

# **CLOSEOUT REQUIREMENTS**



**Contractor Close Out Check List**  
**Pink Sheet Attachment**

**Substantial Completion – Minimum Requirements**

- Certificate of Substantial Completion - A punch list and a final completion date are required.
- Certificate of Occupancy - Temporary Certificate of Occupancy or Partial Certificate of Occupancy
- Final Code Permit Approvals - Local city or county government may have delegated authority for elevator approvals.
  - May include General Building Permit, Plumbing, Mechanical, Electrical, HVAC, site work, elevator division
- Final Health Department Approval - Including water testing, equipment approvals, backflow preventer testing, etc.
- Final Fire Marshall (Office of Fire Safety) Approval - Local fire departments may have delegated authority.
- Final HVAC and Water Balancing - reports if required
- Final Fire Alarm and Sprinkler System Certifications
- Agency Training - Complete all specified training.
- Operator & Maintenance Manuals - A minimum of one complete O&M manual must be provided at the time of Substantial Completion. Remaining specified copies must be submitted for Final Completion.
- Turnover Special Tools and Equipment - turned over to the agency on or before the date of Substantial Completion
- Keys/Locksets - temporary or permanent lock cores and the submission of all specified keys to agency representative
- Commissioning - final operational testing, startup reports or testing reports

**Final Completion**

- Final Payment - DTMB-440
- Final Bond Company/Surety Release for Final Payment
- Completion of All Punch List Work
- General Guarantee/Warrantees - DTMB-437
- Extended Guarantees/Warrantees - all specified material/equipment extended warranties
- Final Contract Change Order - includes final adjustments to unit price work, allowances, liquidated damages, time extensions and extended general conditions if applicable
- As Built Drawings - record documents including a final site survey when required; submit per the contract
- Disposal Records - Submit copies of disposal records, as specified, for materials being removed from the project.
- Maintenance Agreements - Submit all specified agreements for elevators, kitchen equipment or specialized systems.
- Operator & Maintenance Manuals - submission of the remaining copies specified that were not submitted at Substantial Completion
- SESC and Storm Water Permits - submit evidence of final closure
- Extra Material/Spare Parts - submit evidence of turnover to the agency of all specified materials and parts
- Demobilization - final cleaning, removal of all temporary measures and restoration of project site
  - No salvage or surplus material may be sold or burned on the agency project site
  - The contractor shall recycle or properly dispose of all surplus or salvage material





## Final Completion Checklist

Dollar Bay to Lake Linden Trail – Bid Package 2

OHM File #: 7136-20-0040

DTMB File #: 751/14068.TAP

Date:

The following is a list of contractual items that the owner and architect have found to be incomplete or in need of correction. The failure to include any items on the list does not alter the responsibility of the Contractor to complete all Work in accordance with the contract documents.

### General Items:

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1. Provide As-Built drawings.
2. Provide DMB-437 Guarantee and Indebtedness Statement.
3. Provide DMB-445 Certificate of Substantial Completion.
4. Provide Consent of Surety for final payment.
5. Provide sworn statement.
6. Provide final waiver of liens.
7. Provide Close Out Checklist – Signed off.

### Specific Items:

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2.	
3.	
4.	
5.	

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# GUARANTEE AND INDEBTEDNESS STATEMENT

**RETURN TO:** DEPARTMENT OF TECHNOLOGY, MANAGEMENT AND BUDGET  
State Facilities Administration  
Design and Construction Division  
Mailing Address: P.O. Box 30026, Lansing, MI 48909  
Street Address: 3111 W. St. Joseph Street, Lansing, MI 48917

This form is required to receive final payment for the contract. Upon completion, submit a completed form to the address above. Authority: 1984 PA 431

The undersigned provides the following statements covering the work defined in the contract dated:

SIGMA CODING	AGENCY NUMBER	FILE NUMBER	CONTRACT NUMBER
DEPARTMENT/AGENCY			
PROJECT NAME			

## GUARANTEE

We guarantee that all labor and materials furnished and the Work performed by us in connection with the subject work are in accordance with the plans and specifications, authorized alterations and additions that should any defects develop or become apparent for a period of \_\_\_\_\_ year(s) from date of acceptance \_\_\_\_\_ the same shall, upon written notice, be made good by us without expense to the Owner, and that any other Work, affected in correcting such defects shall also be made good. In addition to the above guarantee, the following additional items are guaranteed as noted:

## INDEBTEDNESS STATEMENT

We certify that all payrolls, material bills, and other indebtedness connected with the work on the subject project have been paid in full.

COMPANY NAME AND CONTRACTOR'S SIGNATURE

DATE

WITNESS SIGNATURE

DATE

cc: Agency  
Designer





**CERTIFICATE OF SUBSTANTIAL COMPLETION**  
 DEPARTMENT OF TECHNOLOGY, MANAGEMENT AND BUDGET  
 State Facilities Administration  
 Design and Construction Division

**DATE OF SUBSTANTIAL COMPLETION:** \_\_\_\_\_  
**FINAL COMPLETION DATE:** \_\_\_\_\_

The work performed under the subject contract between the State of Michigan and the contractor named at the location listed, has been inspected and found to be in compliance with the contract documents, including duly authorized changes, except for the list of the exceptions noted. The Contractor agrees to complete or correct these items on or before (date):

SIGMA CODING	AGENCY NUMBER	FILE NUMBER	CONTRACT NUMBER
DEPARTMENT/AGENCY			
PROJECT NAME			CONTRACT PRICE
CONTRACTOR NAME AND ADDRESS			
PROFESSIONAL			

1. **SCOPE:** This Certificate of Substantial Completion is for the entire Work \_\_\_\_\_ or the parts of the Work listed in Attachment A \_\_\_\_\_.
2. **DIVISION OF RESPONSIBILITIES:** The responsibilities between the Owner and Contractor for security, operation, safety, maintenance, heat and utilities, insurance and warranties and guarantees, pending final payment (or Substantial Completion of the entire Work), shall be as shown on Attachment B.
3. **DOCUMENTS ATTACHED:** The following documents are attached to and made a part of this Certificate:

**PUNCH LIST**

Provide all Closeout Documents

<b>APPROVALS</b>	
AGENCY REPRESENTATIVE	DATE
CONTRACTOR	DATE
STATE FACILITIES ADMINISTRATION	DATE
PROFESSIONAL	DATE

White - Contract    Green - Project Manager    Canary - Professional Service Contractor    Pink - Contractor    Goldenrod - Agency

Items of work must be completed before final payment can be made and the contract close out. Authority: 1984 PA 431.



# **TECHNICAL SPECIFICATIONS**



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## SECTION 01 22 00 - UNIT PRICES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section includes administrative and procedural requirements for unit prices.

#### 1.3 DEFINITIONS

- A. Unit price is a price per unit of measurement for materials, equipment, or services, or a portion of the Work, added to or deducted from the Contract Sum by appropriate modification, if the scope of Work or estimated quantities of Work required by the Contract Documents are increased or decreased.

#### 1.4 PROCEDURES

- A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.
- B. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.
- C. List of Unit Prices: A schedule of unit prices is included in Part 3. Specification Sections referenced in the Part 3 "Schedule of Unit Prices" Article contain requirements for materials described under each unit price.
- D. Construction testing including compaction testing or other testing as required in the Plans and Specifications are considered incidental to the pay items and work activities they are associated with.
- E. All work shall be performed and paid for per the MDOT 2020 Standard Specifications for Construction and the requirements of this Specification and the Project Manual. Where there are differences with this Specification and the Project Manual and the MDOT 2020 Standard Specifications for Construction, this Specification and the Project Manual shall apply.
- F. Work activities including labor, equipment or materials for items that are not listed below but are shown on the plans or detailed in the specifications are considered incidental to the pay items included in the project and the Contractor shall include the cost to complete those items within the pay items of the project.

