.22(f)
13	Pesticide Application and Nutrient Management Reporting Forms are completed.	710.03.01(d) and (f)
14	Staking, guying, and Material Inspection Seals are removed.	710.03.22(g)
15	Damage repairs and Establishment Punch List are completed.	710.03.22(h)

710.04 MEASUREMENT AND PAYMENT. Tree, shrub, and perennial installation and establishment will be measured and paid for at the Contract unit price per each for one or more of the item, specified by common name, biological designation, and by container type, size, caliper or height. The payment will be full compensation for all plants, material, labor, equipment, tools, and incidentals necessary to complete the work.

710.04.01 Tree, Shrub, and Perennial Installation and Establishment. Tree, shrub, and perennial installation and establishment shall include the cost of trees, shrubs, perennials, vines, and grasses, layout, marking, pruning, planting pit excavation, fertilizer, soil amendments, backfilling, staking, guying, berming, edging, watering, pest management, plant maintenance, and all operations related to the Installation and Establishment Phases of each plant, until Final Acceptance.

Tree, shrub, and perennial installation and establishment will be paid for in monthly pro-rated payments based upon the approved Breakdown List of Contract Prices.

Refer to Section 710.03.02(a). In the event of change in the quantities required, payment adjustments will be based on the approved Breakdown List of Contract Prices.

(a) Payment Schedule. Payments will be made according to the following schedule when construction requirements are met:

PAYMENT SCHEDULE			
INSTALLATION AND ESTABLISHMENT PHASE COMPLETION		**PERCENT OF TOTAL CONTRACT PRICE**	**PRO-RATED MONTHLY FOR COMPLETED WORK**
Sections 710.03.01 through .21	Installation Phase	70	Duration of Installation Phase
Sections 710.03.22(a) through (d)	Establishment Phase Care & Mainten-ance	20	At Each Monthly Inspection
Sections 710.03.22(e) through (h)	Establishment Phase Removal & Replacement and Final Acceptance	10	At Final Acceptance
Total Payment		**100**	

(b) Forfeiture. Failure to complete operations as required or directed in conformance with the Payment Schedule will result in forfeiture of that percentage of payment based upon the Breakdown List of Contract Prices.

710.04.02 Constructing Planting Beds. ***Constructing Planting Beds*** will be measured and paid for at the Contract unit price per square yard. The price shall include the cost of layout, marking, fertilizer, soil amendments, roto-tilling, berming, edging, applying 3 in. of SHB mulch, and all operations related to construction of the planting bed.

Mulching individual planting pits of trees, shrubs, perennials, vines, and grasses within planting beds will not be measured but the cost will be incidental to Section 710.04.01.

710.04.03 Relocating Plants. ***Relocating Plants*** will be measured and paid for at the Contract unit price per cubic foot of planting pit volume excavated as specified in Section 710.03.04(c).

Refer to the following Table to determine planting pit volume based upon planting pit diameter:

RELOCATING PLANTS			
PIT DIAMETER In.	**PIT VOLUME Cu.Ft.**	**PIT DIAMETER In.**	**PIT VOLUME Cu.Ft.**
3	0.1	16	10
5	0.3	18	14
6	0.5	20	19
8	1.2	24	35
10	2.4	30	65
12	4.0	36	110
14	5.7	42	175

710.04.04 Abandoned Planting Pits. ***Abandoned Planting Pits*** will be measured and paid for at the Contract unit price per cubic foot of excavated planting pit as specified in Section 710.04.03.

710.04.05 Additional Mulching. ***Additional Mulching*** will be measured and paid for at the Contract unit price per square yard of 1.0 in. depth of shredded hardwood bark (SHB) mulch over designated areas.

710.04.06 Composted Wood Chip Mulch. ***Composted Wood Chip (CWC) Mulch*** will be measured and paid for at the Contract unit price per square yard at 1.0 in. depth over designated areas.

710.04.07 ***Wetmix Seeding*** of wetlands shall be measured and paid for at the Contract unit price per pound (lb) applied.

SECTION 711 – ANNUALS AND BULBS INSTALLATION AND ESTABLISHMENT

711.01 DESCRIPTION. Install and establish annuals and bulbs.

711.02 MATERIALS.

Limestone	920.02.01
Sulfur	920.02.02
Iron Sulfate	920.02.03
Compost	920.02.05
Fertilizer	920.03
Shredded Hardwood Bark (SHB) Mulch	920.04.03
Plant Materials	920.07
Marking and Staking Materials	920.08
Water	920.09.01
Pesticides	920.09.03

711.03 CONSTRUCTION.

711.03.01 General.

(a) Regional Areas. Refer to Section 705.03.01(a).

(b) Planting Seasons. Install plants during the following Planting Seasons unless a Modification Request is approved:

PLANTING SEASONS		
SEASON	**PLANTS**	**INSTALLATION DATE**
Spring	Container Grown Summer Annuals	5/10 – 6/10
Fall	Container Grown Winter Annuals	9/10 – 10/31
	Spring Flowering Bulbs	9/10 – 12/31

(c) Modification Request. See Section 710.03.01(b).

(d) Pesticide Application. See Section 710.03.01(c).

(e) Pesticide Application Reporting. See Section 710.03.01(d).

(f) Nutrient Management Plan (NMP). See Section 701.03.01(b).

(g) Nutrient Management Reporting. See Section 701.03.01(c).

(h) Plant Storage and Handling. See Section 920.07.05.

711.03.02 Submittals and Inspection. Submit the following items as indicated:

(a) Breakdown List of Contract Prices. Refer to Section 710.03.02(a).

(b) Installation Phase Schedule. Refer to Section 710.03.02(b) and submit the Schedule with dates for completing the requirements of Sections 711.03.02 through .12.

(c) Plant Material Inspection and Approval. The Engineer, accompanied by the Contractor or his representative, shall conduct the Inspection as specified in Section 920.07.02.

(d) Establishment Phase Schedule & IPM Program. Refer to Section 710.03.02(d) and submit the Schedule with dates for completing the requirements of Section 711.03.17.

711.03.03 Utilities Marking, Layout, and Inspection. Refer to Section 710.03.03.

711.03.04 Preparing Planting Beds and Planting Areas.

(a) Planting Beds. Refer to Section 710.03.05 for preparing beds and planting holes for container grown annuals and bulbs. Dig holes for bulbs to the depth and width recommended for the species or variety by the grower.

(b) Planting Areas for Naturalized Daffodils. Dig planting holes to 3.0 diameter and to a 5 in. depth. Mix 0.20 oz of 14-14-14 fertilizer into the backfill soil of each bulb, or as specified in the NMP. Firmly cover each bulb with backfill soil to the level of the surrounding grade.

Omit the requirements of Sections 711.03.05 through .10 when installing naturalized daffodils.

711.03.05 Soil Berming. Refer to Section 710.03.10.

711.03.06 Edging. Refer to Section 710.03.11.

711.03.07 Mulching. Refer to Section 710.03.13.

711.03.08 Plant Acclimation. Refer to Section 710.03.06.

711.03.09 Plant Care. Refer to Section 710.03.07.

711.03.10 Installing. Handle annuals and bulbs with care to avoid damage or bruising. Refer to Section 710.03.09 and the following:

(a) Foliage Removal. Remove dead foliage of annuals and other unwanted vegetation from the previous season without damaging or disturbing perennials or other desirable vegetation.

(b) Mulch. Remove and conserve SHB mulch at sites where annuals or bulbs will be installed before digging the planting hole. Replace mulch to a depth of 2 in. over bulbs and around the stems of annuals.

711.03.11 Fertilizing and Watering After Installation.

(a) Application Equipment. Refer to Section 710.03.14(a).

(b) Fertilizer Solution. Refer to Section 710.03.14(b).

(c) Nutrient Management Reporting. Refer to Section 701.03.01(c).

(d) Follow-Up Watering. Refer to Section 710.03.14(d).

711.03.12 Cleanup. Refer to Section 710.03.15.

711.03.13 Unacceptable Plants and Replacement Plants. Refer to Sections 710.03.18 and 920.07 and replace unacceptable plants as specified in Section 711 for the remainder of the growing season until Final Acceptance.

711.03.14 Installation Phase Inspection. Refer to Section 710.03.19.

711.03.15 Installation Phase Punch List. Refer to Section 710.03.20.

711.03.16 Installation Phase Acceptance. Refer to Section 710.03.21 and provide the Establishment Phase Schedule as specified in Section 711.03.02(d).

Installation Phase Acceptance will be granted when the Punch List and all Installation Phase requirements are completed.

The following list includes key Installation Phase requirements:

REQUIREMENTS FOR INSTALLATION PHASE ACCEPTANCE		
Item	**Requirement**	**Section**
a	Submittals are accepted and Inspections are completed.	710.03.01(b), 711.03.02, 920.07
b	Dead foliage in existing beds is removed.	711.03.10(a)
c	Fertilizer and soil amendments are applied.	711.03.04
d	Planting pits and planting beds are bermed and edged.	710.03.10 and 710.03.11
e	SHB mulch is uniformly spread to the specified depth.	710.03.13 and 711.03.10(b)
f	Plants are watered and fertilized.	711.03.04 and 711.03.11
g	Damaging pests are controlled.	710.03.02(c)
h	Cleanup is completed, plant tags and ribbons are removed.	710.03.15
i	Washouts in and around planting beds are repaired.	710.03.13
j	Unacceptable plants are replaced as needed or required.	710.03.18
k	Damage repairs and Installation Phase Punch List are completed.	710.03.20
l	SHA Pesticide Application and Nutrient Management. Reporting Forms are completed.	710.03.01(d) and (f)
m	Plants are properly installed and successfully transplanted.	711.03.01 through .13
n	Establishment Phase Schedule & IPM Program is accepted.	710.03.02(d) and 711.03.16

711.03.17 Establishment Phase. The Establishment Phase for annuals and bulbs planted in beds begins upon Installation Phase Acceptance. Maintain all plants except naturalized daffodils as specified in Sections 711.03.01 through .16 and as follows:

(a) Period of Maintenance. Plants shall be maintained for one Planting Season, until Final Acceptance.

(b) Plant Watering. Refer to Section 710.03.22(b).

(c) Pest Management. Refer to Section 710.03.22(c).

(d) Unacceptable Plants and Replacement Plants. Refer to Section 710.03.22(d). Promptly remove and replace plants that have become unacceptable during the Establishment Phase as needed, or at the request of the Engineer.

(e) End-of-Season Foliage Removal. Remove the foliage of annuals that have declined in late summer or fall, as directed by the Engineer. Remove the foliage and flower stems of bulbs planted in beds after they have declined at the end of their growing season in June.

(f) Establishment Phase Inspection and Punch List. Refer to Section 710.03.22(h). The Inspection will be scheduled and the Establishment Phase Punch List will be developed. Perform repairs, replacements and other work as specified in the Contract Documents and Punch List.

(g) Final Acceptance. Refer to Section 710.03.23. Final Acceptance will be granted when the Punch List and all Establishment Phase requirements are completed.

The following list includes key establishment requirements:

REQUIREMENTS FOR ESTABLISHMENT PHASE & FINAL ACCEPTANCE		
Item	**Requirement**	**Section**
1	Washouts in and around planting beds are repaired.	710.03.13
2	Plants are watered as needed and refertilized as requested.	710.03.14(d) and 710.03.22(b)
3	Damaging pests are controlled.	710.03.22(c)
4	Planting beds are weed free.	710.03.22(c)
5	Pesticide Reporting and Nutrient Management Fertilizer Reporting Forms are completed.	710.03.01(d) and (f)
6	Unacceptable plants are replaced as requested.	711.03.17(d)
7	End-of-season foliage removal is completed.	711.03.17(e)
8	Damage repairs and Establishment Punch List are completed.	711.03.17(f)

711.04 MEASUREMENT AND PAYMENT. ***Annuals and Bulbs Installation and Establishment*** will be measured and paid for at the Contract unit price for one or more of the specified items. The payment will be full compensation for all plants, material, labor, equipment, tools, and incidentals necessary to complete the work.

711.04.01 Annuals and Bulbs Installation and Establishment. ***Annuals and Bulbs Installation and Establishment*** shall be measured and paid for at the Contract unit price per square yard and shall include the cost of plants, layout, marking, pruning, planting pit

excavation, fertilizer, soil amendments, backfilling, berming, edging, watering, pest management, plant maintenance, and all operations related to the Installation and Establishment Phases of each plant, until Final Acceptance.

Annuals and Bulbs Installation and Establishment will be paid for in monthly pro-rated payments based upon the approved Breakdown List of Contract Prices and the following Payment Schedule.

Refer to Section 711.03.02(a). In the event of change in the quantities required, payment adjustments will be based on the approved Breakdown List of Contract Prices.

(a) Payment Schedule. Payments will be made according to the following schedule when construction requirements are met:

PAYMENT SCHEDULE					
INSTALLATION AND ESTABLISHMENT PHASE COMPLETION		**PERCENT OF TOTAL CONTRACT PRICE**			**PRO-RATED MONTHLY FOR COMPLETED WORK**
		Annuals in Beds	**Bulbs in Beds**	**Naturalized Bulbs**	
Sections 711.03.01 through .16	Installation Phase	70	80	100	Duration of Installation Phase
Sections 711.03.17(a) through (d)	Establishment Phase In-Season Maintenance	20	10	–	At Each Monthly Inspection
Sections 711.03.17(e) through (g)	End-of-Season Maintenance, Removal & Replacement, and Final Acceptance	10	10	–	At Final Acceptance
Total Payment		**100**	**100**	**100**	

(b) Forfeiture. Failure to complete operations as required or directed in conformance with the Payment Schedule will result in forfeiture of that percentage of payment based upon the Breakdown List of Contract Prices.

711.04.02 Constructing Planting Beds. Refer to Section 710.04.02

711.04.03 Refertilizing. ***Refertilization*** authorized after the Engineer grants Installation Phase acceptance will be measured and paid for at the Contract unit price per 1000 gallons.

711.04.04 Additional Mulching. Refer to Section 710.04.05.

SECTION 712 – TREE BRANCH PRUNING

712.01 DESCRIPTION. Prune tree branches.

712.02 MATERIALS. Not applicable.

712.03 CONSTRUCTION.

712.03.01General.

(a) Permits. Obtain a Roadside Tree Permit from the Maryland Department of Natural Resources - Forest Service.

(b) Tree Preservation Program (TPP). Adhere to the requirements of the TPP when developed by the County.

712.03.02 Breakdown List of Contract Prices. Refer to Section 712.04 and develop a Breakdown List of Contract Prices for each tree in the Contract. Include costs for pruning and completing all operations per tree.

Submit the written Breakdown List within 14 days after Notice of Award. The Breakdown List will be reviewed by the Engineer for completeness and balance, and will be approved or returned for correction.

712.03.03 Maryland Licensed Tree Expert (LTE). A LTE shall perform or directly supervise the Operations in conformance with the Maryland Roadside Tree Law, the Forest Conservation Act, and accepted arboricultural practices.

712.03.04 Meetings. Meet with the Engineer and the LTE to review areas, Operations, and the approved Breakdown List of Contract Prices before beginning Operations.

712.03.05 Marking. Identify trees to be pruned, and obtain approval before beginning Operations.

712.03.06 Equipment. Equipment and tools shall conform to accepted arboricultural practices.

712.03.07 Notice. Notify the Engineer at least 10 days before beginning Operations.

712.03.08 Operations. The Contract Documents will indicate the trees to be selectively pruned or the dimensions or goals to be achieved by pruning. Meet ANSI A300 standards for Tree Care Operations. Tree branch pruning shall conform to one or more of the following Operations, as specified:

(a) Cleaning. To remove dead, diseased, and broken branches.

(b) Thinning. To reduce the density of live branches.

(c) Raising. To provide vertical clearance to a height of 15 ft, or as specified in the Contract Documents.

(d) Reducing. To decrease the height or spread.

(e) Specialty Pruning. To meet the needs of young trees, at planting, once established, pollarding, for restoration, to maintain vistas, or to accommodate utilities.

712.03.09 Wood Chipping. Chip wood and disperse or dispose of chips as directed.

712.03.10 Cleanup and Restoration. Promptly disperse or remove and dispose of wood debris and other waste materials as directed.

Avoid damage to existing structures, plants, and turfgrass. Keep turfgrass areas, paved surfaces, and sidewalks clean. Restore ruts and damaged turfgrass areas by seeding as specified in Section 705 before beginning any new landscape operations.

712.03.11 Damage Repair. Do not injure vegetation to be preserved.

Repair injuries to bark, trunks, or limbs by cutting, smoothing, and tracing the bark in accordance with ANSI A300 Standards for Tree Care Operations.

712.03.12 Damage Compensation. Monetary compensation for damage or loss of trees will be calculated and assessed in conformance with the Guide for Plant Appraisal of the Council of Tree & Landscape Appraisers.

712.04 MEASUREMENT AND PAYMENT. ***Tree Branch Pruning*** will not be measured, but will be paid for at the Contract lump sum price based upon the Breakdown List of Contract Prices.

The payment will be full compensation for all labor, material, equipment, tools, and incidentals necessary to complete the work. If the County requests a change, the units and payment will be adjusted on the basis of the approved Breakdown List of Contract Prices.

SECTION 713 – BRUSH REMOVAL

713.01 DESCRIPTION. Remove brush as specified.

713.02 MATERIALS.

Herbicide	920.09.03(a)
Marking Dye	920.09.04

713.03 CONSTRUCTION.

713.03.01 General.

(a) Permits. Obtain a Roadside Tree Permit from the Maryland Department of Natural Resources - Forest Service.

(b) Tree Preservation Program (TPP). Adhere to the requirements of the TPP when developed by the County.

(c) Pesticide Application. Refer to Section 710.03.01(c).

(d) Pesticide Application Reporting. Refer to Section 710.03.01(d).

713.03.02 Maryland Licensed Tree Expert (LTE). A LTE shall perform or directly supervise the Operations in conformance with the Maryland Roadside Tree Law, the Forest Conservation Act, and accepted arboricultural practices.

713.03.03 Meetings. Meet with the Engineer and the Licensed Tree Expert to review areas and Operations before beginning Operations.

713.03.04 Marking. Mark areas where brush is to be removed. Identify trees and shrubs to be preserved and protected. Ensure that marking and identification is completed and approved before beginning Operations.

713.03.05 Equipment. Equipment and tools shall conform to accepted arboricultural practices.

713.03.06 Notice. Notify the Engineer at least 10 days before beginning Operations.

713.03.07 Operations. Brush removal shall involve cutting, herbicide treatment, and debris removal of areas of living or dead vegetation. Do not injure vegetation identified for preservation.

One or more of the following Operations will be specified:

(a) Operation 1 - Brush Removal. Cut vegetation to a height of no more than 1 in. above the soil surface. Remove wood debris.

(b) Operation 2 - Brush Removal with Stump Treatment. Cut vegetation as in Operation 1. Immediately treat the cambium layer and exposed bark of live stumps with an approved herbicide solution and marking dye. Remove wood debris.

713.03.08 Wood Chipping. Chip wood and disperse or dispose of chips as directed.

713.03.09 Cleanup and Restoration. Promptly remove, disperse, or dispose of wood debris and other waste materials as directed.

Avoid damage to existing structures, plants, and turfgrass. Keep turfgrass areas, paved surfaces, and sidewalks clean. Restore ruts and damaged turfgrass areas by seeding as specified in Section 705 before beginning any new landscape operations.

713.03.10 Damage Repair. Do not injure vegetation to be preserved.

Repair injuries to bark, trunks, or limbs by cutting, smoothing, and tracing the bark in accordance with ANSI A300 Standards for Tree Care Operations.

713.03.11 Damage Compensation. Monetary compensation for damage or loss of trees will be calculated and assessed in conformance with the Guide for Plant Appraisal of the Council of Tree & Landscape Appraisers.

713.04 MEASUREMENT AND PAYMENT. ***Brush Removal*** will be measured and paid for at the Contract unit price per square yard, as specified. The payment will be full compensation for all labor, material, equipment, tools, and incidentals necessary to complete the work.

SECTION 714 – TREE FELLING

714.01 DESCRIPTION. Fell trees as specified.

714.02 MATERIALS.

Furnished Topsoil	920.01.02
Herbicide	920.09.03(a)
Marking Dye	920.09.04

714.03 CONSTRUCTION.

714.03.01 General.

(a) Permits. Obtain a Roadside Tree Permit from the Maryland Department of Natural Resources - Forest Service.

(b) Tree Preservation Program (TPP). Adhere to the requirements of the TPP when developed by the County.

(c) Pesticide Application. Refer to Section 710.03.01(c).

(d) Pesticide Application Reporting. Refer to Section 710.03.01(d).

714.03.02 Breakdown List of Contract Prices. Refer to Section 714.04 and develop a Breakdown List of Contract Prices for each tree in the Contract. Include costs for felling and completing all operations per tree.

Submit the written Breakdown List within 14 days after Notice of Award. The Breakdown List will be reviewed by the Engineer for completeness and balance, and will be approved or returned for correction.

714.03.03 Maryland Licensed Tree Expert (LTE). A LTE shall perform or directly supervise the Operations in conformance with the Maryland Roadside Tree Law, the Forest Conservation Act, and accepted arboricultural practices.

714.03.04 Meetings. Meet with the Engineer and the LTE to review areas, Operations, and the Breakdown List of Contract Prices before beginning Operations.

714.03.05 Utilities and Tree Marking.

(a) Utilities Marking. Contact 'Miss Utility' or another approved service to identify and mark utilities in the rights-of-way. Contact Property Management personnel, Board of Education, etc. as applicable to mark utilities on County property.

(b) Tree Marking. Mark trees to be felled. Obtain approval before beginning Operations.

714.03.06 Equipment. Equipment and tools shall conform to accepted arboricultural practices.

714.03.07 Notice. Notify the Engineer at least 10 days before beginning Operations.

714.03.08 Operations. Tree felling shall involve cutting, stump removal, stump grinding, herbicide treatment, and debris removal of selected living or dead trees.

When trees cannot be felled as a unit without danger to traffic or injury to other plants or property, remove the top sections until the tree can be safely felled.

One or more of the following Operations will be specified:

(a) Operation 1 - Felling and Stump Removal. Fell trees and remove the stumps or grind them to a depth at least 8 in. below the soil surface. Remove wood debris and stump grindings. Within 24 hours after removal or grinding, backfill the stump holes with topsoil to the surrounding soil level. Seed as specified in Section 705.

(b) Operation 2 - Felling and Stump Treatment. Fell trees and remove wood debris. Cut stumps to a height of no more than 4 in. above the soil surface. Treat with herbicide as specified in Section 713.03.07(b).

(c) Operation 3 - Felling and Removal. Fell trees and remove wood debris. Cut stumps to a height of no more than 4 in. above the soil surface.

(d) Operation 4 - Felling and Delimbing. Fell trees and cut stumps to a height of no more than 12 in. above the soil surface. Branches of felled trees that extend higher than 3 ft above the soil surface shall be cut or delimbed to a height of no more than 3 ft above the soil surface. Do not remove wood debris.

714.03.09 Wood Chipping. Chip wood and disperse or dispose of chips as directed.

714.03.10 Cleanup and Restoration. Promptly remove, disperse, or dispose of wood debris and other waste materials as directed.

Avoid damage to existing structures, plants, and turfgrass. Keep turfgrass areas, paved surfaces, and sidewalks clean. Restore ruts and damaged turfgrass areas by seeding as specified in Section 705 before beginning any new landscape operations.

714.03.11 Damage Repair. Do not injure vegetation to be preserved.

Injuries to bark, trunks, or limbs shall be repaired by cutting, smoothing, and tracing the bark in accordance with ANSI A300 Standards for Tree Care Operations.

714.03.12 Damage Compensation. Monetary compensation for damage or loss of trees will be calculated and assessed in conformance with the Guide for Plant Appraisal of the Council of Tree & Landscape Appraisers.

714.04 MEASUREMENT AND PAYMENT. ***Tree Felling*** will not be measured, but will be paid for at the Contract lump sum price based upon the Tree Felling Size Classes and the Breakdown List of Contract Prices specified in Section 714.03.02.

The payment will be full compensation for all labor, material, equipment, tools, and incidentals necessary to complete the work. Felled trees shall be classed according to the following table of Tree Felling Size Classes, and be paid as per their Size Class:

TREE FELLING SIZE CLASSES			
TREE DIAMETER AT BREAST HEIGHT IN.	**TREE PAY CLASS**	**TREE DIAMETER AT BREAST HEIGHT IN.**	**TREE PAY CLASS**
Under 10+	A	31 to 35+	F
10 to 15+	B	36 to 39+	G
16 to 20+	C	40 to 45+	H
21 to 25+	D	46 to 50+	I
26 to 30+	E	Over 51	J

If the County requests a change, the units and payment will be adjusted on the basis of the Tree Felling Size Classes and the Breakdown List of Contract Prices.

SECTION 715 – TREE ROOT PRUNING

715.01 DESCRIPTION. Prune tree roots as specified.

715.02 MATERIALS.

Salvaged Topsoil	920.01.01
Furnished Topsoil	920.01.02

715.03 CONSTRUCTION.

715.03.01 General.

(a) Permits. Obtain a Roadside Tree Permit from the Maryland Department of Natural Resources - Forest Service.

(b) Tree Preservation Program (TPP). Adhere to the requirements of the TPP when developed by the County.

715.03.02 Maryland Licensed Tree Expert (LTE). A LTE shall perform or directly supervise the Operations in conformance with the Maryland Roadside Tree Law, the Forest Conservation Act, and accepted arboricultural practices.

715.03.03 Meetings. Meet with the Engineer and the LTE before beginning Operations.

715.03.04 Utilities Marking and Conflicts.

(a) Utilities Marking. Contact 'Miss Utility' or another approved service to identify and mark utilities in the rights-of-way.

(b) Conflicts. Notify the Engineer of conflicts that may affect operations. Conflicts will be reviewed by the Engineer and resolved within 14 days after notice.

715.03.05 Marking. Mark areas to be root pruned, and obtain approval before beginning Operations.

715.03.06 Equipment. Use a vibratory knife or other equipment and tools that conform to accepted arboricultural practices.

715.03.07 Notice. Notify the Engineer at least 10 days before beginning Operations.

715.03.08 Operations. Meet ANSI A300 standards for Tree Care Operations. Cleanly cut tree roots to a depth of 24 in. along the approved line, and immediately backfill trenches with excavated soil.

715.03.09 Cleanup and Restoration. Promptly remove, disperse, or dispose of wood debris and other waste materials as directed.

Avoid damage to existing structures, plants, and turfgrass. Keep turfgrass areas, paved surfaces, and sidewalks clean. Restore ruts and damaged turfgrass areas by seeding as specified in Section 705 before beginning any new landscape operations.

715.03.10 Damage Repair. Do not injure vegetation to be preserved. Repair injuries to bark, trunks, or limbs by cutting, smoothing, and tracing the bark in accordance with ANSI A300 Standards for Tree Care Operations.

715.03.11 Damage Compensation. Monetary compensation for damage or loss of trees will be calculated and assessed in conformance with the Guide for Plant Appraisal of the Council of Tree & Landscape Appraisers.

715.04 MEASUREMENT AND PAYMENT. ***Tree Root Pruning*** will be measured and paid for at the Contract unit price per linear foot. The payment will be full compensation for all labor, material, equipment, tools, and incidentals necessary to complete the work.

SECTION 716 – TREE FERTILIZING

716.01 DESCRIPTION. Fertilize trees as specified.

716.02 MATERIALS.

Fertilizer	920.03 and as specified in the TPP.

716.03 CONSTRUCTION.

716.03.01 General.

(a) Permits. Obtain a Roadside Tree Permit from the Maryland Department of Natural Resources - Forest Service.

(b) Tree Preservation Program (TPP). Adhere to the requirements of the TPP when developed by the County.

(c) Nutrient Management Reporting. See Section 701.03.01 (c).

716.03.02 Maryland Licensed Tree Expert (LTE). A LTE shall perform or directly supervise the Operations in conformance with the Maryland Roadside Tree Law, the Forest Conservation Act, and accepted arboricultural practices.

716.03.03 Meetings. Meet with the Engineer and the LTE before beginning Operations.

716.03.04 Marking. Identify trees to be fertilized, and obtain approval before beginning Operations.

716.03.05 Equipment. Equipment and tools shall conform to accepted arboricultural practices.

716.03.06 Notice. Notify the Engineer at least 10 days before beginning Operations.

716.03.07 Operations. Meet ANSI A300 standards for Tree Care Operations. One or more of the following Operations will be specified:

(a) Operation 1 - Broadcast Fertilizing. Apply fertilizer uniformly over the soil surface in accordance with the NMP.

(b) Operation 2 - Injection Fertilizing. Inject fertilizer solution through a pressurized probe, at points 2 to 3 ft apart, to a depth of 8 to 10 in.

(c) Operation 3 - Drill Fertilizing. Place fertilizer into 1 to 3 in. diameter drilled holes, at points 2 to 3 ft apart, to a depth of 8 to 10 in.

716.03.08 Cleanup and Restoration. Avoid damage to existing structures, plants, and turfgrass. Keep turfgrass areas, paved surfaces, and sidewalks clean. Restore ruts and damaged turfgrass areas by seeding as specified in Section 705 before beginning any new landscape operations.

716.03.09 Damage Repair. Do not injure vegetation to be preserved.

Repair injuries to bark, trunks, or limbs by cutting, smoothing, and tracing the bark in accordance with ANSI A300 Standards for Tree Care Operations.

716.03.10 Damage Compensation. Monetary compensation for damage or loss of trees will be calculated and assessed in conformance with the Guide for Plant Appraisal of the Council of Tree & Landscape Appraisers.

716.04 MEASUREMENT AND PAYMENT. ***Tree Fertilizing*** will be measured and paid for at the Contract unit price for one or more of the specified items. The payment will be full compensation for all labor, material, equipment, tools, and incidentals necessary to complete the work.

716.04.01 ***Tree Broadcast Fertilizing*** per square yard.

716.04.02 ***Tree Injection Fertilizing*** per square yard.

716.04.03 ***Tree Drill Fertilizing*** per square yard.

CATEGORY 800
TRAFFIC

SECTION 800 – CONSTRUCTION FOR TRAFFIC CONTROL

800.01 GENERAL. Construction performed for purposes of traffic control shall be performed in accordance with the requirements of the Maryland Department of Transportation – State Highway Administration *Standard Specifications for Construction and Materials*, latest edition. Consult with the Baltimore County Department of Public Works and Transportation, Bureau of Traffic Engineering and Transportation Planning regarding use of MdSHA Special Provision Inserts (SPI) for Baltimore County Traffic Control projects.

(This page intentionally left blank)

CATEGORY 900
MATERIALS

SECTION 900 – GENERAL REQUIREMENTS

900.01 GENERAL. All materials included in this Category will be sampled, tested and inspected as specified in the most recently published cited standards. The specification limits for each material are established and no deviation from these limits will be permitted except when, in the judgment of the Engineer, the deviation will not be detrimental to the work. In such cases, refer to the appropriate specification governing price adjustments for non-conformance.

Within 30 days after receipt of notification of award of the Contract, the Contractor shall submit in writing, to the Engineer, the sources from which the Contractor proposes to obtain all materials to be incorporated into the project. No material shall be introduced into the work until approval of sources has been obtained. The County reserves the right to completely or partially test any material for specification compliance.

Sampling shall conform to the State Highway Administration's Sample Testing and Frequency Guide unless otherwise directed by the Engineer. All source approvals are made subject to continuing production of materials conforming to these Specifications. Material sources may be rejected where it is evident that the material tends to be of marginal quality when compared to the specification limits in any of its specified properties.

SECTION 901 – AGGREGATES

901.01 This section covers the material details, quality requirements and test methods applicable to aggregates. Grading requirements are outlined in Tables 901 A and 901 C; physical properties are outlined in Tables 901 B and 901 D. Force drying may be used in the preparation of samples for grading tests conducted in the field. Quarries providing material to Baltimore County projects must be listed in the current MdSHA Aggregate Bulletin and approved by Baltimore County DPW&T's Division of Construction Contracts Administration.

TABLE 901 A

AGGREGATE GRADING REQUIREMENTS - TEST METHOD T 27

MATERIAL		U.S. STANDARD SIEVE SIZE - PERCENT PASSING																
		3"	2 1/2"	2"	1 1/2"	1"	3/4"	1/2"	3/8"	No. 4	No. 8	No. 10	No. 16	No. 30	No. 40	No. 50	No. 100	No. 200
2" - 3" STONE for SED. CTRL (j)		*100*	*25-60*	-	*0-15*	-	*0-5*	-	-	-	-	-	-	-	-	-	-	-
CRUSHER RUN AGGREGATE CR-1		*100*	-	-	-	*45-70*	-	-	-	*15-45*	-	-	-	-	-	-	-	*0-10*
CRUSHER RUN AGGREGATE CR-6		-	-	*100*	*90-100*	-	*60-90*	-	-	*30-60*	-	-	-	-	-	-	-	*0-15*
BANK RUN GRAVEL- SUBBASE		-	100	-	-	90-100	-	60-100	-	-	-	35-90	-	-	20-55	-	-	5-25
GRADED AGGREGATE-																		
BASE DESIGN RANGE (a)(h)		-	-	100	95-100	-	70-92	-	50-70	35-55	-	-	-	12-25	-	-	-	0-8 (i)
TOLERANCE (b)		-	-	-2	±5	-	±8	-	±8	±8	-	-	-	±5	-	-	-	±3 (c)
BANK RUN GRAVEL - BASE		-	100	-	-	85-100	-	60-100	-	-	-	35-75	-	-	20-50	-	-	3-20
COARSE AGGREGATE (FOR PORTLAND CEMENT CONCRETE)	57 & UNDERDRAIN	-	-	-	100	95-100	-	25-60	-	0-10	0-5	-	-	-	-	-	-	-
	67	-	-	-	-	100	90-100	-	20-55	0-10	0-5	-	-	-	-	-	-	-
	7	-	-	-	-	-	100	90-100	40-70	0-15	0-5	-	-	-	-	-	-	-
FINE AGGREGATE (FOR PORTLAND CEMENT CONCRETE & UNDERDRAIN) (d)		-	-	-	-	-	-	-	100	95-100	-	-	45-85	-	-	5-30	0-10	-
COARSE AGGREGATE (FOR LIGHTWEIGHT PORTLAND CEMENT CONCRETE)		-	-	-	-	100	90-100	-	10-50	0-15	-	-	-	-	-	-	-	-
FINE AGGREGATE (FOR LIGHTWEIGHT PORTLAND CEMENT CONCRETE) (d)		-	-	-	-	-	-	-	100	85-100	-	-	40-80	-	-	10-35	5-25	-
FINE AGGREGATE/ SAND MORTAR and EPOXIES (d)		-	-	-	-	-	-	-	-	100	95-100	-	-	-	-	-	0-25	0-10
MINERAL FILLER		-	-	-	-	-	-	-	-	-	-	-	-	100	-	95-100	-	70-100

(a) To establish target values for design.
(b) Production tolerance.
(c) ± 2 for field grading. (omitting T 11)
(d) Fine aggregate includes natural or manufactured sand. *For underdrain, use bank run sand only.*
(e) Reserved.
(f) Reserved.
(g) 3" Screen
(h) Graded Aggregate Base shall conform to ASTM D2940. Unless otherwise specified, the gradation design range shall control and the limit for material finer than 0.02 mm is waived.
(i) 8.0 max.
(j) AASHTO M43 No. 1 Modified (d_{50}=2.5", d_{100}= 3")

TABLE 901 B

AGGREGATE PHYSICAL PROPERTY REQUIREMENTS

MATERIAL	TEST METHOD										
	SPECIFICATION	T 90	T 104	T 112	T 113	T 112 and T 113	T 11	T 113	D 4791 (a)	T 96	T 21
		PI	SODIUM SULFATE SOUND-NESS	CLAY LUMPS & FRIABLE PARTICLES	CHERT; LESS THAN 2.40 Sp. Gr.	SUM OF CLAY, LUMPS, FRIABLE PARTICLES & CHERT	MATERIAL FINER THAN No. 200 SIEVE	COAL & LIGNITE	FLAT and ELON-GATED	LOS ANGELES ABRASION	ORGANIC IMPURITIES
		max	%max	%max	%max	%max	%max	%max	%max	%max	max
CRUSHER RUN AGGREGATE CR-6	D2940 (h)	6	12	-	-	-	-	-	15	50	-
BANK RUN GRAVEL- SUBBASE	D 2940	9	12	-	-	-	-	-	-	50	-
GRADED AGGREGATE - BASE	D 2940	6	12	-	-	-	-	-	15	50	-
BANK RUN GRAVEL - BASE	D 2940	9	12	-	-	-	-	-	-	50	-
COARSE AGGREGATE - PCC (b)	M 80 Class A	-	12	2.0	3.0	3.0	1.0 (c)	0.5	12	50	- -
FINE AGGREGATE - PCC (b) (d)	M 6 Class B	-	10	3.0	-	-	4.0 (e)	1.0	-	-	3.0
COARSE AGGREGATE - LIGHTWEIGHT PCC	M 195	-	-	2.0	-	-	-	-	12	-	-
FINE AGGREGATE - LIGHTWEIGHT PCC (f)	M 195	-	-	2.0	-	-	-	-	-	-	3.0
FINE AGGREGATE / SAND MORTAR and EPOXIES	M 45	-	10	1.0	-	-	-	0.5	-	-	3.0
MINERAL FILLER (g)	M 17	NP	-	-	-	-	-	-	-	-	-
CRUSHED GLASS	M 80	-	12	-	-	-	-	-	-	45	-

(a) Dimensional ratio of calipers shall be 5:1.
(b) Test coarse and fine aggregate for PCC for alkali silica reactivity (ASR) per MdSHA MSMT 212.
(c) 1.5 if material passing No. 200 sieve is dust of fracture, free of clay or shale.
(d) In areas exposed to traffic, manufactured sand shall have a minimum ultimate polish value of 8, based on the parent rock.
(e) 5.0 for concrete not subject to surface abrasion.
(f) Fine aggregate meeting M 6 may be used if the lightweight concrete does not exceed the maximum unit weight specified in the Contract Documents.
(g) Fly ash shall not exceed 12 percent loss on ignition.
(h) Other approved inert materials of similar characteristics may be used provided they meet these provisions. When crushed reclaimed concrete is used, the soundness loss by 5 cycles of the magnesium sulfate test shall not exceed 18 percent when tested as specified in T 104.

