

SECTION 33 40 00 - STORM DRAINAGE SYSTEM

PART 1 - GENERAL

1.00 INTRODUCTION

- A. These specifications were prepared by Trudell Consulting Engineers (TCE) and are intended to be used in conjunction with the **Standard General Conditions of the Construction Contract**, prepared by the Engineers Joint Contract Documents Committee (EJCDC C-700).
- B. In the event these specifications are incorporated into other documents, including but not limited to AIA Contract Documents, the interpretation of this portion of the specifications shall be governed by EJCDC C-700.

1.01 DESCRIPTION

- A. Work included:
 - 1. Trench excavation of earth
 - 2. Preparation of bed
 - 3. Installation of the storm drainage pipe
 - 4. Installation of other appurtenances
 - 5. Backfill of trenches
 - 6. Stabilization of disturbed areas (i.e. seeding and mulching)
 - 7. Clean up
- B. Related work described elsewhere:

None

1.02 QUALITY ASSURANCE

- A. Provide one person who shall be present at all times during execution of the work, who is thoroughly familiar with the types of

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materials used and execution of the work, and who shall direct all work under this section.

- B. Use all means necessary to protect materials and appurtenances before, during, and after installation including proper storage. Follow the manufacturers' recommended procedures for unloading, storage and installation where applicable.
- C. In the event of damage or theft, make all repairs and replacements necessary, subject to approval by the Engineer, at no additional cost to the Owner.
- D. Soils Testing: Compaction tests shall be Standard Proctor (ASTM D698) as required in this document Part 3 - Execution. Contractor shall engage a soils testing and inspection service for sieve analysis and compaction tests during earthwork.
- E. Comply with all applicable standards referenced herein and all conditions required by State or local permits.

1.03 SUBMITTALS

- A. Within 30 days after the Award of Contract, and before materials and/or equipment are delivered to the site, submit to the Engineer technical information on equipment to be furnished and certification of compliance with applicable standard tests for materials to be used, if materials and/or appurtenances are other than brand names specified.
- B. Where the phrases "or equal" or "of equal quality" appear, substitution may be made only by approval of the Engineer. Such substitution will be considered only when submitted with full and complete technical data and information for evaluation prior to installation (Refer to Article 6 - Standard General Conditions of the Construction Contract - EJCDC C-700).

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- C. An independent testing company, approved by the Project Engineer, shall obtain samples and provide sieve analysis for the granular materials to be used, unless indicated otherwise.
- D. An independent testing company, approved by the Project Engineer, shall provide compaction tests as specified unless indicated otherwise.
- E. An independent testing company, approved by the Project Engineer, shall provide current concrete design mix with a 7 day and two 28-day compressive strength tests for any site concrete requiring reinforcing steel (non-building as that is by others).
- F. Provide minimum of 48-hour notice to Engineer, and a written authorization notice to proceed from the affected utility, before interrupting any utility.
- G. Submit written results of all tests on the installed utilities and appurtenances to the Engineer.
- H. Verify that all materials and equipment will be available in time for orderly installation during the course of the work.

1.04 JOB CONDITIONS

- A. Pipe lengths indicated on the drawings are for information only. Furnish lengths as required.
- B. Site Information: Data on indicated subsurface conditions are not intended as representations or warranties of accuracy or continuity between soil borings. It is expressly understood that the Owner shall not be responsible for interpretations or conclusions drawn therefrom by the Contractor. Data are made available for the convenience of the Contractor. Additional test borings and other exploratory work may be made by the Contractor at no cost to the Owner.

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- C. Existing Utilities: Locate existing underground utilities in the areas of work. If utilities are to remain in place, provide adequate means of protection during earthwork operations.
 - 1. The Contractor will contact DigSafe prior to excavation.
 - 2. The Contract Drawings show existing underground utilities based on above ground observations or record drawings. The Contractor shall anticipate that the actual location or existence of any utility may vary from that shown. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult the utility owner immediately for directions. Cooperate with the Owner and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to the satisfaction of the Utility Owner.
 - 3. Do not interrupt existing utilities serving facilities occupied and used by the Owner or others, except when permitted in writing by the affected utility and then only after acceptable temporary utility services have been provided.
 - 4. If pipe adjustment is necessary due to the locations of other utilities, secure approval from the Engineer.
- E. Do not change pipe sizes without securing written approval of the Engineer.
- F. Protection of Persons and Property: Barricade open excavations occurring as part of this work and post with warning lights.
 - 1. Operate warning lights as recommended by authorities having jurisdiction.
 - 2. Protect structures, utilities, sidewalks pavements, and other facilities from damage caused by settlement, lateral

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movement, undermining, washout and other hazards created by earthwork operations.

