Sanitary Sewer
Installation Specifications

SECTION 4.1

Trenching & Backfill

4.1.01 SCOPE:

This section covers preparation of the site; removal and disposal of all debris; excavation and trenching; the handling, storage, transportation, and disposal of all excavated material; all necessary sheeting, shoring, and protection of work; preparation of subgrades; pumping and dewatering as necessary; protection of adjacent property; backfilling; pipe embedment; surfacing and grading; and other appurtenant work.

4.1.02 GENERAL:

With reference to the terms and conditions of the construction standards for excavations set forth in OSHA "Safety and Health Regulations for Construction", Chapter XVII of Title 29, CFR, Part 1926, CONTRACTOR shall employ a competent person and, when necessary, based on the regulations, a registered Professional Engineer, to act upon all pertinent matters of the work of this section.

All backfill operations shall be in accordance with the City of Mason Supplement to the State of Ohio (ODOT) Construction and Material Specifications, as shown on City of Mason Construction Standards Sheet except as otherwise noted herein. All requirements of these items shall be strictly adhered to by the CONTRACTOR and enforced by the CITY.

4.1.03 CLEARING AND GRUBBING:

Clearing and Grubbing shall be performed as specified in the bid item description in Section 2, Article 11 'Cost of the Work; Allowances; Unit Price of Work'

4.1.04 EXCAVATION:

Excavations shall provide adequate working space and clearances for the work to be performed therein and for installation and removal of concrete forms. In no case shall excavation faces be undercut for extended footings. Subgrade surfaces shall be clean and free of loose material of any kind when concrete is placed thereon. Except where exterior surfaces are specified to be damp-proofed, monolithic concrete manholes and other concrete structures or parts thereof, which do not have footings that extend beyond the outside face of exterior walls, may be placed directly against excavation faces without the use of outer forms, provided that such faces are stable.

No classification of excavated materials will be made for payment purposes. Excavation and trenching work shall include the removal and subsequent handling of all materials excavated or otherwise removed in performance of the work, regardless of the type, character, composition, or condition thereof.

4.1.05 DEWATERING

Dewatering equipment shall be provided to remove and dispose of all surface water and groundwater entering excavations, trenches, or other parts of the work. Each excavation shall be kept dry during subgrade preparation and continually thereafter until the structure to be built, or the pipe to be installed therein, is completed to the extent that no damage from hydrostatic pressure, flotation, or other cause will result.

All excavations for concrete structures or trenches which extend down to or below groundwater shall be dewatered by lowering and keeping the groundwater beneath such excavations.

Surface water shall be diverted or otherwise prevented from entering excavations or trenches to the greatest extent possible without causing damage to adjacent property.

CONTRACTOR shall be responsible for the condition of any pipe or conduit which he may use for drainage purposes, and all such pipe or conduit shall be left clean and free of sediment.

CONTRACTOR shall obtain from the appropriate agencies and authorities, the dewatering and stormwater discharge permits required to remove and dispose of groundwater, surface water, and any other water used in CONTRACTOR's operations. The permits shall be obtained prior to start of construction. CONTRACTOR shall comply with applicable laws and regulations, including but not limited to the requirement that if CONTRACTOR has the capacity to withdraw water at a quantity greater than 100,000 gallons per day the CONTRACTOR shall register with the Ohio Department of Natural Resources (ODNR), Division of Water and then track and report on how much water was pumped. (Ohio Revised Code 1521.16)

4.1.06 SHEETING & SHORING

Except where banks are cut back on a stable slope or other effective trench support is provided, excavations for structures and trenches shall be supported with shoring as necessary to prevent caving or sliding.

Sheet piling or other excavation support systems shall be installed as necessary to limit the extent of excavations for deeper structures and to protect adjacent structures and facilities from damage due to excavation and subsequent construction. CONTRACTOR shall assume complete responsibility for and shall install adequate protection systems for prevention of damage to existing facilities.

Sheeting, shoring and excavation support systems shall meet all applicable OSHA (Occupational Safety & Health Administration) requirements.

Trench sheeting may be removed if the pipe strength is sufficient to carry trench loads based on trench width to the back of sheeting. Trench sheeting shall not be pulled after backfilling. Where trench sheeting is left in place, it shall not be braced against the pipe, but shall be supported in a manner which will preclude concentrated loads or horizontal thrusts on the pipe. Cross braces installed above the pipe to support sheeting may be removed after pipe embedment has been completed. Trench sheeting shall be removed unless otherwise permitted by CITY. Trench sheeting will not be removed, if in the opinion of CITY, removal of the sheeting will cause damage to the facility it is protecting. If left in place, the sheeting shall be cut off 12 inches below finished grade. The design of the support system shall be such as to permit complete removal while always maintaining safety and stability.

4.1.07 STABILIZATION

Sub-grades for concrete structures and trench bottoms shall be firm, dense, and thoroughly compacted and consolidated; shall be free from mud and muck; and shall be sufficiently stable to remain firm and intact under the feet of the workers.

