SECTION 322 - STORM DRAINAGE AND STORMWATER MANAGEMENT

322.01 DESCRIPTION

Work includes all labor, material, and equipment to construct storm drain systems and stormwater management facilities, including all appurtenances as shown on the drawings and as specified. The work shall include, but not be limited to, excavation, dewatering, backfilling, concrete and masonry work, embankments, filters, outlet works, structures, piping, appurtenances, completion of as built plans and closure of applicable associated jurisdictional permits, acceptance of the SWM facility maintenance by MCDPS and M-NCPPC, and/or other related applicable jurisdictions, and all incidental items to complete the work as shown on the Drawings and as specified.

322.02 REFERENCE STANDARDS

The most restrictive requirements of the latest publications of the following specifications will be complied with for this project:

AASHTO	Standard Specification, latest edition - M-145, M-170, M-252, M-294, and T-99
ASTM	Standard - C-361, D1785, and D2321.
MCDOT	Transportation Storm Drain Design Criteria and Standards, latest edition.
MCDPS	Stormwater Management Pond Construction Specifications.
MDDNR	WRA, Stormwater Management Division Standards and Specifications for Infiltration, latest edition.
MDE	Maryland Stormwater Management Design Manual, Volumes I and II, latest edition.
MDSHA	Standard Specifications for Construction and Materials, July 2008, or latest edition - 303.03.04, 305.03.06, 322.02, 420, 901.01, and 903.
M-NCPPC	Section 111 – As Built Drawing (Record Drawing). Section 200 – Excavation, Filling, and Grading Section 503 – Portland Cement Concrete.
USDA	Natural Resources Conservation Service –Maryland Code No. 378 Standards and Specifications for Ponds, latest edition.

322.03 DEFINITIONS

Not applicable

322.04 MATERIALS

A. Pipes: All pipes shall be certified and meet the MSHA Standard Specifications for Construction and Material, July 2008, Section 905. All reinforced concrete pipes through stormwater management embankments shall have bell and spigot joints with rubber gaskets

and conform to ASTM Designation C-361, Type A-25, unless otherwise specified on Drawings.

Storm drainpipes, as installed, will conform as applicable to the following minimum standards:

1. Reinforced Concrete Pipe - AASHTO M-170
2. High Density Polyethylene -AASHTO M-252, AASHTO M-294
3. 12"- 60" Storm Drain or SWM Pipes - AASHTO M-294-Type-S
4. 4"- 12" Perforated Drainpipes - AASHTO M-252-Type-C or AASHTO M-294-Type-S
5. Polyvinyl chloride pipe PVC schedule 40 and 80 - ASTM D1785

Corrugated Metal Pipe (CMP) pipes are not acceptable for use on Park Property unless approved by M-NCPPC CM. The exceptions could be for bridge projects such as using structural plate culverts or arch culvert where all corrugated metal pipe is helically corrugated, 16-gauge minimum, with ½" x 2-2/3" corrugations, and having an aluminized coating. Aluminized surfaces that are in contact with concrete will be painted with one coat of zinc chromate primer.

B. Cast in Place Concrete: MSHA Standard Specifications for Construction and Materials - Sections 420 and Section 513 – Portland Cement Concrete.

C. Precast Concrete structures: MSHA Standard Specifications for construction and materials - Section 305.03. Concrete design shall meet the requirements of ACI 350, Environmental Engineering Concrete Structures, with freezing and thawing exposures. Concrete shall be a type II or IIA cement, with a 28-day compressive strength of 4500 psi for cast in place and 5000 psi for pre-cast structures. Concrete shall also meet the requirements of MSHA Standard Specifications for Construction and Materials, Section 420. Any inflow or outflow pipes or bolting of miscellaneous structures that are added shall be made watertight by methods approved by M-NCPPC CM.

D. Brick for inlets or manhole structures: MSHA Standard Specifications for Construction and Materials - Section 903. After all bricks are installed, there must be a skim coat of concrete or mortar applied over all bricks. Structure shall be watertight.