TABLE 901 C

ASPHALT MIXES

AGGREGATE GRADING REQUIREMENTS, PERCENT PASSING FOR MIX DESIGN, TEST METHOD T 27

MATERIAL	SIEVE SIZE									
	19.0 mm	12.5 mm	9.5 mm	4.75 mm	2.36 mm	1.18 mm	600 µm	300 µm	150 µm	75 µm
HOT MIX ASPHALT SUPERPAVE - 4.75 mm	-	-	100	80-100	36-76	-	-	-	-	2-12
GAP GRADED HOT MIX ASPHALT - 9.5 mm	100	100	75-90	30-50	20-30	-	-	-	-	8-13
GAP GRADED HOT MIX ASPHALT - 12.5 mm	100	90-99	70-85	28-40	18-30	-	-	-	-	8-11
GAP GRADED HOT MIX ASPHALT - 19.0 mm	100	82-88	60 max.	22-30	14-20	-	-	-	-	9-11

MATERIAL		SIEVE SIZE									
		3/4 In.	1/2 In.	3/8 In.	No. 4	No. 8	No. 16	No. 30	No. 50	No. 100	No. 200
SLURRY SEAL (SS) AND LATEX MODIFIED SLURRY SEAL (LMSS)	MIX II	-	-	100	90-100	65-90	45-70	30-50	18-30	10-21	5-15
	MIX III	-	-	100	70-95	45-70	28-50	19-34	12-25	7-18	5-15
CHIP SEAL SURFACE TREATMENT	7	100	90-100	40-70	0-15	0-5	-	-	-	-	-
	8	-	100	85-100	10-30	0-10	0-5	-	-	-	-

Note: HMA Superpave 4.75 mm shall be designed with ESAL ranges of 0.3 to less than 3.0 million.
See AASHTO M 323 for dense-graded asphalt grading requirements

TABLE 901 D

AGGREGATE PHYSICAL PROPERTY REQUIREMENTS FOR ASPHALT MIXES

MATERIAL	SPECIFICATION	TEST METHOD												
		T 90	T 104	T 112	T 113	T 112 and T 113	T 11	T 113	D 4791 (a)	T 96	MSMT 411	T 279
		PI	SODIUM SULFATE SOUND-NESS	CLAY LUMPS & FRIABLE PARTICLES	CHERT; LESS THAN 2.40 Sp. Gr.	SUM OF CLAY, LUMPS, FRIABLE PARTICLES & CHERT	MATERIAL FINER THAN No. 200 SIEVE	COAL & LIGNITE	FLAT and ELON-GATED (h)	LOS ANGELES ABRASION (LA)	PV (c)	BPN (c)
		max	%max	%max	%max	%max	%max	%max	%max	%max	min	min
HOT MIX ASPHALT SUPERPAVE 4.75 mm	M 323	NP	12	2.0	3.0	3.0	-	0.5	10	45	5 (b)	-
HOT MIX ASPHALT SUPERPAVE - 9.5, 12.5, and 19.0 HIGH ESAL	M 323	NP	12	2.0	3.0	3.0	-	0.5	10	45	5 (b)	-
HOT MIX ASPHALT SUPERPAVE - 9.5, 12.5, and 19.0 LOW ESAL	M 323	NP	12	2.0	3.0	3.0	-	0.5	10	45	5 (b)	-
HOT MIX ASPHALT SUPERPAVE - 9.5, 12.5, and 19.0 mm 8PV	M 323	NP	12	2.0	3.0	3.0	-	0.5	10	45	8 (e)	-
HOT MIX ASPHALT SUPERPAVE - 25.0 and 37.5 mm	M 323	NP	12	2.0	3.0	3.0	-	0.5	10	45	-	-
GAP GRADED HOT MIX ASPHALT SUPERPAVE-9.5, 12.5, and 19.0 mm	M 323	NP	12	2.0	3.0	3.0	-	0.5	20/5 (g)(i)	30	8 (e)	-
SLURRY SEAL (SS) and LATEX MODIFIED SLURRY SEAL (LMSS)	-	NP	12	-	-	-	-	-	-	-	4 (f)	16
CHIP SEAL SURFACE TREATMENT	M 80, CLASS A	-	-	2.0	3.0	3.0	1.0 (d)	0.5	-	45	-	-
CRUSHED GLASS	M 80	-	12	-	-	-	-	-	-	45	-	-

(a) Dimensional ratio of calipers shall be 5:1.

(b) Polish Value (PV) shall be 5.5 when any aggregate being blended has a PV less than 5.0. PV shall be 5.0 when the aggregate from each source has a PV 5.0 or greater. Aggregate from more than two sources may be blended. Determine proportions of blended aggregate under MSMT 416 Not applicable for Gap Graded surface mixes or any other surface mix requiring high polish aggregate.

(c) PV and British Pendulum Number (BPN) determined on parent rock. When recycled asphalt pavement (RAP) is used the PV shall be 4.

(d) 1.0 for samples taken at the point of production. Samples taken at any point after shipment shall not have more than 1.5 percent finer than No. 200 sieve.

(e) PV shall be 9 when any aggregate being blended has a PV less than 8. PV shall be 8 when the aggregates from each source has a PV of 8 or greater. When carbonate rock is used, it shall have a minimum of 25 percent insoluble residue retained on the No. 200 sieve.

(f) No blending allowed.

(g) Dimensional ratio of calipers shall be 3:1/5:1.

(h) The test for flat and elongated particles (max/min) shall be conducted on the blend.

(i) Test conducted on particles retained in the No. 4 sieve.

901.01.01 Steel Slag. Steel slag may be used for chip seal surface treatment, but not for any other aggregate.

901.02 STONE FOR RIPRAP, CHANNELS, DITCHES, SLOPES, AND GABIONS. The stone shall be field or quarry stone of approved quality and may be certified from a source previously approved. Except as indicated elsewhere in these Specifications, maximum dimension of stone shall not exceed four (4) times the minimum dimension.

901.02.01 Stone for Riprap.

(a) Riprap for erosion and sediment control and slope reinforcement applications (exclusive of work in MdSHA rights-of-way).

1. Riprap shall be in accordance with the requirements given in Maryland Standards and Specifications for Erosion and Sediment Control (MSSESC), latest edition.
2. The stone for riprap shall be field stone or rough and hewn quarry stone of approved quality and may be certified from a source previously approved by Baltimore County DPW&T's Division of Construction Contracts Administration for this use. The stone must be hard and angular (not limited to a maximum dimension less than or equal to four times the minimum dimension) and of a quality that will not disintegrate with exposure to water or weathering. The specific gravity of the individual stones is to be at least 2.5. Recycled concrete equivalent may be used provided it has a density of at least 150 pounds per cubic foot and does not have any exposed steel or reinforcing bars.
3. Riprap must be composed of a well graded mixture of stone sized so that fifty (50) percent of the pieces, by weight, are larger than the size determined by the Engineer. A well graded mixture, as used herein, is defined as a mixture composed primarily of larger stone sizes but with a sufficient mixture of other sizes to fill the smaller voids between the stones. The diameter of the largest stone in such a mixture must not exceed the respective d_{100} selected from the table in Section 901.02.01(a), item 4 below. The d_{50} refers to the median diameter of the stone. This is the size for which 50 percent, by weight, will be smaller and 50 percent will be larger.
4.

Riprap Sizes and Thickness

Class	d_{50}	d_{100}	Thickness (T)
I	9.5 inches	15 inches	19 inches
II	16 inches	24 inches	32 inches
III	23 inches	34 inches	46 inches

(b) Riprap used in MdSHA rights-of-way.

1. Riprap shall be in accordance with the requirements provided by MdSHA except as modified by these Specifications.
2. Stone for riprap shall be uniformly graded from the smallest to the largest pieces as specified in the Contract Documents. The stone will be accepted upon visual inspection at the point of usage, and shall conform to the following:

CLASS OF RIPRAP	SIZE	PERCENT OF TOTAL By weight
0	Heavier than 33lb. Heavier than 10 lb. Less than 1 lb.	0 50 10 max
I	Heavier than 150lb. Heavier than 40 lb. Less than 2 lb.	0 50 10 max
II	Heavier than 700lb. Heavier than 200lb. Less than 20 lb.	0 50 10 max
III	Heavier than 2000lb. Heavier than 600 lb. Less than 40 lb.	0 50 10 max

Note: Optimum gradation is 50 percent of the stone being above and 50 percent below the midsize. Reasonable visual tolerances will apply.

901.03 STONE FOR CHANNELS AND DITCHES. Stone for channels and ditches shall conform to the size requirements of Class I Riprap given in Section 901.02.01(a), item 4, and the following:

QUALITY REQUIREMENTS	
TEST AND METHOD	**SPECIFICATION LIMITS**
Apparent Specific Gravity T 85, min.	2.50
Absorption T 85, % max.	3.0
Sodium Sulfate Soundness 5 cycles, 2 ½ - 1 ½ in. Aggregate T 104 % loss max.	20

901.04 STONE FOR SLOPES. Stone for slopes shall conform to M 43, size number 1 omitting T 11. The stone shall also conform to the quality requirements specified in Section 901.03.

901.05 STONE FOR GABIONS. Stone for gabions shall conform to the quality requirements specified in Section 901.03 and the following, except that the loss by sodium sulfate shall not be greater than 12 percent.

DEPTH OF BASKET In.	SIZE OF INDIVIDUAL PIECES In.
6	3 – 6
9	4 – 7
12	4 – 7
18	4 – 7
36	4 – 12

Size of pieces will be determined visually.

901.06 RECYCLED CONCRETE FOR AGGREGATE.

901.06.01 Description. Recycled concrete of equivalent gradation may be used as a substitute for natural stone aggregate with the approval of the Engineer. Its use shall be limited to applications that will NOT be exposed to public view.

901.06.02 Materials. Recycled concrete shall meet gradation requirements per Table 901 A for the aggregate as specified. The recycled aggregate shall be noted as RC-1, RC-6, RC-57, etc. where the gradation is equivalent to natural stone aggregate CR-1, CR-6, No. 57, etc. respectively.

Recycled concrete aggregate shall be free of contaminants including, but not limited to, paper, scrap wood, metal including rebar, soil, vegetation, organic content, excessive amount of brick, glass, plastic, petroleum derivatives and other trash. Recycled concrete aggregate shall not contain more than 5 percent brick and/or hot mix asphalt by mass except when used as common borrow. Recycled concrete aggregate shall meet the physical properties requirements of Table 901 B for the equivalent gradation of the recycled concrete to be used.

Environmental testing and Certification shall not preclude the normal materials acceptance process, and the recycled material shall meet all applicable specifications. The Contractor shall submit a copy of all EPA regulations governing use of the recycled materials as well as certified test results and material safety data sheets along with the source of supply letter and sample submitted for approval.

The recycled concrete shall comply with all requirements for recycled materials referenced in Section TC-6.09.

Material determined by the Engineer to be unsuitable shall be immediately removed from the site to a suitable rubble disposal area at no cost to the County.

901.06.03 Construction. Use of this material shall be limited to applications such as backfill that will NOT be exposed to public view upon completion of the project. Recycled concrete shall not be used as Capping Borrow, as aggregate for Portland Cement Concrete, Hot Mix Asphalt, as part of drainage systems or for mechanically stabilized earth systems. Recycled concrete shall not be used in embankment construction:

- Within 1.5 feet of the top surface of any area to be vegetated,
- Within 2 feet of saturated soil or groundwater conditions, as determined,
- Within 100 feet of any flowing or intermittent surface water course,
- Within 3 feet of any metal pipe or shoring,
- Within 3 feet of any water discharge locations,
- Under permeable or porous surfaces,
- As riprap or gabions exposed to flow of surface or groundwater,
- Where settlement could expose recycled concrete to public view.

Storage of quantities of this material in excess of the amounts necessary for immediate use on the project, as approved by the Engineer, is forbidden. Storage of any quantity of recycled concrete on sites that are residentially zoned shall not exceed a period of 24 hours between the time of delivery and the time of installation.

Grading of recycled concrete (RC) shall be done in accordance with Section 204.02 when RC is used in embankment construction, and shall be used in accordance with Section 916.01 when used as Borrow material.

Compaction of this material shall be as specified for the borrow or backfill in which the recycled concrete aggregate is to be used.

901.06.04 Measurement and Payment. Recycled concrete shall be measured and paid for as part of the borrow or backfill item for which it is being used.

SECTION 902 – PORTLAND CEMENT CONCRETE AND RELATED PRODUCTS

902.01 STORAGE. Storage of materials shall conform to the Contract Documents and as directed by the Engineer.

902.02 CERTIFICATION OF PORTLAND CEMENT AND BLENDED HYDRAULIC CEMENT. The manufacturer shall furnish certification as specified in Section GP-1.05. The certification shall also include:

(a) The mill shall report its quality control procedures, and submit a new report whenever there is a procedural change.

(b) The Cement and Concrete Reference Laboratory of the National Institute of Standards and Technology shall inspect the mill's control laboratory on their regularly scheduled visits. The Engineer shall be provided with copies of the reports of these inspections along with an account of the action taken to correct cited deficiencies.

(c) Records of data accumulated by the quality control procedures shall be produced upon request.

(d) A certified document shall accompany each shipment stating that the contents conform to all applicable requirements. Additionally, the document shall show the producer's name, mill location, carrier number, date loaded, weight contained in carrier, silo number, consignee, destination, Contract number, and type of cement. The signature and title of the signer shall be shown on the document.

(e) The mill shall, upon request, supply certified chemical and physical test values that can be associated with any sample representing cement drawn from a particular silo on a given date.

(f) If test results differ from mill results by more than the precision limits given in the test method, then acceptance of cement by certification will be terminated. The acceptance procedure will then revert to storage testing and approval prior to shipment.

902.03 HYDRAULIC CEMENT.

902.03.01 Portland Cement. M 85, with the fineness and the time of setting determined using T 153 and T 131, respectively.

902.03.02 Ground Iron Blast Furnace Slag. Refer to M 302, Grade 100 or 120. The Contractor may request to substitute a maximum of 50 percent of the weight of cement with ground iron blast furnace slag. When ground iron blast furnace slag is used, the minimum cement factor and water/cement ratio will be determined on the basis of the combined weight of the Portland cement and ground iron blast furnace slag. When ground iron blast furnace slag is used to control alkali silica reactivity, see Table 902 B for percentage.

902.04 BLENDED HYDRAULIC CEMENT. M 240, Type I (PM) containing 15 to 25 percent pozzolan by weight of cement. Maximum loss on ignition is 3.0 percent. Do not use ground iron blast furnace slag for blending. The requirement for a manufacturer’s written statement of the chemical composition is waived.

902.05 MASONRY CEMENT. C 91, except the water retention and staining tests are waived.

902.06 CONCRETE ADMIXTURES. Do not use concrete admixtures that contribute more than 200 ppm of chlorides based on the cement content when tested per MSMT 610. Use only prequalified admixtures.

Do not use pozzolan and Type IP cement in the same mix. Since the strength gains are delayed with these materials, a longer period of time may be required for curing and form removal.

902.06.01 Air Entraining Admixtures. M 154.

902.06.02 Chemical Admixtures. M 194, Type A, D, or nonchloride C.

902.06.03 High Range Water Reducing Admixtures. M 194, except that it shall be a liquid, the water content shall be a maximum of 85 percent of that of the control, and the durability factor shall be a minimum of 90. Use Type F for early strength, which shall produce a minimum compressive strength in 12 hours of 180 percent of that of the control. Use Type G when early strength is not specified. The manufacturer shall furnish certification as specified in Section GP-1.05. The certification shall include curves indicating the fluid ounces of admixture per 100 lb of cement as related to water reduction and strength gain for 12 hours when used with a minimum cement factor of 700 lb.

902.06.04 Pozzolans. The use of pozzolans may be requested to control alkali silica reactivity or for other reasons. When a pozzolan is used, determine the minimum cement factor and water/cement ratio on the basis of the combined weight cement and pozzolan. See Table 902 B for percentage of fly ash, and microsilica.

(a) Fly Ash. M 295, pozzolan Class C or F, except that the maximum permissible moisture content shall be 1.0 percent, and when used in concrete Mix Nos. 3 and 6 the maximum loss on ignition 3.0 percent.

(b) Microsilica. C 1240, except that the oversize requirement is waived.

902.06.05 Corrosion Inhibitors. Corrosion inhibitors shall be calcium nitrite based and contain a minimum of 30 percent active ingredients by mass. The gallonage of corrosion inhibitor used in the concrete mixture shall be included as water when determining the water/cementitious materials ratio.

902.07 PORTLAND CEMENT CONCRETE CURING MATERIALS. Use burlap cloth, sheet materials, liquid membrane forming compounds, or cotton mats.

902.07.01 Burlap. Per M 182, Class 1, 2, or 3.

902.07.02 Sheet Materials. C 171 with the following exceptions:

(a) White Burlap Polyethylene Sheeting. Tensile strength and elongation requirements are waived. Use sheeting having a finished product weight of not less than 10 oz/sq.yd..

(b) White Polyethylene Backed Nonwoven Fabric. Per Section 902.07.02(a), with the thickness requirement waived. Use material having a finished product weight of not less than 5 oz/sq.yd..

(c) White Opaque Polyethylene Film. Tensile strength and elongation requirements are waived.

902.07.03 Liquid Membrane and Water Based Cure and Seal Compounds. Liquid membrane forming compounds and water based cure and seal compounds shall conform to

ASTM C 309 Type II**.** Cure and seal compounds must not have high gloss finish and must be approved by Baltimore County DPW&T's Division of Construction Contracts Administration prior to use.

Field control testing of the white pigmented curing compounds shall be on the basis of weight per gallon. The samples shall not deviate more than ± 0.3 lb/gal from the original source sample.

902.07.04 Cotton Mats. Cotton mats consist of a filling material of cotton bats or bats covered with unsized cloth and tufted or stitched to maintain the shape and stability of the unit under job conditions of handling.

Use coverings of cotton cloth, burlap or jute having the following properties:

(a) Cotton cloth covering shall weigh not less than 6.0 oz/sq.yd. and have an average of not less than 32 threads/in. of warp and not less than 28 threads/in. of filling. Use raw cotton, cotton comber waste, cotton card strip waste, or combinations thereof as the raw material used in the manufacture of the cotton cloth.

(b) Burlap or jute covering for cotton mats shall weigh not less than 6.4 oz/sq.yd. and shall have not less than of 8 threads/in. of warp and not less than 8 threads/in. of filling. Use the grade known commercially as "firsts" and they shall be free from avoidable imperfections in manufacture and from defects or blemishes affecting the serviceability.

Use a cotton bat, or bats made of raw cotton, cotton waste, cotton linters, or combinations thereof, as the filling material for the mats. Mats shall weigh not less than 12 oz/sq.yd..

902.08 FORM RELEASE COMPOUNDS. Use form release compounds that effectively prevent the bond of the concrete to the forms. Form release compounds shall not cause discoloration of the concrete or adversely affect the quality or rate of hardening at the interface of the forms.

The flash point of the form release compound shall not be less than 100 F when tested per T 73.

902.09 PARAFFIN WAX. Use clear paraffin wax for use as a bond breaker for concrete. The flash point shall not be less than 380 F when tested under D 92.

902.10 PORTLAND CEMENT CONCRETE. See Section 915 and as specified herein.

902.10.01 Proportioning. Prior to the start of construction, submit to the Engineer the source and proportions of materials to be used for each concrete mix. The mixture shall meet the requirements of Section 902.10.03.

The concrete, with the exception of water and chemical admixtures, shall be proportioned by weight. Water and chemical admixtures may be proportioned by volume or weight. The mix shall be uniform and workable.

902.10.02 Materials.

Coarse Aggregate	901.01
Fine Aggregate	901.01
Cement	902.03 and 902.04
Concrete Admixtures	902.06
Synthetic Fibers	902.15
Water	921.01

902.10.03 Portland Cement Concrete Mixtures.

All Portland Cement Concrete mix designs used on Baltimore County projects must have approval by the Maryland State Highway Administration (MdSHA). The MdSHA mix design approval number must be included on all load tickets. The concrete mixes shall conform to the following:

TABLE 902 A

MIX NO.	PORTLAND CEMENT CONCRETE MIXTURES								
	28 DAY SPECIFIED COMPRESSIVE STRENGTH	STANDARD DEVIATION	CRITICAL VALUE	MIN. CEMENT FACTOR	COARSE AGGREGATE SIZE	MAX. WATER/ CEMENT RATIO	SLUMP RANGE	TOTAL AIR CONTENT	CONCRETE TEMPERATURE
	psi	psi	psi	lb/yd³	M 43	by wt.	in.	%	F
1	2500	375	2430	455	57, 67	0.55	2 - 5	5 - 8	70 ± 20
2	3000	450	3010	530	57, 67	0.50	2 - 5	5 - 8	70 ± 20
3	3500	525	3600	580	57, 67	0.50	2 - 5	5 - 8	70 ± 20
4	3500	525	3600	615	57, 67	0.55	4 - 8	N/A	70 ± 20
5	3500	525	3600	580	7	0.50	2 - 5	5 - 8	70 ± 20
6	4500	675	4770	615	57, 67	0.45	2 - 5	5 - 8	65 ± 15
7	4200	630	4420	580	57	0.50	1 1/2 - 3	5 - 8	70 ± 20
8	4000	600	4180	750	7	0.42	2 - 5	5 - 8	65 ± 15
9	3000 (a)	N/A	N/A	800	57, 67	0.45	4 - 8	5 - 8	70 ± 20
10	4500	675	4770	700	3/4" - No. 4	0.45	2 - 5	6 - 9	65 ± 15
11	4200	630	4420	-	57, 67	0.45	2 - 5	5 - 8	65 ± 15
12	4200	630	4420	-	3/4" - No. 4	0.45	2 - 5	6 - 9	65 ± 15

NOTES:

1. When concrete is exposed to water exceeding 15,000 ppm sodium chloride content, Type II cement shall be used. In lieu of a Type II cement, a Type I cement may be used in combined form with an amount of up to 50 percent replacement with ground iron blast furnace slag, or an amount of up to 25 percent replacement with Class F fly ash. Submit the proposed mix proportions and satisfactory test results per C1012 showing a sulfate resistance expansion not exceeding 0.10 percent at 180 days.
2. The temperature of Mix No. 6 when used for other than superstructure work as defined in GP-1.05 shall be 70 ± 20 F.
3. Type A or D admixture shall be added to bridge, box culvert and retaining wall concrete.
4. Nonchloride Type C admixtures may be used when approved by the Engineer.
5. Other slump requirements:
   When a high range water reducing admixture Type F or Type G is specified, the slump shall be 4" to 8".
   When synthetic fibers are specified, slump shall be 5" maximum.
   When concrete is to be placed by the slip form method, the slump shall be 2 1/2" maximum.
   When the absorption of the coarse aggregate is greater than 10%, the slump shall be 3" maximum.
6. Mix 9 shall contain a Type F high range water reducing admixture.
7. Mix 10 and 12 shall be proportioned as specified in 211.2 of the ACI's Recommended Practices for Selecting Proportions for Structural Lightweight Concrete. The maximum average Density of Cured Concrete shall be 118 lb/cu.ft. Control testing for Density of Cured Concrete shall be two companion cylinders for each 100 cubic yards, or fraction thereof, as specified in M 195.
8. Mixes 11 and 12 shall also conform to all requirements as specified in Table 902 C.

(a) Acceptance will be based on a minimum compressive strength of 3000 psi in 24 hours. Design approval shall be given based on trial batch obtaining a minimum compressive strength of 2500 psi in 12 hours. Testing shall conform to 902.10.08 except that cylinders shall remain in the molds until tests are conducted.

Coarse and fine aggregate having an expansion up to 0.10 percent when tested for alkali silica reactivity (ASR) MSMT 212 may be used without restriction. Aggregates having an expansion greater than 0.10 but less than 0.35 percent are considered reactive and may only be used when one of the options in Table 902 B are employed. Those having an expansion of 0.35 percent and greater are prohibited.

TABLE 902 B

OPTION	ALKALI CONTENT OF CEMENT % max	REPLACE CEMENT WITH		SPECIFICATION
		MATERIAL	% BY WEIGHT	
1	1.50	Class F Fly Ash	15 – 25	M 295
2	1.50	Ground Iron Blast Furnace Slag	25 – 50	M 302 Grade 100 or 120
3	1.50	Microsilica	5 – 7	C 1240
4	-	Blended Cement (a)	100	M 240
5	0.60 (b)	Low Alkali Cement	100	M 85

(a) Pozzolan content of 15 – 25 percent by weight of cement

(b) For Mix 9 used for Portland cement concrete pavement repairs; the maximum allowable percentage of alkalies in Portland cement shall be 0.70.

When reactive aggregate is used, designate which option will be used to control the formation of the ASR gel. If an option other than Option 5 in Table 902 B above is chosen, conduct tests per MSMT 212 using the reactive aggregate and the proposed cementitious material. The expansion test results shall not be greater than 0.10 percent. When more than one reactive aggregate is used in a concrete mix, each shall be tested individually and the maximum amount of pozzolan required to reduce the expansion of all the aggregates to 0.10 percent or less shall be used. Submit the aggregate source, test results, and the percent and type of replacement cement to the Engineer. The Engineer may withhold source approval pending verification testing.

TABLE 902 C

MIX PHYSICAL PROPERTIES		
TEST PROPERTY	TEST METHOD	SPECIFICATION LIMITS
Minimum Cementitious Materials Factor, lb/cu.yd.	—	580
Maximum Content of Portland Cement, lb/cu.yd.	—	550
Water/Cementitious Materials Ratio by Wt.	—	0.45
Corrosion Inhibitor, gal/cu.yd.	Section 902.06.05	2.0
Synthetic Fibers, lb/cu.yd.	Section 902.15	1.5
Permeability of Field Concrete, moving average of three tests, coulombs max	T 277 Modified	2500
Permeability of Field Concrete, individual test, coulombs max	T 277 Modified	3000
Shrinkage at 28 days, microstrains	C 157	400

Note 1: Only Type I or II Portland cement shall be used.

Note 2: Mixes shall contain ground iron blast furnace slag, fly ash or microsilica.

Note 3: The water to cement ratio shall be based upon the total water to cementitious materials ratio. The gallonage of the corrosion inhibitor shall be included in the water/cementitious materials ratio.

Note 4: The permeability test value of field concrete shall be the average of two test specimens representing production concrete. Test specimens shall be molded on the project site in 4 x 8 in. molds conforming to M 205. Test specimens shall be handled under same conditions as compressive strength test specimens in conformance with C 31 for the first seven days. When seven days old, they shall be cured in a 100 F water bath for the remainder of the 28-day curing. The 28-day rapid chloride permeability of the specimens will be determined in conformance with T 277. Test for the geometry of test specimens will be waived.

Note 5: Shrinkage tests will be performed on trial mixes only.

Note 6: High range water reducing admixture may be used except the water reducing requirements will be waived.

Note 7: A sealer conforming to Section 902.12 shall be used on the finished surface.

902.10.04 Trial Batch. A trial batch shall be prepared to certify that each mix meets the requirements of Sections 902.10.05 and 902.10.06. Approval will be given when the test results meets the minimum required average strength.

Make arrangements with the Engineer at least two weeks in advance, to have an authorized representative present during the batching and testing. Each trial batch shall consist of at least 3 cu.yd. of concrete. Supply all equipment, and labor required to produce the trial batches and conduct the required tests at no additional cost to the County.

The Engineer may waive the requirement for a trial batch when past performance records show that the required average strength requirement has been met.

902.10.05 Design Required Average Strength.

Specified Compressive Strength, f_c', psi	Required average compressive strength, f_{cr}', psi
$f_c' \leq 5000$	Use the larger value computed From Eq. (A-1) and (A-2) $f_{cr}' = f_c' + 1.34\ s$ (A-1) $f_{cr}' = f_c' + 2.33\ s - 500$ (A-2)
f_c' Over 5000	Use the larger value computed From Eq. (A-1) and (A-3) $f_{cr}' = f_c' + 1.34\ s$ (A-1) $f_{cr}' = 0.90\ f_c' + 2.33\ s$ (A-3)

where:

f_c' = the 28 day specified compressive strength
s = the standard deviation as specified in Section 902.10.06.

A test is defined as the average strength of two companion cylinders.

902.10.06 Standard Deviation.

(a) When past performance records are available, a standard deviation will be established from documented performance records of the producer consisting of a minimum of 15 consecutive 28-day compressive strength tests obtained within the last 12 months.

The standard deviation will be established as the product of the calculated standard deviation and multiplier.

NUMBER OF TESTS	MULTIPLIER FOR STANDARD DEVIATION
15	1.16
20	1.08
25	1.03
30 or more	1.00

Interpolate for intermediate number of tests.

(b) When past performance records are not available, the required average strength shall meet the following:

Specified Compressive Strength, f_c', psi	Required average compressive strength, f_{cr}', psi
$f_c' < 3000$	$f_{cr}' = f_c' + 1000$
$3000 < f_c' < 5000$	$f_{cr}' = f_c' + 1200$
$f_c' > 5000$	$f_{cr}' = 1.10\ f_c' + 700$

902.10.07 Standard of Control. The average of all sets of three consecutive strength tests shall equal or exceed the critical value as specified in Section 902.10.03, Table 902 A, that shall be computed using the following formula:

$$\text{Critical Value} = f_c' + (1.14 \times S) - 500$$

Failure to conform to this criterion shall be cause for immediate investigation and remedial action up to and including suspension of production. A design standard deviation equal to 15 percent of the specified strength shall be used for calculation until a minimum of 15 test results are obtained.

The actual average strength and standard deviation shall be computed upon the availability of 28-day strength data comprising a minimum of 15 tests. Should this determination indicate an excessive margin of safety, the concrete mix may be modified to produce lower average strength as approved by the Engineer. If these calculations indicate a coefficient of variation greater than 15, the quality of the concrete and testing will be evaluated.

902.10.08 Testing. Sampling per T 141. Testing as follows:

TEST	METHOD	MINIMUM TEST FREQUENCY	RESPONSIBILITY
Temperature (e)	T 309	1 per 50 cu.yd. (or fraction thereof)	Engineer
Slump (a)(e)	T 119	1 per 50 cu.yd. (or fraction thereof)	Engineer
Air Content (a)(e)	T 152 T 196	1 per 50 cu.yd. (or fraction thereof)	Engineer
Compression (b)(c)(d)	T 23	1 per 50 cu.yd. (or fraction thereof)	Engineer
Compression (b)(c)(d) Mix No. 7 Only	T 23	3 per Day	Engineer

(a) A second test will be made when the first slump or air content test fails. Acceptance or rejection will be based on the results of the second test.
(b) Compressive strength tests are defined as the average of two companion cylinders.
(c) The Contractor shall be responsible for the making of all early break cylinders, furnishing the molds and providing weather protection for all cylinders. The Contractor is responsible to deliver all early break cylinders to an AASHTO accredited testing laboratory.
(d) The Engineer shall be responsible for making, numbering, and delivering the 28-day cylinders to the testing laboratory.
(e) When constructing plain and reinforced concrete pavements, the testing frequency for slump, air content, and temperature shall be 1 per 100 cu.yd. or fraction thereof.

902.10.09 Acceptance. Concrete will be acceptable if both of the following requirements are met:

(a) The average of all sets of three consecutive strength tests equal or exceed the specified design strength.

(b) No individual strength test (average of two companion cylinders) falls below the specified design strength by more than 500 psi.

902.10.10 Price Adjustment. A price adjustment will be based on the Contract unit price per cubic yard of concrete. If the unit is a lump sum item, the price per cubic yard for the concrete will be determined by dividing the cubic yards into the Contract lump sum price.

(a) Test Results More Than 500 psi Below the Specified Design Strength. Failing strength tests will be considered individually with a price adjustment being applied on the percentage basis as shown below.

(Price per cu.yd.) x (quantity of cu.yd. represented by the failing concrete strength) x (percent of failure).

Example:

$400.00 per cu.yd. x 50 cu.yd. x [1-(3600/ 4500 psi)] = $4,000.00

No payment will be allowed when the test results fall below 85 percent of the specified design strength for structural concrete or 80 percent for incidental concrete.

The Engineer will determine when the strength of the concrete represented by the failing tests is sufficient to remain in place or whether it must be removed and replaced with Specification concrete.

(b) Test Results 500 psi or Less than the Specified Design Strength. Strength failures 500 psi or less than the specified design strength will be averaged with the next two consecutive tests. If those two tests include a failure greater than 500 psi, those tests will be evaluated as in Section 902.10.10(a) and replaced with the next consecutive test. If the resulting average falls below the specified design strength, a price adjustment will be applied as specified in the table below. Any failure will only be included in one grouping.

STRENGTH BELOW THE SPECIFIED (avg of 3 tests) DESIGN LEVEL, psi	**ADJUSTMENT FACTOR**
MIX NO. 1 THROUGH MIX NO. 12	
1 – 100	0.005
101 – 200	0.01
201 – 300	0.02
301 – 400	0.04
401 – 500	0.08

Adjustment price equals (price per cu.yd.) x (quantity of cu.yd. represented by the failing cylinders) x (the adjustment factor).

Example:

$400.00 per cu.yd. x 50 cu.yd. x 0.01 = $200.00

902.11 MORTAR FOR GROUT. Mortar used for grouting anchor bolts, pipe, handrail posts, and miscellaneous items shall be composed in accordance with one of the following:

(a) One part Portland cement or blended hydraulic cement and one part mortar sand by dry loose volume.

(b) Prepared bag mixes consisting of Portland cement or blended hydraulic cement and mortar sand. The prepared mixes shall produce a mortar meeting the strength requirements specified in the Contract Documents.

(c) Use non-shrink grout when specified. The grout shall have a minimum compressive strength of 5000 psi in seven days when tested as specified per T 106, except that the cube molds shall remain intact with a top firmly attached throughout the curing period. The non-shrink grout shall have no expansion or contraction after seven days when tested as specified per T 160.

(d) Epoxy grout shall consist of sand and epoxy mixed by volume in per the manufacturer's recommendations. The grout shall be capable of developing a minimum compressive strength of 6500 psi in 72 hours when tested per MSMT 501. Sand for epoxy grout as specified in Section 901.01, Table 901 A.

(e) An epoxy or polyester anchoring system may be used when approved by the Engineer in accordance with the manufacturer's recommendations. Strength values shall be as specified in the Contract Documents.

902.12 LINSEED OIL. Shall consist of a 50-50 mixture (by volume) of boiled linseed oil meeting Federal Specification TT-L-190 and kerosene per D 3699.

902.13 LATEX MODIFIED CONCRETE. Portland cement concrete containing prequalified Laboratory approved styrene butadiene latex emulsion is defined as Latex Modified Concrete (LMC).

Latex emulsion shall have a minimum of 90 percent of the nonvolatiles as styrene butadiene polymers. The latex emulsion is specified in Table 902.13 A. The material shall be stored in suitable containers and be protected from freezing and exposure to temperatures in excess of 85 F.

LMC shall be proportioned using volumetric mixing and designed as follows:

LATEX MODIFIED CONCRETE	
MATERIAL	**SPECIFICATION LIMITS**
Portland Cement, 100 lb./cu.yd., min.	6.6
Latex Emulsion/Cement Ratio	0.31 – 0.34
Water/Cement Ratio, max	0.22
Entrained Air, %	6.0 ± 3
Slump, in.	5 ± 1

The physical properties of LMC shall conform to Table 902.13 B. The Contractor shall furnish the necessary 3 x 6 in. molds per M 205 to be used for the fabrication of compressive strength cylinders.

Control and Acceptance Sampling.

(a) Submit a two qt minimum sample, of the styrene butadiene latex emulsion to the Engineer daily for each lot of material used in a day's production.

(b) A batch for LMC is defined as the capacity of the equipment being used on the project. Slump and air samples will be taken and tested before the placement of a batch is permitted. The slump shall be measured four to five minutes after discharge from the mixer. The test material shall be deposited off the deck and not be disturbed during this waiting period. One additional sample for slump and air will be taken randomly during the placement of each batch. For seven day compressive strength,

two tests each per batch are required. A test is defined as consisting of two companion cylinders. The samples for these tests will be taken at random while the placement is in progress.

TABLE 902.13 A

REQUIREMENTS FOR CHEMICAL PROPERTIES OF LATEX EMULSION MATERIALS				
PROPERTY	**SPECIFICATIONS**		**QUALITY ASSURANCE TESTS**	
	LIMITS	**TOLERANCE**	**PREQUALI-FICATION TESTS**	**CONTROL AND ACCEPTANCE**
Color	White	—	X	X
pH	9.0 – 11.0	—	X	X
Weight, lb/gal	8.40 – 8.47	—	X	X
Solids Content, %	46 – 53	—	X	X
*Butadiene Content, % of polymer	30 – 40	—	—	—
Viscosity @ 10 rpm-cps	Match Original	± 20	X	X
*Surface Tension, dynes/cm max	50	—	—	—
*Mean Particle Size, polymer – Å	1400 – 2500	—	—	—
Coagulum, % max	0.10	—	X	X
*Freeze-Thaw Stability, coagulum, % max	0.10	—	X	X
Infrared Spectra of Latex Film	Match Original	—	X	X
Infrared of Alcohol, Soluble Portion of Latex	Match Original	—	X	X
Shelf Life, min	1 yr	—	X	—

Note 1: Quality assurance tests shall be conducted as specified in MSMT 612 except those denoted by an * shall be conducted as specified in FHWA RD – 78-35.

Note 2: The original or prequalification sample shall be accompanied by the producer's certification on all of the tests and properties noted above and as specified in Section GP-1.05. The certification shall contain actual test values of the product and the infrared spectrograph.

Note 3: A separate certification is required for each lot of material. The certification shall note the date of manufacture, lot size, and whether or not the material is identical to the formulation of the original sample.

TABLE 902.13 B

LATEX MODIFIED CONCRETE PHYSICAL PROPERTIES			
TEST PROPERTY	**TEST VALUES**	**QUALITY ASSURANCE TESTS**	
		PREQUALIFIED TESTS	**CONTROL AND ACCEPTANCE**
7 Day Compressive Strength, psi min	3000	X	X
28 Day Compressive Strength, psi min	3500	X	—
42 Day Compressive Strength, psi min	3500	X	—
7 Day Flexural Strength, psi min	550	X	—
28 Day Flexural Strength, psi min	650	X	—
42 Day Shear Bond Strength, psi min	2000	X	—
Durability Factor, 300 cycles, % min	85	X	—
Chloride Permeability, Ppm max	510	X	—
Scaling Resistance, 50 cycles, max	3	X	—

Note 1: Quality assurance tests shall be conducted as specified in MSMT 721.