- G. Unless otherwise noted as specifically not including some element of work, Unit Prices shall include all labor, material, equipment, delivery, disposals, and subcontractors required to perform the work described and shown in the plans and specifications.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF UNIT PRICES

- A. Pay Item: Mobilization, Max
  - 1. Description: This includes mobilization and demobilization of personnel, equipment, supplies, and incidentals to the project site in accordance with 2020 MDOT Standard Specifications for Construction.
  - 2. Unit of Measurement: Lump Sum (LSUM)
- B. Pay Item: Clearing
  - 1. Description: This work consists of all clearing as noted on the plans for culvert replacements, removals, naturalizations, or installations. All wood debris, logs, limbs, trunks, etc shall be removed from the project site and properly disposed of. All work performed in accordance with 2020 MDOT Standard Specifications for Construction.
  - 2. Unit of Measurement: Per Acre (Acre). Measurement will be rounded to the nearest hundredth of an acre.
- C. Pay Item: Trail Clearing
  - 1. Description: This work consists of all clearing and selective thinning needed to achieve design trail widths and perform trimming along the proposed trail route per proposed trail cross sections. All work performed in accordance with 2020 MDOT Standard Specifications for Construction.
  - 2. Unit of Measurement: Per Station (Sta)
- D. Culv, Rem, Less than 24 inch
  - 1. Description: This work consists of removal of culverts less than 24 inches in diameter. Any excavation performed to remove culvert is considered incidental to Culv, Rem, Less than 24 inch. All backfill installation of excavated culverts up to the bottom of aggregate surface course or to the bottom of topsoil for slope restoration is considered incidental to this pay item. All work shall be performed in accordance with 2020 MDOT Standard Specifications for Construction.
  - 2. Unit of Measurement: Per Each (Ea)
- E. Culv, Rem, 24 inch to 48 inch
  - 1. Description: This work consists of removal of culverts 24 inch to 48 inch in diameter. Any excavation performed to remove culvert is considered incidental to Culv, Rem, 24 inch to 48 inch. All backfill installation of excavated culverts up to the bottom of aggregate surface course or to the bottom of topsoil for slope restoration is considered incidental to this pay item. All work shall be performed in accordance with 2020 MDOT Standard Specifications for Construction.
  - 2. Unit of Measurement: Per Each (Ea)

- F. Culv, Rem, Over 48 inch
  - 1. Description: This work consists of removal of culverts over 48 inches in diameter. Any excavation performed to remove culvert is considered incidental to Culv, Rem, Over 48 inch. All backfill installation of excavated culverts up to the bottom of aggregate surface course or to the bottom of topsoil for slope restoration is considered incidental to this pay item. All work shall be performed in accordance with 2020 MDOT Standard Specifications for Construction.
  - 2. Unit of Measurement: Per Each (Ea)
- G. Culv, End, Rem, Less than 24 inch
  - 1. Description: This work consists of removal of culvert end sections less than 24 inches in diameter. Any excavation performed to remove culvert end sections is considered incidental to this pay item. All work shall be performed in accordance with 2020 MDOT Standard Specifications for Construction.
  - 2. Unit of Measurement: Per Each (Ea).
- H. Culv, End, Rem, 24 inch to 48 inch
  - 1. Description: This work consists of removal of culvert end sections from 24 inches up to 48 inches in diameter. Any excavation performed to remove culvert end sections is considered incidental to this pay item. All work shall be performed in accordance with 2020 MDOT Standard Specifications for Construction.
  - 2. Unit of Measurement: Per Each (Ea).
- I. Structures, Rem
  - 1. Description: This work consists of removal of structures. All work performed to remove structure is considered incidental to Structures, Rem. All work shall be performed in accordance with 2020 MDOT Standard Specifications for Construction.
  - 2. Unit of Measurement: Lump Sum (LSUM)
- J. Dr Structure, Rem
  - 1. Description: This work consists of removal of drainage structures. All work performed to remove structure is considered incidental to Dr Structure, Rem. All work shall be performed in accordance with 2020 MDOT Standard Specifications for Construction.
  - 2. Unit of Measurement: Per Each (Ea)
- K. Fence, Rem
  - 1. Description: This work consists of removing and disposing fence per plan or as directed by the engineer. All work shall be performed in accordance with 2020 MDOT Standard Specifications for Construction.
  - 2. Unit of Measurement: Per Foot (Ft)
- L. Embankment, CIP
  - 1. Description: This work consists of providing, placing, and compacting material per plan to meet proposed cross section or as directed by the engineer. This does not include fill material incidental to culvert removals or construction or establishing grades for riprap plunge pools. All work shall be performed in accordance with 2020 MDOT Standard Specifications for Construction.
  - 2. Unit of Measurement: Per Cubic Yard (Cyd)
- M. Excavation, Earth
  - 1. Description: This work consists of excavating material per plan or as directed by the engineer. This does not include any excavation incidental to culvert or structure removals

- or installations or the excavation required for riprap installation. All work shall be performed in accordance with 2020 MDOT Standard Specifications for Construction.
2. Unit of Measurement: Per Cubic Yard (Cyd)
- N. Backfill, Structure, CIP
1. Description: This work consists of backfill for box culverts three sided arches per the plans and specifications and includes the material, labor and equipment costs to install backfill around the structures. This pay item is not for backfill around culverts or manholes as the backfill around those structures is incidental to those pay items. All work shall be performed in accordance with 2020 MDOT Standard Specifications for Construction.
  2. Unit of Measurement: Per Cubic Yard (Cyd).
- O. Machine Grading
1. Description: This work consists of light grading up to 12 inches deep to develop the cross section shown on the plans. This work included scarifying, plowing, disking, moving, compacting, and shaping the earth. Loading and hauling material is not required for machine grading. All work shall be performed in accordance with 2020 MDOT Standard Specifications for Construction. This pay item will only be used in areas where there is not a new aggregate surface being installed. Grading in those areas is incidental to the Aggregate Surface Cse, \_\_ inch pay item.
  2. Unit of Measurement: Per Station (Sta)
- P. Erosion Control, Check Dam, Stone
1. Description: This work consists of installing riprap check dams at sediment traps per plan or as directed by the engineer. All work shall be performed in accordance with 2020 MDOT Standard Specifications for Construction.
  2. Unit of Measurement: Per Foot (Ft)
- Q. Erosion Control, Maintenance, Sediment Rem
1. Description: This work consists of ensuring all soil erosion control measures are functioning properly. This requires removing any sediment and debris effecting the functions of the erosion control measures. This work will be performed as directed by the engineer. All work shall be performed in accordance with 2020 MDOT Standard Specifications for Construction.
  2. Unit of Measurement: Per Cubic Yard (Cyd)
- R. Erosion Control, Sediment Trap
1. Description: This work consists of excavating, provide, maintain, remove, and dispose of sediment traps for soil erosion and sedimentation control protection. Excavate 5cyds or less. Install per plan or as directed by the engineer. All work shall be performed in accordance with 2020 MDOT Standard Specifications for Construction.
  2. Unit of Measurement: Per Each (Ea)
- S. Erosion Control, Silt Fence
1. Description: This pay item includes the installation, maintenance, replacement of damaged or defective silt fence, and removal of silt fence during construction. Install per plan or as directed by the engineer. All work shall be performed in accordance with 2020 MDOT Standard Specifications for Construction.
  2. Unit of Measurement: Per Foot (Ft)
- T. Erosion Control, Turbidity Curtain, Shallow

1. Description: This work consists of installing, maintaining, and removing turbidity curtain where other BMP's cannot be used. Install per plan or as directed by the engineer. All work shall be performed in accordance with 2020 MDOT Standard Specifications for Construction.
  2. Unit of Measurement: Per Foot (Ft)
- U. Erosion Control, Bypass Pumping
1. Description: This work consists of pumping upstream water into a diversion ditch on the downstream side of the work area to allow required work to be performed. Work activities to create the bypass pumping intake including any temporary dams or berms, silt protection, screens or other items are included in this pay item. Labor and Equipment including pumps and other items needed to perform the bypass pumping are included in this pay item. Any incidental tasks required to perform bypass pumping are included in this pay item. This work shall be completed per plan or as directed by the engineer. All work shall be performed in accordance with 2020 MDOT Standard Specifications for Construction.
  2. Unit of Measurement: Per Each (Ea) There shall be no more than one (1) Each per site regardless of the number of times the Contractor may set up or remove bypass pumping operations.
- V. Erosion Control, Diversion Ditch
1. Description: This work consists of creating a ditch for diverting water into during bypass pumping operations. Excavating and installing riprap in ditch is considered incidental to Erosion Control, Diversion Ditch. Removal of the diversion ditch and restoration back to prework conditions are incidental to this pay item. Create diversion ditch per plan or as directed by the engineer. All work shall be performed in accordance with 2020 MDOT Standard Specifications for Construction.
  2. Unit of Measurement: Per Each (Ea)
- W. Subbase, CIP
1. Description: This work consists of providing and placing sand subbase within trail limits per proposed cross sections or as directed by the engineer. Subbase installation incidental to culvert removals or installations is incidental to those pay items and shall not be paid for separately. All work shall be performed in accordance with 2020 MDOT Standard Specifications for Construction.
  2. Unit of Measurement: Per Cubic Yard (Cyd)
- X. Aggregate Surface Cse, 8 inch
1. Description: This work consists of providing and placing 8 inches of aggregate surface course per proposed trail cross section as indicated on the plans or as directed by the engineer. All work shall be performed in accordance with 2020 MDOT Standard Specifications for Construction.
  2. Unit of Measurement: Per Square Yard (Syd)
- Y. Geotextile, Separator, Non-Woven
1. Description: This work consists of providing and placing geotextile separator, non-woven per manufacturer's specifications. All work shall be performed in accordance with 2020 MDOT Standard Specifications for Construction.
  2. Unit of Measurement: Per Square Yard (Syd)