E. Mortar

1. Cement for mortar: MSHA Standard Specifications for Construction and Materials - Section 902.

2. Sand for mortar: MSHA Standard Specifications for Construction and Materials - Section 901.01, Table 901A.

3. Mortar: All mortar shall be composed of the cement and sand specified in MSHA Standard Specifications for Construction and Materials - Section 322.02. For brick masonry, the proportions by volume shall be one part of cement to two parts of

sand. Mortar shall be freshly mixed in small batches for the work at hand. Tight boxes of platforms, made for the purpose, shall be used. The sand and cement shall be thoroughly mixed dry, in the proper proportions, until a uniform color has been produced, whereupon a sufficient quantity of water shall be added, and the mass further mixed so as to produce a stiff pat of the proper consistency. Approved methods of machine mixing may be employed. Mortar shall be used within thirty minutes after mixing, and all hard or otherwise damaged mortar shall be properly discarded.

F. Pipe joint material: Shall be in conformance with MSHA Standard Specifications for Construction and Materials - Section 303.03.04. All Pipe joints shall be made soil and watertight.

G. Manholes and miscellaneous structures shall meet the requirements of MCDOT Standards. All storm drain structures are subject to modification by the M-NCPPC Construction Manager to meet field conditions. Where the drop on the main line through a structure can be accommodated by an invert slope of 1 ½ foot horizontal to 1 foot vertical or flatter, a rounded bottom shaped channel will be built conforming to the inlet and outlet pipes. The sidewalls of the shaped channel shall extend to the crowns of the pipes in the structure. Otherwise, the bottom of the structure shall be lined with granite blocks that are at least 4 inches thick with no shaped channel required. The bottom shall slope ½" per foot toward the invert of the outlet pipe. No structure shall hold water at the bottom unless otherwise noted.

H. Embankment material shall be as specified on Drawings, required by appropriate reference documents, and confirmed by on-site Geotechnical Engineer.

I. All Filter media shall conform to the MCDPS standards for the individual device unless otherwise noted.

J. Montgomery County-Approved Structures: All SWM facilities structures shown on design plans are as approved by Montgomery County. Any proposed substitution must be approved by Montgomery County in writing in advance of construction. The Contractor shall be responsible for all engineering, submittals, and coordination required to obtain Montgomery County revision approvals. All work must be coordinated with and approved by the M-NCPPC Construction Manager. In no instance shall M-NCPPC accept a completed drainage or SWM facility system that provided a lower treatment level than the original design.

322.05 SUBMITTALS

A. Provide all pipe certifications to meet the MSHA Standard Specifications for Construction and Material in Section 905.01.

B. Montgomery County-Approved Structures and SWM facilities - The Contractor shall be responsible for all engineering, submittals, and coordination required to obtain Montgomery County revision approvals. All information shall be also given to the M-NCPPC Construction Manager.

C. Certification from Manufacturer for all precast units.

D. Contractor shall submit for approval the name, company, and qualification of the Engineer of Record.

E. All Shop Drawings for Stormwater Management shall be sealed by a PE and submitted to M-NCPPC CM, and other related applicable jurisdictions, for review and approval prior to initiating construction.

322.06 QUALITY ASSURANCE

The minimum qualifications of the Engineer of Record shall be:

1. Submitted to M-NCPPC for approval.

2. Familiar with the design, construction, and functionality of stormwater management facilities.

3. A licensed Professional Engineer (PE) registered in the State of Maryland.

322.07 CONSTRUCTION

I. STORM DRAINAGE

A. Handling and alignment of pipe: Pipe shall be carefully handled and lowered into the trench. In laying pipe, special care shall be taken to ensure that each length shall abut against the next in such a manner that there shall be no shoulder or unevenness of any kind along the inside of the bottom half of the pipe line.