Note 2: Seven Day Compressive Strength Test will be used for Control & Acceptance of the material. The minimum specified design strength is 3000 psi at seven days. The mix design approval and acceptance will be based on a coefficient of variation of 10 percent with a probability of 1 in 10 tests falling below the specified strength. Only test values 80% or greater than the specified strength will be accepted.

902.14 RAPID HARDENING CEMENTITIOUS MATERIALS FOR CONCRETE PAVEMENT REPAIRS. Materials shall be a dry, packaged cementitious mortar having less than 5 percent by weight of aggregate retained on the 3/8 in. sieve and meet the following requirements:

Classification.

Class I — For use at ambient temperatures below 50 F.
Class II — For use at ambient temperatures of 50 to 90 F.
Class III — For use at ambient temperatures above 90 F.

Chemical Requirements. C 928 except that no organic compounds such as epoxy resins or polyesters as the principal binder.

Physical Requirements. Meet the following when tested per MSMT 725:

COMPRESSIVE STRENGTH, psi min				
CLASSIFICATION	**< 2 hr**	**2-6 hr**	**6 hr**	**28 days**
Type I — Slow	—	—	2000	4500
Type II — Rapid	—	2000	—	4500
Type III — Very Rapid	2000	—	—	4500

TEST RESULTS	
TEST PROPERTY	**LIMITS**
Bond Strength, 7 days, psi min	2000
Length Change, increase after 28 days in water, based on length at 3 hr, % max	+ 0.15
Length Change, decrease after 28 days, % max	- 0.15
Freeze Thaw, loss after 25 cycles in 10% Calcium Chloride solution, % max	8
Initial Setting Time, minutes min	10

Marking. All packages delivered to the project shall be marked with the following information:

(a) Date material was packaged.

(b) Approximate setting time.

(c) Recommended dosage of water or liquid component.

(d) Mixing instructions.

(e) Class or temperature range.

Certification. The manufacturer shall furnish certification as specified in Section GP-1.05 showing the actual test results for each class and type of material submitted to the Laboratory.

902.15 SYNTHETIC FIBERS. When synthetic fibers are specified in the Contract Documents, the fibers shall be ½ to 1-1/2 in. long and conform to C 1116, Type III. The manufacturer shall furnish certification as specified in Section GP-1.05. The quantity of fibers used and their point of introduction into the mix shall conform to the fiber manufacturer's recommendations.

902.16 CONTROLLED LOW STRENGTH MATERIAL.

902.16.01 Usage. Controlled Low Strength Material (CLSM) shall consist of the types described below:

TYPE A – Used where future excavation of the CLSM may be necessary (e.g. utility trenches, pipe trenches, bridge abutments, and around box culverts).

TYPE B – Used where future excavation of the CLSM is not anticipated (e.g. filling abandoned conduits, pipes, tunnels, mines, etc. and replacing unsuitable soils below roadway and structure foundations where extra strength is required).

902.16.02 Materials.

Coarse Aggregate	901.01*
Fine Aggregate	901.01
Cement	902.03 and 902.04
Concrete Admixtures	902.06
Fly Ash	902.06.04
Water	921.01

*maximum size of 3/4 in.

Produce CLSM in conformance with the applicable portions of Section 915 and the following:

902.16.03 Proportioning. Submit the sources and proportions of materials, and test data for each CLSM mixture prior to construction. CLSM shall be proportioned, on the basis of field experience and/or laboratory trial mixtures, to produce a flowable and self-compacting mixture meeting the requirements of Section 902.16.04.

CLSM shall be proportioned by weight; with the exception of water and chemical admixtures. Water and chemical admixtures may be proportioned by volume or weight.

902.16.04 CLSM Mixtures. Proportion CLSM with sufficient amounts of Portland cement, fly ash, or ground granulated blast furnace slag; individually or in combination, to produce a cohesive, non-segregating mixture that conforms to the physical properties in the following table:

CLSM Mix	28 Day Compressive Strength, (psi) ASTM D4832	Flow Consistency, (in.) ASTM D6103
Type A	50 - 200	8 min.
Type B	500 min.	8 min.

SECTION 903 – MASONRY PRODUCTS

903.01 SEWER BRICK. Sewer brick shall have a standard size of 2 1/4 x 3 3/4 x 8 in. and conform to C 32, Grade SS. See Standard Detail Plates for sewer manholes. Use solid brick except as otherwise directed by the Engineer.

903.02 MANHOLE BRICK. Manhole brick shall conform to C 32, Grade SM.

903.03 BUILDING BRICK. Building brick shall conform to C 62, Grade SW.

903.04 HOLLOW CONCRETE MASONRY BLOCK. Hollow load bearing concrete masonry block shall conform to C 90, Class I, normal weight.

903.05 SOLID CONCRETE MASONRY BLOCK. Solid concrete masonry block shall conform to C 139 or C 90 as applicable.

903.06 MORTAR FOR MASONRY. Mortar used for masonry shall be composed in conformance with one of the following:

(a) One part Portland cement or blended cement and three parts mortar sand by dry loose volume and hydrated lime not to exceed 20 percent of the cement by weight;

(b) One part masonry cement and three parts mortar sand by dry loose volume;

(c) Prepared bag mixes consisting of masonry cement and mortar sand. The prepared mixes shall produce a minimum compressive strength of 500 psi in seven days when tested using the applicable procedures specified in C 91.

Materials for mortar shall conform to the following:

Mortar Sand	901.01
Portland Cement	902.03
Blended Cement	902.04
Masonry Cement	902.05
Water	921.01
Lime	921.03

SECTION 904 – PERFORMANCE GRADED ASPHALT BINDERS AND HOT MIX ASPHALT

904.01 CERTIFICATION. The manufacturer and hauler shall furnish certifications as specified in Section GP-1.05 and the following:

The manufacturer shall also certify:

(a) Date and time of loading.

(b) Tank or blending system.

(c) Identification of hauling unit.

(d) Binder grade, temperature, and quantity of materials.

(e) Complete certified analysis.

(f) Lot number, if applicable.

(g) Mixing and compaction temperatures.

The hauler shall also certify:

(a) Identification of hauling unit.

(b) Binder grade and source of last delivery.

(c) The date of the last delivery using this hauling tank and volume of material remaining in the tank at the time of current loading.

904.02 PERFORMANCE GRADED ASPHALT BINDERS. Performance graded asphalt binders for mixes containing all virgin materials, recycled asphalt pavement materials, or roofing shingles from manufacturing waste shall conform to M 320, Table 1, for the specified performance grade. The asphalt binder recovered from the final plant mixed material will be considered Rolling Thin Film Oven (RTFO) material and shall conform to M 320, Table 1 for the specified performance grade.

The performance-graded binder shall be pre-approved by the Engineer. The Contractor shall submit a certificate of analysis showing conformance with the Performance Graded Binder Specification M 320 and showing the critical cracking temperature in conformance with PP 42, *Standard Practice for Determination of Low-Temperature Performance Grade (PG) of Asphalt Binder*, for the binders specified in the Contract Documents.

The PG binder for HMA mixes shall be achieved by the use of Neat Asphalt with elastomer polymer modifications when needed.

904.03 EMULSIFIED ASPHALTS. Emulsified asphalts shall conform to M 140 or M 208 with the following exceptions:

(a) Cement mixing tests are waived.

(b) Grade SS-1 viscosity shall be 50 to 400 seconds at 77 F.

(c) Maximum of 3.0 percent by volume of oil distillate.

(d) The sieve test requirement for field samples shall be a maximum of 0.4 percent.

904.04 HOT MIX ASPHALT (HMA). Mixes shall be produced in a plant as specified in Section 915.

904.04.01 Aggregates. Aggregates shall conform to Section 901, and M 323 with the exception that the aggregate retained on the 4.75 mm sieve shall be tested for flat and elongated particles in conformance with D 4791. When recycled asphalt pavement is used in an HMA mix as defined in MSMT 412, it shall be considered an aggregate source.

904.04.02 Mix Design. The Contractor shall develop a Superpave mix design in conformance with MSMT 416 and M 323, except replace "Table 6, Superpave HMA Design Requirements" with the following Table:

DESIGN LEVEL	20-Year Design Traffic, ESALs	Ndesign
1	<300,000	50
2	300,000 to <3,000,000	65
3	3,000,000 to <10,000,000	80
4	10,000,000 to <30,000,000	80
5	≥30,000,000	100

Design asphalt mixes to the Design Level specified in the Contract Documents.

Asphalt mixes designed with Reclaimed Asphalt Pavement (RAP) and/or Reclaimed Asphalt Shingles (RAS) shall conform to MSMT 412.

All HMA material used on Baltimore County projects must be Maryland State Highway Administration (MdSHA) approved mixes. HMA Superpave mixes shall conform to the specification for Superpave Volumetric Mix Design, M 323, and shall be designed for the Equivalent Single Axle Loading (ESAL) range specified in the Contract Documents.

The contractor may elect to use crushed, recycled asphalt pavement (RAP) material or a maximum of 5 percent roofing shingles from manufacturing waste. Shingles processed from this waste must be ground, screened to a minus 3/8" size and blended with stabilizing aggregate which shall be processed through a fully automated blending facility prior to being incorporated into the hot mix asphalt production facility. All facilities choosing to incorporate shingles into their mixes must be pre-approved by Baltimore County.

Surface mixes using 20 percent or more RAP and base mixes using more than 25 percent RAP shall be tested and evaluated in accordance with TP62, "Determining Dynamic Modulus of Hot Mix Asphalt Concrete Mixtures", to determine plant mixing capabilities. A demonstration strip or mix verification may be required before placement. When using less than 20 percent RAP, binder grade adjustments are not required.

The use of RAP, not to exceed 10 percent, may be considered for applications where higher polish value aggregates are required and in mixes requiring elastomer type polymer binder. Approval for use will be on an individual project basis. Documentation of RAP stockpile quality and traceability shall be submitted to the Engineer for approval prior to use.

Crushed glass shall not be used in surface mixes. RAP and roofing shingles from manufacturing waste shall not be used in gap-graded mixes, surface mixes requiring high polish aggregate, or mixes requiring elastomer type polymer binder. Shingle mixes shall only be used for base course mixes.

904.04.03 Mix Design Approval. At least 30 days prior to paving operations, submit data from the laboratory study to the Engineer for tentative approval. Submit mix designs in an approved format. Include the following:

(a) Mix designation.

(b) Source, percentage, and grade of performance graded asphalt binder.

(c) Source, gradation, and proportion of each component aggregate.

(d) Target aggregate gradation.

(e) Plant where the HMA mix will be produced.

(f) Plant target mixing temperature based on viscosity of 0.22 Pa·s.

(g) Ratio of dust to binder material on effective asphalt.

(h) Maximum specific gravity at the target binder content.

(i) Mix design grading plotted on 0.45 power gradation chart.

(j) Tensile strength ratio and worksheets.

(k) The bulk specific gravity at Ndesign gyrations.

(l) The air void content (percent Va) at Ndesign gyrations.

(m) The voids in the mineral aggregate (percent VMA) and the voids filled with asphalt (percent VFA) at Ndesign gyrations (T 312).

(n) All consensus and source properties.

  (1) Coarse aggregate angularity.

  (2) Flat and elongated.

  (3) Sand equivalent.

  (4) Uncompacted void content of fine aggregate.

(5) Bulk and apparent specific gravity of coarse and fine aggregate.

(6) Absorption of coarse and fine aggregate.

With each mix design submitted to the Engineer for approval, include a quantity of job mix formula aggregate and appropriate amount of required PG binder for ignition oven calibration.

If previous construction or performance experience has shown the proposed mix design to be unsatisfactory, the Engineer may require that a more suitable design be submitted.

When a change to the source of aggregate used in the mix is proposed, submit a revised mix design with the information required above and in Section 904.04.02. If a change in the Performance Grade binder source becomes necessary, conduct a stripping test in conformance with MSMT 410, prior to approval. The Engineer may require an antistripping additive test in conformance with D 4867 before giving the final approval.

Field Verification of Mix Design. After receiving tentative approval for the mix design from the Asphalt Technology Chief Representative, conduct a field verification of the mix at the beginning of production in each plant. Field verification shall be performed by the certified personnel as specified in Section 504.03. Prepare the verification samples per R 35. Notify the Engineer at least two working days in advance of the scheduled verification.

Verification Evaluation.

(a) Initial verification shall consist of four samples tested for the parameters listed in MSMT 735, Table 2. These samples shall be randomly drawn from the first day's production. If the first day of production is less than 2000 tons, the verification testing may be spread over the number of days needed to accumulate 2000 tons. A verification sample and test is required on any day that exceeds 200 tons of production. Complete the verification testing no later than on the day when production has reached the 2000 tons. Evaluate the verification tests results as specified in MSMT 735.

(b) If the mix produced by the plant conforms to the parameters listed in MSMT 735, Table 2 with a Percent Within Specification Limit (PWSL) of at least 85, production may proceed without any changes. If the Contractor has submitted mixes with identical aggregate combinations and differing asphalt contents associated with changes in ESAL loads, verification may be limited to volumetric analysis at the Engineer’s discretion.

(c) If the mix produced by the plant does not conform to the parameters listed in MSMT 735, Table 2 with a PWSL of at least 85, then an adjustment to the asphalt content or gradation may be made to bring the mix design requirements within acceptable levels.

Permissible adjustment limitations between the approved Mix Design and Adjusted Mix Design are as follows:

TEST PROPERTY	PERMISSIBLE ADJUSTMENT % (*)
Larger than 1/2 in. (12.5 mm) sieve	± 5
1/2 in. (12.5 mm) through No. 4 (4.75 mm) sieves	± 4
No. 8 (2.36 mm) through No. 100 (1.50 µm) sieves	± 3
No. 200 (75 µm) sieve	± 1.0
Binder Content	± 0.20

*The permissible adjustment for all mixes shall be within control points.

When an adjustment is made to the mix design, perform a second verification to ensure that the modified mix conforms to all design requirements. Meet the time and tonnage limitations as specified in (a). If the adjusted mix meets the PWSL, production may proceed. If the mix does not meet these requirements, suspend production for the mix and submit a new mix design for approval. Design the new mix as specified in MSMT 412 or R 35.

(d) If subsequent designs submitted due to nonconformance do not meet (b) during the initial verification, suspend production for the mix until corrective action is taken as approved by the Engineer.

Thin Lifts. When specified lift thickness does not meet 3-times nominal maximum aggregate size for fine graded mix designs or 4-times nominal maximum aggregate size for coarse graded mix designs, the lift thickness shall be designated as a thin lift. Fine graded and coarse graded mix designs shall be determined in accordance with M 323, Table 4, Gradation Classification, and the table below.

Thin Lift Mix Design Identification Table

Mix Designation	Gradation Classification Control Sieve Mix Design Target (%Passing)	
	Fine Graded	Coarse Graded
4.75mm	A thin lift is a specified pavement thickness < 1 inch.	A thin lift is a specified pavement thickness < 1 inch.
9.5mm	When the 2.36mm (#8) is ≥ 47%, a thin lift is a specified pavement thickness < 1 1/8 inches	When the 2.36mm (#8) is < 47%, a thin lift is a specified pavement thickness < 1 1/2 inches
12.5mm	When the 2.36mm (#8) is ≥ 39%, a thin lift is a specified pavement thickness < 1 1/2 inches	When the 2.36mm (#8) is < 39%, a thin lift is a specified pavement thickness < 2 inches
19.0mm	When the 4.75mm (#4) is ≥ 47%, a thin lift is a specified pavement thickness < 2 1/4 inches	When the 4.75mm (#4) is < 47%, a thin lift is a specified pavement thickness < 3 inches

Mix Designation	Gradation Classification Control Sieve Mix Design Target (%Passing)	
	Fine Graded	**Coarse Graded**
25.0mm	When the 4.75mm (#4) is ≥ 40%, a thin lift is a specified pavement thickness < 3 inches	When the 4.75mm (#4) is < 40%, a thin lift is a specified pavement thickness < 4 inches
37.5mm	When the 9.50mm (3/8) is ≥ 47%, a thin lift is a specified pavement thickness < 4 1/2 inches	When the 9.50mm (3/8) is < 47%, a thin lift is a specified pavement thickness < 6 inches

904.04.04 Antistripping Additives. HMA shall have a minimum Tensile Strength Ratio (TSR) of 0.85 when tested in conformance with D 4867. The freeze-thaw conditioning cycle is required. HMA mixes not conforming to the minimum TSR requirement shall include an antistripping additive.

When an antistripping additive is needed, the exact quantity shall be determined by the producer in conformance with D 4867 based on a minimum TSR of 0.85.

When a heat stable antistripping additive is used, the minimum dosage rate shall be 0.20 percent of the total weight of asphalt. The additive shall be introduced at the plant by line blending, metering, or otherwise measuring to ensure accurate proportioning and thorough mixing.

When hydrated lime is used, it shall be added in slurry form at the rate of 1.0 to 1.5 percent by weight of total aggregate. The hydrated lime shall conform to C 1097. Lime slurry shall be sprayed uniformly on the damp, cold aggregate on the feed belt prior to entry into the HMA plant dryer.

Plant control and acceptance of the mix shall be based on MSMT 410 with respect to its stripping potential.

904.04.05 Plant Control. Reserved.

SECTION 905 – PIPE

The manufacturer shall furnish certification for all pipe as specified in Section GP-1.05.

905.01 Materials, Use, Specifications, and Remarks.

MATERIAL	USE	SPECIFICATION	REMARKS
Ductile Iron Pipe (Note 1)	Sewer	AWWA C 150 and C 151	Gravity Sewer Class 52
	Pressure	AWWA C 150 and C 151	Water & Sanitary Sewer Force Main, Class 54
	Pressure	AWWA C 115	Flanged pipe, thickness corresponding to Class 54
	All	AWWA C 110 and C 153	Fittings
Steel Pipe	Pressure	AWWA C 200	Exterior coating as specified. Cement mortar lining as specified.
Concrete Pipe -Prestressed Pressure Pipe, Steel Cylinder Type (PCCP)	Water & Sewer	AWWA C 301, C 304	Note 2
-Drain Tile	Drainage	M 178	-
-Nonreinforced	Drainage	M 86, Class 3	-
-Reinforced Circular	Drainage & Sewer	M 170, Class IV & V	M 170 Load Bearing Option
-Reinforced Arch	Drainage	M 206	-
-Reinforced Elliptical	Drainage	M 207	M 207 Load Bearing Option Class HE IV
-Low Head Pressure	Drainage	ASTM C 361	-
-End Sections	Drainage	M 170	Class III Pipe Reinforcement Required
Polyethylene Pipe			
-Corrugated Pipe	Drainage	M 294	15" to 24" I.D. (Note 3)
-Corrugated Drainage Pipe	Drainage	M 252	Perforated Underdrain & UD outlet pipes - Type S. Minimum pipe stiffness 50 psi (Note 4)
HDPE Pipe & Fittings	Water	AWWA C 906	Potable Water, 4" to 30", with BCBEC approval
HDPE Pipe & Fittings	Sewer	ASTM D 1248, SDR 11	Pressure Sewer
Polypropylene Pipe			
-Corrugated Pipe	Drainage	M 330, Type S or Type D	15" to 24" I.D. (Note 3)
Polyvinyl Chloride			
(PVC) Pipe	Drainage	M 278	Underdrain Outlet Pipes, Perforated UD (Note 4)
(PVC) Pipe	Drainage	AASHTO Bridge Sec. 18 PVC Ridged Pipe	24" or smaller
(PVC) Sewer Pipe	Sewer	ASTM D 3034 SDR 35 (4"-15")	Jointing: ASTM D 3212 "Push-On"
		ASTM F 679 (18"-48") Pipe Stiffness 75 (Note 5)	Joints using Locked-in Elastomeric Seal.
(PVC) Sewer Pipe	Sewer	ASTM D 1785 Sch 40 or 80 ASTM D 2241, D 3139 SDR21	Pressure Sewer (less than 2" dia.) Pressure Sewer (2" or larger dia.)
Preformed Rubber	Drainage	C 990	Joint for Circular Pipe
Corrugated Steel Pipe, Pipe Arches & Underdrain	Drainage	M 36	For repair & with prior DPW&T approval only.
Structural Plate Pipe, Pipe Arches & Arches	Drainage	M 167	NOT USED
Polymer Pre-Coated Corru-gated Steel Pipe	Drainage	M 245 & M 246	NOT USED
Corrugated Aluminum Alloy Pipe	Drainage	M 196	NOT USED
Copper Pipe	Water	ASTM B-88	Water service - Type K required.

Note 1 - Pressure Rating Through 24": 350 psi. Pressure Rating 30" -48": 300 psi.
Note 2 - Detailed drawings and schedules per AWWA C 301 Sec. 4.3.1 and Affidavit of Compliance per AWWA C 301, Section 6.3 to be submitted.
Note 3 - Not permitted for sizes greater than 24" diameter.
Note 4 - Underdrain perforations shall conform to F 758.
Note 5 - Subject to approval by the Engineer, Pipe Stiffness 115 pipe may be substituted for Pipe Stiffness 75 pipe.

905.01.01 Marking Non-Reinforced and Reinforced Concrete Pipe. Non-reinforced and reinforced pipe sections shall be provided to the County with the following information clearly marked on each pipe section:

- Pipe Class,
- Specification designation:
- AASHTO M 86 … Non-Reinforced Concrete Pipe,
- AASHTO M 170 … Reinforced Concrete Circular Pipe,
- AASHTO M 206 … Reinforced Concrete Arch Pipe,
- AASHTO M 207 … Reinforced Concrete Elliptical Pipe,
- The date of manufacture,
- The name or trademark of the manufacturer, and
- Plant identification.

Circular pipe sections with elliptical or quadrant reinforcement shall have, in addition, one end marked during or immediately following manufacture as follows:

- Elliptical reinforced sections shall be marked on the inside and outside of opposite walls along the minor axis of the elliptical reinforcing,

- Quadrant reinforced sections shall be marked on the inside and outside of opposite walls along the vertical axis for quadrant reinforcing.

Elliptical pipe with quadrant reinforcement shall be marked with the letter "Q". Marking shall be indented into the pipe section or painted thereon with waterproof paint.

905.01.02 Marking Corrugated Steel Pipe. Corrugated steel pipe shall be marked per manufacturer's practice and Special Provisions in accordance with Contractor's need to identify pipe size and gauge. Coating & lining shall be performed at the construction site.

905.01.03 Marking Corrugated Aluminum Pipe. Reserved.

905.01.04 Marking Polyethylene (PE) and Polypropylene (PP) Drain Pipe. All pipes shall be clearly marked at intervals of no more than 10 feet as follows:

- Manufacturer's name or trademark,
- Nominal size,
- Specification designation; AASHTO M 294 for polyethylene pipe or AASHTO M 330 for polypropylene pipe,
- Plant designation code,
- Date of manufacture or appropriate equivalent code.

Fittings shall be marked with the designation number specification AASHTO M 294 for polyethylene pipe or AASHTO M 330 for polypropylene pipe; and with the manufacturer's identification symbol.

905.01.05 Marking Polyvinyl Chloride (PVC) Drain Pipe. All pipes shall be clearly marked at intervals of no more than 10 feet, with 3/8" or larger letters, and fittings shall be clearly marked, as follows:

- Manufacturer's name or trademark,
- Nominal size,
- Specification designation, AASHTO M 278,
- Plant designation code.

The pipe shall be tagged with the date of manufacture. All bends made from the pipe shall be marked to show the angle and radius of curvature, in addition to the pipe information listed above. Markings on perforated pipe shall be placed 180° from a point equidistant between the bottom two rows of holes.

A "home" mark, located on the spigot end, indicates the proper position of the bell end when the spigot end has been fully inserted.

905.01.06 Marking Polymer Precoated Corrugated Steel Pipe. Reserved.

905.01.07 Marking Concrete Drain Tile. Concrete drain tile shall be marked per manufacturer's practice and per Special Provisions in accordance with Contractor's need to identify pipe size, etc. at the construction site.

905.01.08 Marking Polyvinyl Chloride (PVC) Plastic Perforated Underdrain. The marking shall be applied to the pipe in such a manner that it remains legible after installation and inspection.

All pipes shall be clearly marked at intervals of no more than 5 feet, with 3/8" or larger letters, as follows:

- Manufacturer's name or trademark,
- Nominal pipe size,
- Material designation (cell classification),
- Optional: the words "HIGHWAY UNDERDRAIN",
- "Type PS 28" or "Type PS 46",
- Specification designation, ASTM F 758, and
- Date of manufacture, plant designation and other control symbols internally required by the manufacturer.

Markings on perforated pipe shall be placed 180° from a point equidistant between the bottom two rows of holes.

All bends and fabricated fittings shall be marked as follows:

- Manufacturer's name or trademark,
- Nominal size,
- Material designation (PVC),
- Specification designation, ASTM F 758, and
- Bends shall also be marked to show degree and radius of curvature (e.g.: 90° 24 in. R).

905.01.09 Marking Polyvinyl Chloride (PVC) Sewer Pipe. All pipes shall be clearly marked at intervals of 5 ft or less, as follows:

- Manufacturer's name or trademark and code,
- Date of manufacture,
- Nominal pipe size,
- The PVC cell classification (e.g.: 12454),
- A legend, as follows:
  - (4" to 15" Dia.): "Type PSM SDR-35 PVC Sewer Pipe",
  - (18" to 48" Dia.): "PS 75 PVC Sewer Pipe", or "PS 115 PVC Sewer Pipe".
- Specification designation, as follows:
  - (4" to 15" Dia.): ASTM D 3034,
  - (18" to 48" Dia.): ASTM F679.

All bends and fabricated fittings shall be marked as follows:

- Manufacturer's name or trademark (and code for 18" to 48" Dia.),
- Date of manufacture,
- Nominal size,
- Material designation (PVC),
- Specification designation, as follows:
- (4" to 15" Dia.): ASTM D 3034,
- (18" to 48" Dia.): ASTM F679.

905.01.10 Marking Reinforced Concrete Sewer Pipe, Pressure Type Non-Cylinder. Each length of straight and special pipe and each fitting shall be plainly marked inside, near one end. The markings shall include either the pressure and external load for which the pipe or fitting is designed or the area of steel per linear foot in circumferential reinforcement. Special marks of identification, sufficient to show the proper location of pipe or fitting in the line by reference to layout drawings and schedules shall be placed on the pipe if specifically required in the Contract Documents. All beveled pipes shall be marked with the amount of the bevel, and the point of maximum pipe length shall be marked on the beveled end. If elliptical reinforcement is used, the minor axis of the reinforcement shall be identified. Markings shall be made on the pipe with a waterproof marking material.

905.01.11 Marking Cast Iron Soil Pipe. Each length of pipe and each fitting shall be plainly marked with the country of origin, the manufacturer's initials or registered trademark by which the manufacturer can be readily identified after installation, and with the letters "XH" (Extra Heavy).

The markings shall be cast, stenciled or otherwise applied on the pipe so as to be clear and legible after installation. The marking shall be cast on fittings and shall be clear and legible after installation and located away from the spigot end so as not to interfere with proper joining upon installation.

905.01.12 Marking Prestressed Concrete Pressure Pipe, Steel Cylinder Type. The manufacturer's control number or work order number pertaining to any given section of pipe shall be stamped on the spigot joint ring when production has begun and shall be legibly and

indelibly marked on the concrete interior of the pipe following curing. All inspection reports and production records shall reference the control number or work order number. Each standard pipe shall be marked to designate its strength classification. Beveled pipe and elbows shall be marked to indicate the angle and direction of laying considering the location of the bevel. Each fitting or special shall be sufficiently marked to indicate its position in the pipeline. Pipe sections with steel cylinders thicker than standard shall be so marked.

905.01.13 Marking Steel Pipe. A serial number or other identification shall be painted in a conspicuous location on each section of pipe and each special section. If the pipe is coated or lined, such marking shall be done at the shop and later transferred to the coating or lining. The pipe manufacturer may be required to furnish the Contractor and Engineer with line diagrams, or laying schedules, showing where each numbered pipe or special section belongs in the pipeline. The numbers on such diagrams, or schedules, shall correspond to those painted on the pipes and special sections.

905.01.14 Marking Ductile Iron Pipe. The class or nominal thickness, and casting period shall be shown on each pipe. The manufacturer's mark, country where cast, year in which the pipe was produced, and the letters "DI" or "DUCTILE" shall be cast or metal stamped on the pipe, and letters and numerals on pipe sizes 14 inches and larger shall be not less than ½ inch in height. When required in the Contract Documents, initials not exceeding four in number shall be cast or stamped on the pipe. All required markings shall be clear and legible, and cast or metal stamped marks shall be on or near the bell.

When zinc-coated pipe is specified in the Contract Documents, manufacturer's name shall be marked in the approximate middle of the barrel followed by the word "Zinc" with a 2-inch wide circumferential band of silver / gray-toned coating applied approximately 2 inches on both sides of that marking. If pipe is cut in the field in such a way that the zinc label is removed or otherwise obstructed, paint a circumferential band around one end of the pipe being installed using light grey or silver paint.

In addition to the requirements mentioned above, all "gauged full length" ductile iron pipe shall be clearly marked with at least two green hash marks on the pipe exterior at the bell end. Hash marks shall be made with waterproof green paint and be a minimum of two inches wide.

905.01.15 Packaging & Package Marking Copper Pipe. Each shipping unit shall be legibly marked with the purchase order number, metal or alloy designation, temper, size, total length or piece count or both, and name of supplier. The specification number shall be shown, when specified.

The name or trademark of the manufacturer and the mark indicative of the type shall be permanently (incised) marked on each tube at intervals not greater than three feet. Tube in straight lengths shall be further identified throughout its length by means of a continuous colored stripe, symbol, or logo not less than 3/16 inch in height, including a legend repeated at intervals not greater than 3 feet. The legend shall include the type of the tube, name or trademark of the manufacturer or both, and the country of origin. Other information may be included at the option of the manufacturer.

Type K copper tubing shall have a green color stripe. Such color marking is not applicable to tube furnished in annealed straight lengths or coils.

905.01.16 Marking High Density Polyethylene (HDPE) Water Pipe. All pipe shall bear identification markings that shall remain legible during normal handling and storage. The markings shall be applied in a manner that will not reduce the strength or otherwise damage the pipe. Required markings on the pipe shall include the following and shall be applied so that intervals between markings are no greater than 5 feet:

- Nominal Size and OD base (such as 12" DIOD)
- Standard material code designation (such as PE 4710)
- Dimension ratio (such as DR 11)
- Pressure Class (such as PC 200)
- AWWA designation number in effect at time of manufacture (such as AWWA C906-15)
- Manufacturer's production code to include day, month and year.

All HDPE water pipe shall be manufactured with three equally spaced pairs of blue stripes.

905.02 DUCTILE IRON PIPE AND FITTINGS – WATER MAINS.

902.02.01 Applicable Standards.

1. Cement-Mortar Lining for Ductile-Iron Pipe and Fittings: ANSI/AWWA C104
2. Polyethylene Encasement for Ductile-Iron Pipe Systems: ANSI/AWWA C105
3. Ductile-Iron and Gray-Iron Fittings: ANSI/AWWA C110
4. Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings: ANSI/AWWA C111
5. Flanged Ductile-Iron Pipe With Ductile-Iron or Gray-Iron Threaded Flanges: ANSI/AWWA C115
6. Protective Fusion-Bonded Protective Coatings for the Interior and Exterior Surfaces of Ductile-Iron and Gray-Iron Fittings: ANSI/AWWA C116
7. Thickness Design of Ductile-Iron Pipe: ANSI/AWWA C150
8. Ductile-Iron Pipe, Centrifugally Cast: ANSI/AWWA C151
9. Ductile-Iron Compact Fittings for Water Service: ANSI/AWWA 153
10. Installation of Ductile-Iron Water Mains and Their Appurtenances: ANSI/AWWA C600
11. Ductile-Iron Pipe and Fittings (Manual of Water Supply Practices): AWWA M41

905.02.02 Pipe.

(a) Pipe shall conform to the City of Baltimore Department of Public Works *Specifications for Materials, Highways, Bridges, Utilities, and Incidental Structures*, dated 2006 (and subsequent amendments) except as modified herein. Pipe shall be in accordance with all the requirements of ANSI/AWWA C151/A21.51 except that the

metal thickness shall be as tabulated herein or increased as required. Pipe nominal lengths shall be 18 or 20 feet.

(b) Thickness Determination

For ductile iron pipe furnished by the Contractor, the following table shall be used:

Size	Thickness Class	Wall Thickness (inches)	Outside Diameter (inches)	Working Water Pressure, 5 Feet Cover, Laying Condition B**
3 in.	54	.34	3.96	350 psi
4 in.	54*	.35	4.80	350 psi
6 in.	54*	.37	6.90	350 psi
8 in.	54*	.39	9.05	350 psi
10 in.	54*	.41	11.10	350 psi
12 in.	54*	.43	13.20	350 psi
16 in.	54*	.46	17.40	350 psi
20 in.	54*	.48	21.60	350 psi
24 in.	54*	.50	25.80	350 psi
30 in.	54	.55	32.00	300 psi
36 in.	54	.63	38.30	300 psi
42 in.	54	.71	44.50	300 psi
48 in.	54	.79	50.80	300 psi

* For 4-inch to 24-inch pipe requiring grooved joints, pipe furnished shall be Thickness Class 56.
** Laying Condition B is defined as pipe laid on flat-bottom trench, backfill tamped.

(c) All pipe and fittings shall be designed and constructed to withstand all external pressure caused by overburden indicated on the profile, traffic loads or any other loads to which the pipe may be subjected. Thickness shall be increased if required due to a change in laying condition or due to excessive cover. Design thickness shall be determined from ANSI/AWWA C150/A21.50; however, in no case shall wall thickness furnished be less than required in the table above.

(d) All pipe and fittings 16-inches in diameter or larger (except insulating flanges) shall have joints electrically bonded utilizing a minimum of two (2) bond wires across each joint. In addition, pipe and fittings less than 16-inch in diameter shall have joints electrically bonded where required by individual Contract Documents.

(e) Unless indicated otherwise by individual Contract Documents, for the following lengths of each pipe diameter 14 inches and larger required per Contract, furnish "gauged full length" pipe in the following minimum quantities:

2 – 200 ft.:	furnish one (1) length "gauged full length" pipe
201 – 1333 ft.:	furnish two (2) lengths "gauged full length" pipe
over 1333 ft.:	furnish three-percent (3%) of pipe as "gauged full length" pipe, rounded up to next whole length

"Gauged full length" pipe shall be utilized where it is known that field cuts will be required.

(f) All pipe and fittings shall be furnished complete with all joining materials.

905.02.03 Fittings.

All fittings shall be in accordance with the latest standards of the Baltimore City Department of Public Works and with ANSI/AWWA C110/A21.10 or ANSI/AWWA C153/A21.53. They shall be designed and constructed to withstand a pressure not less than that for the adjacent pipe. Gray iron fittings may be substituted if ductile iron fittings are not available. Fittings 24 inches and smaller shall have a pressure rating of 350 psi. Fittings 30 inches to 48 inches shall have a pressure rating of 250 psi. Consult the Design Division of the Bureau of Engineering and Construction for acceptable pressure ratings for fittings greater than 48 inches.

905.02.04 Lining and Coating.

(a) General Pipe and Fittings.

All general pipe and fittings shall be cement-lined, double thickness. This lining shall be sealed with a bituminous seal coat. The outside surface shall be bituminous coated. Cement lining and seal coat shall be in accordance with ANSI/AWWA C104/A21.4. Outside coating shall be in accordance with ANSI/AWWA C151/A21.51.

1. Subject to approval by the Design Division, epoxy coatings on interior and exterior surfaces may be substituted for use on fittings only; see item (b) below for requirements.

2. When required by the Contract Documents, provide zinc-based coating on exterior of pipe and fittings. The zinc coating system shall conform to ISO 8179-1:2017*, Ductile iron pipes, fittings, accessories and their joints—External zinc-based coating—Part 1: Metallic zinc with finishing layer*. Metallic zinc-based coating shall be applied to the external surface of the pipeline component such that the mean mass of zinc-based coating is not less than 0.655 oz/sq.ft. with no local minimum less than 0.590 oz/sq.ft.. Finishing layer shall be a bituminous topcoat with a minimum average dry film thickness of 3 mils with no local thickness less than 2 mils.

   Zinc coating that has been damaged but deemed repairable by the Engineer shall be repaired using an application of zinc-rich paint. Paint used for such repair shall be in accordance with ISO 8179 requirements and shall contain more than 85-percent zinc, by mass, in the dried film. See the Approved Source of Supply for acceptable paint manufacturers.

(b) Miscellaneous Fittings.

Miscellaneous fittings such as sleeves shall be furnished with a fusion-bonded epoxy coating on all interior and exterior surfaces. Fusion-bonded epoxy coatings shall be in accordance with ANSI/AWWA C116/A21.16 and shall be six to eight mil (6-8) in thickness, or as recommended by the manufacturer of the fitting.

905.02.05 Joints, Non-Restrained.

Pipes shall have mechanical joints or rubber gasket push-type joints. Fittings shall have mechanical joints only. All joints shall be in accordance with ANSI/AWWA C111/A21.11.

The maximum permissible deflection for pipelines 4 inches to 24 inches in diameter is given on Standard Detail Plate W-7.

905.02.06 Joints, Restrained.

(a) Restrained joints shall be used in those sections shown on the Contract Drawings or shown in the *Standard Details for Construction*. Only those listed in the approved *Source of Supply* or approved by the Engineer shall be used. In cases where approval is required, the Contractor shall submit to the Engineer five (5) copies of the catalog cut along with pull-out strength data. If the Contractor requests restrained joints in lieu of another type of restraint system, he shall submit calculations for the restrained length of pipe in accordance with the guidelines set forth by DIPRA (Ductile Iron Pipe Research Association).

(b) Restrained fittings shall have mechanical joint bells only.