- Z. Boulder Relocate
1. Description: This work consists of removing and relocating existing boulders per plan or as directed by the engineer. All work shall be performed in accordance with 2020 MDOT Standard Specifications for Construction.
  2. Unit of Measurement: Per Each (Ea)
- AA. Culv End Sect, \_\_ inch
1. Description: This work consists of providing and placing Culv End Sections. All work shall be performed in accordance with 2020 MDOT Standard Specifications for Construction.
  2. Unit of Measurement: Per Each (Ea)
- BB. Culv End Sect, Conc, \_\_ inch
1. Description: This work consists of providing and placing Concrete Culv End Sections. All work shall be performed in accordance with 2020 MDOT Standard Specifications for Construction.
  2. Unit of Measurement: Per Each (Ea).
- CC. Culv, CI \_\_, \_\_ inch
1. Description: This work consists of excavation down to grade or to the culvert bedding bottom elevation, dewatering and maintaining the stream flow during construction stages unless paid for separately as noted on the plans, providing and placing the culvert, bedding and geotextile, providing temporary cover and restraining the pipe to maintain line and grade, backfill to final grades (providing, placing, and compacting), mandrel testing (if required), and disposing of excess material. All work shall be performed in accordance with 2020 MDOT Standard Specifications for Construction.
  2. Unit of Measurement: Per Foot (Ft)
- DD. Culv CI, B, CSP, 48 inch
1. Description: This work consists of excavation down to grade or to the culvert bedding bottom elevation, dewatering and maintaining the stream flow during construction stages unless paid for separately as noted on the plans, providing and placing the culvert, bedding and geotextile, providing temporary cover and restraining the pipe to maintain line and grade, backfill to final grades (providing, placing, and compacting), and disposing of excess material. All work shall be performed in accordance with 2020 MDOT Standard Specifications for Construction.
  2. Unit of Measurement: Per Foot (Ft).
- EE. Culv CI \_\_, Conc, \_\_ inch
1. Description: This work consists of excavation down to grade or to the culvert bedding bottom elevation, dewatering and maintaining the stream flow during construction stages unless paid for separately as noted on the plans, providing and placing the culvert, bedding and geotextile, providing temporary cover and restraining the pipe to maintain line and grade, backfill to final grades (providing, placing, and compacting), and disposing of excess material. All work shall be performed in accordance with 2020 MDOT Standard Specifications for Construction.
  2. Unit of Measurement: Per Foot (Ft).
- FF. Culv Bedding, Box Culv
1. Description: This work consists of providing, placing, and compacting the culvert bedding material for precast concrete box culverts. All work shall be performed in accordance with 2020 MDOT Standard Specifications for Construction.
  2. Unit of Measurement: Per Cubic Yard (Cyd).

- GG. Culv, Precast Conc Box, 8.5 foot by 8.5 foot
1. Description: This work consists of excavation down to grade or to the culvert bedding bottom elevation, dewatering and maintaining the stream flow during construction stages, providing and placing the culvert and geotextile strip, providing temporary cover and restraining the culvert to maintain line and grade, backfill (providing, placing, and compacting), and disposing of excess material. All work shall be performed in accordance with 2020 MDOT Standard Specifications for Construction
  2. Unit of Measurement: Per Foot (Ft)
- HH. Temporary Culvert, 30 inch
1. Description: This work includes the installation and removal and restoration of the site for a temporary culvert including, but not limited to, the installation and removal of all fill, temporary driving surface, SESC measures and final restoration. All work shall be performed in accordance with 2020 MDOT Standard Specifications for Construction.
  2. Unit of Measurement: Per Foot (Ft)
- II. Culvert Cleaning
1. Description: This work consists of cleaning and removing debris in culverts per plan or as directed by the engineer. It includes removal of dirt, debris, roots or other foreign objects within the culvert. If a culvert is determined to be collapsed, the cleaning activities will stop and the Contractor shall notify the Engineer.
  2. Unit of Measurement: Per Foot (Ft)
- JJ. Culvert Headwall, Conc
1. Description: This work consists of installation of cast in place or precast concrete headwalls for culverts. It includes the cost of forms, rebar, delivery, installation, excavation and backfill for the headwall. All work shall be performed in accordance with 2020 MDOT Standard Specifications for Construction.
  2. Unit of Measurement: Per Each (Ea).
- KK. Video Taping Sewer and Culv Pipe
1. Description: This work consists of dewatering, flow control, video inspection, and documentation of sewer and culvert pipe. All work shall be performed in accordance with 2020 MDOT Standard Specifications for Construction.
  2. Unit of Measurement: Per Foot (Ft)
- LL. Reinforcement, Steel, Epoxy Coated
1. Description: This work consists of furnishing and installing epoxy coated reinforcement steel per plan or as directed by the engineer. All work shall be performed in accordance with 2020 MDOT Standard Specifications for Construction.
  2. Unit of Measurement: Per Pound (Lb)
- MM. Conc, Grade 3500
1. Description: This work consists of installation of concrete, grade 3500 for repairs on existing structures, or installation of new concrete structures as noted on the plans and in the specifications. All work shall be performed in accordance with 2020 MDOT Standard Specifications for Construction.
  2. Unit of Measurement: Per Cubic Yard (Cyd)
- NN. Hand Chipping, Other Than Deck
1. Description: This work applies to removing and disposing of concrete, but does not apply to removing deck top surfaces, regardless of depth. Removal limits per plan or as

directed by the engineer. All work shall be performed in accordance with 2020 MDOT Standard Specifications for Construction.

2. Unit of Measurement: Per Cubic Foot (Cft)
- OO. Adhesive Anchoring of Horizontal Bar, ½ inch
1. Description: This work consists of providing adhesive, drilling and cleaning holes, filling holes with adhesive, installing bars, and testing. All work shall be performed in accordance with 2020 MDOT Standard Specifications for Construction.
  2. Unit of Measurement: Per Each (Ea)
- PP. Adhesive Anchoring of Vertical Bar, ½ inch
1. Description: This work consists of providing adhesive, drilling and cleaning holes, filling holes with adhesive, installing bars, and testing. All work shall be performed in accordance with 2020 MDOT Standard Specifications for Construction.
  2. Unit of Measurement: Per Each (Ea)
- QQ. Patching Conc, C-L
1. Description: This work includes the labor, material and installation of concrete patches including any temporary forms, pumps, slides or other delivery methods needed to install the concrete, preparation of existing surfaces for installation of the patching concrete, finishing and curing concrete. All work shall be performed in accordance with the 2020 MDOT Standard Specifications for Construction.
  2. Unit of Measurement: Per Cubic Yard (Cyd)
- RR. Patching Mortar or Conc
1. Description: This work consists of removing unsound concrete, cleaning patch area, placing, vibrating, finishing and curing concrete. Patching Mortar or Conc performed per plan or as directed by the engineer. All work shall be performed in accordance with 2020 MDOT Standard Specifications for Construction.
  2. Unit of Measurement: Per Cubic Yard (Cyd)
- SS. Adhesive Anchoring of Horizontal Bar, ½ inch
1. Description: This work consists of providing adhesive, drilling and cleaning holes, filling holes with adhesive, installing bars, and testing. All work shall be performed in accordance with 2020 MDOT Standard Specifications for Construction.
  2. Unit of Measurement: Per Each (Ea).
- TT. Adhesive Anchoring of Vertical Bar, ½ inch
1. Description: This work consists of providing adhesive, drilling and cleaning holes, filling holes with adhesive, installing bars, and testing. All work shall be performed in accordance with 2020 MDOT Standard Specifications for Construction.
  2. Unit of Measurement: Per Each (Ea).
- UU. \_Guardrail, Reconstruct
1. Description: This work consists removing and reinstalling existing guardrail per plan or as directed by the engineer. Replacement of posts or other items damaged during removal shall be included in the cost of this pay item. All work shall be performed in accordance with 2020 MDOT Standard Specifications for Construction.
  2. Unit of Measurement: Per Foot (Ft)
- VV. Minor Traf Devices
1. Description: This pay item shall be performed per the 2020 MDOT Standard Specifications for Construction.