B. Bedding Materials:

1. For HDPE and non-metal pipes: Bedding material shall meet the requirements of ASTM D2321 Class I material, with the exception that (per AASHTO Section 30) the maximum particle size of the bedding materials shall be 1.25 in. (32 mm). The bedding material upper limit shall be equal to one-third of the pipes O.D., unless otherwise directed by the MNCPPC Construction Manager. A minimum of 6 (six) inches of loosely compacted bedding material shall be provided below the bottom surface of the pipe prior to pipe placement. Final backfill material shall meet the requirements of ASTM D2321 Class I, Class II, or Class III material. All initial and final backfill material shall be placed in 6 (six) to 8 (eight) inch lifts and compacted to a minimum 90% Standard Proctor Density. See Section 200 Excavation, Filling, and Grading for finished grading over pipes.

2. Bedding material for concrete pipes: Bedding material shall consist of a well-graded mixture of stone, gravel, and sand in accordance with AASHTO M145 type A-1, A-3. This is further described and identified as “Class C bedding” found in the American

Concrete Pipe Association "Concrete pipe & Box culvert installation" guidelines: www.concrete-pipe.org/pdf/installation_guide.pdf.

C. For other pipe installations not included above, follow the most stringent guidelines of the latest publications from WSSC and MCDOT.

D. Pipe placement and foundation: Before joints are made, each pipe shall be well bedded on a solid foundation and no pipe shall be brought into position until the preceding length has been thoroughly embedded and secured in place. Any defects due to settlement shall be repaired by the Contractor at his own expense. When plastic pipe is used, the Contractor shall periodically check for pipe deflection during pipe installation and within 30 days of the completion of the project. The internal diameter of plastic storm drainpipes shall not be reduced by more than 5 percent of its design diameter. If the installation does not meet these requirements, the pipe shall be removed and replaced at no additional cost to the Commission. Bell holes shall be dug sufficiently large to insure the making of proper joints. No pipes shall ever be supported by the bell joints only. Trench widths shall conform to the latest regulations found in the MCDOT Storm Drain design criterion which is equal to the outside diameter of the pipe plus 18 inches on both sides of pipe, or 2 times the outside diameter of the pipe, whichever is narrower. Where any portion of the proposed storm drain system is located in a fill section, Contractor shall provide select fill material compacted to 95% AASHTO T-99 density from original undisturbed ground up to structure bottom slabs and pipe bedding.

E. Equipment for handling material: Proper and suitable tools and appliances for the safe and convenient handling and laying of pipes shall be used.

F. Cleaning pipe: The pipes shall be thoroughly cleaned before they are laid and shall be kept clean until acceptance of the completed work. The open ends of all pipelines shall be provided with a stopper carefully fitted to keep dirt and other substances from entering. This stopper shall always be kept in the end of the pipeline when laying is not in actual progress.

G. Cutting the pipe: Whenever a pipe requires cutting, to fit into the line or to bring it to the required location, the work shall be done in a satisfactorily manner so as to leave a smooth end. Cost of cutting the pipe shall be included in the unit price for the pipe.

H. Trench water: The excavation in which the pipe is being laid shall be kept free from water and no joint shall be made under water. Water shall not be allowed to rise in the excavation until the joint material has received its set. Care shall be used to secure water tightness and to prevent damage to, or disturbing of, the joints during the backfilling process, or at any other time.

I. Laying the pipe in freezing weather: No pipe shall be laid upon a foundation into which frost has penetrated, nor at any time when the Commission Construction Manager shall deem that there is danger of the formation of ice or the penetration of frost at the bottom of excavation, unless all required precautions as to the minimum length of open trench and promptness of backfilling are observed.

J. Grade all disturbed areas to provide positive drainage. All drainage pipes must have a minimum of one (1) foot cover.

K. After Stabilizing site, all Concrete Storm Drain Inlets are to be marked/stenciled with M-NCPPC issued decals. Contractor shall coordinate with M-NCPPC construction manager to obtain and return unused materials.