(c) Joint Type and Applications

Table 905.02.05 Restrained Joints

Type	Material	Restraint Mechanism	Working Pressure	Uses and Restrictions
Set Screw Retainer Glands	A-536 Ductile Iron	Hardened Steel Set Screws with knurled & cupped points and torque-limiting twist off nuts.	-	1. Split ring retaining glands not for use on new construction. 2. Not for connection of DIP to existing CIP. 3. Use only in areas of no settlement. 4. Use only at pipe or fittings installed ≤ 160 feet.
Wedge Action Retainer Glands	A-536 Ductile Iron	Ductile Iron Wedges with heat-treated set screws with torque-limiting twist-off nuts. Restraint mechanism places multiple wedging action against pipe.	4" - 16" Pipe: 350 psi 20" - 48" Pipe: 250 psi 2:1 safety factor	1. Used to retain plain end DIP to pipe or fittings with mechanical joint bells per ANSI/AWWA C 111/A21.11 2. Joint flexibility to be retained following burial. 3. May be used on CIP if sound & of same outer diameter as DIP. 4. Split ring retaining glands not for use on new construction. 5. Approved for use when: a. Straight pipe, ≤160 LF with areas of no settlement. b. Fittings - Inflexible (no settlement) or Semi-flexible (fill or bad soils).
Push-Type with Welded-On Lock Rings		Integral cast restraint joint bell, a spigot end with factory welded alloy steel lock ring & proprietary ductile iron restraining ring or locking segments.	4" - 24" Pipe: 350 psi 30" - 48" Pipe: 250 psi >48" Pipe: Consult Engineer.	1. Used for positive locking of joints on straight pipe. 2. Field-welded steel lock rings are not permitted. 3. Approved for use on straight pipe, short or long runs, inflexible or semi-flexible conditions.
Push-Type with Integral Restraint Gaskets		Boltless restrained joint system for use with conventional push-on joint pipe. Locking segments to be vulcanized into rubber gasket, & shall be of corrosion-resistant hardened stainless steel.	350 psi 2:1 safety factor	1. Not for use with cast iron pipe (CIP). 2. Gasket from disassembled joint shall not be reinstalled. Use a new gasket. 3. Approved for use only on straight pipe, short or long runs, with areas of little or no settlement (non-fill areas only).
Fifteen Degree (15°) Deflection Ball & Socket Restrained Joints	Pipe: ANSI/AWWA C151/A21.51 Socket: A-536 Ductile Iron	Consist of spherical socket, spherical ball, a gasket & proprietary locking system, with extra metal thickness at juncture of ball & pipe barrel.		1. Used in subaqueous applications where variable joint deflections are needed. 2. Deflection of pipelines limited to 12° cumulative horizontal & vertical. Laying schedule to reflect this deflection limit.
Flanged Joints	Pipe: ANSI/AWWA C115/A21.15 except min. wall thickness equal to Class 54. Flange per ASME/ANSI B16.1, Class 125*. Gaskets full-faced.	Bolted connections providing no deflection for installation in vaults or structures per Plans or Std. Details.		1. Shall not be direct buried except with Engineer approval. 2. Used for installation in vaults and structures per Contract Documents and Std. Details.
Flanged Joint Adapters	A-536 Ductile Iron (Gripping wedges or set screws made of ductile iron or steel.) Flange per ASME/ANSI B16.1, Class 125*.	Multiple of individually activated gripping wedges or set screws to maximize restraint capability.	3" - 12" Pipe: 250 psi 14" - 24" Pipe: 150 psi 2:1 safety factor	1. Used for adapting and restraining a plain end of DIP to a flange. (e.g. in large meter vaults for installation of flanged bypass gate valves.) 2. Shall be installed in vaults or structures per Contract Drawings or Std. Details. 3. Shall not be direct buried. 4. Not for use on plain end mechanical joint fittings. 5. Deflection limited to initial installation within manufacturer's guidelines. No additional deflection is allowed after initial installation.
Grooved Joints	ANSI/AWWA C606 Housing: A-536, Grade 65-45-12. Minimum DIP wall thickness prior to grooving: Thickness Class 56.	Plain end DIP with circumferentially cut grooves coupled together with curved housing sections with integral keys, multiple connecting bolts & nuts, and proprietary gaskets formulated for water service.		1. Used in vaults & structures to restrain two sections of DIP where future disassembly is anticipated. 2. All grooved joints shall be the "flexible" type unless indicated otherwise. 3. Grooved joints shall not be direct buried.

* unless indicated otherwise in Contract Documents.

905.02.07 Couplings.

(a) All couplings shall be manufactured in accordance with AWWA C219, Bolted, Sleeve-Type Couplings for Plain-End Pipe, except as modified by these Standard Specifications.

(b) These Standard Specifications cover coupling sizes 4-inches through 24-inches. Consult the Design Division of the Bureau of Engineering and Construction for couplings with a diameter greater than 24 inches.

(c) All couplings shall be rated for a minimum working pressure of 230 psig and shall be rated for a minimum test pressure of 345 psig.

(d) Couplings shall be manufactured from carbon steel, stainless steel, or ductile iron and are intended for use in potable water systems only.

(e) All nuts and bolts shall be either be either high strength low alloy steel with a baked-on fluoropolymer coating containing PTFE, or zinc-plated high strength low allow steel with a Xylan 1424 (PTFE) coating. ANSI 304 stainless steel bolts and tie rods with ANSI 316 stainless steel nuts is optional. Bolts and nuts shall be a minimum 0.50-inch diameter in size.

(f) Gaskets shall be of the hydraulically assisted type, compounded with an EPDM or Buna-N material, suitable for potable water. Gaskets shall be molded as an integral component of the coupling and shall be circumferentially ribbed to prevent "roll over" and to ensure a watertight seal on any combination of new, pitted, or corroded pipe surfaces.

(g) Couplings shall be coated both internally and externally with NSF-61 approved fusion-bonded epoxy coatings, or Rilsan nylon, conforming to AWWA C116 (for ductile iron) or AWWA C213 (for carbon steel).

(h) All couplings shall be of the "stab-fit" design without the need to dismantle the coupling.

(i) Shop drawings shall be submitted to the Engineer for approval and shall include the following: dimensions, manufacturer's name and model number, weight, working and test pressure ratings, and installation instructions.

Where couplings are used to connect new ductile iron pipe to existing pipe, the Contractor shall be responsible for verifying the outer diameter of the existing pipe before ordering to ensure the proper size coupling is provided.

905.02.08 Accessories.

(a) *Tie Rods, Nuts, and Bolts*

1. Rods for tie rod assemblies shall meet the material requirements of ASTM A193, Grade B7, and shall be threaded for at least eight inches (8”) on both ends. Rods shall be three-quarters of an inch (3/4”) in diameter unless otherwise noted. Nuts shall meet the requirements of ASTM A194, Grade 2H. Manufactured tie rods and appurtenances shall result in the completed restrained joint assembly having a minimum working pressure rating of two hundred (200) psi.
2. Bolts and studs for strapping and harnessed joints shall be minimum three-quarters of an inch (3/4”) in diameter and shall meet requirements of ASTM A307.

3. Shapes, plates, and bars for strapping and harnessed joints shall meet requirements of ASTM A588.
4. All nuts and bolts and harness tie rods shall be either high strength low alloy steel with a baked-on fluoropolymer coating containing PTFE, or zinc-plated high strength low allow steel with a Xylan 1424 (PTFE) coating.
    a. Optional: ANSI 304 stainless steel bolts and tie rods with ANSI 316 stainless steel nuts
5. T-head bolts, harness tie rods, coupling bolts, flanged joint bolts, etc. shall be designed to provide at least one (1) complete thread projecting beyond the nut when properly tightened. Any such threaded unit that fails to meet this requirement shall be replaced at no additional cost to Baltimore County.
6. NOTE: Tie rod assemblies are no longer acceptable for use at fire hydrant settings.

(b) *Wire For Bonded Joints*

1. Wire for bonded joints shall be single conductor, stranded copper with high molecular weight polyethylene (HMWPE) insulation (black).
2. Wire size shall be AWG No. 2 for piping and fittings larger than thirty-six inches (36") in diameter, AWG No. 4 for piping and fittings sixteen inches (16") to thirty-six inches (36") in diameter, and (where required) AWG No. 6 for piping and fittings twelve inches (12") in diameter and smaller.

905.02.09 Polyethylene Encasement for Ductile Iron Pipe

(a) When required by the Contract Documents, provide polyethylene encasement for ductile iron pipe and for ductile/gray iron fittings. Polyethylene encasement shall meet all the requirements of ANSI/AWWA C105. Additionally, polyethylene encasement for use with ductile iron pipe systems shall consist of three (3) layers of co-extruded Linear Low Density Polyethylene (LLDPE), fused into a single thickness of not less than eight (8) mils.

(b) The inside surface of all polyethylene wrap to be in contact with the pipe exterior shall be infused with a blend of an antimicrobial biocide (to mitigate microbiologically influenced corrosion) and a volatile corrosion inhibitor (to control galvanic corrosion).

905.03 Steel Pipe – Water Mains.

905.03.01 General.

Steel pipe for water mains shall be furnished by Contractors in accordance with Special Provisions provided as part of Contract Documents for Contracts requiring use of this material. Contractors shall install steel pipe of the sizes and in the locations as shown on the Contract Drawings and as described in the Contract Specifications.

905.03.02 Applicable Standards.

1. Steel Water Pipe, 6 inches and Larger: ANSI/AWWA C200
2. Cement-Mortar Protective Lining and Coating for Steel Water Pipe, 4 inches and Larger-Shop Applied: ANSI/AWWA C205
3. Field Welding of Steel Water Pipe: ANSI/AWWA C206
4. Steel Pipe Flanges for Waterworks Service, 4 inches Through 144 inches: ANSI/AWWA C207
5. Dimensions for Fabricated Steel Water Pipe Fittings: ANSI/AWWA C208
6. Cold-Applied Tape Coatings for the Exterior of Special Sections, Connections, and Fittings for Steel Water Pipelines: ANSI/AWWA C209
7. Liquid-Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines: ANSI/AWWA C210
8. Fusion-Bonded Epoxy Coating for the Interior and Exterior of Steel Water Pipelines: ANSI/AWWA C213
9. Tape Coating Systems for the Exterior of Steel Water Pipelines: ANSI/AWWA C214
10. Extruded Polyolefin Coatings for the Exterior of Steel Water Pipelines: ANSI/AWWA C215
11. Polyurethane Coatings for the Interior and Exterior of Steel Water Pipe and Fittings: ANSI/AWWA C222
12. Steel Water Pipe: A Guide for Design and Installation (Manual of Water Supply Practices): AWWA M11
13. Cement Mortar Lining of Water Pipelines in Place – 4-Inch and Larger: ANSI/AWWA C602

905.04 Prestressed Concrete Cylinder Pressure (PCCP) Pipe – Water Mains.

905.04.01 General.

Prestressed concrete cylinder pressure (PCCP) pipe for water mains shall be furnished by Contractors in accordance with Special Provisions provided as part of Contract Documents for Contracts requiring use of this material. Contractors shall install (PCCP) pipe of the sizes and in the locations as shown on the Contract Drawings and as described in the Contract Specifications. Tapping Sleeves for Prestressed Concrete Cylinder Pipe shall be installed in accordance with Special Provisions contained in the Contract Documents.

905.04.02 Applicable Standards.

1. Prestressed Concrete Pressure Pipe, Steel-Cylinder Type: ANSI/AWWA C301
2. Design of Prestressed Concrete Cylinder Pipe: ANSI/AWWA C304
3. Concrete Pressure Pipe (Manual of Water Supply Practices): AWWA M9
4. Steel Pipe Flanges for Waterworks Service – Sizes 4-Inches through 144-Inches: ANSI/AWWA C207

905.05 High-Density Polyethylene Pipe and Fittings (HDPE) – Water Mains.

905.05.01 General.

High-density polyethylene (HDPE) pipe and fittings for water mains shall be used only when and as directed by the Design Division of the Bureau of Engineering and Construction. When so approved for use, HDPE pipe and fittings shall be furnished by Contractors in accordance with Special Provisions provided as part of Contract Documents for Contracts requiring use of this material. Contractors shall install HDPE pipe of the sizes and in the locations as shown on the Contract Drawings and as described in the Contract Specifications.

905.05.02 Applicable Standards.

Polyethylene (PE) Pressure Pipe and Fittings, 4 In. through 63 In., for Water Distribution and Transmission: ANSI/AWWA C906.

905.06 RESERVED.

905.07 Fire Hydrants, Water Valves, Water Meters, Appurtenances and Accessories.

905.07.01 General. All water meter settings, corporation stops, service saddles, fittings of 2" diameter or less and miscellaneous appurtenances of 2" diameter or less shall be "lead-free" as defined in Code of Maryland Regulation (COMAR) 09.20.01.03.

905.07.02 Fire Hydrants.

(a) Approved Models: Only fire hydrants approved by Baltimore City Department of Public Works are accepted.

(b) Hydrant Design: Hydrant barrel shall be a traffic model made in two sections with the flange or adjusting feature located approximately 2 inches above the ground line. The **main valve stem** shall be made in two sections with a breakaway coupling. There shall be a minimum of eight nuts and bolts connecting the upper barrel and the lower barrel at the traffic/safety flange.

(c) Operating Nut and Cap Nuts: Operating nuts shall be pentagonally shaped, measuring 1-7/16 inches from the point to the flat on the top surface. To open the hydrant, the nut shall turn counter-clockwise. The direction of the opening shall be shown on the bonnet with a raised arrow.

(d) Elbow: The elbow shall be ductile iron or cast iron ASTM A-126, Class B, standard 6-inch mechanical joint on the inlet end and a flanged connection on the standpipe end.

(e) Lower Standpipe: Lower standpipe shall be made of ductile iron or cast iron ASTM A-126, Class B.

(f) Hose Connections: There shall be one 4.5-inch pumper connection with Baltimore City Standard Threads as shown on Standard Detail Plate W-3B and two 2.5-inch hose connections with National Standard Threads.

(g) Valve Opening: The main valve opening of the hydrant shall be not less than 5.25 inches.

(h) Bury: The depth of bury is defined as the distance measured from the base of the elbow to the ground line (bury line) set by the manufacturer. Hydrants shall be furnished to a 5-foot bury unless noted otherwise on the Contract Drawings.

(i) Manufacturer's origin shall be cast into the bonnet or upper barrel of the fire hydrant.

(j) Coating Requirements: All fire hydrants to be incorporated into the Metropolitan Water System in Baltimore County shall be furnished with one of the following coating systems:

Fire Hydrant Coating Systems			
	System 1	**System 2**	**System 3**
Exterior Ferrous, Above Bury Line			
Primer	High-build Epoxy, 1 coat @ 4.0 - 6.0 mils dft	Electro-deposition (E-coat) Epoxy, 1 coat @ 0.5 – 1.0 mils dft	Heat-fused powder Epoxy, 1 coat @ 5.0 - 6.0 mils dft
Top Coat	Polyurethane enamel, 2 coats @ 1.2 – 2.0 mils dft per coat	Two-component (2K) aliphatic polyurethane, 1 coat at 1.5 – 3.0 mils dft	Heat-fused powder polyester, 1 coat @ 6.0 mils dft
Total Minimum dft	6.4 - 10.0 mils	2.5 mils	11.0 mils
Top Coat Color	Caution Orange	Caution Orange	Caution Orange
Exterior Ferrous, Below Bury Line			
Primer	N/A	Asphalt, 1 coat @1.5 – 3.0 mils dft	Asphalt, 1 coat @1.0 – 3.0 mils dft
Top Coat	High-build Epoxy, 1 coat @ 4.0 - 6.0 mils dft	Asphalt, 1 coat @1.5 – 3.0 mils dft	Asphalt, 1 coat @1.0 – 3.0 mils dft
Total Minimum dft	4.0 – 6.0 mils	2.0 mils	2.0 mils
Interior Ferrous, Elbow (Shoe), & Bottom Plate			
Primer	High-build Epoxy, NSF 61 & AWWA C550 certified, 1 coat @ 4.0 - 6.0 mils dft	Fusion bonded powder Epoxy, NSF 61 & AWWA C550 certified, 1 coat @ 4.0 – 12.0 mils dft	Heat-fused powder Epoxy, NSF 61 & AWWA C550 certified, 1 coat @ 8.0 – 10.0 mils dft

Fire Hydrant Coating Systems			
	System 1	**System 2**	**System 3**
Top Coat	High-build Epoxy, NSF 61 & AWWA C550 certified, 1 coat @ 4.0 - 6.0 mils dft		
Total Minimum dft	8.0 - 12.0 mils		

Surface Preparation: Prepare surfaces to be coated with near white metal blast cleaning in accordance with NACE No.2/SSPC-SP10.

(k) Testing: All fire hydrants shall be shop tested in accordance with AWWA Specification C502.

(l) Certificate of Compliance:

1. The manufacturer shall provide an affidavit certifying that all fire hydrants comply with the construction requirements of Baltimore City and that all fire hydrants comply with the coating requirements of Baltimore County (note: affidavit to indicate Coating System No. furnished).
2. Submit certifications of compliance to the Engineer before delivery of fire hydrants.

(m) Hydrant Tee: To facilitate vertical setting of hydrant valve and hydrant in sloping terrain, or to facilitate installation where a compact installation is either required or preferred, hydrant isolation gate valve (MJxMJ) may be close-coupled to service main utilizing a hydrant tee. Hydrant tee shall be ductile iron compact fitting rated for 350 psi working pressure and shall be manufactured in accordance with AWWA C153. Hydrant tee lining shall be NSF61 certified. Branch end of hydrant tee shall be plain end with ductile iron rotatable (swivel) mechanical joint gland.

905.07.03 Water Valves and Tapping Sleeves.

(a) Requirements: Valves and appurtenances shall conform to the specifications and requirements of the Department of Public Works of **Baltimore City** except as modified herein.

Water Valves		
	Resilient Seat Gate Valves	**Rubber-Seated Butterfly Valves****
Applicable Valve Sizes	4" –24" Diameter	30" – 72" Diameter
Rating	250 psig working pressure	250 psig differential operating pressure
Installation	16" – 24" diameter shall be installed with valve bonnet oriented horizontally or vertically per Contract Drawings	Installation in Cast-In-Place vaults sized per plans. Provide one pipeline access assembly adjac-ent to butterfly valve for access to adjust valve seat. Provide valve overtorque protectors and valve actuators per Baltimore City requirements.

Water Valves		
	Resilient Seat Gate Valves	**Rubber-Seated Butterfly Valves****
Operation	Clockwise turning to open.	Clockwise turning to open.
Valve gearing	Per Baltimore City requirements.	-
Handwheels / Operating Nuts / Position Indicator	AWWA Operating Nuts EXCEPT: (a) large meter setting valves (for meters 3" & above) (b) dewatering valves (c) manual air release valves. (d) valves attached to companion flanges at pipeline access assemblies.	AWWA Operating Nuts Provide position indicator on valve actuator
Use as Tapping Valves	Waterway inside diameter shall be ¼" greater than shell cutter. Consult Design Division of BCBEC for applications requiring gate valves in sizes larger than 24" diameter.	-
Bypass	Required only per specific Contract requirements.	-

**Field Certification: Following installation, butterfly valves and operators shall be furnished with a manufacturer's certificate stating that the valves and operators have been installed in accordance with the manufacturer's recommendations, that they have been adjusted and initially operated from the fully closed position to the fully open position and back (minimum of two full cycles) in the presence of the manufacturer's field representative, and that they are operating in accordance with the specific Contract requirements and these Standard Specifications. The manufacturer's field representative shall be a representative from the manufacturer's plant familiar with the actual problems of manufacturing, installing, adjusting, and operating the valves and operators with enough years of experience to determine the successful operation of the valves and operators. The cost for providing a manufacturer's certificate shall be included in the Contract price to provide the butterfly valves and operators.

(b) Joints: Approved joints for valves are as follows:

Approved Joints for Valves		
	Resilient Seat Gate Valves	**Rubber-Seated Butterfly Valves**
Flanged	ANSI B16.1 – Class 125#	ANSI B16.1 – Class 125# or Class 250# as approved by Engineer, all sizes
Mechanical Joint	AWWA C111	AWWA C111, size 30 inch through 48 inch only
Flanged x Mech. Joint	Tapping Valves Only	-

(c) Tapping Sleeves and Valves:

1. Tapping sleeves for cast iron or ductile iron pipe shall be either the ductile iron body, mechanical joint type; the stainless steel body, full circumferential band type; or the epoxy-coated fabricated steel type. Outlets shall be flanged, shall have recess dimensions in accordance with Manufacturer's Standardization Society Standard Practice SP-60, and shall be fully compatible with tapping valve.

Tapping sleeves shall be furnished with a tapped outlet for testing, complete with ¾-inch standard brass or Type 304 stainless steel square head closure plug.

2. Shop drawings shall be submitted to the Engineer for approval and shall include the following: dimensions, manufacturer's name and model number, weight, working and test pressure ratings, and installation instructions. Contractor shall be responsible for verifying the outer diameter of the pipe before ordering to ensure the proper size sleeve is provided.
3. Unless approved otherwise by the Engineer, gate valves used for tapping shall have flanged x mechanical joint end connections.
   a. Ductile iron body mechanical joint tapping sleeves shall be rated for a working pressure of 200 psi. Bolts and nuts shall be high-strength, low-alloy steel per AWWA C111; gaskets shall be rubber. All parts in contact with potable water shall be NSF61 certified.
   b. Stainless steel body full circumferential band tapping sleeves shall be rated for a working pressure of 150 psi. Body, flanged outlet, and flange shall be manufactured from Type 304 stainless steel. Bolts, nuts, and washers shall be manufactured from Type 304 stainless steel; bolts and nuts shall be coated to prevent galling. Sleeve outlet side and sleeve plain side shall be manufactured with triangular sidebars and joined using removable trackhead bolts; lifter bar style sleeves with studs are not acceptable. Gaskets shall be SBR or Buna-N, compounded for water service and shall be NSF61 certified. Body sleeve gasket shall provide full 360-degree contact with the pipe.
   c. Epoxy-coated fabricated steel tapping sleeves shall be rated for a working pressure of 150 psi. Body, flanged outlet and flange shall be manufactured from A-36 carbon steel. Bolts, nuts and washers shall be manufactured from Type 304 stainless steel. Bolts and nuts shall be coated to prevent galling. Sleeves shall be lined and coated with 8 to 12 mils fused epoxy. Gaskets shall be SBR or Buna-N, compounded for water service and shall be NSF 61 certified.

(d) Valve Appurtenances:

1. **Pitometer Corporations:** All in-line (non-tapping) gate valves, 16 inches in diameter or greater, and all butterfly valves shall have 1-inch diameter corporations installed on each side of the valve for use with pitometers. Corporations shall be full-ported ball valve type rated for 300 psig working pressure, shall have AWWA taper thread inlet, and shall have increased male iron pipe thread outlet with inside driving threads. Provide bronze threaded cap on outlet.
2. **Pipeline Monitoring Corporations:** All butterfly valves installed in conjunction with prestressed concrete cylinder pipe (PCCP) shall have 1.5-inch diameter corporations installed on each side of the valve for use with pipeline monitoring equipment.

   Corporations shall be full-ported ball valve type rated for 300 psig working pressure and shall have an AWWA taper thread inlet with a male iron pipe thread

outlet. Provide bronze threaded cap on outlet if corporation is not initially used for installation of pipeline monitoring equipment.

3. **Pipeline Access Assemblies:**
   a. All butterfly valve vaults shall be provided with pipeline assemblies that provide access for seat adjustment and pipeline maintenance/assessment. Pipeline access assemblies shall be installed immediately adjacent to the valve and shall include the following:
      1) 24-inch flanged outlet tee, oriented vertically
      2) 24" x 6" companion flange
      3) Four ½-inch diameter steel bars welded at 90-degree intervals around the 24-inch flange
      4) Two 5/8-inch diameter steel pulling irons installed on vault walls below top slab, centered over 24-inch flanged outlet
      5) 6-inch resilient-seated gate valve, flanged by flanged with handwheel operator, mounted to companion flange for vertical (upward) flow through valve
      6) 6-inch blind flange mounted to top end of resilient-seated gate valve, drilled and tapped for 1-inch diameter corporation. Provide 1-inch ball valve type corporation rated for 300 psig with MNPT inlet and MNPT outlet
      7) Two 1-inch diameter full-ported ball valve type pitometer corporations and 1/8-bend couplings installed outboard of butterfly valve and outboard of 24-inch flanged outlet tee. See Section 905.07.03(d), item 1
      8) 30-inch frame and cover with corresponding opening in top slab and brickwork, centered over flanged outlet.
   b. For pipeline access assemblies installed in conjunction with prestressed concrete cylinder pipe (PCCP), also provide two pipeline monitoring corporations as described in Section 905.07.03(d), item 2. The pipeline monitoring corporations shall be installed on flanged outlet tees to be provided and shall be placed outboard from all other appurtenances.
4. **Valve Extension Stem and Stem Guides:** Where the depth of a butterfly valve or gate valve (including bypass valve, if so equipped) is such that the operating nut is more than 5 feet below the valve cover surface, a valve extension stem shall be provided to bring the operating nut to a point within 18 inches (below) of the valve cover surface.
   a. Valve extension stems shall be of a solid design (no intermediate couplings), 1.25-inch square or round, manufactured from galvanized Schedule 80 steel capable of transferring a torque of 450 foot-pounds without damage. A 2-inch female socket coupling shall be provided at the lower end of the stem, and the coupling shall be pinned to the valve operating nut. A 2-inch AWWA operating nut shall be provided at the upper end of the stem.
   b. Provide adjustable stem guides, with brackets, at 7-foot intervals along extension stems. Stem guides and brackets shall be manufactured from ductile

iron. Guide blocks shall be bronze bushed where they come into contact with extension stems.

c. For applications where valve extension stems extend into or through valve vault top slabs, support extension stems at top slabs by providing alignment washers or bushing-type floor boxes installed integral with the top slabs.

5. Special Castings: Valve vaults, frames and covers or other special castings and other materials must be of the sizes, patterns, and materials shown on the Standard Detail Plates or as directed by the Engineer.

905.07.04 Water Meter Settings, Corporation Stops, and Service Saddles.

(a) Water Meter Settings and Corporation Stops

Water Meter Settings & Corporation Stops			
	Standard Detail Plate	**Rating**	**Description**
¾" – 1" Supply Lines	W-21, W-22,W-23, W-28A, B	300 psig	Corporation stops with flared copper coupling at main. Stop shall be ball valve type corporation with an AWWA taper-thread inlet. For W-28A, B: eighth bend service fitting, female copper thread x flare copper may be utilized to facilitate installation in vault.
¾" – 1" Supply Lines - connect to Blind Flange	City Details	300 psig	Corporation stops shall be a ball valve type corporation with a male iron pipe (MIP) thread inlet with flared copper coupling nut outlet.
1½" – 2" Supply Lines	W-24, 24A, W-25, 26, W-26A, W-28A and B, W-32, 33	300 psig	Corporation stops shall be ball valve type corporation with an AWWA taper-thread inlet with CTS (copper tube size) compression outlet. For W-28A, B: (1) Eighth bend service fitting, female copper thread x female copper thread may be utilized to facilitate vault installation. (2) Provide appropriate 90 degree (ell) coupling to continue meter setting connection.
1½" – 2" Supply Lines - connect to Blind Flange	City Details	300 psig	Corporation stops shall be ball valve type corporation with a male iron pipe (MIP) thread inlet with male iron pipe (MIP) thread outlet.

1. **Insulating Corporation Stops**: Insulating corporation stops for service connections ¾-inch to 2 inches in diameter shall be provided where required by specific Contract requirements to prevent the flow of stray electrical currents.

   a. Insulating corporation stop shall consist of a ball valve type corporation with AWWA/CC taper thread inlet, inert service insulator, and either flare copper nut outlet (¾-inch and 1-inch) or CTS (copper tube size) compression outlet (1.5-inch and 2.0-inch).

   b. The nylon insulator shall have high dielectric, compressive, and impact strength. The insulator skirt shall be extra long to resist electrical bridging or shorting.

   c. O-ring seal, when required by individual manufacturers, shall be retained in a groove to prevent O-ring loss if tailpiece (outlet) is removed.

d. Factory-assembled insulating corporation stop assemblies shall be furnished whenever possible.

2. **Meter Yokes** (5/8-inch meters, ¾-inch meters, 1-inch meters): Meter yokes shall conform to Baltimore City requirements. They shall be manufactured from cast iron and have a corrosion-resistant finish of either epoxy powder coating or black E-coating (Powercron 590). They shall be furnished with ends suitable to connect angle yoke ball valves and shall have support lips to hold water meter and expansion connection. NOTE: Expansion connection and water meter shall be furnished by Baltimore City.

   All domestic water services (5/8-inch to 2-inch meters) shall be furnished with full-port angle yoke ball valves on both the inlet and outlet side of the meter.

   Meter yokes for twin meters shall be provided with a yoke bar spacer (tie bar) of appropriate length, firmly attached to each yoke bar.

3. **Field-Assembled Meter Settings:** Field-assembled meter settings are as shown on **Standard Detail Plates W-21, W-22, and W-23**; and include as appropriate single 5/8-inch meters and single 3/4-inch meters on **Standard Detail Plates W-28A and W-28B**.

4. **Factory-Assembled Meter Settings:** Factory-assembled meter settings are as shown on **Standard Detail Plates W-24, W-24A, W-25, W-26, W-26A, W-32, and W-33;** and include, as appropriate, single 1-inch meters, single 1.5-inch meters, and single 2-inch meters, on **Standard Detail Plates W-28A** and **W-28B**.

   a. Due to the number of fittings required and the use of soldered joints, field-assembly of these meter settings is not permitted.

      i. Factory-assembled meter settings require approval from the Design Division of the Bureau of Engineering and Construction.

      ii. Settings shall be pressure tested to 150 psig.

      iii. Soldered joints shall be lead free.

   b. All meter settings shall be furnished with horizontal inlet and outlet(s) equipped with FIP threads.

   c. All inlet and outlet tees shall be furnished with brace eye supports. Inlet and outlet tees shall function as elbows; tees shall not be drilled for by-pass flow.

   d. All single-yoke meter settings and all single-flanged meter settings shall be furnished with tie bar tube connecting closed (undrilled) port of inlet tee to closed (undrilled) port of outlet tee. The tie bar tube shall connect to one (or both) tee(s) with a compression coupling.

   e. Meter settings shall be constructed from “no-lead” brass and Type K copper tubing.

5. **Fittings:** Fittings shall be of the size and type shown on the Standard Detail Plates and in accordance with the following requirements:

   a. Connections to ¾-inch and 1-inch Copper Tubing:

      i. All connections to terminal ends of ¾-inch and 1-inch copper tubing shall be made using flared connections; the use of sweated (soldered) joints to

make connections on terminal ends of ¾-inch and 1-inch copper tubing is strictly prohibited.

ii. Male iron pipe (MIP) thread copper connections for ¾-inch and 1-inch copper tubing shall be straight couplings, copper flare nut x MIP.

iii. Brass connection at service end of ¾-inch and 1-inch tubing shall be copper flare x FIP.

iv. All service ends of ¾-inch and 1-inch copper tubing not immediately connected to house service shall be provided with brass or plastic plug (MIP thread) to prevent any foreign matter from entering into pipe.

v. Couplings to join adjacent ends of ¾-inch copper tubing or to join adjacent ends of 1-inch copper tubing shall be three-part union, copper flare x copper flare.

b. Connections to 1.5-inch and 2-inch Copper Tubing:

i. All connections to terminal ends of 1.5-inch and 2-inch copper tubing shall be made using copper compression couplings. The use of either sweated (soldered) joints or flared joints to make connection on terminal ends of 1.5-inch and 2-inch copper tubing is strictly prohibited.

ii. Commercial copper compression couplings shall be as listed in the approved *Source of Supply*.

iii. Full-size, straight, copper compression coupling x MIP thread shall be used to connect 1.5-inch and 2-inch copper tubing to the following:

- inlet and outlet of all meter settings shown on **Standard Detail Plates W-24, W-24A, W-25, W-26, W-26A, W-32,** and **W-33**, or included as appropriate on **Standard Detail Plates W-28A** and **W-28B**.
- threaded inlet of flanged meter ball valves (2-inch size) (for repairs to factory-assembled meter settings)
- galvanized cap at service end

iv. All service ends of 1.5-inch and 2-inch copper tubing not immediately connected to house service shall be provided with galvanized cap (FIP thread) to prevent any foreign matter from entering the pipe.

v. Straight couplings to join adjacent ends of 1.5-inch copper tubing or to join adjacent ends of 2-inch copper tubing shall be copper compression x copper compression.

vi. 90-degree (ell) coupling, if required to join right-angle ends of 1.5-inch copper tubing or to join right-angle ends of 2-inch copper tubing, shall be copper compression x copper compression.

vii. 90-degree (ell) couplings, if required to connect 1.5-inch copper tubing to an offset (right-angle) FIP-threaded fitting or to connect 2-inch copper tubing to an offset (right-angle) FIP-threaded fitting, shall be copper compression x MIP thread.

viii. 90-degree (ell) couplings, if required to connect 1.5-inch copper tubing to an offset (right-angle) MIP-threaded fitting or to connect 2-inch copper tubing to an offset (right-angle) MIP-threaded fitting, shall be copper compression x FIP thread.

ix. Straight coupling, if required to connect 1.5-inch copper tubing to a 1-inch angle-yoke ball valve shall be reduced-size copper compression x MIP thread.

c. **U-Branch** (**Meter Spreader**) Requirements for Twin Meters:

i. U-branch for twin 5/8-inch meters, as shown in **Standard Detail Plate W-22**, shall be of "no lead" brass construction with 7.5-inch center-to-center spacing. Branch connection shall have 1-inch copper flare nut inlet and ¾-inch MIP thread outlets.

ii. U-branch (or Y-branch) for twin ¾-inch meters, as shown in **Standard Detail Plate W-32**, shall be of "no lead" brass or Type K copper construction with 9-inch center-to-center spacing. Branch connection shall have 1.5-inch copper compression inlet and 1-inch MIP-thread outlets.

iii. U-branch (or Y-branch) for twin 1-inch meters, as shown in **Standard Detail Plate W-33**, shall be of "no-lead" brass or Type K copper construction with 9-inch center-to-center spacing. Branch connection shall have 1.5-inch copper compression inlet and 1-inch MIP-thread outlets.

6. **Meter Vaults:**

a. Prefabricated meter vaults shall be of the size indicated on the Standard Detail Plates or as approved by the Design Division of the Bureau of Engineering and Construction.

b. Prefabricated water meter vaults shall be furnished with a standard Meter Frame and Cover, including antenna retainer bracket, as shown in the Standard Detail Plates.

c. Meter vaults for housing (single or twin) 5/8-inch, ¾-inch, and 1-inch meters generally shall be constructed of pre-cast concrete. Subject to the approval of the Design Division of the Bureau of Engineering and Construction, meter vaults constructed from high-density polyethylene (HDPE) may be substituted for concrete meter vaults in non-traffic areas.

i. Concrete meter vaults shall have materials, wall thickness, and reinforcement in accordance with AASHTO M-170.

ii. HDPE meter vaults, when approved, shall be manufactured from heavy wall, high-density polyethylene, minimum nominal wall thickness of ½-inch, and shall be able to withstand a vertical freestanding load of 20,000 pounds. Meter vaults shall be of one-piece molded construction, shall have a top flange for frame and cover seating, and shall have a bottom flange for anti-settling at the base.

(b) Service Saddles for Tapping Pipe: Where shown on specific Standard Detail Plates, provide service saddles for tapping PCCP, ductile iron or cast iron pipe. Internal threads for connecting the corporation stop shall be AWWA standard threads (Type "CC") per AWWA C 800.

Service Saddles			
Purpose	Tapping ductile iron or cast iron pipe		Tapping PCCP
Body	**Brass** (alloy) **Body**	**Ductile Iron Body**: Four-bolt design with nylon or epoxy coating over entire body	Body and outlet: A 536 ductile iron, fusion epoxy coated.
Straps	Double flattened silicon bronze straps	Dual or single-wide Type 304 stainless steel band(s); welds treated for add'l. corrosion resistance	Type 304 stainless steel
Hardware	Nuts: brass alloy with integral washers	Nuts & washers: Type 304 stainless steel; coat bolts (studs) & nuts to prevent galling.	Washers: A 536 ductile iron; outlet bolts: corrosion resistant, hi-strength low alloy steel
Gasket	Buna-N rubber or equal, compounded for potable water	Buna-N or EPDM, NSF 61 certified, compounded for water service	Buna-N, NSF 61 certified, compounded for water service
Applicable Requirements	ANSI/AWWA C 800		
Working pressure	200 psig	200 psig	150 psig

905.07.05 Miscellaneous Appurtenances.

(a) Corporation Stop in Air Release Valve Applications (see **Standard Detail Plate W-8**):

1. Corporations for connection to ductile iron pipe (sizes 4-inch to 30-inch) or PCCP (sizes 16-inch to 30-inch) shall be ball valve type rated for 300 psig working pressure, shall have AWWA taper thread inlet, and shall have female iron pipe (FIP) thread outlet.
2. Corporations for connection to 4-inch and 6-inch blind flanges (pipe diameters 36 inches and larger) shall be ball valve type rated for 300 psig working pressure, shall have male iron pipe (MIP) thread inlet, and shall have MIP thread outlet.

   Provide 1/8 bend coupling, FIP thread inlet x copper flare outlet, on end of corporation.

(b) Corporation Stop in Blow-Off Valve Applications (see **Standard Detail Plate W-11**):

Corporations for connection to ductile iron pipe with diameters 4 inches to 12 inches shall be ball valve type rated for 300 psig working pressure, shall have AWWA taper thread inlet, and shall have female iron pipe (FIP) thread outlet.

(c) Brass or Bronze Gate Valve with Handwheel shall be used in air release applications for 4-inch to 30-inch pipe (see **Standard Detail Plate W-8**) and shall be used in blow-off applications for 4-inch to 12-inch pipe (see **Standard Detail Plate W-11**). Gate valve shall be manufactured from heavy-duty brass or bronze, shall be rated for 200 psig working pressure, shall be fully ported with solid wedge disc, shall

have FIP thread ends and non-rising stem, and shall be provided with iron or aluminum handwheel.

See appropriate **Standard Detail Plate (W-8 or W-11)** for size requirements.

(d) Brass Pipe: Provide threaded seamless brass pipe, extra strong, of appropriate length and diameter, as required by **Standard Detail Plates W-8 and W-11**.