2. Unit of Measurement: Lump Sum (LSUM)

WW. Riprap, Heavy

1. Description: This work consists of provided and placing heavy riprap meeting the gradation requirements for the 2020 MDOT Standard Specifications for Construction per plan or as directed by the engineer. Any excavation required to install riprap per the plans and grades shall be incidental to this pay item. The non-woven geotextile fabric installed under permanent riprap shall be incidental to this pay item. Check dams as noted within riprap drainage channels are incidental to this pay item. All work shall be performed in accordance with 2020 MDOT Standard Specifications for Construction.
2. Unit of Measurement: Per Square Yard (Syd)

XX. Riprap, Plain

1. Description: This work consists of provided and placing riprap per plan or as directed by the engineer. Any excavation required to install riprap per the plans and grades shall be incidental to this pay item. The non-woven geotextile fabric installed under permanent riprap shall be incidental to this pay item. Check dams as noted within riprap drainage channels are incidental to this pay item. All work shall be performed in accordance with 2020 MDOT Standard Specifications for Construction.
2. Unit of Measurement: Per Square Yard (Syd)

YY. Riprap, Salvage

1. Description: This work consists of salvaging, stockpiling and protecting existing riprap per plan or as directed by the engineer. Existing riprap shall be salvaged clean of debris and other soils. All work shall be performed in accordance with 2020 MDOT Standard Specifications for Construction.
2. Unit of Measurement: Per Square Yard (Syd)

ZZ. Riprap, Salvaged

1. Description: This work consists of installing salvaged riprap per plan or as directed by the engineer. Any excavation required to install riprap per the plans and grades shall be incidental to this pay item. The non-woven geotextile fabric installed under permanent riprap shall be incidental to this pay item. Check dams as noted within riprap drainage channels are incidental to this pay item. All work shall be performed in accordance with 2020 MDOT Standard Specifications for Construction.
2. Unit of Measurement: Per Square Yard (Syd)

AAA. Riprap, Minimum 36 inch

1. Description: This work consists of installing riprap with a  $D_{50}$  of 26 inches per plan or as directed by the engineer. Any excavation required to install riprap per the plans and grades shall be incidental to this pay item. The non-woven geotextile fabric installed under permanent riprap shall be incidental to this pay item. Check dams as noted within riprap drainage channels are incidental to this pay item. All work shall be performed in accordance with 2020 MDOT Standard Specifications for Construction.
2. Unit of Measurement: Per Square Yard (Syd)

BBB. Slope Restoration, Type B

1. Description: This work consists of restoring disturbed slopes meeting criteria for Type B. All areas disturbed should be restored per plan or as directed by the engineer. All work shall be performed in accordance with 2020 MDOT Standard Specifications for Construction.
2. Unit of Measurement: Per Square Yard (Syd)

CCC. Slope Restoration, Type D

1. Description: This work consists of restoring disturbed slopes meeting criteria for Type D. All areas disturbed should be restored per plan or as directed by the engineer. All work shall be performed in accordance with 2020 MDOT Standard Specifications for Construction.
2. Unit of Measurement: Per Square Yard (Syd)

END OF SECTION 01 22 00

## SECTION 31 10 00 - SITE CLEARING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:

1. Protecting existing vegetation to remain.
2. Removing existing vegetation.
3. Clearing and grubbing.
4. Stripping and stockpiling topsoil.
5. Stripping and stockpiling rock.
6. Removing above- and below-grade site improvements.

- B. Related Requirements:

1. 31 20 00 "Earth Moving."
2. 31 25 00 "Erosion and Sedimentation Controls."

#### 1.3 DEFINITIONS

- A. Subsoil: Soil beneath the level of subgrade; soil beneath the topsoil layers of a naturally occurring soil profile, typified by less than 1 percent organic matter and few soil organisms.
- B. Surface Soil: Soil that is present at the top layer of the existing soil profile. In undisturbed areas, surface soil is typically called "topsoil," but in disturbed areas such as urban environments, the surface soil can be subsoil.
- C. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil; the zone where plant roots grow. Its appearance is generally friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects larger than 2 inches in diameter; and free of weeds, roots, toxic materials, or other nonsoil materials.
- D. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

#### 1.4 MATERIAL OWNERSHIP

- A. Except for materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

## 1.5 FIELD CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
  - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
  - 2. Provide alternate routes around closed or obstructed trafficways if required by Owner or authorities having jurisdiction.
- B. Improvements on Adjoining Property: Authority for performing site clearing indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.
  - 1. Do not proceed with work on adjoining property until directed by Architect.
- C. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing.
- D. Do not commence site clearing operations until temporary erosion- and sedimentation-control measures are in place.
- E. Soil Stripping, Handling, and Stockpiling: Perform only when the soil is dry or slightly moist.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Section 31 20 00 "Earth Moving."
  - 1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Protect and maintain benchmarks and survey control points from disturbance during construction.
- B. Verify that trees, shrubs, and other vegetation to remain or to be relocated have been flagged.
- C. Protect existing site improvements to remain from damage during construction.
  - 1. Restore damaged improvements to their original condition, as acceptable to Owner.

### 3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- A. Comply with the requirements of the soil erosion and sedimentation control permit, Part 91 of the Natural Resources and Environmental Protection Act 1994 PA 451 as Amended, and Section 31 25 00 "Erosion and Sedimentation Controls."

### 3.3 TREE AND PLANT PROTECTION

- A. Protect trees and plants remaining on-site.

### 3.4 EXISTING UTILITIES

- A. Locate and identify existing utilities prior to commencing work.

### 3.5 CLEARING AND GRUBBING

- A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.
  - 1. Grind down stumps and remove roots larger than 3 inches in diameter, obstructions, and debris to a depth of 18 inches below exposed subgrade.
- B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.
  - 1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches, and compact each layer to a density equal to adjacent original ground.

### 3.6 TOPSOIL STRIPPING

- A. Remove sod and grass before stripping topsoil.
- B. Strip topsoil to depth as necessary in a manner to prevent intermingling with underlying subsoil or other waste materials.
  - 1. Remove subsoil and nonsoil materials from topsoil, including clay lumps, gravel, and other objects larger than 2 inches in diameter; trash, debris, weeds, roots, and other waste materials.
- C. Stockpile topsoil away from edge of excavations without intermixing with subsoil or other materials. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water. Surround base of stockpile with silt fence to retain soil that is eroded.
- D. Topsoil that will not be reused can be disposed of in the spoils location identified on the plans or it shall be removed from the site. Spoils piles shall be topsoiled, seeded, and mulched prior to completion of the project. Slope spoil pile sides at 3:1 or flatter and surround with silt fence.

3.7 SITE IMPROVEMENTS

- A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.

3.8 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Surplus soil material and unsuitable topsoil may be stockpiled in locations noted on the plans or transported and legally disposed of off Owner's property.
- B. Obstructions, demolished materials, and waste materials including trash and debris, shall be legally disposed of off Owner's property.

END OF SECTION 31 10 00

## SECTION 31 20 00 - EARTH MOVING

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Excavating and filling for rough grading the Site.
2. Preparing subgrades for culverts, and roadways/trails.
3. Excavating and backfilling for structures and culverts.
4. Bedding course for culverts
5. Subbase course and surface course for aggregate road/trail surfaces.

#### 1.2 REFERENCES

##### A. Michigan Department of Transportation 2020 Standard Specifications for Construction

1. Other than measurement and payment. See DTMB specification section 01025 Measurement and Payment.

#### 1.3 DEFINITIONS

##### A. Backfill: Soil material or controlled low-strength material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

##### B. Surface Course: Aggregate layer for finished trail surface.

##### C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

##### D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

##### E. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Engineer. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
2. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Engineer. Unauthorized excavation, as well as remedial work directed by Engineer, shall be without additional compensation.

##### F. Fill: Soil materials used to raise existing grades.

- G. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
- H. Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.
- I. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.
- J. Unsuitable Materials: Existing subgrade not capable of providing proper bearing strength to meet design requirements.
- K. Utilities: On-site underground pipes, conduits, ducts, and cables as well as underground services within buildings.

#### 1.4 ACTION SUBMITTALS

- A. Qualification Data: For qualified testing agency.

#### 1.5 QUALITY ASSURANCE

- A. Geotechnical Testing Agency Qualifications: Qualified according to ASTM E329 and ASTM D3740 for testing indicated.

#### 1.6 FIELD CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth-moving operations.
  - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
  - 2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.
- B. Improvements on Adjoining Property: Authority for performing earth moving indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.
  - 1. Do not proceed with work on adjoining property until directed by Engineer.
- C. Utility Locator Service: Notify utility locator service for area where Project is located before beginning earth-moving operations.
- D. Do not commence earth-moving operations until measures specified in Section 31 25 00 "Erosion and Sedimentation Controls" and the DTMB SESC guidebook are in place.



## PART 2 - PRODUCTS

### 2.1 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- B. Satisfactory Soils: Soil Classification Groups GW, GP, GM, SW, SP, and SM according to ASTM D2487, or a combination of these groups; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
- C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D2487, or a combination of these groups.
  - 1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.
- D. Subbase Material: Granular naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; meeting MDOT Class II.
- E. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; meeting manufacturer's requirements.
- F. Culvert Bedding Course: Naturally or artificially graded mixture of natural or crushed sand; meeting MDOT Class IIIA.
- G. Roadway/Trail Surface Course: Meeting MDOT 23A.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Protect structures, utilities, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth-moving operations.
- B. Protect and maintain erosion and sedimentation controls during earth-moving operations.
- C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

### 3.2 DEWATERING

- A. Provide dewatering system of sufficient scope, size, and capacity to control hydrostatic pressures and to lower, control, remove, and dispose of ground water and permit excavation and construction to proceed on dry, stable subgrades.
- B. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

- C. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
  - 1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
- D. Dispose of water removed by dewatering in a manner that avoids endangering public health, property, and portions of work under construction or completed. Dispose of water and sediment in a manner that avoids inconvenience to others.
- E. When dewatering of the area is no longer required, do not turn off the dewatering system in a manner that the upsurge in water weakens the subgrade for completed excavation and culvert bedding/backfill work.