- G. Dust control during construction shall be accomplished using calcium chloride or water applied to such sections of the site as required to eliminate windborn particles and dust, or as designated by the Engineer. The number of applications and amount of water used shall be based on field and weather conditions. Wetting shall be by hose or a tank truck equipped with a valve control shut off in the cab. Care shall be used during the application to avoid excess water runoff and the erosion control measures shall be in place.
- H. Protection of existing trees and vegetation: Erect snowfence or silt fence around trees and vegetations indicated to remain, to protect vegetation against unnecessary cutting or breaking, skinning roots, or bark, or smothering by stockpiled material.
- I. Contractor shall comply with the latest rules of the Vermont Occupational Safety and Health Administration (VOSHA).

1.05 TESTING LABORATORY SERVICES

Vacant

PART 2 - MATERIALS AND PRODUCTS

2.00 SELECT BACKFILL

Select backfill shall consist of on-site or borrow material of soil or soil-rock mixture free from organic material and other deleterious substances. The material shall contain no rocks or lumps larger than 3 inches in diameter. Material must be approved by the Engineer prior to use.

2.01 BACKFILL

- A. All on-site fill material shall be soil or soil-rock mixture free from organic matter and other deleterious substances; it shall contain no

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frozen soil, rocks or lumps of soil larger than 12 inches in greatest dimensions and no more than 25% of the rock or soil lumps shall be larger than 6 inches. Excavated earth from on-site construction must be approved by the Engineer.

- B. Borrow material shall meet the requirements of this section and be granular in nature and show evidence of satisfactory compaction.

2.02 GRANULAR BACKFILL FOR STRUCTURES

Granular Backfill shall consist of material satisfactorily graded, free draining granular material, reasonably free from loam, silt, clay, and organic material, and meet the following requirements: (Ref.: VAOT 704.08)

2.03 CRUSHED STONE

Crushed stone for bedding or other designated uses shall be nominal 3/4 inch size and be reasonably free from dirt and deleterious material and meet the following requirements: (Ref.: VAOT 704.02B)

2.04 CONCRETE

- A. Concrete shall be termed Class A (4000 psi), Class B (3500 psi) or Class D (2500 psi) and meet the following requirements: (Ref.: VAOT 501.03)
- B. Portland cement shall conform to the requirements of AASHTO M-85 Type II.
- C. Coarse aggregate shall meet the following requirements: (Ref.: VAOT 704.02B)
- D. Fine aggregate shall meet the following requirements: (Ref: VAOT 704.01)

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- E. All water shall be clear and free of deleterious substances, organic matter, mud, or silt.
- F. Reinforcing bars shall conform to the requirements of Deformed Billet-Steel Bars for Concrete Reinforcement, AASHTO M31 Grade 60.
- G. If the structural notes on the Contract Drawings vary from these specifications, the structural notes will govern.

2.05 PRECAST CONCRETE CATCH BASINS (TYPE A)

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2.06 PRECAST CONCRETE STORMWATER MANHOLES AND CATCH BASINS (TYPE B)

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2.07 CONCRETE PIPE CATCH BASIN (TYPE C)

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2.08 PRECAST CONCRETE STORMWATER MANHOLES AND CATCH BASINS (TYPE D)

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2.09 PRECAST CONCRETE CATCH BASIN (TYPE E)

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A. STORMWATER MANHOLE FRAMES, COVERS AND GRATES

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2.10 CLEANOUT

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- A. Provide 4 or 6 inch SDR 35 PVC pipe and valve box and cover as shown on the approved plans.
- B. An optional cover if indicated on the Contract Drawings shall be a Carson Industries, Inc. structural plastic green cover Model #608-12.

2.11 POLYVINYL CHLORIDE PIPE (PVC)

- A. Polyvinyl chloride pipe, SDR 35, meeting the requirements of ASTM D3034 with nominal inside dimensions as shown on the Contract Drawings shall be provided.
- B. Joints shall be of bell-and-spigot type, of the same composition as the pipe, and have a rubber ring factory installed and locked in place.
- C. Fittings shall be compatible with and of the same class as the sewer pipe.