905.07.06 Accessories.

(a) External Coating System for Insulating Flanges and Insulating Corporation Stops:

1. Insulating flanges shall receive exterior tape wrapping/coating in the field. Insulating corporation stops (including saddles) not protected by extending polyethylene encasement (see 905.02.09) or not protected with pipe wrap tape (see 905.07.06(b)) also shall receive exterior tape wrapping/coating in the field. All components of the wrapping/coating system shall be manufactured by a single supplier to assure compatibility of components. Provide System A or System B as described below.
2. System A:
    a. Primer: A blend of microcrystalline wax, plasticizer, and corrosion inhibitors having a paste-like consistency, designed to displace moisture, penetrate rust and wet the surface, ensuring adhesion of the tape.
    b. Filler Putty: A cold-applied anti-corrosive moldable filler material used to even the contours of irregular fittings and surfaces. The filler putty shall have the following properties:
        i. Specific gravity: 1.15
        ii. Density: 24 cu in/lb
        iii. Filler putty shall be used at all irregular surfaces to provide a smooth surface for the application of the innerwrap and outerwrap.
    c. Innerwrap: A non-woven, non-stitch bonded synthetic fabric saturated with a blend of microcrystalline wax, plasticizer, and corrosion inhibitor (no clay fillers). The inner tape shall have the following properties:
        i. Thickness: 70 to 90 mils
        ii. Dielectric strength: 170 volt/mil.
    d. Outerwrap: A white, resin-coated, woven fiberglass fabric. The outerwrap shall have the following properties:
        i. Thickness: 0.005 inch
        ii. Tensile strength (per 1-inch width), minimum: 85 pounds
        iii. Tape width: 6 inches
3. System B:
    a. Primer: A primer containing moisture displacing corrosion inhibitors having the following properties:
        i. Solids content: greater than 98-percent

ii. Specific gravity: 1.08

iii. Specific volume: 26 cu in/lb

b. Filler Mastic: A cold-applied self-supporting molding mastic consisting of a petrolatum compound containing beads of closed-cell, cellular polymer with flow control additives. Filler mastic shall have the following properties:

i. Solids content: 100 percent

ii. Specific gravity: 0.605

iii. Specific volume: 45.9 cu in/lb

c. Innerwrap: A non-woven synthetic fabric carrier fully impregnated with a neutral compound based on saturated petrolatum and inert siliceous fillers. Innerwrap shall have the following properties:

i. Thickness: 46 mils

ii. Breaking strength: 22.5 lbf/in

iii. Water vapor transmission: 0.006 perms average

iv. Resistance to cathodic disbonding: 0.28 sq in average

d. Outerwrap: A plasticized polyvinyl chloride sheeting coated on one side with a rubber resin, pressure sensitive adhesive. Outerwrap shall have the following properties:

i. Thickness: 10 mils

ii. Weight: 0.07 lbs/sq. ft

iii. Breaking strength: 25 lbf/in

4. Applications:

a. Insulating Flanges: Coating System A or B is required for use in conjunction with all polyethylene-encased ductile iron water mains and all bonded coated water mains.

b. Insulating Corporation Stops (Including Saddles): Coating System A or B is required for use in conjunction with new bonded coated water mains or existing bonded coated water mains. Coating System A or B is acceptable for use in conjunction with new polyethylene-encased ductile iron water mains. Coating System A or B is not recommended for use in conjunction with existing polyethylene-encased ductile iron water mains due to the need to clean, cut and re-seal the existing encasement.

(b) Pipe Wrap Tape for Copper Supply Lines Connecting to Polyethylene-Encased Water Mains:

1. Polyethylene-encased ductile iron water mains always require the use of insulating corporation stops to prevent the flow of stray electrical currents. As an alternative to extending the polyethylene encasement (see 905.02.09) along the copper supply line or providing System A or B (see 905.07.06(a)), the Contractor may provide pipe wrap tape to wrap corporation stop, saddle, and adjoining first three (3) feet of copper supply line.

2. Pipe wrap tape shall have the following properties, as described by test methods in ASTM D-1000:
    a. Tape thickness: 10 mils
    b. Adhesion to steel: 20 oz/in
    c. Adhesion to backing: 20 oz/in
    d. Elongation at break: 200 percent
    e. Tensile strength: 25.7 lbs/in
    f. Dielectric strength: 1250 volts/mil
3. Applications:
    a. Pipe wrap tape can be used at insulated copper supply line connections to new polyethylene-encased ductile iron water mains or to existing polyethylene-encased ductile iron water mains.
    b. Pipe wrap tape is not approved for use at insulated copper supply line connections to bonded coated water mains.

SECTION 906 – GABIONS

906.01 WIRE FOR GABIONS. The wire shall have a minimum tensile strength of 60,000 psi when tested as specified in A 370. All wire sizes and mesh spacing shall be as recommended by the manufacturer. Tie and connecting wire shall also conform to this Specification.

Stainless steel interlocking fasteners may be substituted for wire ties. The fasteners shall conform to A 313. When subjected to directional tension along its axis, the fastener shall remain in a closed and locked condition for a minimum force of 900 lb.

906.01.01 Galvanized Coating for Gabions. Galvanized coating for fabric, ties, and connecting wire shall not be less than 0.8 oz/sq.ft. when tested as specified in A 90.

906.01.02 Polyvinyl Chloride (PVC) Coating for Gabions. PVC coating for fabric, ties, and connecting wires for gabions shall exhibit no weight loss when tested as specified in MSMT 508. Color shall conform to Federal Standard 595, gray color No. 26440 or green color No. 24533 and shall match throughout the project.

SECTION 907 – PILES AND PILING

907.01 TIMBER PILING. Timber piling shall conform to M 168.

907.01.01 Resin and Fiberglass Caps for Timber Pile Heads. Resin and fiberglass for use in protecting timber pile heads shall conform to the following:

PROPERTY	SPECIFICATION LIMIT	TEST METHOD
MOISTURE INSENSITIVE RESIN		
Tensile Strength, psi, min.	5000	D 638
Tensile Elongation, % min.	0.05	D 638
Compressive Strength, psi, min.	9000	C 109
Abrasive Resistance, * l/mil, min.	60	D 968
WOVEN GLASS CLOTH		
Weight, oz/sq.yd. min.	9	-
Type	Volan A	-

*liters (l) of fine aggregate per mil thickness of resin

907.02 CASINGS FOR CAST-IN-PLACE CONCRETE PILES. Steel shells or casings shall be formed from a single piece of metal having not more than one continuous welded seam. The seam shall have a yield strength of 28,000 psi minimum. Tips shall conform to A 36.

907.03 STEEL BEARING PILES. Steel bearing piles and steel bearing pile splice material shall conform to A 36.

907.04 STEEL SHEET PILES. Steel sheet piles shall conform to A 328. Sheet pile accessories shall conform to A 36. High strength bolts shall conform to the requirements given in Section 909.07.

907.05 WELDING MATERIALS. Welding materials shall conform to AASHTO/AWS D1.5.

907.06 STEEL PIPE PILES. Per A252 Grade 2.

SECTION 908 – REINFORCEMENT STEEL

908.00 CERTIFICATION. The steel manufacturer shall furnish certification for each heat of steel as specified in Section GP-1.05.

908.01 DEFORMED REINFORCEMENT. Unless otherwise specified, reinforcement bars and reinforcement bars used as anchoring devices shall be Grade 60 deformed bars per A 615 or A 706. Deformed bars shall be epoxy coated when specified. Epoxy powder shall be as specified in Section 917.02.

908.02 PLAIN REINFORCEMENT. Unless otherwise specified, dowel bars and dowel bars used as ties in Portland cement concrete pavement expansion and contraction joints shall

be plain round steel bars conforming to A 615, Grade 60 or A 36. Bars shall be epoxy coated. Epoxy powder shall conform to the requirements given in Section 917.02.

908.03 STAINLESS STEEL BARS. In lieu of epoxy coated plain bars, the Contractor may use stainless steel bars. Deformed bars shall be stainless steel when specified in the Contract Documents. Stainless steel shall conform to A 276, Type XM-29. Deformed stainless steel bars shall conform to A 615 for cross sectional area and deformations.

908.04 SLEEVES FOR DOWEL BARS IN PAVEMENT EXPANSION JOINTS. Sleeves for dowel bars shall be of sheet metal capable of sliding over 2 ±1/4 in. of the dowel and shall have a closed end with a stop to hold the end of the sleeve at a minimum distance of 1 inch from the end of the dowel bar.

908.05 WELDED STEEL WIRE FABRIC. Welded steel wire fabric shall conform to M 55. Fabric used in pavement construction shall be furnished in flat sheets.

908.06 WELDED DEFORMED STEEL WIRE FABRIC. Welded deformed steel wire fabric shall conform to M 221.

908.07 FABRICATED STEEL BAR MATS. Steel shall meet A 184, Grade 60.

908.08 WIRE FABRIC FOR PNEUMATICALLY APPLIED MORTAR AND CONCRETE ENCASEMENT. Fabric shall meet A 185 and be galvanized as specified in Section 906.01.01. Fabricate from size W1.4 wire on 3 in. centers in each direction or from W0.9 wire on 2 in. centers in each direction.

908.09 COLD DRAWN STEEL WIRE. Concrete reinforcement per M 32.

908.10 TIE DEVICES FOR CONCRETE PAVEMENT. Tie device sizes shall be as specified and produce a frictional force of at least 160 lb/ft per foot of spacing when tested per MSMT 512.

908.11 STEEL STRAND. M 203, Grade 270, Low Relaxation Strand.

908.12 STRESS RELIEVED WIRE. Stress relieved wire shall conform to M 204, Type WA.

SECTION 909 – METALS

909.00 CERTIFICATION. The metal producer shall furnish certification as specified in Section GP-1.05. The certification shall include actual mill test results. The processing manufacturer shall also furnish information regarding the chemical and physical properties of the finished metal products.

909.01 STRUCTURAL STEEL. Structural steel shall conform to the requirements specified in the Contract Documents. All primary load carrying members shall conform to the supplementary toughness requirements of M 270, Zone 2.

Primary load carrying members are as follows or as designated in the Contract Documents: Finger joint steel from which saw tooth configurations have been cut, all stringers, cover plates, bearing stiffeners, splice plates, pins and pin links for straight rolled steel beam bridges; all flanges, webs, bearing stiffeners, splice plates, pins and pin links for straight steel girder bridges. Additionally, on curved rolled steel beam and steel girder bridges; all diaphragms, cross frames, lateral bracing, including connection plates to main stringers.

909.02 STEEL FOR MISCELLANEOUS USE. Steel for miscellaneous use shall conform to A 36 or A 709, Grade 36. Steel for bearings on structures shall conform to A 709, Grade 50.

909.03 WELDING MATERIALS. Welding materials shall conform to AASHTO/AWS D1.5.

909.04 GRAY IRON CASTINGS. Iron castings for placement within Baltimore County rights-of-way or easements for drainage or utility use shall conform to the following:

1. Materials per ASTM A48, Class No. 30B, or better, unless indicated otherwise.
2. Castings shall be free of burnt-on sand, blowholes, welds and plugs. Surfaces shall be reasonably and consistently smooth. Runners, risers, fins, etc. shall be removed and the areas ground smooth. Finish to be unpainted. Presence of dirt, scab or slag requires repair, re-cleaning and re-submittal of affected castings. Pinholes, shrink or cracks in a casting are cause for rejection.
3. Bearing surfaces between frames and covers / grates shall be cast or machined with sufficient precision that uniform bearing is provided throughout the intended area of contact. Pairs of machined castings shall be match marked for identification during installation.
4. Covers and grates shall not rock within frames. Rocking may not occur when cover / grate is rotated to any position in the frame.
5. Cover / grate shall sit within frame so that top of cover / grate is flush with top of frame as shown on Standard Detail Plates. A difference of more than 1/8" at any point is unacceptable. Variation in level between cover & frame shall not exceed 1/16" in over 1/4 of circumference.
6. Tolerances shall be as noted on Standard Detail Plates or as follows:

FRAME:

Cover Opening Diameter:	+ 1/16"
Cover Opening Depth:	+ 1/32", -0"
Height:	+ 1/8"
Flange:	+ 1/4"

COVER / GRATE:		
	Diameter:	+ 1/16"
	Seat Depth:	+ 0", -1/32"
OTHER DIMENSIONS:		+ 1/8"

7. Each casting provided to Baltimore County shall be prominently marked with the foundry name, country, date of manufacture, AASHTO/ASTM designation, Class and heat number by casting, engraving or stamping with 1/2" min. letters. Foundry name and country of manufacture, at a minimum, shall be visible after installation. Covers and grates shall have foundry name and country of manufacture imprinted on their top surfaces.
8. In addition to the criteria stated in items 1 through 7, acceptance of castings shall be based upon acceptable proof load tests on actual castings, per Sections 7.1 and 8.1.1 of AASHTO M 306. Test bar results shall not constitute acceptable proof of load bearing capacity for castings to be used in Baltimore County.
9. The foundry shall provide certification of results of proof load testing of samples through the supplier to Baltimore County DPW&T's Division of Construction Contracts Administration or to the Baltimore County Bureau of Utilities, or Bureau of Highways, as applicable, upon delivery to site. Certification shall be based upon random testing of each item at a minimum of once every 6 months, and/or upon on-demand testing as requested by Baltimore County. Castings for which no certification is provided, or where certification is deemed inadequate shall be rejected and removed from the site. The foundry shall maintain and make records of test results available to Baltimore County for a minimum period of 7 years.

909.05 STEEL STUD SHEAR DEVELOPERS. Shear developers shall conform to AASHTO/AWS D1.5.

909.06 BOLTS, NUTS AND WASHERS FOR GENERAL USE. Bolts, nuts and washers for general use shall conform to A 307 Grade A, and shall be galvanized as specified in A 153. Anchor bolts shall be galvanized and shall conform to A 709, Grade 36.

909.07 HIGH STRENGTH BOLTS, NUTS AND WASHERS. High strength bolts, nuts and washers shall conform to A 325.

909.07.01 Anchor Bolts for Traffic Signals, Highway Lighting, and Signs. Anchor bolts for traffic signals, highway lighting, and signs shall conform to F 1554, Grade 55 S1. Anchor bolts shall be galvanized for the full length of the threads and 3 in. below the threads in conformance with A 153. Nuts shall be hex nuts conforming to A 194, grade 2H or A 563, Grade DH. Flat washers shall be heavy washers conforming to F 436. All hardware shall be galvanized in conformance with A 153.

909.08 CAST WASHERS. Cast washers, ogee washers and special cast washers shall conform to A 47. Cast washers shall be mechanically or hot dip galvanized. The coating shall conform to the thickness, adherence and quality requirements of A 153.

909.09 HARDWARE. Spikes, wood screws, staples, brads, lag screws, carriage bolts and other parts under the general heading of HARDWARE shall be composed of carbon steel and shall conform to Federal Specification FF-N-105.

909.10 STEEL FORMS. Steel bridge deck forms and deck form supports that remain in place shall be fabricated from steel conforming to A 653, Designation SS, Grades 33 through 80, Coating Designation G 165. The minimum thickness of uncoated steel shall be 0.0359 in.

SECTION 910 – BEARINGS

910.00 CERTIFICATION. The bearing producer shall furnish certification as specified in Section GP-1.05. The certification shall include actual mill test results. The processing manufacturer shall also furnish the chemical and physical properties of the finished bearings.

910.01 BRONZE OR COPPER ALLOY BEARING AND EXPANSION PLATES. Bronze or copper alloy plates shall be either of cast bronze or rolled copper alloy.

910.01.01 Cast Bronze. Cast bronze bearing and expansion plates shall conform to B 22, Alloy No. 91100 or No. 91300.

Self-lubricating bronze bearing plates shall be an article of standard production by an established manufacturer of such equipment. They shall be provided with trepanned recesses (not grooves) that shall be filled with a lubricating compound consisting of graphite and metallic substances with a lubricating binder capable of withstanding the atmospheric elements. The lubrication compound shall be compressed into the recesses by pressure to form dense, non-plastic lubricating inserts. The lubricating area shall comprise at least 25 percent of the total area. The static coefficient of friction shall not exceed 0.10.

The certification shall be as specified above and shall include the actual test results showing that bearing plates of the same design as those supplied conform to the static coefficient of friction requirements.

The test specimens shall measure at least 4 in. long by 4 in. wide. The static coefficient of friction shall be determined by testing a specimen plate subjected to a vertical pressure of 1000 psi and 1000 cycles consisting of 1/2 in. horizontal strokes at a speed not to exceed 9 cycles per minute. Testing shall be conducted at an ambient temperature of 77 ±9 F. The static coefficient of friction on the specimen bearing plate shall be calculated by dividing the total applied vertical load on the plate into the total horizontal load required to start motion between the bearing plate and its mating surface while subject to the vertical load. Upon completion of the test, the bronze plate shall show no signs of galling.

910.01.02 Rolled Copper. Rolled copper alloy bearing and expansion plates shall conform to B 100, Alloy No. 51000.

910.02 STRUCTURAL BEARING PADS. The manufacturer shall furnish certification as specified in Section GP-1.05.

910.02.01 Elastomeric Pads. Elastomeric bearing pads shall conform to the material requirements described in the AASHTO Standard Specifications for Highway Bridges. The elastomeric bearing shall be 60 durometer hardness, Shore Type A. Accompanying the certificate for elastomeric bearing pads shall be two standard ASTM tensile slabs molded from the same compound batch as the furnished elastomeric bearings.

The static load deflection of any layer of elastomeric bearing pads shall not exceed seven percent at 800 psi average unit pressure when tested under laboratory conditions.

The design load for the elastomeric bearing pads will be specified in the Contract Documents. The manufacturer shall proof load each steel reinforced bearing with a compressive load of 1.5 times the maximum design load and shall specify that the material conforms to the material certification.

When test specimens are cut from an actual bearing pad, a reduction of 10 percent in the minimum requirements for original tensile strength and ultimate elongation will be required.

910.02.02 Self-Lubricating Bearing Assembly. Self-lubricating bearing assembly shall consist of a fabric reinforced elastomeric pad, Tetrafluoroethylene (TFE) bonded to the pad, and a stainless steel sheet. All the elements shall conform to AASHTO Standard Specifications for Highway Bridges as modified herein.

Fabric reinforced elastomeric pad shall be Type A, durometer hardness of 70-90. Stainless steel sheet shall be Type 304, minimum thickness of 16 gauge. The surface of the stainless steel sheet in contact with Tetrafluoroethylene shall have 2B finish, and shall be welded to the sole plate using a welding procedure approved by the Engineer.

910.02.03 Pre-formed Fabric Pads for General Application. Pre-formed fabric pads shall be composed of multiple layers of 8 oz cotton duck impregnated and bound with high quality natural rubber or of equally suitable materials, approved by the Engineer and compressed into resilient pads of uniform thickness, after compression and vulcanizing. The finished pads shall withstand compression loads perpendicular to the plane of the laminations of not less than 10,000 psi without detrimental reduction in thickness or extrusion.

SECTION 911 – JOINTS

911.01 JOINT SEALER AND CRACK FILLER. Joint sealer and crack filler shall conform to D 6690 as modified by MSMT 404. The manufacturer shall furnish certification as specified in Section GP-1.05. Manufacturer's recommendations regarding heating and pouring temperatures will be used when testing these materials. If a range of temperatures is recommended, the midpoint will be used as the pour point.

911.01.01 SILICONE JOINT SEALER AND CRACK FILLER. Silicone joint sealer and crack filler shall be low modulus, one component compound that may or may not require a primer for bonding to concrete. If a primer is required, it shall be as recommended by the sealant manufacturer and shall be placed on the joint faces following the insertion of the backup material.

Silicone material, when tested at 73 ±3 F and 45-55 percent relative humidity, shall conform to the following:

TEST PROPERTY	TEST METHOD	SPECIFICATION LIMITS
Shore A Hardness, at 7 days	D 2240	10-25
Tensile Strength at 150% Elongation, psi max.	D 412 Die C	45
Elongation, % min.	D 412 Die C	700
Adhesion in Peel, Lb/in. min.	Fed. Spec. TT-S-00230	20
Flow, 0.01 in. max.	T 187	0.3
Tack-Free Time, minutes	D 2377	20-75

Each container of silicone sealer and crack filler shall have a minimum shelf life of six months. Material more than six months old shall be retested.

911.02 PREFORMED JOINT FILLERS. Preformed Sponge Rubber and Cork expansion joint filler shall conform to M 153. Preformed non-extruding and resilient bituminous type expansion joint filler shall conform to M 213-01 (2010), Section 4.1.2 or 4.1.3.

911.03 PREFORMED JOINT INSERTS. Preformed inserts shall conform to M 220.

911.04 PREFORMED POLYCHLOROPRENE ELASTOMERIC COMPRESSION JOINT SEALS. The manufacturer shall furnish certification as specified in Section GP-1.05.

911.04.01 Roadway Seals. Roadway seals shall conform to M 220.

911.04.02 Bridge Seals. Bridge seals shall conform to M 297.

The minimum depth of all seals measured at the contact surface shall be at least 90 percent of the minimum uncompressed width of the seal.

911.04.03 Lubricant Adhesive. The lubricant adhesive shall be compatible with the preformed joint seals and concrete. The Engineer will determine that consistency is suitable at the time of installation.

The manufacturer shall furnish certification as specified in Section GP-1.05 showing that lubricant adhesive conforms to the following:

TEST and METHOD	SPECIFICATION LIMITS
Viscosity, D 1084, Method B, CP min.	25,000
Film Strength, D 412, psi min.	2,000
Elongation, D 412, % min.	250

No lubricant adhesive shall be used after nine months from the date of manufacture. Each container shall be plainly marked with the manufacturer's name or trademark, lot number, and date of manufacture.

911.05 NEOPRENE STRIP SEALS. The manufacturer shall furnish certification as specified in Section GP-1.05 showing that the neoprene strip seals conform to the following:

PHYSICAL PROPERTIES FOR PREFORMED ELASTOMERIC STRIP SEALS		
PROPERTY	**REQUIREMENT**	**TEST METHOD**
Tensile Strength, psi min.	2000	D 412
Elongation at Break, % min.	250	D 412
Hardness, Type A Durometer, points	60 ± 5	D 2240 (modified) (a) (c)
Oven Aging, 70 hr. at 212 F Tensile Strength, % loss, max. Elongation, % Loss, max. Hardness, Type A Durometer, Points change	 20 20 0 to +10	D 573 D 2240 (modified) (a) (c)
Oil Swell, ASTM Oil 3 70 hr. at 212 F weight change, % max.	45	D 471
Ozone Resistance 20% strain, 300 pphm in air, 70 hr. at 104 F	No Cracks	D 1149 (modified) (b)
Low Temperature Stiffening 7 Days at 14 F Hardness, Type A Durometer, Points change	 0 to +15	D 2240 D 2240 (modified) (a) (c)
Compression Set, 70 hr. at 212 F, % max.	40	D 395 Method (modified) (b) (a)

(a) The term "modified" in the table relates to the specimen preparation. The use of the strip seal as the specimen source requires that more applications than specified in either of the modified test procedures be used. The specimen modification shall be agreed upon by the purchaser and producer or supplier prior to testing.
(b) Test per procedure A of D 518. Ozone concentration is expressed in pphm.
(c) The hardness test shall be performed with the durometer in a durometer stand as recommended in D 2240.

911.05.01 Special Molded Intersection Pieces. Where joint elements intersect, a special strip seal element manufactured by molding in one piece from neoprene material similar to that specified above shall be 10 in. from point of intersection to nearest end along center line of joint in any direction. Ends shall be plane and square to facilitate bonding to adjacent

extruded areas, and corners of sharp angles shall be rounded sufficiently to relieve damaging stress concentrations. Angles to which moldings are fabricated shall be within 5 degrees of the actual angle as specified in the Contract Documents to avoid excessive deformation when installed in steel joint components.

Lubricant adhesive for use in installing and bonding neoprene seal elements to steel joint components shall be one part moisture curing polyurethane and hydrocarbon solvent mixture having the following physical properties:

TEST AND METHOD	SPECIFICATION LIMITS
Average Weight, lb/gal.	8 ± 0.8
Solids Content, % min.	65
Adhesives shall remain liquid from, F	5 to 120
Film Strength, D 412, psi min.	2000
Elongation, D 412, % min.	250

Steel extrusions and neoprene seals shall be matching components by the same manufacturer. The steel extrusions shall have a thickness of at least 3/8 in. All steel portions of the joint assembly shall be painted with an inorganic zinc rich primer meeting the requirements of Section 912.02 and applied as specified in Section 413.

911.06 SEALER FOR LOOP DETECTOR. Sealing material to seal saw cuts for loop detector wires shall be either Type A, two part epoxy or Type B, one part polyurethane. The manufacturer shall furnish certification as specified in Section GP-1.05.

No aggregate shall be mixed with the sealer material. The sealer shall be applied in conformance with the manufacturer's recommendations.

911.06.01 Tests. Tests shall conform to the following:

TYPE A – TWO PART EPOXY	
TEST AND METHOD	**SPECIFICATION LIMITS**
Viscosity, cone and plate Viscometer @ 25 C, cps max.	12,000
Pot life @ 25 C, minutes min.	10
Cure Time @ 25 C, no tackiness, hr. max.	1
Hardness, Type A Durometer, D 2240	50 – 60
Tensile Elongation, D 638, % min.	100
Water absorption, D 570, %/24 hr. max.	0.5
Oil absorption, D 471, % max.	0.02
Volume resistivity @ 25 C, D 257, Ohm-cm min.	2.4×10^{10}

TYPE B – ONE PART POLYURETHANE	
TEST AND METHOD	**SPECIFICATION LIMITS**
Viscosity, Brookfield RVF #6 spindle @ 20 rpm 25 C, cps max.	30,000
Cure time @ 25 C, no tackiness, hr. max.	24
Hardness, Rex Type A	50 – 60
Tensile Strength, D 412, psi min.	500
Tensile Elongation, D 412, % min.	300
ARC Resistance, D 495, sec. min.	70
Dielectric Constant, D 150, min.	6 @ 50 hz., 4.25 @ 500 hz.
Nonvolatile Content, %	85

911.07 ROOFING PAPER. Roofing paper to be used in expansion joints shall be composed of roofing felt saturated and coated on both sides with an asphaltic material. It shall not weigh less than 39.8 lb/100 sq.ft. and shall not crack when bent 90 degrees over a 1/2 in. radius at room temperature.

911.08 WATERSTOPS. Waterstops shall be made of rubber or polyvinyl chloride (PVC).

The waterstop shall be of the shape and dimensions specified in the Contract Documents. The cross section shall be uniform along its length and transversely symmetrical so that the thickness at any given distance from either edge of the waterstop shall be uniform.

The waterstop shall conform to the following:

TEST AND METHOD	SPECIFICATION LIMITS
Tensile Strength, D 412, psi min.	2000
Elongation @ Break, D 412, % min.	300
Hardness, Rubber, Type A durometer, D 2240	55 $\pm$ 5
Hardness, PVC, Type A durometer, D 2240	75 $\pm$ 5

The Contractor shall furnish a test sample for each lot or shipment of waterstop. The manufacturer shall furnish certification as specified in Section GP-1.05.

911.09 ASPHALT SEALER FOR CONCRETE PIPE. The sealer shall be a mixture of asphalt, mineral filler, and petroleum solvents, and shall have adhesive and cohesive properties. Each container shall be clearly marked with a lot number, manufacturer and location of manufacturer.

The supplier shall furnish a certified copy of the test results showing that the sealer meets the following:

TEST AND METHOD	SPECIFICATION LIMITS
Residues by evaporation, nonvolatile Matter, D 2939, % min.	70
Inorganic filler on ignition, ash content, D 2939, %	15 – 45

911.10 CLOSED CELL NEOPRENE SPONGE ELASTOMER. Closed cell neoprene sponge elastomer shall conform to D 1056, Type 2. Skin coating is optional. The material shall conform to the following:

TEST AND METHOD	SPECIFICATION LIMITS
Compression Deflection, D 1056	Pressure necessary for 25% deflection, 5-10 psi, one layer ½" thick Pad @ 70 ± 5 F
Accelerated Aging Test	Change in compression deflection after aging 7 days @ 158 F, 20% max.
Permanent set*, D 1056	50% deflection @ 158 F for 22 hrs., 40% max. residual permanent set after 10 days recovery, 10% max.
Water absorption by weight	2 in. immersion of 1.129 in. diameter sample for 24 hr. @ room temperature, 10% max.
Water Resistance, D 1171	Quality retention, 6 weeks exposure, 100%

* Method to calculate permanent set:

$$Permanent\_Set = \frac{(t_0 - t_1)x100}{t_0}$$

where:

t_0 = original thickness of sample, and

t_1 = thickness of specimen 30 minutes after removal of clamps or after 10 days recovery.

911.11 DRAINAGE TROUGHS.

911.11.01 Neoprene Drainage Troughs. Neoprene for drainage troughs shall conform to M 220, and the following:

NEOPRENE DRAINAGE TROUGHS		
PHYSICAL PROPERTY	**METHOD**	**LIMITS**
Thickness, in., min.	-	¼
Tensile Strength, psi, min.	D 412	2000
Elongation at Break, % min.	D 412	250
Hardness, Type A Durometer	D 2240 (modified)	60 ± 5
Compression set, 22 hr. @ 212 F, % max.	D 395	35
Oven Aging, 70 hr. @ 212 F	D 573	
Tensile Strength, % loss max.		20
Elongation, % loss max.		20
Hardness, Type A Durometer, (Points change)		0 to +10

911.11.02 Optional Preformed Fabric Drainage Troughs. A sheet composed of multiple plies of 15 ± 5 oz/sq.yd. polyester fabric laminated with butadiene acrylonitrile, vulcanized to form an integral laminate. Physical properties of the laminate shall meet the following:

ALTERNATE PREFORMED FABRIC DRAINAGE TROUGHS		
PHYSICAL PROPERTY	**METHOD**	**LIMITS**
No. of Plies	-	3
Laminate Weight, lb/sq.ft. min.	-	0.85
Thickness, in. min.	-	5/32
Breaking Strength, lb/in. min.	D 378	1200
Elongation at Break, % max.	D 378	30
Elongation at 1/10 Breaking Strength, % max.	D 378	3

911.12 Preformed Flexible Joint Sealants. Preformed flexible joint sealants for use with precast concrete structures and pipe shall be the butyl rubber type conforming to C 990, Section 6.2. Sealant as specified shall not be used in expansion joints or joints that move.

SECTION 912 – COATING SYSTEMS FOR STRUCTURAL STEEL

912.01 GENERAL. The Design Division shall approve paint selections and suppliers. Unless otherwise specified, paint shall be tested in accordance with Federal Test Method Standard 141. Only one formulation per color will be permitted per project. Tests shall be performed at 75 F and 50 percent relative humidity unless otherwise specified. All paint shall be satisfactory for brushing, rolling, or spraying. All paints within a system shall be from the same manufacturer and shall be tinted at the point of manufacture to differentiate between coats, existing coats, and bare metal. Paint shall be shipped in the original containers and all containers shall bear the identification of the paint, consisting of the manufacturer's name, the name or title of material, volume of contents, manufacturer's paint identification number, the date of manufacture, color name and number, handling instructions, Materials Safety Data Sheet, precautions, and the batch number.

912.01.01 Approved Paint Manufacturers. Approval of Paint Manufacturers shall be based upon the acceptance of the manufacturer's submitted Quality Control Plan.

912.01.02 Quality Control Plan. The Quality Control Plan shall define the manufacturer's process to ensure the quality of the products during and upon completion of the manufacturing process. As a minimum, the Quality Control Plan shall list the following information:

(a) Name of quality control tests and test procedures used.

(b) Detailed description of the test procedures if not a standard test.

(c) Frequency of quality control tests.

(d) Maintenance of quality control records and length of time that they will be maintained.

912.01.03 Acceptance. The paint manufacturer shall furnish certified test results for each lot and color of paint as specified in Section GP-1.05. Certified test results for each lot shall list the actual test results for the specified properties. The Structural Design Section shall approve the certification prior to shipment, and a copy shall accompany each shipment.

912.01.04 Original Infrared Spectrogram. The manufacturer shall submit an original analysis of vehicle solids by infrared spectroscopy performed as specified in D 2621 as follows:

(a) For zinc primer coatings, infrared spectrum of each vehicle component.

(b) For two component coatings, infrared spectrum of each single component and each mixed component, when applicable, in appropriate mixing ratios.

912.01.05 Certification Verification Tolerances. The manufacturer's facilities will be visited at random intervals, and samples will be taken. A comparison will be made between the manufacturer's certified test results and the County's tests results on the same batch. The tolerances between these results shall meet the following:

TEST	TOLERANCE	TEST METHOD
Total Solids by mass, %	± 2	D 2369
Pigment Content by mass, %	± 2	D 2698 or D 4451
Vehicle Solids by mass, %	± 2	D 2369
Viscosity, KU	± 10	D 562
Unit Weight, lb/gal	± 0.5	D 1475

**Volatile Organic Compound (VOC) maximum limits shall meet the current regulations governing the point of application.*

912.02 PRIMER COATS AND SEALERS.

912.02.01 Inorganic Zinc Rich. Per M 300, Type I or IA. Zinc dust per D 520, Type II.

912.02.02 Aluminum Epoxy Mastic. Aluminum epoxy mastic primer shall have one component that is the condensation product of the reaction of epichlorohydrin with bisphenol A. Drying times shall be 8 hours maximum to touch, 24 hours minimum to 30 days maximum for recoat, and 48 hours maximum for hard. Minimum pot life shall be three hours. Solids by weight shall be 90 percent minimum and 80 to 90 percent by volume. Viscosity shall be 95 to 140 KU and flexibility shall pass a 180-degree bend around a 3/4 in. mandrel

when tested per D 522. The material shall resist sagging when tested per D 4400 with no sagging at the manufacturer's recommended wet film thickness. The material shall weigh 13.0 ± 0.5 lb/gal.

912.02.03 Organic Zinc Rich. Per SSPC-Paint 20, Type II.

912.02.04 Zinc Rich Moisture Cured Urethane. One-component having a minimum zinc pigment content in the dry film of 80 percent. Minimum solids shall be of 80 percent by weight and 62 percent by volume. The viscosity shall be 95 to 105 KU, and shall be capable of being applied at 50 percent greater film build than required without runs or sags per D 4400. The interval for application of the next coat shall be 8 hours minimum and 30 days maximum. The coating shall also meet the Moisture Cured Urethanes Additional Performance Criteria Table except that the maximum loss for Abrasion Resistance shall be 82.0 mg, and Salt Spray after 1000 hours shall be 1/32 in. maximum.

912.02.05 Micaceous Iron Oxide and Aluminum Filled Moisture Cured Urethane shall have a minimum solids content of 75 percent by weight and 60 percent by volume.

The viscosity shall be 95 to 100 KU. The coating shall also meet the Moisture Cured Urethanes Additional Performance Criteria Table.

912.02.06 Penetrating Sealer. A viscosity of 75 to 101 KU and be able to penetrate and seal existing coatings and substrate. It shall be suitable for application over marginally prepared steel and most generic types of aged coatings. The sealer shall conform to one of the following:

(a) Epoxy penetrating sealer shall be cross-linked amido-amine epoxy primer/sealer having two components mixed in accordance with the manufacturer's recommendations. It shall be a minimum of 95 percent solids by weight.

(b) Moisture cured urethane micaceous iron oxide filled penetrating primer/sealer shall be one component having a minimum of 75 percent solids by weight. It shall also meet the Moisture Cured Urethanes Additional Performance Criteria Table.

912.03 INTERMEDIATE COATS.

912.03.01 Acrylic. Coating shall consist of a single component 100 percent acrylic and have minimum solids of 48 percent by weight and 36 percent by volume. The maximum dry time to touch and recoat shall be 2 and 8 hours, respectively.

912.03.02 Epoxy Polyamide. Epoxy polyamide intermediate coat shall have one component that is the condensation product of the reaction of epichlorohydrin with bisphenol A. The epoxy polyamide shall have a 3.0 minimum fineness of grind (Hegman Units), and minimum solids of 75 percent by weight and 62 percent by volume. Maximum dry time to touch and recoat shall be 6 and 15 hours, respectively.

912.03.03 Micaceous Iron Oxide Moisture Cured Urethane. Micaceous Iron Oxide Moisture Cured Urethane shall be one-component having minimum solids of 80 percent by weight and 60 percent by volume. The viscosity shall be 90 to 100 KU. The interval for application of the next coat shall be 8 hours minimum and 30 days maximum. The coating shall meet the Moisture Cured Urethanes Additional Performance Criteria Table. The micaceous iron oxide content shall be at least 3.0 lb/gal.

912.04 FINISH COATS. The color number will be specified in the Contract Documents and shall conform to Federal Standard 595. All finish coats shall resist sagging when tested per D 4400 with no sagging at the manufacturer's recommended wet film thickness.

912.04.01 Acrylic. Refer to Section 912.03.01.

912.04.02 Aliphatic Urethane. Finish coat shall have minimum solids of 70 percent by weight and 47 percent by volume. Drying time to touch and hard shall be the minimum recommended by the paint manufacturer.

912.04.03 Moisture Cured Aliphatic Urethane. Finish coat shall be one-component having a maximum free monomer content of 0.7 percent. Minimum solids shall be 75 percent by weight and 60 percent by volume, and the viscosity shall be 70 to 80 KU. The interval for application of the next coat shall be 8 hours minimum and 30 days maximum. The coating shall meet the Moisture Cured Urethanes Additional Performance Criteria Table.