### 3.3 EXPLOSIVES

- A. Explosives: Do not use explosives.

### 3.4 EXCAVATION, GENERAL

- A. Classified Excavation: Excavate to subgrade elevations. Material to be excavated will be classified as earth and rock. Do not excavate rock until it has been classified and cross sectioned by Engineer. The Contract Sum will be adjusted for rock excavation according to the Contract Documents. Changes in the Contract Time may be authorized for rock excavation.
  - 1. Earth excavations shall have slopes no steeper than 2 horizontal to 1 vertical due to the assumed existing soil conditions.
  - 2. Existing soils will be evaluated by the engineer during excavation to determine if they can be reused as backfill.
  - 3. Earth excavation includes excavating pavements and obstructions visible on surface; underground structures, utilities, and other items indicated to be removed; and soil, boulders, and other materials not classified as rock or unauthorized excavation.
    - a. Intermittent drilling; ram hammering; or ripping of material not classified as rock excavation is earth excavation.

### 3.5 EXCAVATION FOR CULVERTS

- A. Excavate to indicated gradients, lines, depths, and elevations.
- B. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of Bedding Course. Shape subgrade to provide continuous support for culverts. Remove projecting stones and sharp objects along trench subgrade.
  - 1. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for Bedding Course.
  - 2. Place geotextile on finished trench bottom before placement of Bedding Course.

### 3.6 SUBGRADE INSPECTION

- A. Subgrade for culverts shall be in accordance with ASTM B789.
- B. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Engineer, without additional compensation.

### 3.7 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Architect.

### 3.8 STORAGE OF SOIL MATERIALS

- A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
  - 1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

### 3.9 BACKFILL

- A. Place backfill on subgrades free of mud, frost, snow, or ice.
- B. Place and compact culvert bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for footings, plates, bells, joints, and barrels of pipes.
- C. Initial Backfill: Place and compact initial backfill of satisfactory soil, free of particles larger than 1 inch in any dimension, to a height of proposed trail elevation. Backfill must be placed symmetrically on each side of the structure in layers no greater than 8 inches deep.
  - 1. Carefully compact initial backfill under pipe & culvert haunches and compact evenly up on both sides & along the full length of piping or culvert to avoid damage or displacement of piping or culvert. Compact backfill to at least 95 percent of maximum unit weight determined by ASTM D 1557 or the Michigan Cone Test.
- D. Final Backfill: Place and compact final backfill of satisfactory soil to final subgrade elevation.

### 3.10 SOIL MOISTURE CONTROL

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.
  - 1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
  - 2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

### 3.11 GRADING

- A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
  - 1. Provide a smooth transition between adjacent existing grades and new grades.
  - 2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
- B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to elevations required to achieve indicated finish elevations, within the following subgrade tolerances:
  - 1. Turf or Unpaved Areas: Plus or minus 1 inch.
  - 2. Roadway/Trail Area: Plus or minus 1/2 inch.

### 3.12 SUBBASE AND BASE COURSES UNDER ROADWAYS/TRAILS

- A. Place subbase course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place subbase course for roadway/trail as follows:
  - 1. Place subgrade in thickness indicated on plans.
  - 2. Shape subbase course to required crown elevations and cross-slope grades.
  - 3. Place subbase course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
  - 4. Compact subbase course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D698, ASTM D1557, or the Michigan Cone Test.

### 3.13 AGGREGATE SURFACE COURSE ON ROADWAYS/TRAILS

- A. Meet the requirements specified in Subsection 306 of the 2020 Standard Specifications for Construction for Aggregate surface course.
- B. On prepared subbase, place aggregate surface course for roadway/trail as follows:
  - 1. Shape aggregate course to required crown elevations and cross-slope grades.
  - 2. Place base in thickness indicated on plans.
  - 3. Compact aggregate course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 97 percent of maximum dry unit weight.

### 3.14 BEDDING COURSE UNDER CULVERTS

- A. Place bedding course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place and compact bedding course under culverts as follows:
  - 1. Install separation geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
  - 2. Place bedding in thickness indicated on plans.

3. Compact the bedding course to required cross sections and thicknesses to not less than 95 percent of maximum dry unit weight according to ASTM D698.
4. Shape bedding course to provide continuous support for culverts, footings, and plates.

### 3.15 FIELD QUALITY CONTROL

- A. Testing Agency: Contractor shall engage a qualified geotechnical engineering testing agency to perform tests and inspections.
- B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.
- C. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. The subgrade must be capable of providing a bearing capacity of at least 3,000 pounds per square foot. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Engineer.
- D. Testing agency will test compaction of soils in place according to ASTM D1556, ASTM D2167, ASTM D2937, ASTM D6938, and the MDOT Standard Specifications for Construction 2020, as applicable. Tests will be performed at the following locations and frequencies:
  1. Aggregate Surface Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. or less of aggregate surface area, but in no case fewer than two tests.
  2. Culvert Backfill: At each compacted backfill layer, at least one test for every 2000 sq. ft. or less of backfill area, but in no case fewer than one test per layer.
- E. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

### 3.16 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
  1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.17 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Surplus soil material and unsuitable topsoil may be stockpiled in locations noted on the plans or transported and legally disposed of off Owner's property.
- B. Obstructions, demolished materials, and waste materials including trash and debris, shall be legally disposed of off Owner's property.

END OF SECTION 31 20 00

## SECTION 31 25 00 - EROSION AND SEDIMENTATION CONTROLS

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Silt Fence.
2. Riprap for stream beds, scour protection/energy dissipators and bank protection.
3. Mulch Blanket and High Velocity Mulch Blanket

##### B. Related Sections:

1. Section 00700 – General Conditions.
2. Section 00750 – Special Working Conditions.
3. Section 31 20 00 – Earth Moving.
4. Section 32 92 00 – Turf & Grasses.

#### 1.2 REFERENCES

##### A. American Association of State Highway and Transportation Officials:

1. AASHTO T88 - Standard Specification for Particle Size Analysis of Soils.
2. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.
3. AASHTO M288 - Standard Specification for Geosynthetic Specification for Highway Applications.

##### B. ASTM International:

1. ASTM C127 - Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Coarse Aggregate.
2. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort 12,400 ft-lbf/ft<sup>3</sup>.
3. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort 56,000 ft-lbf/ft<sup>3</sup>.
4. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
5. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
6. ASTM D-7880 - Standard Test Method for Determining Flow Rate of Water and Suspended Solids Retention from a Closed Geosynthetic Bag.

##### C. MDOT R-96-E Soil Erosion and Sedimentation Control Measures

#### 1.3 CLOSEOUT SUBMITTALS

- ##### A. Section 01700 – Contract Closeout: Requirements for closeout submittals.

#### 1.4 QUALITY ASSURANCE

- ##### A. Perform Work in accordance with requirements of the DTMB which has jurisdiction over soil erosion and sediment control.

- B. Perform Work in accordance with part 91, Soil Erosion and Sedimentation Control (SESC), of the Natural resources and Environmental Protection Act, 1994 PA 451, of the State of Michigan, as amended.

## 1.5 ACTION SUBMITTALS

- A. Qualification Data: For qualified testing agency.
- B. Product Data: For each type of the following manufactured products required:
  - 1. Geotextiles.

## PART 2 - PRODUCTS

### 2.1 SOILS

- A. Rock: Furnish materials according to State of Michigan Department of Transportation standards.
  - 1. Plain Riprap: MDOT Sections 813 and 916.
  - 2. Heavy Riprap: MDOT Section 813 and 916.
  - 3. Stone: Clean ¾" to 5" sized rock.

### 2.2 GEOTEXTILE

- A. Silt Fence Geotextile Fabric: Furnish materials complying with MDOT Sections 910 and 916 of the Standard Specifications for Construction, at a nominal height of 3'.
- B. Subsurface Drainage Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications such as around drain tile, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:
  - 1. Survivability: Class 2; AASHTO M 288.
  - 2. Survivability: As follows:
    - a. Grab Tensile Strength: 157 lbf; ASTM D4632.
    - b. Sewn Seam Strength: 142 lbf; ASTM D4632.
    - c. Tear Strength: 56 lbf; ASTM D4533.
    - d. Puncture Strength: 56 lbf; ASTM D4833.
  - 3. Apparent Opening Size: maximum; ASTM D4751.
  - 4. Permittivity: 0.5 minimum; ASTM D4491.
  - 5. UV Stability: 50 percent after 500 hours' exposure; ASTM D4355.
- C. Separation/Liner Geotextile: Woven geotextile fabric, manufactured for separation applications such as under riprap and bedding, made from polyolefins or polyesters; with elongation less than 50 percent; complying with AASHTO M 288, MDOT Section 910 of the Standard Specifications for Construction, and the following, measured per test methods referenced:
  - 1. Survivability: Class 2; AASHTO M 288.
  - 2. Survivability: As follows:



- a. Grab Tensile Strength: 270 lbf; ASTM D4632.
  - b. Sewn Seam Strength: 200 lbf; ASTM D4632.
  - c. Tear Strength: 100 lbf; ASTM D4533.
  - d. Puncture Strength: 100 lbf; ASTM D4833.
- 3. Apparent Opening Size: No. 60 sieve, maximum; ASTM D4751.
  - 4. Permittivity: 0.02 per second, minimum; ASTM D4491.
  - 5. UV Stability: 50 percent after 500 hours' exposure; ASTM D4355.
- D. Filter Bags: Furnish materials complying with MDOT Section 910 of the Standard Specifications for Construction for Non-Woven and Woven Geotextile Separators and ASTM D-7880 for Determining Flow Rate of Water and Suspended Solids Retention from a Closed Geosynthetic Bag.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verification of existing conditions before starting work.
- B. Verify compacted subgrade is acceptable and ready to support devices and imposed loads.
- C. Verify gradients and elevations of base or foundation for other work are correct.