2.12 CORRUGATED POLYETHYLENE PIPE (CPEP or HDPE)

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2.13 DUCTILE IRON PRESSURE PIPE FOR STORMWATER

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2.14 REINFORCED CONCRETE PIPE (RCP) FOR STORM DRAINS

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2.15 CORRUGATED METAL PIPE (CSP AND CAAP)

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2.16 UNDERDRAIN

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2.17 RIPRAP

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2.18 GEOTEXTILE FABRIC

Geotextile Fabric of woven or bonded polypropylene shall be of equal quality to Mirafi 500X Ground Stabilization Fabric under all road or parking area bases and be of equal quality to Mirafi 140N for other uses.

PART 3 - EXECUTION

3.00 GENERAL

- A. Prior to all work in this Section, become familiar with all site conditions, materials and equipment to be installed, procedures of installation and scheduling of work.
- B. Do not cover any work until it has been observed by the Engineer. Any such covered work will be uncovered at no additional cost to the Owner.

3.01 TRENCH EXCAVATION (for open cut)

- A. Prior to opening an excavation, effort will be made to determine where underground installations are located. When the excavation approaches the estimated location of such an installation, the exact location shall be determined and when it is uncovered, proper supports shall be provided for the existing installation. Utility companies shall be contacted and advised of proposed work prior to the start of actual excavation (DIGSAFE 1-800-225-4977)
- B. Trees, boulders, and other surface encumbrances, involved in excavation work or in the vicinity thereof at any time during operations, shall be removed before excavating is begun.

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- C. In excavations, excavated or other material shall be effectively stored and retained at least 2 feet or more from the edge of the excavation.
- D. Diversion ditches, dikes, or other suitable means shall be used to prevent surface water from entering an excavation and to provide adequate drainage of the area adjacent to the excavation. Water shall not be allowed to accumulate in the excavation.
- E. Earth excavated shall be separated into topsoil and other clearly distinguishable soil types such that the best material may be used for backfill operations.
- F. Excavate the trench at the level of the storm drain pipe to provide a minimum width for working and compacting backfill. Provide a maximum width of 2 feet beyond the outside of the pipe for ductile iron pipe, and a maximum width of 3 feet for reinforced concrete pipe and corrugated metal pipe.
- G. If ledge, boulders or large stones are encountered, remove them to provide 6 inches of clearance on all sides of the pipe. Backfill and thoroughly compact with approved backfill, any excess material to be removed.
- H. Excavations for manholes shall be a maximum 3 feet beyond the outside of the manhole wall on all sides at the bottom depth, and deep enough to allow 12 inches of gravel or crushed stone under the base.

3.02 PIPE INSTALLATION (for open cut)

- A. Smooth the bottom of the stone bed to provide continuous support under the pipe. Where Type 2 bedding is authorized by the Architect/Engineer, compact the granular material to 95% maximum density with an engine driven mechanical compactor (Standard Proctor).

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- B. Carefully lower the pipe into the trench, avoiding disturbance of the bed and trench walls, and damage to the pipe. Lay the pipe with the bells on the upgrade end.
- C. When pipe laying is not in progress, seal the open ends of the pipe with a water tight plug.
- D. After installation of the pipe to the proper line and grade, place additional stone bedding to the crown of the pipe, carefully tamping under the haunches. Where Type C bedding is authorized, compact with an engine driven mechanical compactor to 90% maximum density (Standard Proctor).
- E. Place the initial backfill above the pipe, ensuring the material is free of roots, stones, organic or frozen material.
- F. Backfill the trenches in lifts. Compact each lift with an engine driven mechanical compactor to 90 % maximum density where the trench will not be under a paved area, and to 95% maximum density where the trench is under a paved area (Standard Proctor). If trench is located in the road bed of an existing roadway, the fill below the existing road shall be gravel to the depth shown on the detail or as ordered by the Architect/Engineer. The gravel shall be compacted with an approved power roller weighing between 8 and 10 tons.

3.03 CLEAN UP

All extraneous material or construction debris shall be removed from the site before completion of construction as directed by the Engineer. Disposal of this material is the responsibility of the Contractor.

END OF SECTION