912.05 PAINT SYSTEMS. As specified in the Paint Systems Table.

PAINT SYSTEMS TABLE

PAINT	COAT	SECTION	DRY FILM THICKNESS, mils, min - max	USAGE
SYSTEM A				
Inorganic Zinc	I	912.02.01	3.0 - 5.0	Shop Primer
Acrylic	II	912.03.01	2.0 - 4.0	First Field Coat
Acrylic	III	912.04.01	2.0 - 4.0	Finish Coat
SYSTEM B				
Inorganic Zinc	I	912.02.01	3.0 - 5.0	Shop Primer
Epoxy Polyamide	II	912.03.02	5.0 - 8.0	First Field Cover-All Coat
Aliphatic Urethane	III	912.04.02	2.0 - 3.0	Finish Coat
SYSTEM C				
Organic Zinc	I	912.02.03	3.0 - 5.0	Primer/First Cover-All Coat
Epoxy Polyamide	II	912.03.02	5.0 - 8.0	Second Cover-All Coat
Aliphatic Urethane	III	912.04.02	2.0 - 3.0	Finish Coat

PAINT	COAT	SECTION	DRY FILM THICKNESS, mils, min - max	USAGE
SYSTEM D				
Organic Zinc	I	912.02.03	3.0 - 5.0	Primer/First Cover-All Coat
Acrylic	II	912.03.01	2.0 - 4.0	Second Cover-All Coat
Acrylic	III	912.04.01	2.0 - 4.0	Finish Coat
SYSTEM E				
Aluminum Epoxy Mastic	I	912.02.02	5.0 - 8.0	Primer/First Cover-All Coat
Epoxy Polyamide	II	912.03.02	5.0 - 8.0	Second Cover-All Coat
Aliphatic Urethane	III	912.04.02	2.0 - 3.0	Finish Coat
SYSTEM F				
Micaceous Iron Oxide, Aluminum Filled Moisture Cured Urethane	I	912.02.05	2.0 - 3.0	Primer/First Cover-All Coat
Micaceous Iron Oxide Moisture Cured Urethane	II	912.03.03	3.0 - 5.0	Second Cover-All Coat
Moisture Cured Aliphatic Urethane	III	912.04.03	1.5 - 2.0	Finish Coat
SYSTEM G				
Zinc Rich Moisture Cured Urethane	I	912.02.04	2.0 - 3.0	Primer/First Cover-All Coat
Micaceous Iron Oxide Moisture Cured Urethane	II	912.03.03	3.0 - 5.0	Second Cover-All Coat
Moisture Cured Aliphatic Urethane	III	912.04.03	1.5 - 2.0	Finish Coat
SYSTEM H				
Penetrating Sealer	I	912.02.06	1.0 - 2.0	Sealer
Aluminum Filled Epoxy Mastic	II	912.02.02	3.0 - 5.0	Spot Coat
Aliphatic Urethane	III	912.04.02	3.0 – 5.0	Finish Coat

MOISTURE CURED URETHANES
ADDITIONAL PERFORMANCE CRITERIA TABLE

TEST PROPERTY	TEST METHOD	TEST CRITERIA	COAT I and II	ENTIRE SYSTEM
Cyclic Salt Fog/UV Exposure of Painted Metal	D 5894	Final Ratings: Rusting: 6 min Blistering: 10 min Rust Creep: 6 max Cracking: Degree & Type Flaking: Degree & Type	1000 hr	3000 hr
Salt Spray	B 117	1/32 in Scribe, 1/16 in. max undercut	1000 hr	3000 hr
Abrasion Resistance	D 4060	Taber Abraser, CS-17 Wheel, 1000 g load, 1000 cycles, max loss	100 mg	56 mg
Adhesion	D 3359	Cross-Cut Tape Test	No peeling or removal	No peeling or removal
Flexibility	D 522	Conical Mandrel Bend Test, min elongation	10 %	40 %
Pencil Hardness	D 3363	min	F	F
Accelerated Weathering	G 53	QUV using UV - B Lamp, time after no more than 10 % loss of gloss	—	400 hr
Impact Resistance	D 2794	min	—	40 in.·lb
Chemical Resistance, Solutions	Fed. Spec. T-C-550 4.4.6	5 % Sodium Hydroxide 5 % Hydrochloric Acid 5% Sulfuric Acid 5 % Acetic Acid	—	Unaffected - Slight discoloration permitted
Reversed Impact	D 2794	Rapid Deformation	—	No cracking or delamination

SECTION 913 – WATERPROOFING

913.00 CERTIFICATION. The producer shall furnish certification as specified in Section GP-1.05.

913.01 ASPHALTIC MATERIALS FOR DAMP-PROOFING AND WATER-PROOFING.

913.01.01 Hot Applied Asphalt. Per D 449.

913.01.02 Cold Applied Asphalt. Meet the following when tested per MSMT 423, Procedure A. The material shall not contain isocyanide or any derivative of cyanide.

TEST and METHOD		SPECIFICATION LIMITS		
		GRADE I	GRADE II	GRADE III
R and B Softening Point T 53		104 – 143 F	145 – 170 F	172 – 200 F
Penetration, 0.10 mm, T 49	32 F, 200 g, 60 sec	10 min	5 min	5 min
	77 F, 100 g, 5 sec	30 – 100	25 – 50	20 – 40
	115 F, 50 g, 5 sec	100 min	130 max	100 max
Permeability, g/cubic cm, max, MSMT 423		0.09	0.09	0.09
Flow test, mm, max, MSMT 423		CC	20	15
Flexibility, 60 F, MSMT 423		No peeling or loss of adhesion		
Imperviousness Test, MSMT 423		No pitting or discoloration		
Sag test, MSMT 423		No movement		

Grade I— Suitable for below ground and horizontal applications.
Grade II—Suitable for below ground and above ground where surface temperatures do not exceed 120 F.
Grade III—Suitable for below ground and above ground where surface temperatures exceed 120 F.

913.01.03 Cold Applied Asphalt Emulsion. Per D 1227, Type II, using D 2939, modified by MSMT 423, Procedure B.

913.02 PRIMER FOR USE WITH ASPHALT FOR DAMPPROOFING AND WATERPROOFING. Per D 41.

913.03 FABRIC SATURATED WITH ASPHALT FOR USE IN WATERPROOFING. Per D 173.

913.04 DAMPPROOFING AND WATERPROOFING MEMBRANE. The adhesive side of the membrane shall be protected with a special release paper that can be easily removed for installation. The membrane shall meet the following requirements:

TEST PROPERTY	TEST METHOD	SPECIFICATION LIMITS
Grab Tensile Strength, lb/in. @ 12 in./minute rate of loading, min	D 5034	70
Pliability, 180° bend, 1 in. mandrel @ 20 F	D 146	unaffected
Resistance to Puncture, lb min	E 154 (square mounting frame method)	40
Permeance, perm (kg/Pa · s · m^2), max	E 96, Procedure B	0.1

TEST PROPERTY	TEST METHOD	SPECIFICATION LIMITS
Weight, oz/sq.yd. min	D 3776	40
Primer	—	as specified by the manufacturer

Roll and sheet waterproofing membrane may be accepted on certification. The manufacturer shall furnish certification as specified in Section GP-1.05 with actual test results showing that the material meets these Specifications.

913.05 SHEET METAL FOR FLASHING. Shall be of the material and gauge specified.

913.05.01 Copper. Per B 152 for weight per square foot and gauge.

913.05.02 Galvanized Sheets. Per A 653, Coating Designation G 90.

SECTION 914 – CHAIN LINK FENCE

914.00 CERTIFICATION. The manufacturer shall furnish certification as specified in Section GP-1.05. In addition, a sample of the fence fabric shall be submitted with the fabric certification.

914.01 CHAIN LINK FENCING FABRIC. Chain link fencing fabric shall be 2 in. mesh woven from coated No. 6 gauge wire for 6 ft and 8 ft fence and No. 9 gauge wire for 5 ft fence unless otherwise specified in the Contract Documents. The ends shall have a knuckled selvage at the bottom and a barbed selvage at the top. The fabric shall conform to M 181. Type I fabric shall conform to Class D coating. Vinyl coated steel shall conform to F 668, Class 2B thermally fused. Vinyl color shall be warm gray or black as specified in the Contract Documents. Where used for stormwater management facilities, the chain link fence characteristics shall be as directed by the Department of Environmental Protection and Sustainability, to be summarized in the Contract Documents.

914.01.01 Fence Fabric for Super Silt Fence. Galvanized fabric for super silt fence shall meet Section 914.01 except that it shall be woven from No. 6 gauge wire having a Class C coating. The fabric shall be 42 in. high.

914.02 TIE WIRES, LINE POST CLIPS, TENSION WIRES AND TENSION WIRE CLIPS. These items shall conform to M 181. The galvanized coating shall weigh a minimum of 1.2 oz/sq.ft.. These items, when used with aluminum coated steel fabric, shall be coated with aluminum at a minimum weight of 0.40 oz/sq.ft.. The tension wire used with polyvinyl chloride (PVC) coated steel fabric shall have the same coating thickness and color requirement as the fence fabric.

914.03 POSTS, BRACES, FITTINGS AND HARDWARE. All posts, braces, fittings and hardware shall conform to M 181. When these items are specified to be PVC coated, they shall be thermally fused and bonded. The PVC thickness shall be 10 to 15 mil except that bolts, nuts, and washers shall be metallic coated steel.

When opting to use round posts, the posts shall conform to industry standards for Grade 1 or Grade 2.

914.04 GATES. The fabric used for gates shall be identical to the fencing fabric. The gate frame and other hardware shall conform to Sections 914.02 and 914.03. When the gate frame is PVC coated, movable fittings, such as hinges and latches, shall be field coated with a PVC coating specifically prepared for this purpose.

914.05 BARBED WIRE. Barbed wire shall conform to A 121. The barbed wire shall be 12½ gauge with four point, round barbs at 5 in. spacings and Coating Type Z, Class 3 coating requirements.

SECTION 915 – PRODUCTION PLANTS

915.01 GENERAL. These specifications are applicable to all batching and proportioning plants.

915.01.01Approval. The plant from which the Contractor proposes to obtain material to be used on Baltimore County projects must have approval by the Maryland State Highway Administration (MdSHA).

915.01.02 Lead Time. Notify the Engineer at least two working days prior to the start of operations. The Division of Construction Contracts Administration shall be kept informed of plant operational procedures and be notified when a change is planned. Inspectors shall have safe access to all areas of the plant for the performance of their duties. All equipment, tools, machinery, and parts of the plant shall be maintained in a satisfactory working condition at all times.

915.01.03 Storage. The storage and handling of aggregates in stockpiles and bins shall be done in a manner that will prevent segregation, intermingling, and contamination by foreign material or equipment. Bins discharging to feeder systems shall be equipped with accessible calibrated devices to vary the quantity of material being fed.

915.01.04 Measuring Devices. Measuring devices shall meet the current edition of the National Institute of Standards and Technology Handbook 44, except as modified by Table 915. The producer shall provide all personnel and equipment for calibrating measuring devices.

Before the plant starts any proportioning operation, and at least once each year thereafter, all measuring devices, meters, dispensers, test weights, and other measuring devices shall be

inspected, tested, and certified to be in proper operating condition by an approved testing agency. During the period of operation, all measuring devices, including meters and dispensers, shall be tested and certified for accuracy and operating condition by the producer or an approved testing agency on a monthly basis during the period of operation. Any weighing device by which materials are sold by weight as a basis of payment shall be tested monthly and certified by an approved testing agency. The Engineer shall be notified at least two working days in advance of monthly scale inspections. The certifications shall state capacities, minimum graduations, loads applied, degree of accuracy, and magnitude.

Balance and zero conditions of scales shall be checked daily, and at any other time requested by the Division of Construction Contracts Administration. The Engineer may, at any time, direct that any measuring device be tested by the producer or by an outside agency if there is any doubt about the accuracy of the measuring device. Certificates of inspection shall be posted in a prominent place in the plant, and a copy shall be promptly submitted to the Engineer.

Production plant tolerances shall meet the following table:

TABLE 915

MATERIAL	*MAINTENANCE TOLERANCE	UNIT OF MEASUREMENT
Aggregate	0.2%	Weight
Portland Cement or Blended Hydraulic Cement of Ground Iron Blast Furnace Slag or Fly Ash	0.2%	Weight
Asphalt	0.2%	Weight or Volume
Water	1.5%	Weight or Volume
Additives	0.5%	Weight or Volume

*Maintenance tolerance shall be the larger of specified percent of the total capacity of the scale or the smallest scale graduation.

If, during the monthly check, the measuring devices are found to deviate from the allowable tolerance, they will be suspended from use until recalibrated to the Specification requirements. A price adjustment will apply to materials sold and accepted by weight that are supplied during the measuring device malfunction period when the malfunction resulted in an overpayment. The measuring device malfunction period is defined as the elapsed time between the two successive monthly checks.

915.01.05 Sampling Equipment. The producer shall provide all personnel and equipment for obtaining samples from the last practical point prior to combination with other ingredients or introduction into the mixer. Sampling of liquid binder from HMA plants shall be from a tap located at the last practical, safe point, between the binder control unit and the plant (M 156 and D 140). Sampling shall meet Tables 1 and 2 of the MSMT Manual. The sampling equipment shall have a minimum capacity of 30 lb and be positioned in a manner that will provide an accurate representation of the material being furnished. When the size of the sample is too large to be transported, approved sample splitting devices shall be available at the point of sampling that will split the sample to no more than twice the proper testing size.

915.01.06 Quality Control Laboratory. At proportioning or batching plants the producer shall provide an on-site County-approved laboratory suitable for conducting the various tests required. An off site laboratory requires approval of the Engineer. Continued approval of the laboratory and the testing personnel will be subject to periodic inspection by the County. Any deficiencies shall be corrected to the satisfaction of the Engineer or the approval will be withdrawn.

915.02 HOT MIX ASPHALT (HMA) PLANTS. All plants providing HMA material to Baltimore County projects must have approval from the Maryland State Highway Administration (MdSHA), meet M 156, and be equipped with Automatic Batching and Recording of Batching, except as modified in Section 915.01 and the following:

(a) Dryer. The fuel used for drying aggregates shall be compatible with the plant manufacturer's recommendations.

(b) Hot Aggregate Bins. New plants shall meet the requirements of M 156.

(c) Mixer Unit for Batch Method. Minimum dry and wet mixing times shall be 5 seconds and 15 seconds, respectively.

(d) Truck scale weighing shall meet the National Institute for Standards and Technology (NIST), except as follows:

(1) A plant summary shall be kept by the producer showing the Contract number, truck identification (ID) number, ID of the type of mix being produced, the number of truck loads, and the total tons of mix.

(2) The producer shall supply a delivery ticket with the ID number, Contract number, State-approved mix number, date, truck ID number, time loaded, gross and tare weights, and net weight of the mix for each load. When requested by the Engineer, the temperature of the mix shall be shown on the delivery ticket.

(e) Automatic Weighing and Printout. The producer shall use an approved plant automatic weighing and printing system. A printed delivery ticket for each load shall be provided with the cumulative total weighed into the truck, Contract number, time loaded, State-approved mix number, and net weight of mix. When requested by the Engineer, the temperature of the mix shall be shown on the delivery ticket. The temperature may be handwritten.

(f) Hauling Units. Transport the mixture to the work site in units previously cleaned of all foreign material, and with the contents of each load completely covered with suitable material of sufficient size to protect it from the weather. Each unit shall have convenient access from ground level to insert thermometers to determine mix temperature.

Treat the inside surface of all hauling units with an approved release agent that will not contaminate or alter the characteristics of the mixture. Petroleum derivatives are prohibited. Approval will be based on results from tests performed per MSMT 414.

(g) Drum mixer plants shall be calibrated per MSMT 453 and approved. A monitoring station for the purpose of controlling the entire operation shall be provided. If any part of this control system fails, an alternative control system approved by the Engineer may be used for a maximum of two working days.

The producer shall determine the moisture content of all aggregates per MSMT 251.

915.02.01 Certified Hot Mix Asphalt (HMA) Plant. The producer is responsible for quality control of plant operations to ensure that the material meets Specifications. The quality control process will be subject to unannounced periodic inspection by representatives of the Engineer when County projects are in progress. The plant's certified technician shall fully participate in the inspections.

Initial Inspection. Any plant initially setting up and starting production will be subject to a comprehensive inspection to determine whether the plant equipment and personnel meet all applicable Specifications. The County will accept certification by a Professional Engineer registered in the State of Maryland that the plant facilities meet all applicable Specifications; however, the County shall determine final acceptance.

Responsibilities of the HMA Producer.

(a) Notification. Notify the Engineer one working day prior to producing materials for County projects. Report total tons shipped to County projects within one business day of completed daily shipments.

(b) Quality Control. The minimum sampling and testing frequencies and criteria necessary for quality control of the HMA is the responsibility of the producer. Develop and use a quality control plan acceptable to the Engineer that addresses all elements necessary for quality control in the plant.

Conduct the minimum sampling and testing as specified in MSMT 735, Table 2. Additional sampling and testing shall be performed when directed. The Engineer shall be offered the opportunity to witness all sampling and testing.

(c) Reports. The test results shall be furnished to the Engineer on documents approved by the County.

915.03 PORTLAND CEMENT CONCRETE PLANTS. Per M 157, except as modified herein, including the applicable requirements of Section 915.01.

915.03.01 Storage of Aggregate. Coarse and fine aggregate for use in Portland cement concrete shall be maintained at a uniform moisture content in excess of its saturated surface dry condition. Water added for this purpose shall meet the requirements given in Section 921.01.

915.03.02 Temperature of Water and Cement. The plant shall be equipped with approved methods of heating and cooling the mix. The temperature of the plastic concrete shall meet the requirements given in Section 902.10.03. The temperature of the cementitious materials and the mixing water at the time they are used in the mix shall not exceed 170 F.

915.03.03 Load Tickets. A MdSHA-approved computer generated batch ticket indicating the pertinent information per M 157 shall be provided in duplicate for each load. The ticket shall indicate maximum allowable water, and maximum water allowed for jobsite slump adjustment. Distribution shall be made as specified in Section 915.03.05(c)(2). The producer's copy shall be readily available for inspection upon request by the Engineer. A completed MdSHA Form 116 shall be issued for each load in the event a computer generated batch ticket cannot be provided.

915.03.04 Mixers and Agitators. The requirements for mixers and agitators and for mixing and delivery of ready mixed concrete shall conform to M 157 with the following exceptions:

(a) During transit, operate drums at agitating speed only. Mixing during transit is prohibited.

(1) At least 85 percent of design water requirement shall be added at the plant through the certified plant water meter.

(2) Water for slump adjustment may be added at the plant through the MdSHA-approved truck water system under the supervision of the certified concrete technician, provided the maximum specified water/cement ratio is not exceeded.

(3) A maximum of 3 gal of water per cubic yard of concrete may be added at the job site provided the maximum specified water/cement ratio is not exceeded.

(4) Adding water after partial discharge of the load is prohibited.

(b) Loading of mixers or agitators that contain wash water in the drum is prohibited.

(c) When the concrete is specified or permitted to be made by volumetric batching and continuous mixing, the batching and mixing unit shall meet C 685. Calibration shall meet MSMT 558.

Where no mixer performance tests are made for stationary mixers, the minimum mixing time is 75 seconds.

915.03.05 Certified Concrete Plant. Concrete plants providing material to Baltimore County projects shall be certified by the Maryland State Highway Administration (MdSHA) and shall satisfy all criteria outlined in the Maryland Department of Transportation State Highway Administration *Standard Specifications for Construction and Materials*, latest edition. The producer shall be responsible for quality control of plant operations to ensure that the material meets Specification requirements. The quality control process will be subject to unannounced periodic inspection by the Division of Construction Contracts Administration. Full participation in the inspection by the plant's certified technician will be required.

Initial Inspection. Any plant initially setting up and starting production will be subject to a comprehensive inspection to determine whether the plant equipment and personnel meet all applicable Specification requirements. The MdSHA will accept certification, signed and sealed by a Professional Engineer registered in the State of Maryland, that the plant facilities meet all applicable Specification requirements.

Responsibilities of the Concrete Producer.

(a) Notification. Notify the Engineer one working day prior to producing materials for County projects. Proceed with production only with the Engineer's approval.

(b) Quality Control. Have the certified concrete plant technician present while concrete is being batched and delivered to the project. This technician shall supervise concrete production.

(1) Develop and use an acceptable Quality Control Plan that addresses all elements necessary for quality control in the plants.

(2) The certified concrete plant technician shall perform control tests. This technician shall perform moisture tests, adjust proportions of aggregate for free moisture, complete and sign batch or approved delivery tickets, and ensure quality control of the batching operations.

(3) Technician certification will be awarded upon satisfactory completion of examinations per MSMT 560.

(4) Supply all necessary test equipment.

(5) Sample frequency shall meet the MSMT Frequency Guide, Table 1.

(c) Reports. The producer shall process the following reports:

(1) MdSHA Form 113, daily, stating that the material was sampled and tested in accordance with sampling and testing guidelines and complies with the applicable Specifications. Make a distribution to the producer's file and the Division of Construction Contracts Administration.

(2) MdSHA Form 116, for each load. Make a distribution to the Division of Construction Contracts Administration's project file and producer's file.

(3) Forms for all concrete materials sampled at the plant per MSMT Frequency Guide, Table 1.

(4) Test Worksheet, daily, for all tests performed at the plant.

915.03.06 Moisture Probes. Moisture probe readings may be used in place of actual daily moisture testing of fine aggregate. When used, moisture probes shall be calibrated and maintained per the manufacturer's recommendations. Actual moisture tests for the fine aggregate shall be performed weekly and as directed. When the actual tests of the fine aggregate indicate a difference of greater than 0.5 percent free moisture than that of the moisture probe readings, a second actual test shall be performed immediately. When the second test indicates a moisture difference of greater than 0.5 percent, then the moisture probe shall be recalibrated per the manufacturer's recommendations and verified. Records of all calibrations and weekly tests shall be maintained and made available to the Engineer.

915.04 BASE COURSE PLANTS.

915.04.01 Non-stabilized. Base course plants producing graded aggregate base material without a stabilizing agent shall meet the requirements of Sections 915.01, 915.04.03, and the following:

(a) The material is produced in a processing plant using an approved aggregate source.

(b) The Quality Control Plan shall be submitted to and approved by the MdSHA prior to production.

(c) The production shall meet the gradation requirements of the approved job mix formula.

(d) The required moisture content shall be maintained prior to shipment.

(e) Stockpiles shall be maintained to prevent segregation.

(f) Frozen aggregates shall not be used.

(g) Mixed material shall be handled and transported in a manner that will minimize segregation and the loss of moisture. All loads shall be covered in accordance with State laws unless hauling is off road and approved by the Engineer.

915.04.02 Stabilized. Stabilized base course plants shall meet the requirements of Sections 915.01, 915.04.03, and the following:

(a) Mechanical mixers shall be used, as approved. All plants shall be equipped with automatic cutoff devices interlocked so the plant will stop operating if delivery of any component of the mix fails.

(b) The amount of stabilization shall be determined per MSMT 254.

(c) The charge in a batch mixer or rate of feed to a continuous mixer shall not exceed that which will permit complete mixing of all materials.

(d) Mixed materials shall be handled and transported in a manner that will minimize segregation and loss of moisture or volatiles. All loads shall be covered in accordance with State laws unless hauling is off road and approved by the Engineer.

(e) When cement is used as a stabilizing agent, the amount of water added at the plant shall be controlled to obtain a uniform mixture that meets the required density.

(f) When emulsified asphalt is used as a stabilizing agent, all aggregate shall contain moisture in excess of the saturated surface dry condition at time of mixing.

915.04.03 Certification of Base Course Plants. The quality control and condition of all materials used in base courses, as well as all necessary adjustments required in using the materials, is the responsibility of the base course producer. The quality assurance process will be subject to unannounced periodic inspection by representatives of the Division of Construction Contracts Administration when County projects are in progress. The plant's certified technician shall participate in the inspection.

Inspection. Any plant initially setting up and starting production will be subject to a comprehensive inspection to determine whether the plant equipment and personnel meet all applicable Specification requirements. After the initial inspection the plant shall meet the requirements given in Section 915.01.04. The County will accept certification (signed and sealed by a Professional Engineer registered in the State of Maryland) that the plant facilities meet all applicable Specification requirements. However, the Engineer shall determine final acceptance.

Responsibilities of the Base Course Producer.

(a) Notification. Notify the Division of Construction Contracts Administration one working day prior to producing materials for County projects.

(b) Quality Control. The producer is responsible for quality control of plant operations to ensure that the material meets Specification requirements. All producers supplying base courses shall have a certified base course plant technician present while base course material is being plant mixed and delivered to the project. This technician shall supervise base course production.

(1) A certified base course plant technician shall perform Control tests. This technician shall obtain samples and test per MSMT Frequency Guide, Table 1 and 2.

(2) Technician certification will be awarded upon satisfactory completion of an examination per MSMT 562. The certification shall be as follows:

Applications for certification shall be obtained from the Engineer a minimum of 30 days prior to producing material for the County.

The Division of Construction Contracts Administration will contact the producer and schedule an examination based on AASHTO and MSMT procedures and knowledge of MdSHA's base course plant reports and documentation.

Upon satisfactory completion of the examination, a certificate will be issued.

(3) Supply all necessary test equipment and provide on-site facilities suitable for conducting the required tests. Off-site test facilities require approval by the Division of Construction Contracts Administration.

(c) Reports. The producer shall process the following reports:

(1) MdSHA Form 43, daily, stating that the material was sampled and tested using the MdSHA's sampling and testing guidelines and meets the applicable Specifications. Make a distribution to the Engineer and to the producer's file.

(2) MdSHA Form 88, for all additives introduced at the plant, frequency in accordance with Table 2. Make a distribution to the Engineer and to the producer's file.

(3) Daily Plant Certification Form showing that a technician was on duty at the plant. Make a distribution to the Division of Construction Contracts Administration's project file and producer's file.

(4) Test Worksheet, daily, for all tests performed at the plant.

(5) Base course plant checklist daily. Make a distribution to producer's file.

915.05 CERTIFIED PRECAST CONCRETE PLANTS. The National Precast Concrete Association shall certify all plants that produce precast concrete items for the County. The producer is responsible for quality control plant operations to ensure that the material meets Specifications. The quality control process will be subject to unannounced periodic inspection by representatives of the Division of Construction Contracts Administration. The plant's certified technician shall fully participate in the inspections.

Initial Inspection. Any plant initially setting up and starting production will be subject to a comprehensive inspection to determine whether plant equipment and personnel meet all

applicable Specifications and that suitable testing facilities will be available. The County will accept signed and sealed certification by a Professional Engineer registered in the State of Maryland that the plant facilities meet all applicable Specifications; however, the Engineer shall determine final acceptance.

915.05.01 Responsibilities of the Precast Concrete Producer.

(a) Notification. Notify the Engineer at least two working days prior to producing materials for County projects.

(b) Quality Control Procedures. Quality control procedures shall include the following:

(1) Sampling and testing shall be in accordance with Tables 1, 2, and 3 of the MSMT Sample Frequency Guide.

(2) The method of inspecting reinforcement steel placement and forms prior to pouring concrete.

(3) The method of curing the concrete.

(4) The method of maintaining accurate quality control records.

(5) Samples of documents approved by the Engineer.

(6) Patching procedures.

(7) Methods of preparing the concrete units for shipment.

(8) A method of identifying each piece as tested and approved by quality control.

(c) Quality Control Plan. Submit a Quality Control Plan prior to the start of production. The plan shall indicate the following:

(1) All precast concrete products shall meet the Standards or approved working drawings. All materials shall be from a MdSHA-approved source and meet all applicable Specifications.

(2) The plan shall indicate how the producer intends to handle all of its materials. Certification of materials shall be as specified in the MSMT Sample Frequency Guide.

(3) The names, qualifications, and responsibilities of a Quality Control Manager and a Quality Control Technician.

(d) Quality Control Technician. The Quality Control Technician may be approved if certified from at least one of the following:

(1) The Precast/Prestressed Concrete Institute Plant Certification Program, PCI Technician Level I, minimum.

(2) American Concrete Institute, ACI Field Technician Level I.

(e) Test Equipment and Facilities. Supply all necessary test equipment and provide County-approved facilities suitable for conducting the various tests required. The Engineer shall approve any off site test facilities.

SECTION 916 – SOIL AND SOIL-AGGREGATE BORROW

916.01 BORROW EXCAVATION. All borrow excavation shall be a soil or soil aggregate mixture and shall conform to the following:

Maximum dry density and optimum moisture content of the material shall be determined as specified in T 180, Method C unless the material has more than 35 percent retained on the No. 4 sieve, in which case Method D shall be used. Material with a maximum dry density of less than 100 lb/cu.ft. is unsatisfactory and shall not be used in embankments unless otherwise specified in the Contract Documents. Potentially expansive materials, such as steel slag, are prohibited.

Recycled Portland cement concrete or HMA pavement may be used as select borrow, capping borrow and modified borrow with the written approval of the Engineer. Recycled Portland cement concrete, recycled HMA pavement and processed contaminated soil are prohibited for use within one foot of the surface of any area to be vegetated. All recycled or re-handled materials shall meet Section TC-6.09.

916.01.01 Select Borrow. Select borrow shall conform to A-2, A-3 or A-2-4 material as specified in the Contract Documents. The maximum dry density shall not be less than 105 lb/cu.ft.

916.01.02 Capping Borrow. Capping borrow shall conform to the Select Borrow requirements except when A-3 material has less than 10 percent retained on the No. 10 sieve, at least 15 percent shall pass the No. 200 sieve. Sieve analysis shall be determined using T 88.

916.01.03 Modified Borrow. Modified borrow shall have a minimum of 50 percent retained on the No. 4 sieve, a liquid limit not greater than 30 when tested as specified in T 89, and a

plasticity index not greater than 9 when tested as specified in T 90. The maximum dry density shall not be less than 125 lb/cu.ft. A-5 material, as defined in the Contract Documents, shall not be used.

916.01.04 Common Borrow. Common borrow shall have a maximum dry density of not less than 100 lb/cu.ft.

SECTION 917 – MISCELLANEOUS PROTECTIVE COATINGS

917.01 EPOXY PROTECTIVE COATINGS FOR CONCRETE. Protective coatings shall be two component epoxy systems for use in conjunction with concrete. One component shall be a clear or pigmented condensation product of the reaction of epichlorohydrin with bisphenol A, the resin of which shall be composed of 100 percent reactive constituents. The other component shall be a clear polyamide hardener.

The producer shall submit a sample of each component for laboratory analysis. The sample shall be coded as the original sample. The original and all subsequent samples shall conform to the following:

TEST PROPERTY	TEST METHOD	SPECIFICATION LIMITS
Pot Life, hr min	Fed. Spec TT-C-535	8
Color	Fed. Std. 595	Gray No. 26440
Dry Film Thickness 1st coat, mil min 2nd coat, mil min	D 1005	 2 3
Sagging	D 4400	Must pass test for Recommended film Thickness
Flexibility	Federal Spec TT-P-115	Must not crack, check or delaminate
Infrared Spectrogram	Equipment Manufacturer's Procedure	Each component shall match original sample
Tensile Strength, psi min	MSMT 609	400

917.02 FUSION BONDED EPOXY POWDER COATINGS FOR STEEL. M 284. The epoxy protective coating shall be a one-coat, heat curable, thermosetting powdered coating that is electrostatically applied on metal surfaces as specified. The coating color shall be bright for reinforcement steel, in order to contrast with the normal color of reinforcement and

rust (e.g. orange, red, green, yellow etc. and not brown or any color in the rust family). Reinforcement steel coated before fabrication shall have all hairline cracks and minor damage on fabrication bends patched, even if there is no bond loss. The Design Division of the Bureau of Engineering and Construction shall approve epoxy coating material.

917.02.01 Touch-Up System. Material used for the touch-up system shall be a two-part epoxy system designated and color matched for patching the epoxy coating used.

Patching material shall be available through the manufacturer of the epoxy powder. The patching material shall be fully cured one hour after application at 35 F ambient.

917.02.02 Certification. The manufacturer shall furnish certification as specified in Section GP-1.05.

917.03 FUSION BONDED POLYESTER POWDER.

917.03.01 Materials. The polyester powder shall be super durable TGIC (Triglycidyl Isocyanurate) polyester conforming to the requirements given in Section 917.03.02. The Design Division of the Bureau of Engineering and Construction shall approve the polyester powder.

917.03.02 Polyester Qualification Requirements. The following physical tests will only be required to qualify the polyester, and will not be required for certification:

TEST PROPERTY	TEST METHOD	SPECIFICATION LIMITS
Abrasion Resistance	Taber Abraser CS-10, 1000 gm load, 1000 cycles, D 1044	100 mg max weight loss
Adhesion	D 3359, Method A (Bonderite 1000 panel)	Rating 5A
Gloss	D 523, 60° initial	30 - 45 per Fed. Std 595
Hardness	D 3363	Min 2H - No gouge
Impact	D 2794	Pass 80 in·lb
Salt Spray Resistance	B 117, D 1654 1000 hr (Bonderite 1000 panel)	Table 2, Rating 7
Thickness	G 12	7 ± 2 mils
Color	E 1331	As specified in the Contract Documents from Fed. Std. 595 Color No. 20040
Infrared Spectrogram	Equipment manufacturer's procedures	Manufacturer's IR
Weather Resistance	D 4587, test condition D Test shall be conducted with a UVA lamp (340 nm peak) for 1000 hr	50 % min gloss retention
Specific Gravity	D 5965	Manufacturer's result
Chloride Permeability	A 775, A 1.3.4	<0.0001*M*

917.03.03 Certification. The polyester powder manufacturer shall furnish production batch certification as specified in Section GP-1.05 showing conformance to the following:

TEST PROPERTY	TEST METHOD	SPECIFICATION LIMITS
Infrared Spectrogram	D 2621	Match Qualification sample
Taber Abrasion Resistance, mg loss, max	D 4060	100
Specific Gravity	D 5965 (Method A)	Qualification sample ± 0.02
Color	E 1331	Match Fed. Std. 595 color no. specified in Contract Documents

917.03.04 Acceptance. Acceptance will be based on the quality control test results required on the manufacturer's certification. The coating applicator shall be responsible for reviewing certifications to ensure conformance to Section GP-1.05. The coating applicator shall also maintain a file of all reviewed certifications.

917.04 EMULSIFIED ASPHALT PROTECTIVE COATINGS FOR METAL. D 1187, Type I. Provide a thick film of emulsified asphalt as a protective coating between dissimilar

metals and on metal surfaces which will be in contact with concrete, mortar, or absorptive materials subject to wetting. Emulsified asphalt shall be asbestos-free.

SECTION 918 – TRAFFIC BARRIERS

918.00 CERTIFICATION. The manufacturer shall furnish certification as specified in Section GP-1.05.

918.01 TRAFFIC BARRIER W BEAM. Rail elements and end treatments shall conform to M 180, Type II or IV. In lieu of galvanizing, rail elements may be coated with a minimum of 5 mil dry film thickness of inorganic zinc rich primer conforming to the requirements of Section 912.02.01. The primer shall be applied as specified by the manufacturer after the rail elements are fabricated.

918.02 TRAFFIC BARRIER POSTS. Posts shall conform to ASTM A36 for steel and M 111 for galvanized coating. In lieu of galvanizing, posts may be coated with a minimum of 5 mil dry film thickness of inorganic zinc rich primer conforming to the requirements of Section 912.02.01. The primer shall be applied as specified by the manufacturer after the posts are fabricated.

918.03 HARDWARE FOR TRAFFIC BARRIERS. Hardware for traffic barriers shall conform to ASTM A36 for quality of steel and M 232 for galvanized coating.

918.04 TIMBER RAIL AND POSTS. Timber rail and posts shall conform to M 168.

918.05 WIRE ROPE. Wire rope shall conform to Federal Specification RR-W-410, Type I, General Purpose, Class 2, 6 by 19, improved plow steel, fiber core. The individual wire strands shall have a zinc coating of 0.8 oz/sq.ft. when tested as specified in T 65.

SECTION 919 – RESERVED

SECTION 920 – LANDSCAPING MATERIALS

920.01 SOILS. Topsoil, Subsoil, and Bioretention Soil Mix shall conform to requirements of this section. Soils shall be sampled, tested and approved per specifications of MSMT 356 or by other approved tests or laboratories. Soils shall be amended as specified by the Nutrient Management Plan (NMP).

920.01.01 Salvaged Topsoil. The surface material classified as topsoil that is removed from the project and stored for reuse. Salvaged topsoil shall conform to the following:

COMPOSITION - SALVAGED TOPSOIL					
TEST PROPERTY	**TEST METHOD**	**TEST VALUE AND AMENDMENT**			
Prohibited Weeds	—	Free of seed or viable parts of shattercane, Johnsongrass, Canada thistle, bull thistle, plumeless thistle, musk thistle, and common reed when inspected before transportation.			
Debris	—	1.0 % or less by weight of cement, concrete, asphalt, crushed gravel or construction debris when inspected.			
Grading Analysis	R 58	**Sieve Size**		**Passing by Weight Minimum %**	
		2 in.		100	
		No. 4		90	
		No. 10		80	
Textural Analysis	T 88	**Particle**		**% Passing by Weight**	
		Size	**mm**	**Minimum**	**Maximum**
		Sand	2.0 – 0.050	20	75
		Silt	0.050 – 0.002	10	60
		Clay	less than 0.002	5	30
Soil pH	D 4972	pH of 4.8 to 7.4. Apply limestone to soil with pH 4.8 to 6.1 per NMP. Apply sulfur or iron sulfate to soil with pH 7.1 to 7.4 per NMP.			
Organic Matter	T 194	1.0 to 8.0 % OM by weight. Apply compost to soil with 1.0 to 1.7% OM per NMP to achieve at least 2.0% OM.			
Nutrient Content	Mehlich-3	County will assess. Apply fertilizer per NMP for nitrogen requirement and optimum fertility index values (FIV) for phosphorus and potassium.			
Soluble Salts	EC1:2 (V:V)	800 ppm or less. Apply gypsum to soil with 500 to 800 ppm per NMP.			
Harmful Materials	—	Shall not contain substances in concentrations that are harmful to human health, water quality, or plant growth. Industrial waste such as ash, slag, raw sludge, dredge spoil, or similar materials shall not be soil components.			

920.01.02 Furnished Topsoil. A natural, friable, surface soil that is uniform in color and texture, and not derived from the project.

Furnished topsoil shall conform to the following:

(a) Composition.

COMPOSITION - FURNISHED TOPSOIL		
TEST PROPERTY	**TEST METHOD**	**TEST VALUE AND AMENDMENT**
Prohibited Weeds	—	Free of seed and viable parts of species in Section 920.01.01, and viable parts of Bermudagrass, quackgrass, and yellow nutsedge.
Debris	—	Section 920.01.01
Grading Analysis	R 58	Section 920.01.01
Textural Analysis	T 88	Section 920.01.01

COMPOSITION - FURNISHED TOPSOIL		
TEST PROPERTY	**TEST METHOD**	**TEST VALUE AND AMENDMENT**
Soil pH	D 4972	pH of 5.2 to 7.4. Apply limestone to soil with pH 5.2 to 6.1 per NMP. Apply sulfur or iron sulfate to soil with pH 7.1 to 7.4 per NMP.
Organic Matter	T 194	Section 920.01.01
Nutrient Content	Mehlich-3	Section 920.01.01
Soluble Salts	EC1:2 (V:V)	500 ppm or less.
Harmful Materials	—	Section 920.01.01

(b) Storage. Soil shall be a homogenous mixture stored at a specific, identifiable site in a stockpile constructed as specified in Section 701.03.02(c).