### 3.2 SILT FENCE

- A. Construct generally in accordance with silt fence requirements detailed in the DTMB SESC Guidebook and MDOT R-96-E SESC Measures.
- B. Install in locations shown on the plans.

### 3.3 RIPRAP

- A. Meet the requirements specified in Subsection 813 & 916 of the MDOT 2020 Standard Specifications for Construction for plain and heavy riprap.
- B. Install plain and heavy riprap over liner geotextile in locations indicated on the drawings.
- C. Install riprap to thickness as shown on the drawings, with a minimum of 12" thick.

### 3.4 SITE STABILIZATION

- A. Incorporate erosion control devices indicated on the Drawings into the Project at the earliest practicable time.
- B. Construct, stabilize and activate erosion controls before site disturbance within tributary areas of those controls.
- C. Stockpile and waste pile heights shall not exceed 20 feet. Slope stockpile sides at 2:1 or flatter and surround with silt fence.
- D. Spoils piles shall be topsoiled, seeded, and mulched prior to completion of the project. Slope spoil pile sides at 3:1 or flatter and surround with silt fence.

- E. Stabilize diversion channels, sediment traps, and stockpiles immediately.

### 3.5 FIELD QUALITY CONTROL

- A. Inspect erosion control devices on a weekly basis and after each runoff event. Make necessary repairs to ensure erosion and sediment controls are in good working order.
- B. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.
- C. The Owner shall also perform inspections at each progress meeting.

### 3.6 CLEANING

- A. When sediment accumulation in sedimentation structures has reached a point one-third depth of sediment structure or device, remove and dispose of sediment.
- B. Do not damage structure or device during cleaning operations.
- C. Do not permit sediment to erode into construction or site areas or natural waterways.
- D. Clean channels when depth of sediment reaches approximately one half channel depth.

### 3.7 MAINTENANCE

- A. Maintenance of the SESC measures and systems is the Contractor's responsibility.
- B. Contractor is responsible for correcting any violations and paying any fines levied by agencies having jurisdiction over the soil erosion control.

END OF SECTION 31 25 00

## SECTION 32 92 00 - TURF AND GRASSES

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section Includes:

1. Seeding.
2. Topsoil.
3. Fertilizer.
4. Mulch Blanket.

- A. Requirements of Section 816 of the 2020 MDOT Standard Specifications for Construction shall be included here-in. Where this specification and the 2020 MDOT Standard Specifications for Construction conflict, the most stringent requirement shall apply.

#### 1.2 DEFINITIONS

- A. Finish Grade: Elevation of finished surface of planting soil.
- B. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. Pesticides include insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. They also include substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.
- C. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. Pests include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.
- D. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.
- E. Subgrade: The surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.
- F. Subsoil: All soil beneath the topsoil layer of the soil profile and typified by the lack of organic matter and soil organisms.
- G. Surface Soil: Whatever soil is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil, but in disturbed areas such as urban environments, the surface soil can be subsoil.
- H. Topsoil: Natural or cultivated top layer of the soil profile or manufactured topsoil; containing organic matter and sand, silt and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 1 inch in diameter; and free of weeds, roots, wood pieces, chips, shredded bark, toxic materials and other non-soil materials.

### 1.3 DELIVERY, STORAGE, AND HANDLING

- A. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws, as applicable.

### 1.4 FIELD CONDITIONS

- A. Planting Restrictions: Follow MDOT 2020 Standard Specifications requirements for permanent seed planting. Seeding must be done prior to September 20.
- B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions.

### 1.5 MAINTENANCE SERVICE

- A. Initial Maintenance Service: Provide full maintenance by skilled employees of the landscape Installer. Maintain as required in Part 3 of this specification. Begin maintenance immediately after each area is planted and continue until acceptable growth is established.

## PART 2 - PRODUCTS

### 2.1 TOPSOIL

- A. Cultivated top layer of soil profile or manufactured soil that meets the definition of topsoil.
  - 1. All topsoil material shall be passed through a 1 inch screen prior to placement.
  - 2. Topsoil samples may be taken from stockpiles by the Engineer for submission to a testing laboratory. Topsoil that does not meet the required specifications shall be removed from the project site by the Contractor and shall be replaced with suitable topsoil that meets the testing requirements.
  - 3. ASTM D 5268 topsoil. Verify suitability of soil to produce viable planting soil. Clean soil of roots, plants, sod, stones, clods, clay lumps, pockets of coarse sand, concrete slurry, concrete layers or chunks, cement, plaster, building debris, and other extraneous materials harmful to plant growth.

### 2.2 SEED

- A. Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Rules for Testing Seeds" for purity and germination tolerances.
- A. Seed Species: State-certified seed of grass species as follows:
  - 1. MDOT Type THM Mix (20% Perennial Rye, 30% Kentucky Blue, 50% Red Fescue).

## 2.3 FERTILIZERS

- A. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:

1. MDOT Class A fertilizer. 228 pounds per acre.

## 2.4 MULCHES

- A. Mulch Blankets (slopes greater than 4:1 and less than 2:1 or areas indicated on plans; areas not subject to direct contact with running storm water within the channel, entering the culvert inlet): Mulch blankets shall be one of the following or an approved equal:

1. S1 Erosion Control Blanket – BonTerra America
2. Contech ERO-MAT – Contech Construction Products
3. Erosion Control Blankets DS-75 – North American Green

- B. High Velocity Mulch Blankets (slopes of 2:1 or steeper, bottoms of all ditches including a minimum of 12" up ditch side slopes and areas indicated on plans; areas not in direct contact with storm water within the channel near the culvert inlet): High velocity mulch blankets shall be one of the following or an approved equal:

1. S2 Erosion Control Blanket – Bon Terra America
2. Contech High Velocity ERO-MAT – Contech Construction Products
3. ECS High Impact Excelsior Blanket – Erosion Control Systems, Inc.
4. ECS High Velocity Straw Mat – Erosion Control Systems, Inc.
5. Erosion Control Blanket DS-150 – North American Green

## 2.5 PESTICIDES

- A. General: Pesticide, registered and approved by the EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.
- B. Pre-Emergent Herbicide (Selective and Nonselective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.
- C. Post-Emergent Herbicide (Selective and Nonselective): Effective for controlling weed growth that has already germinated.

## PART 3 - EXECUTION

### 3.1 TURF AREA PREPARATION

- A. Newly Graded Subgrades: Loosen subgrade to a minimum depth of 4 inches. Remove stones larger than 1 inch in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.

1. Apply fertilizer directly to subgrade before loosening.

2. Thoroughly blend planting soil off-site before spreading or spread topsoil, apply soil amendments and fertilizer on surface, and thoroughly blend planting soil.
  3. Spread planting soil to a depth of 3 inches but not less than required to meet finish grades after light rolling and natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.
- B. Unchanged Subgrades: If turf is to be planted in areas unaltered or undisturbed by excavating, grading, or surface-soil stripping operations, prepare surface soil as follows:
1. Remove existing grass, vegetation, and turf. Do not mix into surface soil.
  2. Loosen surface soil to a depth of at least 6 inches. Apply soil amendments and fertilizers according to planting soil mix proportions and mix thoroughly into top 3 inches of soil. Till soil to a homogeneous mixture of fine texture.
    - a. Apply fertilizer directly to surface soil before loosening.
  3. Remove stones larger than 1 inch in any dimension and sticks, roots, trash, and other extraneous matter.
  4. Legally dispose of waste material, including grass, vegetation, and turf, off Owner's property.
- C. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus 1/2 inch of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit finish grading to areas that can be planted in the immediate future.
- D. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.
- E. Before planting, obtain Engineer's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

### 3.2 SEEDING

- A. Do not broadcast or hydroseed when wind velocity exceeds 5 mph. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other. Do not seed against existing trees. Limit extent of seed to outside edge of planting saucer.
- B. Sow seed at a total rate of 3 to 4 lb/1000 sq. ft.
- C. Rake seed lightly into top 1/8 inch of soil, roll lightly, and water with fine spray.
- D. Protect seeded areas with slopes not exceeding 1:6 by spreading straw mulch. Spread uniformly at a minimum rate of 2 tons/acre to form a continuous blanket 1-1/2 inches in loose thickness over seeded areas. Spread by hand, blower, or other suitable equipment.
  1. Anchor straw mulch by crimping into soil with suitable mechanical equipment.
- E. Protect steeper seeded areas (not in direct high-water contact with storm water in the channel) with mulch blankets or high velocity mulch blankets (non-synthetic/biodegradable), per Part 2 of this specification. Install per Section 816 of the MDOT 2020 Standard Specifications for Construction.