Sub-grades for concrete structures or trench bottoms which are otherwise solid, but which become mucky on top due to construction operations, shall be reinforced with crushed rock or gravel as specified for granular fills. The stabilizing material shall be placed in a manner that no voids remain in the granular fill. All excess granular fill with unfilled void space shall be removed. The finished elevation of stabilized sub-grades shall allow for installation of pipes, manholes, etc. to

the elevations indicated on the drawings.

4.1.08 TRENCH EXCAVATION:

No more trench shall be opened in advance of pipe laying than is necessary to expedite the work. One (1) block or four hundred (400) feet, whichever is the shorter, shall be the maximum length of open trench on any line under construction. Except where no dig methods are indicated on the drawings, is specified, or is permitted by CITY, all trench excavation shall be open cut from the surface.

Alignment, Grade, and Minimum Cover

The alignment and grade or elevation of each pipeline shall be fixed and determined from offset stakes. Vertical and horizontal alignment of pipes, and the maximum joint deflection used in connection therewith, shall be in conformity with requirements of the section covering installation of pipe.

Fill Section

Where the sewer trench is in a fill section and the top of the pipe extends above the vertical limits of where the fill begins (portions of the trench backfill are in the constructed embankment) the CONTRACTOR shall refer to ODOT section 603 requirements, and City Supplement requirements thereto, for placement of the embankment fill prior to beginning the trench excavation.

Mechanical Excavation

The use of mechanical equipment will not be permitted in locations where its operation would cause damage to trees, buildings, culverts, or other existing property, utilities, or structures above Mechanical equipment used for trench excavation shall be of a type, design, and construction, and shall be so operated, that the rough trench excavation bottom elevation can be controlled, and that trench alignment is such that pipe, when accurately laid to specified alignment, will be centered in the trench with adequate sidewall clearance. Undercutting the trench sidewall to obtain sidewall clearance will not be permitted. In locations where maximum trench widths are required for designated rigid conduits, mechanical equipment shall be operated so that uniform trench widths and vertical sidewalls are obtained at least from an elevation twelve (12) inches above the top of the installed pipe to the bottom of the trench.

Cutting Concrete Surface Construction

Cuts in concrete pavement and concrete base pavements shall be no larger than necessary to provide adequate working space for proper installation of pipe and appurtenances. Cutting shall be started with a concrete saw in a manner which will provide a clean groove at least one and one-half (1 1/2) inches deep along each side of the trench and along the perimeter of cuts for structures. Concrete pavement and concrete base pavement over trenches excavated for pipelines shall be removed so that a shoulder not less than 6 inches in width at any point is left between the cut edge of the pavement and the top edge of the trench. Trench width at the bottom shall not be greater than at the top and no undercutting will be permitted. Pavement cuts shall be made to and between straight or accurately marked curved lines which, unless otherwise required, shall be parallel to the center line of the trench. Pavement removal for connections to existing lines or structures shall not exceed the extent necessary for the installation.

Where the trench parallels the length of concrete walks, and the trench location is all or partially under the walk, the entire walk shall be removed and replaced. Where the trench crosses drives, walks, curbs, or other surface construction, the surface construction shall be removed and

subsequently replaced between existing joints or between saw cuts as specified for pavement.

Excavation Below Pipe Sub-grade

Except where otherwise required, pipe trenches shall be excavated below the underside of the pipe, to provide for the installation of granular embedment.

4.1.09 BACKFILL REQUIREMENTS:

The bedding for SDR 35 pipe shall be number 8 pea gravel, 6" under and around the pipe and 12" over the top of the pipe. The ditch is then to be filled with clean clay fill compacted in 6" lifts. The bedding for SDR 26 plastic pipe shall be number 57 (1" washed stone) 6" under, around and 12" over the pipe. The balance of the backfill is to be clean clay in 6" lifts and compacted. At no time will the construction debris be permitted in the trench. Settling of the trench shall be the responsibility of the installer. The City engineer reserves the right to alter the granular fill for changing soil conditions. Bedding and backfill shall conform to the type and compaction specifications for Class B Bedding as provided by the most recent edition of the "State of Ohio Department of Transportation Construction and Material Specification," Sections 603.04 and 603.08.

4.1.10 PROTECTION OF TRENCH BACKFILL IN DRAINAGE COURSES:

Where trenches are constructed in ditches or other watercourses, backfill shall be protected from surface erosion. Where the grade of the ditch exceeds one (1) percent, or as otherwise required, ditch checks shall be installed. Unless otherwise indicated on the drawings, ditch checks shall be concrete. Ditch checks shall extend at least 2 feet below the original ditch or watercourse bottom for the full bottom width and at least 18 inches into the side slopes, and shall be at least 12 inches thick.