(c) Approval. Ensure that MdSHA Form 27B has been completed and that a source of supply letter for the soil has been submitted and approved. Tests shall be completed and approval granted before soil is delivered.

(d) Certification and Delivery. Certification shall be submitted that the soil is delivered from an approved stockpile. Certification shall accompany the first load of soil delivered each day.

920.01.03 RESERVED.

920.01.04 RESERVED.

920.01.05 Bioretention Soil Mix (BSM). A homogeneous mixture composed by loose volume of 5 parts Coarse Sand, 3 parts Base Soil, and 2 parts Fine Bark. BSM shall conform to the following:

(a) Components. Components of BSM shall be sampled, tested and approved before mixing as follows:

(1) Coarse Sand. MSMT 356. Coarse Sand shall be washed silica sand or crushed glass that conforms to ASTM Fine Aggregate C 33. Coarse Sand shall include less than 1% by weight of clay or silt size particles, and less than 5% by weight of any combination of diabase, greystone, calcareous or dolomitic sand.

(2) Base Soil. Base Soil shall be tested and certified by the producer to conform to the following requirements:

COMPOSITION - BASE SOIL					
TEST PROPERTY	**TEST METHOD**	**TEST VALUE AND AMENDMENT**			
Prohibited Weeds	—	Free of seed and viable plant parts of species in Sections 920.06.02(a), (b), and (c) when inspected.			
Debris	—	No observable content of cement, concrete, asphalt, crushed gravel or construction debris when inspected.			
Grading Analysis	R 58	**Sieve Size**		**Passing by Weight Minimum %**	
		2 in.		100	
		No. 4		90	
		No. 10		80	
Textural Analysis	T 88	**Particle**		**% Passing by Weight**	
		Size	**mm**	**Minimum**	**Maximum**
		Sand	2.0 – 0.050	50	85
		Silt	0.050 – 0.002	5	45
		Clay	less than 0.002	5	10
Soil pH	D 4972	pH of 5.7 to 6.9.			
Organic Matter	T 194	1.0 to 10.0 % by weight.			
Soluble Salts	EC1:2 (V:V)	500 ppm or less.			
Harmful Materials	—	Section 920.01.01			

(3) Fine Bark. Fine Bark shall be the bark of hardwood trees that is milled and screened to a uniform particle size of 2 in. or less. Fine Bark shall be composted and aged for 6 months or longer, and be free from sawdust and foreign materials.

A 1 to 2 lb sample of Fine Bark shall be submitted to the Engineer for examination.

(b) Composition. BSM shall be sampled and tested according to the requirements of MSMT 356 and conform to the following:

COMPOSITION- BIORETENTION SOIL MIX (BSM)					
TEST PROPERTY	**TEST METHOD**	**TEST VALUE AND AMENDMENT**			
Weeds	—	Free of seed and viable plant parts of species in Sections 920.06.02(a), (b), and (c) when inspected.			
Debris	—	Section 920.01.05(a)(2)			
Textural Analysis	T 88	**Particle**		**% Passing by Weight**	
		Size	**mm**	**Minimum**	**Maximum**
		Sand	2.0 – 0.050	55	85
		Silt	0.050 – 0.002	–	20
		Clay	less than 0.002	1	8
Soil pH	D 4972	pH of 5.7 to 7.1.			
Organic Matter	T 194	Minimum 1.5 % by weight.			

COMPOSITION- BIORETENTION SOIL MIX (BSM)						
TEST PROPERTY	**TEST METHOD**	**TEST VALUE AND AMENDMENT**				
Nutrient Analysis and Soluble Salts	Mehlich-3	**Concentration**				
		Element	**Minimum**		**Maximum**	
			ppm	**FIV**	**ppm**	**FIV**
		Calcium (Ca)	32	25	no limit	no limit
		Magnesium (Mg)	15	25	no limit	no limit
		Phosphorus (P)	18	25	92	100
		Potassium (K)	22	25	no limit	no limit
		Sulfur (SO_4)	25	n/a	no limit	no limit
	EC1:2 (V:V)	Soluble Salts	40	n/a	500	n/a
Harmful Materials	—	Section 920.01.01				

(c) Amendment or Failure. BSM that does not conform to composition requirements for pH or nutrient analysis shall be amended as specified by the NMP. BSM that exceeds maximum phosphorus concentration or fails other composition requirements will not be accepted, and shall not be delivered or used as BSM.

(d) Storage. Section 920.01.02(b). BSM shall be stored in a stockpile that is protected from weather under tarp or shed. BSM stored for 6 months or longer shall be re-sampled, re-tested, and re-approved before use.

(e) Approval. Section 920.01.02(c).

(f) Certification and Delivery. Section 920.01.02(d).

920.02 SOIL AMENDMENTS.

920.02.01 Limestone. Limestone shall be an approved agricultural product manufactured and labeled for increasing soil pH. Limestone shall contain at least 85 percent calcium and magnesium carbonates. Dolomitic limestone shall contain at least 10 percent magnesium as magnesium oxide and 85 percent calcium and magnesium carbonates.

Limestone shall be supplied as a fine powder, or as pellets produced from fine powder, that conforms to the following:

LIMESTONE GRADING ANALYSIS	
SIEVE Size Number	**PASSING BY WEIGHT Minimum %**
10	100
20	98
100	50

920.02.02 Sulfur. Sulfur shall be an approved agricultural product manufactured and labeled for reducing soil pH. Sulfur labeled as a fertilizer may also be used to supply sulfur as a plant nutrient. Sulfur shall be supplied as a fine powder or pelletized powder with a minimum purity of 90 percent elemental sulfur.

920.02.03 Iron Sulfate. Iron sulfate shall be an approved agricultural product manufactured and labeled for reducing soil pH. Iron sulfate labeled as a fertilizer may also be used to supply sulfur or iron as a plant nutrient. Iron sulfate shall be supplied as a fine powder or pelletized powder with a minimum purity of 15 percent water soluble iron derived from ferrous sulfate.

920.02.04 Gypsum. Gypsum shall be an approved agricultural product manufactured and labeled as an aid for improving soil structure and removing soil soluble salts, or as a fertilizer to supply calcium and sulfate. Gypsum shall be supplied as a fine powder or pelletized powder with a minimum purity of 68 percent calcium sulfate dihydrate.

920.02.05 Compost.

(a) Compost Types. Compost shall be either Type A (biosolids) or Type B (source-separated), and will be subject to approval by the Engineer as follows:

(1) Biosolids Compost (Type A). Type A Compost shall be approved for distribution by the Maryland Department of the Environment (MDE).

(2) Source-Separated Compost (Type B). Type B Compost shall be produced by a compost operator who is certified by the Maryland Department of Agriculture (MDA).

Type B Compost shall be tree leaf compost or non-tree leaf compost. Type B Compost produced from lawn clippings shall be tested for contaminants in conformance with Maryland law and regulations.

(b) Stability. Compost shall be biologically mature and no longer able to reheat to thermophilic temperatures.

(c) pH. Compost shall have a pH of 6.0 to 7.5 except when specified in Sections 710 and 711 where it shall have a pH of 6.0 to 7.0.

(d) Soluble Salts. Type A Compost shall have a soluble salt concentration less than 10.0 mmhos/cm, and Type B Compost shall have soluble salts concentration less than 5.0 mmhos/cm.

(e) Moisture. Compost shall have a moisture content of 30 to 55 percent.

(f) Particle Size and Grading. Compost shall be screened so that it has a uniform particle size of 0.5 in. or less, with grading analysis as follows:

COMPOST GRADING ANALYSIS	
SIEVE SIZE mm	**PASSING BY VOLUME Maximum %**
4.75	90
0.425	25
0.075	2.2

920.02.06 Peat Moss. A milled sphagnum peat moss with negligible woody substances.

920.02.07 Aged Pine Bark Fines. Derived from the bark of pine trees that have been composted and milled to a fineness approved for use by the Engineer.

920.02.08 Water Absorbent Gel. A cross linked polyacrylamide agricultural product used to maintain moisture around bare root plants and as a soil conditioner. Formulas used shall conform to the manufacturer's recommendations.

920.03 FERTILIZERS.

920.03.01 Composition. Fertilizers shall be commercial grade labeled for use as agricultural fertilizer, and shall conform to Federal and Maryland State regulations and the Standards of the Association of Official Analytical Chemists. All analyses are subject to approval by the Engineer prior to application.

Standard and Special Fertilizers shall be the following:

(a) Standard Fertilizer. Standard fertilizers shall be produced of ingredients, analysis, and composition as follows:

(1) Ingredients. One or more of the following:

FERTILIZER INGREDIENTS	
ammonium nitrate	polymer coated urea
ammonium sulfate	potassium chloride
biosolids	potassium sulfate (SOP)
diammonium phosphate (DAP)	sulfur coated urea
isobutylidene diurea	triple super phosphate
methylene urea	urea
monoammonium phosphate (MAP)	ureaform (UF)

(2) Analysis and Composition. Standard fertilizers shall contain nitrogen (N), phosphorus (P), potassium (K), and sulfate (SO_4) derived from ingredients above.

STANDARD FERTILIZER ANALYSIS and COMPOSITION		
FERTILIZER	**USE**	**SECTION**
0-0-50 SOP [a]	Supply P and SO_4	705, 706, 707, 708, others
5-20-20 [b]	Refertilization	705
11-52-0 MAP [a]	Supply N and P	706, 707, others
15-30-15 [b]	Temporary seeding	704
20-16-12 (83% UF with MAP and SOP) [c]	Turfgrass establishment and other seeding	705, 706, 707, 708, 709
38-0-0 UF [a]	Slow-release N	705, 706, 707, 708, others

[a] Purity shall be at least 98% UF, MAP, or SOP as indicated.
[b] Shall be a mixture of any ingredients listed in Section 920.03.01(a)(1) with no more than 2% by weight of any combination of other materials.
[c] Shall be a mixture of UF, MAP, and SOP with no more than 2% by weight of any combination of other materials.

(b) Special Fertilizers. Special fertilizers shall be of ingredients, analysis, and composition as follows:

(1) Ingredients. Special fertilizers shall provide label analysis guaranteeing nitrogen, phosphorus, and potassium from ingredients in (a) and also include plant micronutrients, coatings, or materials to augment their performance.

(2) Analysis and Composition. As follows:

SPECIAL FERTILIZER ANALYSIS and COMPOSITION		
FERTILIZER*	**USE**	**SECTION**
14-14-14 Polymer-coated with minor nutrients	Plant installation.	710, 711
20-10-5 21 to 23 grams per tablet. 13% water insoluble and 7% water soluble N, with minor nutrients	Tree, shrub, vine installation.	710
20-20-20 Water soluble powder with minor nutrients	Fertilizer solution application after plant installation.	710, 711, others

* Shall be a mixture of any ingredients listed in Sections 920.03.01(a)(1) and (b)(1) with no more than 5% by weight of any combination of other materials.

920.04 MULCHES. Materials used as mulch shall have a uniform texture and be free from foreign materials or concentrations of metals, chemicals, or other substances that are harmful to human health, water quality, or plant growth.

920.04.01 Straw Mulch. Shall consist of thoroughly threshed stems and leaves of barley, oats, rye, and wheat.

Straw mulch shall be in an air-dry condition suitable for application with a mulch blower or other equipment.

Straw mulch shall be visually inspected to ensure it is free of objectionable quantities of mold, foreign substances, and weed seeds.

920.04.02 Wood Cellulose Fiber Mulch. A uniformly processed wood product that is able to form a homogeneous slurry with seed, fertilizer, and other materials under agitation with water.

The fiber shall perform satisfactorily in hydraulic seeding equipment without clogging or damaging the system. The slurry shall contain a green dye to provide easy visual inspection for uniformity of application.

The manufacturer shall furnish certification as specified in Section GP-1.05 of the Technical Association of Pulp and Paper Industry (TAPPI) in conformance with the following:

WOOD CELLULOSE FIBER	
TEST PROPERTY	**TEST VALUE**
Particle Length	Approx. 0.5 in.
Particle Thickness	Approx. 0.063 in.
Net Dry Weight Content	Minimum as stated on bag
pH, TAPPI Standard T 509,	4.0 – 8.5
Ash Content, TAPPI Standard T 413	7.0% maximum
Water Holding Capacity	90% minimum

The material shall be delivered in packages of uniform weight, which shall not exceed 75 lb net weight and shall bear the name of the manufacturer, the net weight, and a supplemental statement of the net weight content.

920.04.03 Shredded Hardwood Bark (SHB) Mulch. Shall consist of natural bark derived from hardwood trees that has been milled and screened to a maximum 4 in. particle size.

SHB mulch shall contain negligible quantities of sawdust or other non-bark woody materials.

920.04.04 Composted Wood Chip (CWC) Mulch. Shall consist of natural wood mechanically reduced to a maximum size of 2 x 2 x 0.5 in. by a chipping machine before being composted.

Grading analysis of CWC mulch shall be as follows:

COMPOSTED WOOD CHIP MULCH	
SIEVE SIZE in.	**PASSING BY VOLUME Maximum %**
2	100
1	30
0.5	10

920.05 SOIL STABILIZATION MATTING.

920.05.01 Soil Stabilization Matting (SSM). SSM products shall be selected from the MdSHA Office of Materials Technology's *Qualified Products List for Soil Stabilization Matting Manufacturers*.

SSM shall consist of machine-produced matting of uniform thickness, weave, or distribution of fibers supplied in rolls at least 40 in. wide. SSM shall be smolder resistant.

The chemical components shall be nonleaching, nontoxic to vegetation and germinating seed, and noninjurious to the skin. SSM shall conform to the following:

SOIL STABILIZATION MATTING				
TEST PROPERTY and METHOD	**TYPE A**	**TYPE B**	**TYPE C**	**TYPE D**
Functional Longevity	Degradable; 24 months	Non-degradable; Permanent	Non-degradable; Permanent	Degradable; 48 months
Matting Fiber	Excelsior	Non-woven; synthetic, UV-stabilized	Synthetic lattice; easily soil infilled and compacted.	Woven coir
Netting on Top and Bottom	Degradable, synthetic	Non-degradable synthetic; UV-stabilized	–	–
Netting Opening	No more than 2.0 x 1.0 in.	No more than 0.75 x 0.75 in.	–	–
Stitching, Thread, and Spacing	Degradable, no more than 4.0 in. apart	Non-degradable, UV-stabilized, synthetic, no more than 4.0 in. apart	–	–
Thickness D 6525	At least 0.25 in.	At least 0.30 in.	At least 0.50 in.	At least 0.30 in.
Weight D 6475	At least 9.6 oz per sq.yd.	At least 10.0 oz per sq.yd.	At least 7.0 oz per sq.yd.	At least 19.0 oz per sq.yd.
Tensile Strength (MD) D 6818	At least 6.25 lb per in.	At least 12.5 lb per in.	At least 14.6 lb per in.	–
Tensile Strength (TD) D 6818	At least 4.7 lb per in.	At least 12.5 lb per in.	At least 14.6 lb per in.	–

SOIL STABILIZATION MATTING				
TEST PROPERTY and METHOD	**TYPE A**	**TYPE B**	**TYPE C**	**TYPE D**
Tensile Strength > 500 hr. exp. D 4355	–	At least 80% of original	At least 80% of original	–
Light Penetration D 6567	At least 15 %	At least 15%	–	–
Porosity or Open Area	–	–	At least 80%	At least 35%
Soil Loss Ratio at 2 in. per hr. for 30 min. D 6459	At least 5.0 to 1	At least 5.0 to 1	–	–
Shear for 0.5 in. soil loss D 6460	At least 1.75 lb per sq.ft.	At least 2.5 lb per sq.ft.	–	–

920.05.02 Fasteners for Soil Stabilization Matting and Turfgrass Sod. Fasteners marked 'X' shall be used as specified in Section 709.03.05 and conform to the following:

(a) Wood Peg.

WOOD PEG. Wood, biodegradable, Untreated; single leg is driven into the soil so that wider top is flush with turfgrass sod and SSM.	**Turfgrass Sod**	**Soil Stabilization Matting**		
		Type A	**Type B**	**Type C and D**
Approx. 6 in. long, 3/8 in. thick; top 1 in. wide, tapered to base.	X	X		

(b) T-Head Pin.

T-HEAD PIN. Molded plastic; biodegradable. Single leg with barbs is driven into the soil so that molded T-Head top is flush with turfgrass sod and SSM.	**Turfgrass Sod**	**Soil Stabilization Matting**		
		Type A	**Type B**	**Type C and D**
Approx. 6 in. long, 3/8 in. thick; head 1 in. wide.	X	X		

(c) Circle-Top Pin.

CIRCLE-TOP PIN. Steel wire; single leg is driven into the soil so that coil or loop top is flush with turfgrass sod and SSM.	**Turfgrass Sod**	**Soil Stabilization Matting**		
		Type A	**Type B**	**Type C and D**
11 gauge; leg 6 in long.	X	X		
11 gauge; leg 8 in. long.	X	X		

(d) Round-Head Pin.

ROUND-HEAD PIN. Molded plastic; biodegradable. Single leg with barbs is driven into the soil so that molded disk top is flush with turfgrass sod and SSM.	**Turfgrass Sod**	**Soil Stabilization Matting**		
		Type A	**Type B**	**Type C and D**
Approx. 6 in long; head 1 in. dia.	X	X		
Approx. 8 in long; head 1 in. dia.	X	X		

(e) U-Shape Staple.

U-SHAPE STAPLE. Steel wire; two main legs are driven into the soil so that top of staple is flush with turfgrass sod and SSM.	**Turfgrass Sod**	**Soil Stabilization Matting**		
		Type A	**Type B**	**Type C and D**
11 gauge bent into U shape; legs 6 in. long; top 1 to 1-1/2 in. wide.	X	X		
8 gauge bent into U shape; legs 8 in. long; top 1 to 1-1/2 in. wide.	X	X	X	X
8 gauge bent into U shape.; legs 12 in. long; top 1 to 1-1/2 in. wide			X	X

(f) Fabric Pin.

FABRIC PIN. Steel nail; single leg is driven into the soil so that steel washer top is flush with SSM.	**Turfgrass Sod**	**Soil Stabilization Matting**		
		TYPE A	**Type B**	**Type C and D**
11 gauge approx. 12 in. long.			X	X
3/16 in. approx 18 in. long.			X	X

920.06 SEED AND TURFGRASS SOD STANDARDS.

920.06.01 Names and Naming. The authority for common and scientific names shall be the USDA NRCS, The Plants Database website at http://plants.usda.gov. Cultivar names shall be those of the registered cultivar.

Plant and seed identification, tags, and labels shall correspond to the common name and scientific name of the species in The Plants Database. The Engineer shall resolve any conflict in names or naming.

920.06.02 Prohibited Weeds.

(a) Weeds Prohibited in Turfgrass Sod and SHA Seed Mixtures. Turfgrass Sod, SHA Turfgrass Seed Mix, SHA Temporary Seed Mix, and Additive Seed shall be free from seed or viable parts of the following species:

WEEDS PROHIBITED IN TURFGRASS SOD AND SHA SEED MIXTURES	
COMMON NAME	**SCIENTIFIC NAME**
annual bluegrass	*Poa annua* L.
balloonvine	*Cardiospermum halicacabum* L.
Bermudagrass	*Cynodon dactylon* (L.) Pers.
Canada Thistle	*Cirsium arvense* (L.) Scop.
Carolina horsenettle	*Solanum carolinense* L.
common corncockle	*Agrostemma githago* L.
common reed = phragmites	*Phragmites australis* (Cav.) Trin. ex Steud.
crested anoda = spurred anoda	*Anoda cristata* (L.) Schltdl.
dodder	*Cuscuta spp.* L.
field bindweed	*Convolvulus arvensis* L.
Japanese bristlegrass = giant foxtail	*Setaria faberi* Herrm.
Java-bean = sicklepod	*Senna obtusifolia* (L.) Irwin and Barneby
Johnsongrass	*Sorghum halepense* (L.) Pers. and hybrids
meadow garlic = wild onion	*Allium canadense* L.
plumeless thistle	*Carduus* L.
quackgrass	*Elytrigia repens* (L.) Gould
Rough cocklebur	*Xanthium strumarium* L.
serrated tussock	*Nassella trichotoma* (Nees) Hack.
wild garlic	*Allium vineale* L.
yellow nutsedge	*Cyperus esculentus L.*

(b) Weeds Prohibited in Meadow and Wildflower Seed. Meadow and Wildflower Seed shall be free of species listed in (a) and the following species:

WEEDS PROHIBITED IN MEADOW and WILDFLOWER SEED	
COMMON NAME	**SCIENTIFIC NAME**
asiatic tearthumb = mile-a-minute	*Polygonum perfoliatum* L.
burdock and related species	*Arctium* L.
canarygrass and related species	*Phalaris* L.
common wormwood = mugwort	*Artemisia vulgaris* L. var. *vulgaris*
dogbane and related species	*Apocynum* L.
eastern poison ivy	*Toxicodendron radicans* (L.) Kuntze
fig buttercup = lesser celandine	*Ranunculus ficaria* L. var. *bulbifera* Marsden-Jones
garlic mustard	*Alliaria petiolata* (M. Bieb.) Cavara and Grande
Giant hogweed	*Heracleum mantegazzianum* Sommier and Levier

WEEDS PROHIBITED IN MEADOW and WILDFLOWER SEED	
COMMON NAME	**SCIENTIFIC NAME**
Japanese honeysuckle, Tatarian honeysuckle and related species	*Lonicera* L.
Japanese Knotweed	*Polygonum cuspidatum* Siebold and Zucc.
lesser knapweed = spotted knapweed	*Centaurea nigra* L.
multiflora rose	*Rosa multiflora* Thunb.
Nepalese browntop = Japanese stiltgrass	*Microstegium vimineum* (Trin.) A. Camus
purple loosestrife and related species	*Lythrum* L.
poison hemlock	*Conium maculatum* L.
silvergrass and related species	*Miscanthus* Andersson
thistle and related species	*Cirsium* Mill., *Onopordum L.*

(c) Weeds Prohibited in Shrub Seed. Shrub Seed shall be free of species listed in (a) and (b) and the following species:

WEEDS PROHIBITED IN SHRUB SEED	
COMMON NAME	**SCIENTIFIC NAME**
common buckthorn	*Rhamnus cathartica L.*
Burningbush	*Euonymus alatus* (Thunb.) Siebold
Japanese barberry	*Berberis thunbergii* DC.
oriental bittersweet	*Celastrus orbiculatus* Thunb.
privet, etc.	*Ligustrum L.*
oleaster; Russian olive, autumn olive, related species	*Elaeagnus L.*
tree of heaven	*Ailanthus altissima* (Mill.) Swingle

920.06.03 Turfgrass Sod. Turfgrass Sod shall be Maryland Certified Sod and comply with the Maryland Turfgrass Law and Regulations of the State of Maryland.

(a) Each load of turfgrass sod shall bear a Maryland State Certified Label and be in good health at the time of delivery.

(b) Turfgrass sod shall be field grown in the State of Maryland and be sufficiently knitted when harvested to resist breakage under normal handling.

(c) Prior to harvest, Tall Fescue sod shall be mowed to a height of 2.0 to 3.5 in. Bermudagrass sod shall be mowed from 0.75 to 1.0 in. height.

(d) Turfgrass sod shall be machine cut in strips at least 14 in. wide.

(e) Turfgrass sod shall be uniform thickness of 0.75 to 1.25 in., excluding top growth, with thatch thickness less than 3/8 in.

920.06.04 Approved Cultivars. Refer to '*Specifications for Seed and Seed Mixes'*, a list of cultivars of species approved for use in seed mixes and specifications maintained by the MdSHA Landscape Operations Division. Only cultivars included on that list may be used. When no cultivar is specified, any common type cultivar of the species may be provided.

920.06.05 Seed Testing and Sampling. Seed shall comply with the Maryland Seed Law and Regulations of the State of Maryland. Seed suppliers shall assume charges for seed inspections and testing.

(a) Mixtures and Additive Seed. Turfgrass Seed Mix, Special Purpose Seed Mix, Temporary Seed Mix, and certified cultivars of Additive Seed shall be sampled and tested by an inspector of the Maryland Department of Agriculture, Turf and Seed Section (MDA) for percent purity, percent germination, percent weed seed, noxious weed content, and conform to MDA Standards for Maryland Certified Seed. Seed Mixtures used in Baltimore County shall carry MDA Certified Seed tags that show the purity, germination, weed seed, and noxious weed seed content. Seed mixtures certified as SHA seed mixtures may be used in Baltimore County as applicable.

(b) Unmixed Seed. Seed supplied for use as Meadow Seed or Shrub Seed shall be supplied in containers of a single species, unmixed. Each species shall be tested for purity, germination, and weed seed; and carry tags provided by the grower or distributor that indicate the test results. Seed shall be accompanied by MDA documentation to indicate the seed conforms to requirements when it is mixed or seeded.

920.06.06 Standards for Seed Species. Seed supplied in lots of individual species or used to produce mixes shall conform to the requirements of this section for minimum percent germination, minimum purity, and maximum percent of weed seed.

Subject to review and approval by the Engineer, meadow or shrub seed that does not conform to germination or purity requirements may be used. The seed will be subject to use at increased seeding rates or measures to compensate for reduced substandard seed purity or germination.

(a) SHA Turfgrass Seed Mix and SHA Special Purpose Seed Mix. Species included in SHA Turfgrass Seed Mix and SHA Special Purpose Seed Mix shall be MDA Certified Seed of approved cultivars and conform to the following requirements for minimum percent purity, maximum percent weed seed, and minimum percent germination:

TURFGRASS SEED SPECIES			
COMMON NAME, and SCIENTIFIC NAME	**PURITY Min %**	**WEED Max %**	**GERM Min %**
Chewings fescue *Festuca rubra* L. ssp. *fallax* (Thuill.) Nyman	98	0.5	85
red fescue *Festuca rubra* L. ssp. *rubra*	98	0.5	85
hard fescue *Festuca brevipila* Tracey	98	0.5	85
Kentucky bluegrass *Poa pratensis* L. ssp. *pratensis*	95	0.4	80
perennial ryegrass *Lolium perenne* L. ssp. *perenne*	98	0.5	85
sheep fescue *Festuca ovina* L.	98	0.5	85
tall fescue *Schedonorus phoenix* (Scop.) Holub = Festuca elatior L.	98	0.5	85

(b) Temporary and Grass Additive Seed. Species included in Temporary Seed Mix, or used as Additive Seed with Turfgrass Seed Mix or Special Purpose Seed Mix shall conform to the following requirements for minimum percent purity, maximum percent weed seed, and minimum percent germination:

TEMPORARY and GRASS ADDITIVE SEED SPECIES			
COMMON NAME, and SCIENTIFIC NAME	**PURITY Min %**	**WEED Max %**	**GERM Min %**
cereal rye *Secale cereale* L.	98	0.1	85
common barley, winter type *Hordeum vulgare* L.	98	0.3	85
common oat, winter type *Avena sativa* L.	98	0.5	85
common wheat, winter type *Triticum aestivum* L.	98	0.1	85
Italian ryegrass = annual ryegrass *Lolium perenne* L. ssp. *multiflorum* (Lam.) Husnot	95	0.3	85
foxtail bristlegrass = foxtail millet *Setaria italica* (L.) P. Beauv.	99	0.1	80
Lehmann lovegrass *Eragrostis lehmanniana* Nees	98	0.5	80
weeping lovegrass *Eragrostis curvula* (Schrad.) Nees	98	0.5	80

(c) Legume Additive Seed. Species used as Additive Seed with SHA Turfgrass Seed Mix or SHA Special Purpose Seed Mix shall be MDA Certified Seed when cultivars are specified and conform to the following requirements for minimum percent purity, maximum percent weed seed, minimum percent germination, and maximum percent hard seed.

LEGUME ADDITIVE SEED SPECIES				
COMMON NAME, SCIENTIFIC NAME, and CULTIVARS	**PURITY Min**	**WEED Max %**	**GERM Min %**	**HARD Max %**
birdsfoot trefoil *Lotus corniculatus* L. var. *corniculatus*	98	0.5	85	20
crownvetch *Securigera varia* (L.) Lassen	98	0.5	80	30
sericea lespedeza *Lespedeza cuneata* (Dum. Cours.) G. Don cv. Interstate or Interstate 76	98	0.5	85	20

Note: Minimum percent germination includes all seed identified as hard seed.

(d) Meadow Forb Seed. Seed shall be supplied in lots of individual species, unmixed, and conform to the following:

(1) Purity. Weed and/or other crop seed content shall be 2.5 percent or less by weight. After review and approval by the Engineer, seed that does not conform to this specification may be used at increased seeding rates, or with measures to compensate for increased weed or crop seed content.

(2) Origin. Seed shall either be collected from native sources in USDA Hardiness Zone 5b, 6a, 6b and 7a in the States of Maryland, Pennsylvania, New York, New Jersey, Delaware, Virginia, West Virginia, or North Carolina, or shall be grown and produced from seed certified to have been collected from sites in the USDA Hardiness Zones of those States. After review and approval by the Engineer, seed that does not conform to origin requirements may be used.

(3) Species. Seed shall conform to the following species, subspecies and varieties:

MEADOW FORB SEED SPECIES	
COMMON NAME	SCIENTIFIC NAME
Allegheny monkeyflower = square stem monkeyflower	*Mimulus ringens* L. var. *ringens*
bearded beggarticks = showy tickseed	*Bidens aristosa* (Michx.) Britton
blackeyed Susan	*Rudbeckia hirta* L. var. *hirta* *Rudbeckia hirta* L. var. *pulcherrima* Farw.
browneyed Susan	*Rudbeckia triloba* L. var. *triloba* *Rudbeckia triloba* L. var. *pinnatiloba* Torr. and A. Gray
common boneset	*Eupatorium perfoliatum* L. var. *perfoliatum*
common evening primrose	*Oenothera biennis* L.
crimsoneyed rose mallow	*Hibiscus moscheutos* L.
eastern purple coneflower	*Echinacea purpurea* (L.) Moench
flat-top goldenrod = grass-leaved goldenrod	*Euthamia graminifolia* (L.) Nutt. *Euthamia graminifolia* (L.) Nutt. var. *graminifolia* *Euthamia graminifolia* (L.) Nutt. var. *hirtipes* (Fernald) C.E.S. Taylor and R.J. Taylor
gray goldenrod	*Solidago nemoralis* Aiton var. *nemoralis*
lanceleaf tickseed = lanceleaf coreopsis	*Coreopsis lanceolata* L.

MEADOW FORB SEED SPECIES	
COMMON NAME	SCIENTIFIC NAME
Maryland senna	*Senna marilandica* (L.) Link
Maximilian sunflower	*Helianthus maximiliani* Schrad.
New England aster	*Symphyotrichum novae-angliae* (L.) G.L. Nesom
New York aster	*Symphyotrichum novi-belgii* (L.) G.L. Nesom var. *elodes* (Torr. and A. Gray) G.L. Nesom *Symphyotrichum novi-belgii* (L.) G.L. Nesom var. *novi-belgii* *Symphyotrichum novi-belgii* (L.) G.L. Nesom var. *villicaule* (A. Gray) J. Labrecque and L. Brouillet
New York ironweed	*Vernonia noveboracensis* (L.) Michx.
partridge pea	*Chamaecrista fasciculata* (Michx.) Greene *Chamaecrista fasciculata* (Michx.) Greene var. *fasciculata* *Chamaecrista fasciculata* (Michx.) Greene var. *macrosperma* (Fernald) C.F. Reed
king of the meadow = tall meadow rue	*Thalictrum pubescens* Pursh
seedbox	*Ludwigia alternifolia* L.
smooth blue aster	*Symphyotrichum laeve* (L.) A. Löve and D. Löve var. *laeve* *Symphyotrichum laeve* (L.) A. Löve and D. Löve var. *concinnum* (Willd.) G.L. Nesom
smooth oxeye = ox-eye sunflower	*Heliopsis helianthoides* (L.) Sweet var. *helianthoides* *Heliopsis helianthoides* (L.) Sweet var. *scabra* (Dunal) Fernald
spotted trumpetweed = spotted joe pye weed	*Eupatoriadelphus maculatus* (L.) King and H. Rob. var. *maculatus*
stiff goldenrod	*Oligoneuron rigidum* (L.) Small var. *rigidum*
sundial lupine = wild blue lupine	*Lupinus perennis* L. ssp. *perennis* *Lupinus perennis* L. ssp. *perennis* var. *perennis* *Lupinus perennis* L. ssp. *perennis* var. *occidentalis* S. Watson
swamp milkweed	*Asclepias incarnata* L. *Asclepias incarnata* L. ssp. *incarnata* *Asclepias incarnata* L. ssp. *pulchra* (Ehrh. ex Willd.) Woodson
swamp sunflower = narrow-leaved sunflower	*Helianthus angustifolius* L.
swamp verbena = blue vervain	*Verbena hastata* L. var. *hastata*
talus slope penstemon = tall white beardtongue	*Penstemon digitalis* Nutt. ex Sims
trumpetweed = joe pye weed	*Eupatoriadelphus fistulosus* (Barratt) King and H. Rob.
wild bergamot	*Monarda fistulosa* L. ssp. *fistulosa* *Monarda fistulosa* L. ssp. *fistulosa* var. *mollis* (L.) Benth. *Monarda fistulosa* L. ssp. *fistulosa* var. *rubra* A. Gray *Monarda fistulosa* L. ssp. *brevis* (Fosberg and Artz) Scora, ined.

(e) Meadow Grass, Sedge, and Rush Seed. Seed shall be supplied in lots of individual species, unmixed, and conform to the following:

(1) Purity. Refer to Section 920.06.06(d)(1). Grasses with awns shall be debearded or deawned.

(2) Origin. Refer to Section 920.06.06(d)(2). Cultivars may be produced in any state east of the Mississippi River.

(3) Species. Seed shall conform to the following species, subspecies, varieties, and cultivars:

MEADOW GRASS, SEDGE and RUSH SEED SPECIES	
COMMON NAME and CULTIVARS	**SCIENTIFIC NAME**
big bluestem cv. Niagara	*Andropogon gerardii* Vitman
longhair sedge = bristly sedge	*Carex comosa* Boott
broomsedge bluestem = broomsedge	*Andropogon virginicus* L. *Andropogon virginicus* L. var. *virginicus* *Andropogon virginicus* L. var. *decipiens* C.S. Campbell
deertongue cv. 'Tioga'	*Dichanthelium clandestinum* (L.) Gould
fox sedge	*Carex vulpinoidea* Michx. var. *vulpinoidea*
gamagrass cv. 'Meadowcrest', 'Pete'	*Tripsacum dactyloides* (L.) L.
Indiangrass cv. 'Rumsey'	*Sorghastrum nutans* (L.) Nash
little bluestem cv. 'Aldous'	*Schizachyrium scoparium* (Michx.) Nash var. *scoparium* *Schizachyrium scoparium* (Michx.) Nash var. *divergens* (Hack.) Gould
shallow sedge = lurid sedge	*Carex lurida* Wahlenb.
rattlesnake mannagrass	*Glyceria canadensis* (Michx.) Trin.
common rush = soft rush = lamp rush	*Juncus effusus* L. var. *conglomeratus* (L.) Engelm. *Juncus effusus* L. var. *decipiens* Buchenau *Juncus effusus* L. var. *pylaei* (Laharpe) Fernald and Wiegand *Juncus effusus* L. var. *solutus* Fernald and Wiegand
switchgrass cv. 'Blackwell', 'Shelter'	*Panicum virgatum* L. var. *virgatum* *Panicum virgatum* L. var. *spissum* Linder
woolgrass	*Scirpus cyperinus* (L.) Kunth

(f) Wildflower Seed. Seed shall be supplied in lots of individual species, unmixed, and conform to the following:

(1) Purity. Species shall be 98 percent purity or greater, with 75 percent germination or greater, and with weed and/or other crop seed content of 2.5 percent or less by weight. After review and approval by the Engineer, seed that does not conform to purity requirements may be used at increased seeding rates, or with measures to compensate for increased weed or crop seed content.

(2) Origin. Any State of the United States.

(2) Species. Seed shall conform to the following species, subspecies, varieties, and cultivars:

WILDFLOWER SEED SPECIES	
COMMON NAME and CULTIVARS	SCIENTIFIC NAME
firewheel = annual gaillardia	*Gaillardia pulchella* Foug. *Gaillardia pulchella* Foug. var. *pulchella*
blackeyed Susan	*Rudbeckia hirta* L. var. *hirta* *Rudbeckia hirta* L. var. *pulcherrima* Farw.
calendula	*Calendula officinalis* L.
lemon beebalm	*Monarda citriodora* Cerv. ex Lag.
garden cosmos = pink cosmos cv. 'Sensation'	*Cosmos bipinnatus* Cav.
doubtful knight's-spur = rocket larkspur	*Consolida ajacis* (L.) Schur
Siberian wallflower	*Erysimum ×marshallii* (Henfr.) Bois
Moroccan toadflax = Spurred Snapdragon	*Linaria maroccana* Hook. f.
common sunflower cv. 'Autumn Beauty'	*Helianthus annuus* L.
garden cornflower = bachelors button	*Centaurea cyanus* L.
sulphur cosmos = yellow cosmos cv. 'Bright Lights'	*Cosmos sulphureus* Cav.

(g) Shrub Seed. Seed shall be supplied in lots of individual species, unmixed, and conform to the following:

(1) Purity. Weed and/or other crop seed content shall be 0.5 percent or less by weight. Minimum purity and minimum germination shall conform to the requirements of (3), below.

(2) Origin. Refer to Section 920.06.06(d)(2).