- F. Protect seeded areas from hot, dry weather or drying winds by applying planting soil within 24 hours after completing seeding operations. Soak areas, scatter mulch uniformly to a thickness of 3/16 inch, and roll surface smooth.
- G. Follow up seeding shall be performed by placing seed underneath mulch blanket. This work shall be performed in compliance with the seasonal limitations described in section 816 of the 2020 MDOT Standard Specifications for Construction.

### 3.3 MAINTENANCE

- A. Seed installations shall meet the following criteria as determined by the Engineer:
  - 1. Satisfactory Seeded Growth: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 sq. ft. and bare spots not exceeding 5 by 5 inches.
- B. Use specified materials to reestablish growth that does not comply with requirements and continue maintenance until growth is satisfactory.
- C. Seeded Growth Maintenance Period: 60 days from date of Substantial Completion.
  - 1. When initial maintenance period has not elapsed before end of planting season, or if growth is not fully established, continue maintenance during next planting season.

END OF SECTION 32 92 00





## SECTION 33 01 30.72 - CURED-IN-PLACE PIPE LINING

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Cleaning and flushing of existing sanitary sewers.
2. Taking video of existing sewers and analyzing their condition.
3. Installing an inverted, resin-impregnated tube pipe liner.

##### B. Related Requirements:

1. Section 03 01 30 – Maintenance of Cast-In-Place Concrete: Repair as required by this Section.
2. Section 33 01 30.11 - Television Inspection of Sewers: TV inspection of pipeline and preparatory activities.

#### 1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

##### A. Section 01 22 00 – Unit Prices: Contract Sum/Price modification procedures.

##### B. Relining Sewers:

1. Basis of Measurement: By linear foot, measured along length of pipe.
2. Basis of Payment: Includes pipe cleaning and flushing, TV inspection and videography, bypass pumping, equipment removal/replacement, and liner installation.

#### 1.3 REFERENCE STANDARDS

##### A. ASTM International:

1. ASTM D5260 - Standard Classification for Chemical Resistance of Poly (Vinyl Chloride) (PVC) Homopolymer and Copolymer Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
2. ASTM D5813 - Standard Specification for Cured-In-Place Thermosetting Resin Sewer Piping Systems.
3. ASTM F1216 - Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube.
4. ASTM F1743 - Standard Practice for Rehabilitation of Existing Pipelines and Conduits by Pulled-in-Place Installation of Cured-in-Place Thermosetting Resin Pipe (CIPP).
5. ASTM F2019 - Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Pulled in Place Installation of Glass Reinforced Plastic (GRP) Cured-in-Place Thermosetting Resin Pipe (CIPP).

#### 1.4 COORDINATION

##### A. Section 01 31 00 – Project Management and Coordination: Requirements for coordination.

##### B. Coordinate Work of this Section with treatment plant personnel.

##### C. Notify Owner at least 3 weeks in advance of expected work. This will allow Owner to adjust operations at the WWTP, if required.

##### D. Provide and maintain temporary facilities, including piping and pumps, to meet requirements.

## 1.5 PREINSTALLATION MEETINGS

- A. Section 01 31 00 – Project Management and Coordination: Requirements for preinstallation meeting.
- B. Convene minimum one week prior to commencing Work of this Section.

## 1.6 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data:
  - 1. Submit manufacturer information regarding liner material, curing chemicals, and lubricants.
  - 2. Submit complete description of proposed wet-out procedures.
- C. Shop Drawings: Indicate liner dimensions for each pipe size to be relined.
- D. Samples: Submit two samples of liner material in both uncured and cured state.
- E. Digital Video Discs (DVDs):
  - 1. Submit video recordings of piping sections as follows:
    - a. Show condition of existing pipe and pipe joints after cleaning and prior to relining.
    - b. Show cured liner after relining Work has been completed.
- F. Test and Evaluation Reports: Submit reports certifying that liner material meets ASTM testing standards as specified in this Section.
- G. Manufacturer Instructions:
  - 1. Submit detailed description of liner placement and curing procedures for piping.
  - 2. Include description of procedures for sealing liner material at manholes and reestablishing service connections.
  - 3. Submit manufacturer's requirements for receiving, handling, and storage of materials.
- H. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.
- I. Qualifications Statements:
  - 1. Submit qualifications for manufacturer, installer, licensed professional, pipeline assessor, and inspector.
  - 2. Submit manufacturer's approval of installer.

## 1.7 CLOSEOUT SUBMITTALS

- A. Section 01 77 00 - Closeout Procedures: Requirements for submittals.
- B. Section 01 78 39 – Project Record Documents: Record actual locations of pipe defects along pipe length.

## 1.8 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years' documented experience.
- B. Installer: Company specializing in performing Work of this Section with minimum ten years' documented experience in installation of liner materials and licensed or certified by

manufacturer. Installer should be capable of providing at least one (1) non-circular CIPP project in the last five (5) years.

C. Pipeline Assessor:

1. Person specializing in assessing condition of sewer pipelines prior to and following relining.
2. Currently certified in Pipeline Assessment and Certification Program (PACP) of the National Association of Sewer Service Companies (NASSCO).

D. Inspector:

1. Person specializing in inspection of sewer pipeline rehabilitation.
2. Currently certified in Inspector Training and Certification Program (ITCP) of NASSCO.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.

C. Store materials according to manufacturer instructions.

D. Protection:

1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
2. Provide additional protection according to manufacturer instructions.

1.10 EXISTING CONDITIONS

A. Field Measurements:

1. Verify field measurements prior to fabrication.
2. Indicate field measurements on Shop Drawings.

1.11 WARRANTY

A. Section 01 77 00 - Closeout Procedures: Requirements for warranties.

PART 2 - PRODUCTS

2.1 PERFORMANCE AND DESIGN CRITERIA

A. Design lining material to have sufficient structural strength to support dead loads, live loads, and groundwater load imposed, assuming existing pipe cannot share loading or contribute to structural integrity of liner.

B. Design liner to least-possible thickness to minimize decreasing interior pipe diameter. Wall thickness shall be in accordance with Appendix X1 of ASTM F 1216.

C. Design liner material to provide jointless, continuous, and structurally sound construction able to withstand imposed static, dynamic, and hydrostatic loads on a long-term basis.

D. Identify design provisions for shrinkage control to prevent future misalignment of service reconnections.

## 2.2 INVERTED, RESIN-IMPREGNATED TUBE PIPE LINER

### A. Fabric Tube Manufacturers:

1. Applied Felts Inc.
2. RS PUXR-Liner
3. Substitutions: As specified in Section 01 60 00 - Product Requirements.

### B. Resin Manufacturer:

1. Cook Composites & Polymers, Kansas City, Mo.
2. RS MaxPox
3. Substitutions: As specified in Section 01 60 00 - Product Requirements.

### C. Description:

1. Fabric Tube:
  - a. One or more layers of absorbent, non-woven felt fabric, felt/fiberglass, or fiberglass.
  - b. Comply with ASTM D5813, F1216, F1743, and F2019.
  - c. Capable of absorbing and carrying resins.
  - d. The flexible tube shall be manufactured and fabricated under quality-controlled conditions set by the process manufacturer. The tube shall be manufactured of a size that when installed it will fit snugly to the internal circumference of the pipe or conduit being rehabilitated and have minimal wrinkling.
  - e. The tube thickness shall also be specified such that the installed thickness meets the requirements of the specifying agency.
  - f. The tube length shall be manufactured such that it will span the entire length of the access points with no joints. When the product is installed between manholes, the CIPP shall extend beyond and seal the end of each manhole and/or structure.
  - g. The specified tube material shall have a minimum tensile strength in the longitudinal and transverse directions as specified in ASTM D5813.
2. Resin:
  - a. Corrosion-resistant polyester or vinyl ester resin and catalyst system.
  - b. Comply with ASTM F1216 or F1743.
  - c. Use of recycled polyethylene terephthalic (PET) resins shall not be allowed.
3. Wet-Out Fabric Tube:
  - a. Furnish uniform thickness and excess resin distribution that, when compressed at installation pressure, will meet or exceed design thickness after cure.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation examination.
- B. Verify location of piping to be relined.
- C. Verify primary settling tank equipment that will need to be removed and submit to Owner.
- D. Provide all equipment required to remove, transport and unload the primary settling tank equipment while relining is occurring.