L. Splash/Plunge Pool: Use specified class of riprap. Use geotextile as specified in the plans, and protect from punching, cutting, or tearing. Repair any damage by placing another piece of geotextile over the damaged part or by completely replacing the geotextile. Provide a minimum of 1 (one) foot overlap for all repairs and for joining two pieces of geotextile. Prepare the subgrade to the required lines and grades. Compact any fill required in the subgrade to a density of approximately that of the surrounding undisturbed material. Embed the geotextile a minimum of 4 (four) inches and extend the geotextile a minimum of 6 (six) inches beyond the edge of the scour hole. Stone for the plunge pool may be placed by equipment. Construct to the full course thickness in one operation and in such a manner as to avoid displacement of underlying materials. Deliver and place the stone for the plunge pool in a manner that will ensure that it is reasonably homogeneous with the smaller stones and spalls filling the voids between the larger stones. Place stone for the plunge pool in a manner to prevent damage to the geotextile. Hand place to the extent necessary. At the plunge pool outlet, place the stone so that it meets the existing grade. Maintain line, grade, and cross section. Keep outlet free of erosion. Remove accumulated sediment and debris. After high flows inspect for scour and dislodged riprap. Make repairs immediately.

M. Storm Drain As-Builts – See Section 111 – As Built Drawings (Record Drawings).

II. STORMWATER MANAGEMENT

The construction of all stormwater management facilities shall conform to the approved drawings, Montgomery County Stormwater Management construction standards, MDE Stormwater Design Manual Volumes I&II, and the State of Maryland Highway Standard Specifications. The Contractor is responsible for fully understanding the design and functions of the proposed facilities and for constructing facilities in full compliance with design standards and the approved plans.

A. Engineer of Record (EOR)

1. The Contractor shall designate an EOR. The purpose of the EOR is to oversee and inspect the construction of all stormwater management facilities and related stormwater management structures at no additional cost to MNCPPC and signoff on the MCDPS inspection checklist on the contract drawings for each facility.

2. The EOR shall be solely responsible for overseeing, inspecting, and certifying that all stormwater-related facilities are built per the approved project plans and specifications. This includes all above and below ground structural and material components. The EOR

shall verify all critical inverts and elevations throughout construction to ensure conformance with approved designs. This information shall be provided to M-NCPPC in a timely manner during construction. The EOR shall make any corrections and adjustments required to fully provide required design volumes, function, and structural integrity of facilities at no additional cost to the owner. The EOR shall also verify that all site improvements, flow paths, and drainage areas to each facility are in conformance with the approved design plans.

3. The EOR shall be responsible for signing any applicable MCDPS inspection checklists related to each stormwater-related facility. Note: all applicable inspection checklists should be shown on the project plans; in the event that they are not, they can be provided at the contractor's request.

4. Any minor adjustments to the design plans during construction of a stormwater management facility shall be reviewed and approved by EOR and approved by M-NCPPC Construction Manager in coordination with the MCDPS inspector.

B. Shop Drawings: All Shop Drawings shall be sealed by a PE and submitted to M-NCPPC, and other related applicable jurisdictions, for review and approval prior to initiating construction.

C. As-built drawings shall be provided as documented in Section 111 – As Built Drawings (Record Drawings).

D. Stormwater Facility Maintenance: The Contractor shall be solely responsible for maintenance of all stormwater-related facilities until MCDPS, or other related applicable jurisdictions, conducts the closeout inspection and releases the permit. The Contractor shall also perform any required maintenance to the facility to ensure full functionality, and any final required punch-list items as required by M-NCPPC, prior to final M-NCPPC acceptance of the facility.

322.08 MEASUREMENT AND PAYMENT

Payment will be full compensation for all material, labor, equipment, tools, and incidental items necessary to complete the work. Payment shall be made on a unit rate or lump sum basis as shown in the bid proposal. Payment for as built drawing and closure of stormwater management permit will be paid under Section 111 – As Built Drawing (Record Drawing). Full Payment for stormwater management related bid items (up to 20% of the full value of this item) maybe withheld at the discretion of the Commission pending MCDPS and/or other applicable jurisdictions approval of as built plans.