(3) Species. Seed shall conform to the following species, subspecies, and varieties:

SHRUB SEED SPECIES		
SPECIES Including Subspecies and Variety	**PURITY Min %**	**GERM Min %**
American black elderberry *Sambucus nigra* L. ssp. *canadensis* (L.) R. Bolli	98	60
American cranberrybush *Viburnum opulus* L. var. *americanum* Aiton	99	70
black chokeberry *Photinia melanocarpa* (Michx.) K.R. Robertson and Phipps	99	70
bristly locust *Robinia hispida* L. var. *fertilis* (Ashe) R.T. Clausen *Robinia hispida* L. var. *hispida*	99	90
chokecherry *Prunus virginiana* L. var. *viginiana*	99	70

SHRUB SEED SPECIES		
SPECIES **Including Subspecies and Variety**	**PURITY** **Min %**	**GERM** **Min %**
common buttonbush *Cephalanthus occidentalis*	98	60
common ninebark *Physocarpus opulifolius* (L.) Maxim., orth. cons.	99	75
common winterberry *Ilex verticillata* (L.) A. Gray	99	60
desert false indigo *Amorpha fruticosa* L.	98	70
fragrant sumac *Rhus aromatica* var. *aromatica*	99	85
gray dogwood *Cornus racemosa* Lam.	99	70
inkberry *Ilex glabra* (L.) A. Gray	98	60
mapleleaf viburnum *Viburnum acerifolium* L.	99	70
nannyberry *Viburnum lentago* L.	99	75
red chokeberry *Photinia pyrifolia* (Lam.) K.R. Robertson and Phipps	85	60
red elderberry *Sambucus racemosa* L. var. *racemosa*	95	70
redosier dogwood *Cornus sericea* L. ssp. *sericea*	99	70
silky dogwood *Cornus amomum* Mill.	98	70
smooth sumac *Rhus glabra* L.	99	80
southern arrowwood *Viburnum dentatum* L. var. *dentatum* *Viburnum dentatum* L. var. *venosum* (Britton) Gleason *Viburnum recognitum* Fernald	99	70
spicebush *Lindera benzoin* (L.) Blume var. benzoin	95	60
staghorn sumac *Rhus typhina* L.	99	85
steeplebush *Spiraea tomentosa* L.	85	70
swamp rose *Rosa palustris* Marsh.	99	65
witch hazel *Hamamelis virginiana* L.	99	70

920.06.07 Seed Mixes. Refer to Sections 920.06.01 through .06 and the document '*Specifications for Seed and Seed Mixes*' maintained by the MdSHA Landscape Operations Division, which includes lists of approved cultivars.

(a) Turfgrass Seed Mix.

TURFGRASS SEED MIX		
MIX %	**SPECIES**	
	Common Name	Scientific Name
90	tall fescue	*Schedonorus phoenix* (Scop.) Holub
5	Kentucky bluegrass	*Poa pratensis* L. ssp. *pratensis*
5	perennial ryegrass	*Lolium perenne* L. ssp. *perenne*

(b) Special Purpose Seed Mix.

SPECIAL PURPOSE SEED MIX		
MIX %	**SPECIES**	
	Common Name	Scientific Name
75	hard fescue	*Festuca brevipila* Tracey
20	Chewings fescue	*Festuca rubra* L. ssp. *fallax* (Thuill.) Nyman
5	Kentucky bluegrass	*Poa pratensis* L. ssp. *pratensis*

(c) Temporary Seed Mix.

TEMPORARY SEED MIX		
MIX %	**SPECIES**	
	Common Name	Scientific Name
95	common wheat, winter type	*Triticum aestivum* L.
	common barley, winter type	*Hordeum vulgare* L.
	common oat, winter type	*Avena sativa* L.
	cereal rye, winter type	*Secale cereale* L.
5	foxtail bristlegrass = foxtail millet	*Setaria italica* (L.) P. Beauv.

920.07 PLANT MATERIALS.

920.07.01 Certificate and Licenses. Sellers, distributors, installers or producers of nursery stock shall possess the Plant Dealer License, Plant Broker License, or Nursery Inspection Certificate of the Maryland Department of Agriculture, or substitute a similar certificate or licenses from another State where they do business.

920.07.02 Plant Material Inspection. Plant material will be inspected for conformance with Sections 920.07.03 through .05, and tagged with MdSHA Plant Material Inspection Seals (Seals) as follows:

(a) Inspection. The Plant Material Inspection will be conducted in Maryland at the nursery where the plant material is grown, or at the brokerage where the plant material is sold.

When a nursery located outside of Maryland produces plant material, the Inspection will be conducted at the Contractor's holding area, or at the project site before planting, unless otherwise specified in the Contract Documents.

The Contractor shall ensure that the plant material is present for inspection on the scheduled date, and that it meets the requirements of Section 920.07. The condition and identity of plant material will be subject to re-inspection for the duration of the Contract.

(b) Scheduling. The Engineer will schedule the inspection. At least 14 days notice to schedule an inspection within Maryland, and at least 45 days notice to schedule an inspection outside Maryland.

(c) Seals. The County will determine which plants, if any, will be tagged with seals.

When seals are placed upon representative plants within a block of plant material, the plant material delivered for installation shall be similar in size, shape and character to the plant material that received seals.

Plant material that is delivered with broken or missing seals, or that is not similar to the plant material within the block that was tagged with seals will be rejected.

(d) Rejected Plants. Plant materials that do not meet these requirements will be rejected. Plant material rejected at the nursery or holding area shall not be delivered to the project; if delivered, it shall immediately be removed.

Plants shall not be installed until the Plant Material Inspection has been completed and satisfactory identification has been provided.

920.07.03 Plant Material Standards. Plant material shall be grown, identified, graded, and delivered in good condition as specified in this section.

(a) Hardiness Zones of Origin. Plant material shall be nursery grown within plant hardiness zones 5, 6, or 7 according to the '*USDA Plant Hardiness Zone Map*' unless otherwise specified. Plant material shall be dug and transported in conformance ANSI Z60.1. Bare root deciduous plants shall be delivered in a dormant condition. Roots shall be adequately protected and kept moist.

(b) Names and Identification. Refer to Section 920.06.01. Tags or labels identifying the grower or distributor shall clearly and correctly identify all plant material. Plant materials that are misidentified, or not satisfactorily tagged or labeled, or do not conform to the accepted characteristics of the species or cultivar, will be rejected.

(c) ANSI Standards. Plant material shall conform to *American Standard for Nursery Stock* (ANSI Z60.1) of the American Nursery and Landscape Association. Plant grades shall be those established in ANSI Z60.1, and shall include plants from that

size up to but not including the next larger grade size. When specimen plants are specified by the Contract documents, the specimen requirement shall also be met. The Engineer shall reject plant material that does not meet the standards of this section.

(d) Health and Sanitation. Plant material shall be in good health and be declared and certified free from disease and insects as required by law for transportation, and shall be free from pest-related stress and pest damage.

Plants shall be healthy, free from physical defects and stresses, and have well-developed branches and a vigorous root system. Plants that exhibit wilt, shriveling, insufficient root mass, broken or loose root balls, or inadequate protection will be rejected.

Container grown plants shall be well rooted, vigorous and established in the size pot specified, shall have well balanced tops for their pot size, and shall not be root bound.

Plants grown in fields or containers that include Ailanthus, Canada thistle, Johnsongrass, or yellow nutsedge will be rejected.

(e) Shade and Flowering Trees. Shade and flowering trees shall be symmetrically balanced. Major branch unions shall not have 'V' shaped crotches, bark inclusion or unions derived from water sprouts (epicormic growth) capable of causing structural weakness.

Trees shall be free of unhealed branch removal wounds greater than 1 in. diameter, or wounds or scars caused by staking, wire or ties, or any other defect that could cause structural failure or disfigurement.

Shade trees and central leader flowering trees shall have a single main trunk. Trunk height to the lowest branch shall conform to the following:

HEIGHT TO LOWEST BRANCH	
CALIPER in.	**HEIGHT ft**
1-1/2 and 1-3/4	4
2 to 2-1/2	5
3	6

(f) Unacceptable Plants. Plant material that becomes unacceptable after installation shall be rejected as specified in Section 710.03.18.

920.07.04 American Holly (*Ilex opaca* Aiton). Each lot of plants shall include 90 percent female plants and 10 percent male plants of cultivars selected from the following:

AMERICAN HOLLY CULTIVARS		
FEMALE		MALE
Angelica	Miss Helen	David
Arlene Leach	Old Heavy Berry	Jersey Knight
B and O	Patterson	Leather Leaf
Dan Fenton	Satyr Hill	Nelson West
Jersey Princess	Wyetta	North Wind

920.07.05 Plant Storage and Handling. Adequate facilities shall be provided for plant storage. Plants shall be handled with care to avoid damage.

(a) Bulbs. Bulbs shall be stored under appropriate climate control.

(b) Annual Plants. Annual plants shall be kept moist.

(c) Bare Root Plants. Bare root plants shall be kept moist and heeled into moist soil or other suitable material until installed. During transport, the roots shall be covered with canvas, burlap or straw.

(d) Balled and Burlapped and Container Grown Plants. Balled and burlapped plants and container grown plants shall be kept moist and installed within seven days of delivery, or the root balls or containers shall be covered with mulch or straw until removed for installation.

920.08 MARKING AND STAKING MATERIALS.

920.08.01 Outline Stakes. Outline stakes shall be full cut 1.75 x 1.75 in. sound hardwood, 48 in. long, as approved.

920.08.02 Stakes. Stakes for supporting trees shall be rough sawn, straight grain hardwood reasonably free from bark, knot holes, excessive warping, or other imperfections. Stakes shall be full cut 2.0 x 2.0 in. thickness.

920.08.03 Wire. Wire shall be No. 12 and 14 gauge new annealed galvanized wire.

920.08.04 Wire Rope. Wire rope shall be 0.25 in. zinc coated steel wire seven strand as commonly used for guying large trees.

920.08.05 Cable Clamps. Cable clamps shall be zinc-galvanized steel.

920.08.06 Hose. Hose shall be 5/8 in. inside diameter corded synthetic rubber hose.

920.08.07 Turnbuckles. Turnbuckles shall be zinc galvanized with 4.5 in. openings and 5/16 in. threaded ends with screw eyes.

920.08.08 Anchors. Tree anchors shall be earth anchors of a type commonly used for anchoring large trees.

920.09 WATER, PESTICIDES, AND ADJUVANTS.

920.09.01 Water. Water used for the installation and establishment of vegetation shall not contain concentrations of substances that are harmful to plant growth.

Water derived from public and municipal water systems in Maryland shall be acceptable for irrigation, fertilization, or mixing with pesticides. Water derived from wells or other sources may be used when it has soluble salts concentration less than 500 ppm, sodium less than 50 percent of total salts, and pH between 5.0 and 7.8.

920.09.02 Seed Carrier. Seed carrier shall be one or more inert, horticultural-grade materials used to improve seed mixing and distribution through a spreader or drill. Seed carriers shall be free flowing, easily mixable with seed, and nontoxic to seed, plants, humans, and wildlife. Seed carrier shall include one or more of the following:

(a) Calcined Clay. Calcined clay shall be a furnace-baked clay product.

(b) Cocoa Shell. Cocoa shell shall be processed cocoa seeds.

(c) Oyster Shell. Oyster shell shall be crushed shells of oyster or other mollusk.

(d) Vermiculite. Vermiculite shall be heat-expanded mineral mica.

(e) Perlite. Perlite shall be heat-expanded mineral perlite.

920.09.03 Pesticides. Pesticides shall be EPA-approved and registered for use in Maryland to control plants, fungi, insects or other pests. Pesticides shall be approved for use, and acceptable application rates established as follows:

(a) Herbicide. Herbicide shall control or prevent re-growth of plants or vegetation.

(b) Insecticide. Insecticide shall control or protect against insect or other arthropod pests.

(c) Fungicide. Fungicide shall control or protect against fungal or bacterial pests.

(d) Other Pesticides. Other pesticides shall control or protect against other pests.

920.09.04 Marking Dye. Marking dyes shall be used to color spray solutions, be non-phytotoxic, oil or water soluble, and compatible with the pesticide products they are applied with. Marking dye products and their applicable application rates shall be established by the Contractor and approved by the Engineer.

920.09.05 Spray Adjuvant and Wetting Agent. Spray adjuvant and wetting agents shall be mixable with water and compatible with the pesticides or other products they are applied with.

920.09.06 Antidesiccant. Antidesiccant and antitranspirant products shall be materials that provide a film over plant surfaces to limit water loss. These products and their applicable application rates shall be established by the Contractor and approved by the Engineer.

SECTION 921 – MISCELLANEOUS

921.01 WATER FOR CONCRETE MIXES. Water shall conform to the pH requirements of T 26, Method B and shall be clear. If questionable quality is suspected, the water shall conform to the limits of the comparison tests with distilled water as specified in T 26. The chloride concentration of water used in mixing and curing of Portland cement concrete shall be determined in conformance with D 512 and shall not exceed the following limits:

Bridge Superstructure and Prestressed Concrete	500 ppm
Latex Modified Concrete	50 ppm
Other Concrete and Water Used in Curing	1000 ppm

921.02 MOISTURE AND DUST CONTROL AGENTS.

921.02.01 Calcium Chloride. Solid calcium chloride shall conform to M 144, Type S, Grade I, Class A. Calcium chloride in solution shall contain a minimum of 30 percent salts. The solution shall be made using potable water in a quantity designated by the Engineer. When analyzed on a dry basis in conformance with MSMT 601, the residue shall conform to M 144.

921.02.02 Magnesium Chloride. Flakes shall meet the following:

TEST PROPERTY	SPECIFICATION LIMITS
Magnesium Chloride $MgCl_2$, %	46.0 – 47.0
Calcium Chloride $CaCl_2$, %	2.0 – 3.0
Potassium Chloride KCl, %	0.5 – 1.0
Sodium Chloride NaCl, %	0.5 – 1.0
Sulfates, % max	0.05

When used as a solution, that solution shall contain 30 to 32 percent solids.

921.03 LIME.

921.03.01 Hydrated lime shall conform to the chemical requirements of C 206, Type N when used in finishing or C 207, Type N when used for masonry.

921.03.02 Hydrated lime for soil stabilization shall have a minimum combined calcium oxide and magnesium oxide content of 65 percent when tested in conformance with C 25 and shall conform to the following gradation:

SIEVE SIZE	PERCENT RETAINED max
3/8 in.	0
No. 30	3
No. 200	25

921.03.03 Quicklime shall have a combined calcium oxide and magnesium oxide content of 75 percent minimum and a gradation of 100 percent passing the 3/8 in. sieve when tested in conformance with C 25.

921.04 EPOXY ADHESIVES. Epoxy resin bonding material shall consist of a thermosetting epoxy resin and a hardener. The individual components of mixed epoxy shall not settle or skin and contain no volatile solvents, lumps or foreign materials. The epoxy shall conform to C 881. Unless otherwise specified, epoxy adhesive used for bearing and expansion pads shall be non-sagging.

The manufacturer shall furnish certification as specified in Section GP-1.05. The certification or data sheet shall show actual test results for each required property of the type, grade and class of epoxy submitted, and shall accompany each sample.

The manufacturer shall supply actual bond test results for each batch submitted for use.

921.05 STRUCTURAL TIMBER AND LUMBER. The manufacturer shall furnish certification as specified in Section GP-1.05. Structural timber and lumber shall conform to M 168.

921.06 TIMBER PRESERVATIVES. Preservatives and pressure treatment for timber shall conform to M 133.

921.07 CONDUITS. Conduit shall conform to the following:

921.07.01 Metallic Conduit.

MATERIAL	SPECIFICATION
Electrical Metallic Tubing	UL 797
Intermediate Metal Conduit	UL 1242
Rigid Metal Conduit	UL 6
Rigid Steel Conduit, Zinc Coated	ANSI C80.1

MATERIAL	SPECIFICATION
Metallic Outlet Boxes	UL 514A
Fittings for Conduit and Outlet Boxes	UL 514B

921.07.02 Nonmetallic Conduit. The manufacturer shall furnish certification as specified in Section GP-1.05. Each length shall be stamped or embossed with the grade or type and applicable UL or NEMA designation.

MATERIAL	SPECIFICATION
Schedule 40 and 80 Rigid Polyvinyl Chloride (PVC) Conduit	UL 651
Electrical Plastic Tubing (EPT) and Electrical Plastic Conduit (EPC-40 and EPC-80)	NEMA TC 2
Nonmetallic Outlet Boxes, Flush Device Boxes and Covers	UL 514C
Electrical Nonmetallic Conduit (ENC)	NEMA TC 13
PVC Fittings for use with Rigid PVC Conduit and Tubing	NEMA TC 3
Flexible PVC Coated Conduit	UL 360
Liquid Tight Flexible Nonmetallic Conduit for Detector Sleeves	UL 1660

921.07.03 PVC Coated Metallic Conduit. PVC externally coated, galvanized, rigid steel conduit and electrical metallic tubing shall conform to NEMA RN 1.

921.08 STRAW BALES. Straw bales for erosion and sediment control shall conform to the Contract Documents and shall be approximately 14 x 18 x 36 in.

921.09 GEOTEXTILES.

921.09.01 Geotextile Requirements. All geotextiles shall be listed in the National Transportation Product Evaluation Program (NTPEP) for geotextiles. The geotextile shall be manufactured from fibers consisting of long chain synthetic polymers, composed of a minimum 95 percent by weight of polyolefins or polyesters. The fibers shall be formed into a stable network so that the filaments or yarns retain their dimensional stability relative to each other, including selvages. The geotextile shall meet the following:

MARYLAND APPLICATION CLASS		TYPE OF GEOTEXTILE	GRAB STRENGTH lb D 4632	PUNCTURE STRENGTH lb D 6241	PERMITTIVITY sec^{-1} D 4491	APPARENT OPENING SIZE, max mm D 4751	TRAPEZOID TEAR STRENGTH lb D 4533
	TYPE I	NONWOVEN	160	56	0.5	0.43	55
		WOVEN,	250	90	0.5	0.43	90

MARYLAND APPLICATION CLASS		TYPE OF GEOTEXTILE	GRAB STRENGTH lb D 4632	PUNCTURE STRENGTH lb D 6241	PERMITTIVITY sec^{-1} D 4491	APPARENT OPENING SIZE, max mm D 4751	TRAPEZOID TEAR STRENGTH lb D 4533
SD		MONOFILAMENT					
	TYPE II	NONWOVEN	160	56	0.2	0.25	55
SD	TYPE II	WOVEN, MONOFILAMENT	250	90	0.2	0.25	90
PE	TYPE I	NONWOVEN	200	80	0.7	0.43	80
		WOVEN, MONOFILAMENT	250	90	0.7	``0.43	90
	TYPE II	NONWOVEN	200	80	0.2	0.25	80
		WOVEN, MONOFILAMENT	250	90	0.2	0.25	90
	TYPE III	NONWOVEN	200	80	0.1	0.22	80
		WOVEN, MONOFILAMENT	250	90	0.1	0.22	90
SE		NONWOVEN	200	80	0.2	0.3	80
		WOVEN	250	90	0.2	0.3	90
ST		WOVEN	300*	110	0.05	0.15**	110
F		WOVEN	100	–	0.05	0.6	–
E		NONWOVEN	90	30	0.5	0.3	30

Note 1: All property values are based on minimum average roll values in the weakest principle direction, except for apparent opening size.
Note 2: The ultraviolet stability shall be 50 percent after 500 hours of exposure for all classes, except Class F, which shall be 70 percent (D 4355).
* Minimum 15 percent elongation.
** This is a MINIMUM apparent opening size, not a maximum.

APPLICATION TYPES

SD = Subgrade Drainage
SE = Separation
E = Filter Covering
PE = Permanent Erosion Control
ST = Stabilization
F = Silt Fence

Only those geotextiles that have been tested by NTPEP will be considered candidates for use. In addition, the geotextiles shall meet the Contract Documents and the Geotextile Acceptance and Quality Assurance Procedure, MSMT 732.

Geotextiles used for reinforcement applications shall have a separate approval process.

921.09.02 Seam and Overlap. D 4884. When geotextiles are joined by sewing, the geotextile seam shall meet the following:

(a) Seams shall be either "J" or "Butterfly" type and shall utilize a lock stitch.

(b) Seams shall meet the tensile strength requirements for the geotextile when tested across the seam.

(c) The durability of the thread for seaming shall be at least equal to the geotextile itself.

921.09.03 Securing Pins or Staples shall be a minimum 10 in. length and be designed to securely hold the geosynthetic in place during construction.

921.10 RESERVED.

921.11 RAPID HARDENING CEMENTITIOUS MATERIALS FOR CONCRETE PAVEMENT REPAIRS. Materials shall be a dry, packaged cementitious mortar having less than 5 percent by weight of aggregate retained on the 3/8 in. sieve and shall conform to the following requirements:

Classification.

Class I - For use at ambient temperatures below 50 F.
Class II - For use at ambient temperatures of 50-90 F.
Class III - For use at ambient temperatures above 90 F.

Chemical Requirements. The material shall conform to the chemical requirements of C 928 and contain no organic compounds such as epoxy resins or polyesters as the principal binder.

Physical Requirements. The material shall conform to the following when tested in conformance with MSMT 725:

TEST	METHOD
Apparent Opening Size	D 4751
Grab Tensile Strength	D 4632, Grab Test – 4 in. x 8 in. specimen, 1 in. x 2 in. clamps; 12 in./minute strain rate both principal directions of geotextile.
Burst Strength	D 3786

Bond Strength, 7 days, psi min.	2000
Length change, increase after 28 days in water, based on length at 3 hr, % max	+0.15
Length change, decrease after 28 days, % max.	-0.15
Freeze-Thaw, loss after 25 cycles in 10% $CaCl_2$ solution, % max.	8
Initial setting time, minutes min.	10

Marking. All packages delivered to the project shall be marked with the following information:

(a) Date material was packaged.
(b) Approximate setting time.
(c) Recommended dosage of water or liquid component.
(d) Mixing instructions.
(e) Class or temperature range.

Certification. The manufacturer shall furnish certification as specified in Section GP-1.05

showing the actual test results for each class and type of material submitted to the Laboratory.

921.12 DAMPPROOFING AND WATERPROOFING MEMBRANE. The adhesive side of the membrane shall be protected with a special release paper that can be easily removed for installation. The membrane shall conform to the following requirements:

TEST PROPERTY	TEST METHOD	SPECIFICATION LIMITS
Grab tensile strength, lb/in at 12 in./minute rate of loading, min.	D 1682	70
Pliability, 180 degree bend, 1 in. mandrel @ 20F	D 146	Unaffected
Resistance to puncture, lb min.	E 154 (square mounting frame method)	40
Permeance, perm max.	E 96 Method B	0.1
Weight, oz/sq.yd min.	D 3776	40
Primer	-	As specified by the manufacturer

Roll and sheet waterproofing membrane may be accepted on certification. The manufacturer shall furnish certification as specified in Section GP-1.05 with actual test results showing that the material conforms to these Specifications.

921.13 PREFORMED FIBERGLASS. Meet the following:

TEST PROPERTY	TEST METHOD	SPECIFICATION LIMITS
Density, g/cm, min	D 792	1.25
Absorption, % max	D 570	1.0
Tensile Strength, average of five specimens each direction*, psi min	D 638	10 000
Thickness (unless otherwise specified), in.	—	3/16
Thickness Tolerance, in.	—	+1/16, -0
Color No.	Fed. Std. 595	26622

* Longitudinal and transverse directions.

SECTION 922 – PREFABRICATED EDGE DRAINS

922.01 CERTIFICATION. The manufacturer shall furnish certification as specified in Section GP-1.05.

922.02 PREFABRICATED EDGE DRAINS shall be flexible, rectangular conduit consisting of supporting drainage core encased in a geotextile.

Drainage Core. Material shall be manufactured from polymers having a high resistance to deterioration by pavement deicing salts, petroleum based materials, and naturally occurring soil chemicals. The core shall have sufficient flexibility to withstand bending and handling without damage or significant weakening.

The core geotextile contact point spacing for post and cuspated (having a point or a pointed end) sheet type cores shall not exceed 1.125 in. Elongated pipe core sections shall have a 7.5 in./ft minimum open area to allow lateral flow into the core. Cores with support on only one side shall have a minimum of 5 percent of the area of that support side in unobstructed flow. Drainage core shall meet the following requirements:

TEST PROPERTY	TEST METHOD	SPECIFICATION LIMITS
Thickness, in. min	—	0.75
Compressive Strength, psi, @ 20% maximum deformation, min	(a)	40
In-plane Flow Rate, gal/min/ft of width, min	D 4716 (b)	15

(a) D 5034 for crushed sheet and post type cores.
D 2412 for elongated pipe type cores.
(b) 10 psi load after 100 hr at a hydraulic gradient of 0.1.

Geotextile Wrap. Section 921.09, Class SD, Type II.

The fabric shall be bonded to contact points of supporting core for post and cuspated sheet type cores to ensure that the geotextile does not sag into the core flow area. The geotextile shall be tightly stretched over the core for elongated pipe type cores.

922.03 FITTINGS. Fittings for the pavement edge drain systems, including, but not limited to end seals, splices, outlets, and shunts shall meet the manufacturer's recommendations and be of sufficient strength to withstand construction handling and permanent loading. All fittings shall be as approved.

922.04 OUTLET PIPE. Pipe for outlets shall be 6 in. minimum diameter and meet the requirements of Section 905.

SECTION 923 – SLURRY SEAL

923.01 AGGREGATES. Aggregates shall be crushed stone, compatible with the emulsion, and shall meet the requirements of Section 901.

923.02 MINERAL FILLER. Section 901.

923.03 EMULSIFIED ASPHALT. M 208, Grade CSS-1h. The cement mixing test is waived.

Emulsified asphalt shall not separate before placement of SS or LMSS.

923.04 LATEX MODIFIED EMULSION. The latex modifier and other emulsifiers shall be milled into the asphalt cement. The emulsified asphalt shall be modified by the addition of 3.0 ± 0.4 percent latex solids by weight of the asphalt. The latex modifier shall be an unvulcanized styrene butadiene rubber (SBR) or 100 percent natural latex in liquid form. The manufacturer shall furnish certification as specified in Section GP-1.05 showing actual test results meeting these Specifications.

923.05 MIX DESIGN APPROVAL. Mix design data shall be submitted to the Engineer for approval at least three weeks in advance of the paving operation. The mix design shall list the ingredients and their proportions as well as the gradation of the proposed aggregate.

The SBR latex modifier shall meet the following:

TEST PROPERTY	SPECIFICATION LIMITS
Styrene butadiene Ratio	24:76 ± 1.5
Solids Content, % min	60
pH, max	6.2
Weight Per Gallon, Wet Basis @ 25 C, lb min Dry Basis @ 25 C, lb min	 7.9 4.5

Latex modified emulsion CSS-1h shall meet M 208 modified as follows:

The 100 percent natural latex shall be a high ammonia natural latex meeting D 1076, Type I.

The mix design report shall show test results meeting the following:

TEST PROPERTY	SPECIFICATION LIMITS
MSMT 403, Mixing Test, minutes min	2
MSMT 403, Setting Time, minutes max	30
MSMT 403, Water Resistance	Slight Discoloration
MSMT 403, Wet Track Abrasion, g/sq.ft. max	75
International Slurry Seal Association (ISSA) TB 139, Set Time Test, 30 minutes, kg/cm min	12

The percent of residual asphalt, based on the dry aggregate weight, shall be between 8.0 and 12.5 for Type II Mix and 7.0, and 11.0 for Type III Mix, each having a control tolerance of ± 1.0 percent.

The Contractor shall submit sufficient material for testing the mix design whenever the Engineer requires corroborating information.

RESIDUE REQUIREMENTS	
TEST PROPERTY	SPECIFICATION LIMITS
Penetration @ 25 C, min	30
Ductility @ 25 C, min @ 4 C, min	150 100
R and B Softening Point, F, min	140
Cement Mixing Test	Waived

The latex modified emulsion, after standing undisturbed for 24 hours, shall be a uniform color throughout.

923.06 MIX DESIGN. The stability shall be a minimum of 1800 lb and the flow shall be 0.06 to 0.16 in. when tested per T 245, Modified (modification permits air drying of the mixture at 70 to 75 F for a minimum of 24 hours, followed by placement in a 140 F oven and drying to a constant weight prior to reheating and placing in molds).

SECTION 924 – RESERVED

SECTION 925 – DETECTABLE WARNING SURFACES

925.01 GENERAL. The detectable warning surface shall conform to the most recent accessibility guidelines of the Americans with Disabilities Act (ADA). The Division of

Construction Contracts Administration will maintain a list of pre-qualified products, from which a surface shall be selected. Prior to inclusion on the list of products, the manufacturer shall submit test results, to the Engineer, showing conformance to the table of physical properties as specified in Section 925.06. In addition, the manufacturer shall submit complete conforming physical property test results in six-month intervals, beyond the date of the original prequalification testing. Materials shall meet certification requirements prior to use on a project Submit the proposed source of supply, and specific product, to the Engineer, for approval.

925.02 COMPOSITION. The surface shall be either flexible or rigid. The Engineer shall be notified of any changes to the composition of a prequalified detectable warning product. In this case, the manufacturer shall re-submit complete test results showing conformance to the table of physical properties as specified in Section 925.06.

925.03 SIZE. The detectable warning surface shall be 24 in. min. wide in the direction of pedestrian travel, and extend the full width of the curb ramp, landing, or blended transition.

925.04 CONFIGURATION AND DIMENSIONS. The surface shall consist of a system of truncated domes, aligned in conformance with, and meeting the dimensional requirements of the most recent ADA accessibility guidelines. Each dome shall have a base diameter of 0.9 in. to 1.4 in. a top diameter of 50 to 65 percent of the base diameter, minimum, to 65 percent of the base diameter, and a height of 0.2 in. Arrange the truncated domes in a square grid with center-to-center spacing of 1.66 in. to 2.35 in.

925.05 COLOR. Detectable warning product shall contrast with adjoining surfaces in conformance with current ADA requirements. The color shall be homogenous throughout the surface.

925.06 PHYSICAL PROPERTIES. The detectable warning surface shall meet the following requirements:

PROPERTY	TEST METHOD	SPECIFICATION LIMIT
Slip Resistance Coefficient	C 1028 (dry method)	.80 minimum
Abrasive Wear, index	C 501	150 minimum
Fade (UV) Resistance/Color Retention	G 151/ G 154 (Cycle1)	No fading or change in color after 3000 hours*
Chemical Stain Resistance	D 1308**	No discoloration or staining
Freeze/Thaw Resistance	C 1026	No disintegration
Adhesion/Bond Strength	C 482	No adhesion failure

PROPERTY	TEST METHOD	SPECIFICATION LIMIT
Contrast	Contrast percentage formula*** using E 1349 to determine cap Y brightness/light reflectance values (LRV)	Current ADA requirement****

*Chromaticity coordinates (CIE system) checked per E 1349, before and after test.
**Immersion Test for acid solution, soap solution, and detergent solution reagents. Spot Test, Open for salts, lubricating oils and greases. Tests shall be conducted at 77 F for durations of 16 hrs.
***Contrast % = [(B1 – B2)/B1] x 100,

where B1 = (LRV) of the lighter area, and B2 = (LRV) of the darker area.

****For the purpose of determining whether a material meets acceptable contrast criteria, inserting cap Y brightness of detectable warning surface, and assume a value of 15 for the cap Y brightness of cured concrete, to determine percentage difference. When a detectable warning surface is to be installed on any material other than cured concrete, additional testing will be required to ensure the contrast requirements are met.

925.07 CERTIFICATION. The manufacturer shall furnish certification stating that the detectable warning surface meets all Maryland State Highway Administration specification requirements, and that the surface meets the most recent ADA accessibility guidelines.

With the exception of test results, the certification shall be as specified in Section GP-1.05.

SECTIONS 926 Through 949 – RESERVED

SECTION 950 – TRAFFIC CONTROL-RELATED MATERIALS

950.01 PRECAST CONCRETE TRAFFIC BARRIER, as specified in the Contract Documents. Welded wire fabric as specified in Section 908.05.

950.02 RESERVED.

950.03 REFLECTORIZATION OF SIGNS AND CHANNELIZING DEVICES. Unless otherwise specified in the Contract Documents, retroreflective sheeting for signs shall meet the requirements given in Sections 950.03.01, .02, or .03. When yellow type III, IV, VI, VII,

or IX, is specified in the Contract Documents, fluorescent yellow shall be used. Retroreflective sheeting for channelizing devices shall meet the requirements given in Sections 950.03.01, .02, .03, .04, or .06.

Sign sheeting shall be selected from the QPL. All Retroreflective Sheeting shall meet D 4956.

Sign legend and background sheeting shall be from the same sheeting manufacturer.

950.03.01 Type III Retroreflective Sheeting, per D 4956, Type III and the following:

MINIMUM REFLECTIVE INTENSITY VALUES FOR TYPE III SHEETING **Minimum Coefficient of Retroreflection (R_A) cd/(lx · m²)**							
Observation Angle°	**Entrance Angle°**	**White**	**Yellow**	**Red**	**Blue**	**Green**	**Brown**
0.2	+40	100	60	18	7	15	3
0.5	+40	60	45	10	7	10	2.5

950.03.02 Type IV Retroreflective Sheeting, per D 4956, Type IV and the following:

MINIMUM REFLECTIVE INTENSITY VALUES FOR TYPE IV SHEETING **Minimum Coefficient of Retroreflection·(R_A) cd/(lx · m²)** E-810 (Average of 0 and 90 degrees Orientation)							
Observation Angle°	**Entrance Angle°**	**White**	**Yellow**	**Red**	**Green**	**Blue**	**Orange**
.2	+40	120	80	16	12	9	29
0.5	+40	55	40	10	8	4	14
1.0	+40	9	8	1	0.8	0.5	1

950.03.03 Type IX Retroreflective Sheeting, per D 4956 Type IX, and the following:

MINIMUM REFLECTIVE INTENSITY VALUES FOR TYPE IX SHEETING **Minimum Coefficient of Retroreflection·(R_A) cd/(lx · m²)** Per ASTM E-810 (Average of 0 and 90 degrees Orientation)								
Observation Angle°	**Entrance Angle°**	**White**	**Yellow**	**Fluor. Yellow**	**Fluor. Yellow Green**	**Red**	**Green**	**Blue**
0.2	+40	90	70	55	75	26	9.8	4.5

MINIMUM REFLECTIVE INTENSITY VALUES FOR TYPE IX SHEETING Minimum Coefficient of Retroreflection·(R_A) cd/(lx · m^2) Per ASTM E-810 (Average of 0 and 90 degrees Orientation)								
Observation Angle°	**Entrance Angle°**	**White**	**Yellow**	**Fluor. Yellow**	**Fluor. Yellow Green**	**Red**	**Green**	**Blue**
0.5	+40	35	27	15	23	10	3.5	1.5
10.	+40	10	8.8	6	8	3	1.6	0.8

950.03.04 Temporary Traffic Signs (TTS).

(a) All rigid temporary traffic signs shall be fluorescent orange and meet D 4956, Type VII or Super High Efficiency, Full Cube Retroreflective Sheeting.

(b) All temporary flexible rollup signs shall be fluorescent orange and meet D 4956, Type VI.

950.03.05 Black Sheeting, shall be nonreflective.

950.03.06 Drums for Maintenance of Traffic. per D 4956 Type VII.

950.04 Overhead Sign Structures. Structural steel shall meet A 709, Grade36. Steel tubes or pipes shall meet A 595, Grade A or API 5-LX52. Design and minimum thickness of material shall meet AASHTO Specifications for Structural Supports for Highway Signs, Luminaries, and Traffic Signals. All steel shall be galvanized per A 123. Hardware shall be galvanized per A 153.

950.05 to 950.07 RESERVED.

950.08 SIGNS. The manufacturer or supplier shall furnish certification as specified.

950.08.01 Sheet Aluminum Sign Panels. B 209, with an anodized mill finish. Alloys shall be either 6061 T6 or 5052-H38.

950.08.02 Extruded Aluminum Sign Panels and Edge Strip. B 221, alloy 6063 T6.

950.08.03 Hardware shall be clear anodized, meeting of the following: B 209, alloy 2024 T4; or B 211, alloy 2024 T4, 6262 T9, 6061 T6, 7075 T6 or 2017 T4.

SECTION 951 – UNDERGROUND ELECTRICAL & DETECTION MATERIALS

951.01 BACKFILL MATERIAL FOR TRENCHES FOR BURIED CABLE. The lower 1 ft depth of trench shall be fine aggregate meeting Section 901. Material above the 1 ft depth shall be select material as specified in Section 916.

951.02 ELECTRICAL CABLE AND WIRE. A standard commercial product manufactured not more than one year prior to the date of the Contract. All cable and wire shall be made of copper.

951.02.01 Direct Burial Cable. A single conductor stranded, with an unshielded, chemically crosslinked thermosetting polyethylene insulation rated for 600 volts. The cable shall be suitable for direct earth burial or installation in ducts or conduit and shall meet UL Type USE, XHHW or THW and bear the applicable UL labels denoting type, size, stranding, manufacturer's name and surface marking or molded ridges for phase and neutral identification. Sizes shall be as specified.

951.02.02 Building Cable and Wire. 600 V, plastic insulated, nylon jacketed and shall meet UL Type THWN/THHN and bear the applicable UL labels denoting type, size, stranding, manufacturer's name and surface marking or molded ridges for phase and neutral identification. Sizes shall be as specified.

951.02.03 Cable Duct shall consist of cables preinstalled in either a polyvinyl chloride (PVC) or polyethylene (PE) plastic duct meeting NEMA TC 7 and the NEC. PVC shall meet D 3485. PE duct shall be manufactured from black, virgin, high density PE resin meeting D 1248, Type III, Grade P34, Class C, Category 5. Minimum inside diameter of duct shall be 1-1/2 in. Cable shall be rated for 600 volts.

951.02.04 Ground Wire and Rods. Ground wire shall be bare medium drawn copper. Ground wire shall be of the size (solid or stranded) configuration shown in the Contract Documents. Ground rods shall be 0.75 in. diameter, a minimum of 10 ft in length, with a steel core and copper jacket.

951.03 UTILITY DETECTION TAPE. Consists of one layer of aluminum foil laminated between two layers of inert plastic film. The foil shall be 3 in. wide with a tensile strength of 60 lb. The plastic film shall have a 4.5 mil minimum thickness.

(This page intentionally left blank)

INDEX

A

B

C

D

E

F

G

H

I

J

L

M

N

O

P

R

S

T

U

V

W

Z