### 3.2 PREPARATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation preparation.
- B. Cleaning: Clean existing sewer pipes of debris, sedimentation, and mineral deposits with high-velocity cleaner, bucket and scraper, root saws, rolling or balling units.
- C. Initial Video Inspection and Repair:
  - 1. Conduct closed-circuit video inspection as specified in Section 33 01 30.11 - Television Inspection of Sewers.
  - 2. Determine condition of existing piping, degree of offset of joints, and locations of crushed walls and obstructions.
  - 3. Determine sizes and locations of connections.
  - 4. Evaluation of pipe conditions, performed by pipeline assessor.
  - 5. Inspection of Work, performed by an ITCP-certified inspector.
  - 6. Clear obstructions, service piping protrusions, and other materials from bottom of existing pipe to ensure that inserted pipe liner directly contacts existing pipe wall.
- D. Bypassing Sewage:
  - 1. Coordinate primary influent bypassing with Owner. The Owner will bypass primary influent to the other primary tanks as needed.
- E. Equipment Removal
  - 1. Coordinate the removal and replacement of the primary clarifier mechanism to access the conduit that is to be relined.
  - 2. Mechanism shall be placed at a predetermined location on the WWTP as designated by Owner. Contractor shall load and unload the equipment when it is removed and when it is reinstalled.
  - 3. Drive units removed shall be stored in accordance with manufacturer's recommendation in a weather tight, dry environment.
  - 4. Damaged equipment shall be repaired at no expense to the Owner.

### 3.3 INSTALLATION

- A. Perform relining without need for excavation while minimizing disruptions to plant operations.
- B. Inverted, Resin-Impregnated Tube Pipe Liner:
  - 1. Work will be done "over the hole." Resin shall be catalyzed and pumped into the tube during installation.
  - 2. To ensure a tight fit within the rectangular host pipe, concrete grout "haunches" will be installed in pipeline corners to form a more nearly circular inner profile.
  - 3. Coat fabric tube (before inversion or pull-in, as applicable) with an impermeable, flexible membrane that will contain resin and facilitate, if applicable, vacuum impregnation and monitoring of resin saturation during resin impregnation (wet-out) procedure.
  - 4. Prior to installation, and as recommended by manufacturer, place remote temperature gages or sensors inside host pipe to monitor temperature during cure cycle.
  - 5. Positioning:
    - a. Position wet-out tube in pipeline using method specified by manufacturer.
    - b. Do not damage tube during installation.
  - 6. Cure installed liner by using appropriate medium according to manufacturer's recommended cure schedule.
  - 7. Allow installed pipe liner to cool according to manufacturer instructions.
  - 8. Annular Spaces:
    - a. Verify that no gap or annular space exists between finished liner and existing pipe.

- b. Grout annular space, if present, to prevent damage to or collapse of liner or service connections.
- c. Install watertight seals to host pipe at beginning and end of installed liner.

### 3.4 FIELD QUALITY CONTROL

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.
- B. Testing of Completed Pipe Liner:
  - 1. Prepare and test samples for each lined run of pipe using either method described in ASTM F1216, Section 8.1.
- C. Manufacturer Services: Furnish services of manufacturer's representative experienced in installation of products furnished under this Section for not less than two days, 12 hours on Site for installation, inspection, and field testing.
- D. Liner Acceptance:
  - 1. Adjust, repair, modify, or replace components failing to perform as specified and rerun tests.
  - 2. If liner fails to form, remove failed liner and install new liner.
  - 3. Conduct closed-circuit video inspection of completed relining Work, indicating no visual defects, including foreign inclusions, dry spots, pinholes, cracks, or delamination.
  - 4. No infiltration of groundwater is permitted.
  - 5. Make final adjustments to liner under direction of manufacturer's representative.
- E. Furnish installation certificate from manufacturer's representative attesting that liner has been properly installed and is ready for startup and testing.

END OF SECTION 33 01 30.72

## SECTION 33 41 00 - STORM UTILITY DRAINAGE PIPING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Culverts/Pipe
  - 2. Box Culverts
  - 3. Pipe end sections.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings:
  - 1. Stormwater end sections. Include plans, elevations, sections, & details.
  - 2. CMP or HDPE Pipes/Culverts
  - 3. Reinforced Concrete Pipes/Culverts
    - a. Joint Ties
  - 4. Concrete Box Culverts:
    - a. Include calculations, dimensions for structure, all components by supplier/manufacturer showing compliance with AASHTO LRFD loading criteria with required soil cover as noted in the plans and specifications.
    - b. Load rating of structure according to MDOT requirements.
    - c. Adequate protective cover shall be identified by the manufacturer.
    - d. Adequate structure base shall be identified by the manufacturer.

#### 1.3 DELIVERY, STORAGE, AND HANDLING

- A. Protect pipe, pipe fittings, and seals from dirt and damage.
- B. Handle all products according to manufacturer's written rigging instructions.

### PART 2 - PRODUCTS

#### 2.1 CULVERTS/PIPE WITH LESS THAN 20 FEET OF COVER

- A. Culverts or pipe with less than 20 feet of cover shall be corrugated steel, reinforced concrete pipe with joint ties, or dual wall HDPE pipe. Culverts shall meet the following requirements:

1. Culverts shall meet MDOT 2020 Standard Specifications for Construction for Classes A-D and Type II through V for material depending on the bury depth. Comply with MDOT Section 401 and related sections for installation.

B. End Sections:

1. Metal Pipe: End sections shall be metal or reinforced concrete meeting MDOT 2020 SSC requirements.
2. Concrete Pipe: End sections shall be reinforced concrete meeting MDOT 2020 SSC requirements.
3. Dual Wall HDPE Pipe: End sections shall be metal or reinforced concrete meeting MDOT 2020 SSC requirements.

## 2.2 CONCRETE PIPE AND FITTINGS

- A. Reinforced-Concrete Sewer Pipe and Fittings: Comply with MDOT 2020 SSC requirements for Classes A-D and Type II through V for material depending upon bury depth. Comply with MDOT Section 401 and Table 401-1 and related sections for installation.
- B. Tongue-and-groove ends, or bell-and-spigot ends and gasketed joints with ASTM C 443, rubber gaskets.
- C. Provide culverts and end sections as indicated on plans.
- D. All raw material and manufacturing shall be within the United States.
- E. All culverts shall be wrapped in non-woven geotextile.
- F. Joint Ties shall be hot dipped galvanized per ASTM 153.
- G. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (420 MPa) deformed steel.
- H. End Sections: Shall be reinforced concrete meeting MDOT 2020 SSC requirements.

## 2.3 CONCRETE BOX CULVERT

- A. Reinforced Concrete Box Culvert: Comply with MDOT 2020 SSC requirements.
- B. Joints: Per manufacturer
- C. All raw material and manufacturing shall be within the United States.
- D. Reinforcing Bars: ASTM A 615, Grade 60 (420 MPa) deformed steel.
- E. The structure must have four sides and wing walls.

## PART 3 - EXECUTION

### 3.1 EARTHWORK

- A. Excavation, trenching, and backfilling are specified in Section 31 20 00 "Earth Moving."



- B. Backfilling sections depicting material locations are shown on the plans.

### 3.2 PIPING INSTALLATION

- A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.
- B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.
- C. Install all galvanized Joint Ties according to manufacturer's written instructions and prior to covering the culvert with nonwoven geotextile and backfilling.
- D. Nonwoven geotextile shall be installed to completely wrap the culvert before backfilling.
- E. Loading Restrictions Heavy construction equipment must not be operated over the culverts without adequate protective cover. Construction loads that exceed highway load limits are not allowed on the culvert without approval from the Engineer. Live load traffic is not allowed on the structure until the structure has been backfilled and compacted.

### 3.3 PIPE JOINT CONSTRUCTION

- A. Join gravity-flow, nonpressure drainage piping according to the following:
  - 1. Join reinforced-concrete sewer piping according to ACPA's "Concrete Pipe Installation Manual" for rubber-gasketed joints.
  - 2. Join dissimilar pipe materials with nonpressure-type flexible couplings.
- B. Use Joint Ties at all joints per the drawing details and install them per the written manufacturers specifications.
- C. Wrap all joints in geotextile fabric.

### 3.4 STORMWATER END SECTION (INLETS AND OUTLETS) INSTALLATION

- A. Install end sections meeting MDOT 2020 SSC requirements.
- B. Construct riprap of broken stone, as indicated.
- C. Install outlets that spill onto grade, with flared end sections that match pipe, where indicated.
- D. Construct energy dissipaters at outlets, as indicated.

### 3.5 FIELD QUALITY CONTROL

- A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.
  - 1. Defects requiring correction include the following:
    - a. Alignment: Less than full diameter of inside of pipe is visible between structures.
    - b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
    - c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
    - d. Infiltration: Water leakage into piping.
    - e. Exfiltration: Water leakage from or around piping.
  - 2. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
  - 3. Reinspect and repeat procedure until results are satisfactory.

END OF SECTION 33 41 00