4.1.11 FINAL GRADING:

After other outside work has been finished, and backfilling and embankments completed and settled, all areas which are to be graded shall be brought to existing grade and slope. Use of graders or other power equipment will be permitted for final grading and dressing of slopes, provided the result is uniform and equivalent to manual methods. All surfaces shall be graded to secure effective drainage. Final grades and surfaces shall be smooth, even, and free from clods and stones, weeds, brush, and other debris. Seeding and other restoration activities shall comply with section 3.2.16 Restoration.

4.1.12 DISPOSAL OF EXCESS EXCAVATED MATERIALS:

Disposal of excess material from other trench excavation sites shall be as follows. Excavated material shall be placed in spoils locations designated on construction drawings. Except as otherwise permitted, all excess excavated materials shall be disposed of away from the site.

Broken concrete and other debris resulting from pavement or sidewalk removal, excavated rock in excess of the amount permitted to be installed in trench backfill, debris encountered in excavation work, and other similar waste materials shall be disposed of away from the site.

4.1.13 SETTLEMENT:

CONTRACTOR shall be responsible for all settlement of trench backfill which may occur within the correction period stipulated in the General Conditions.

CONTRACTOR shall make, or cause to be made, all repairs or replacements made necessary by settlement within thirty (30) days after notice from CITY.

SECTION 4.2

Sanitary Sewer Pipe

4.2.01 SCOPE:

This section covers furnishing polyvinyl chloride (PVC) pipe and fittings, complete with all jointing materials and appurtenances including, but not limited to, all necessary site preparation, excavation, embankment, dewatering, maintaining existing sanitary flow, sheeting, preparation of trench bottom, granular bedding and initial backfill, backfill, testing, disposal of waste material, dust, odor and noise control, traffic control, lights, signs and barricades, cleaning up, coring of existing manholes and connection, saw cutting and concrete encasement

Pipe trenching, bedding, and backfilling are covered in the Trenching and Backfilling Section 4.1

4.2.02 PRODUCTS:

PVC (S.D.R. 26 & 35) Pipe is used under these items, all operations shall be in accordance with Items 603.016 and 707.41 of the City of Mason Supplement to the State of Ohio, Department of Transportation, Construction and Material Specifications, latest edition. PVC sewer pipe and fittings, ASTM D-3034 and ASTM F-679 (ASTM F-679 for 18" and greater PVC only) latest edition, shall have ASTM D-3212 joints (flexible elastomeric seals).

4.2.03 INSTALLATION:

MAINS

Mains shall be SDR 35 plastic above 14 feet cover and SDR 26 plastic below 14 feet of cover. If any portion of a section of sewer between manholes exceeds 14 feet of cover, the entire section of pipe shall be SDR-26. During installation of sanitary mains, the connection to existing system shall be plugged until all air tests of the new mains have been completed and passed. Any water in new sewer mains shall be pumped out prior to removing the plug. Installer is responsible for obtaining and maintaining updates from manufactures.

LATERALS

Sewer laterals shall be extended to a minimum of the back of right of way limits, easement limits, or as directed by the Engineer. The lateral shall be capped and marked with a 2"x6" board, from the bottom of the trench at the invert of the pipe to 4 feet above final grade. The 2"x6" board should have a large red "S" painted at the top and the lot number and depth of bury painted in red below the "S". There shall also be an "S" stamped into the curb over the sewer lateral. The lateral depth shall not exceed 14 feet at the cap unless otherwise approved by the Engineer. Lateral must have a minimum fall of 1/4 inch per foot (2.0%) and must be 6" diameter from main to within 3 feet to 5 feet of foundation. Cleanout must be placed within 2 feet to 6 feet of foundation. If lateral is longer than 100 feet there must be a clean-out every 50 feet. In no case shall a lateral be less than 6" pipe from the sewer main to the building drain no more than 5 feet from the foundation.

4.2.04 AIR TESTING:

All new sewers shall be subjected to a leakage check either by an air test, or by an infiltration or exfiltration test. These tests, including furnishing of all appurtenances thereof, shall be performed at the Contractor's expense. This work shall be done only in the presence of a City inspector. The

air test, for conduits 24" and under, shall be performed by first inserting plugs in the line, isolating test sections between manholes. The isolated test section is then air pressurized to a minimum of 3.5 psi. Valves to and from the test section are then closed and air supply disconnected. Time elapsed before the pressure in the test section drops to 2.5 psi is noted and recorded. The test section shall be considered acceptable if the elapsed time is greater or equal to the time listed for the corresponding conduit include in the City of Mason Construction Standards.

4.2.05 MANDRELL TESTING:

Mandrell testing shall be done 45 days after sanitary sewer has passed the air test. Use of the City of Mason's Mandrell is required.

SECTION 4.3

Sanitary Sewer Manholes

4.3.01 MANHOLES:

Manholes shall be a minimum of 48" in diameter and constructed of precast concrete complete with cast iron frame and steps in accordance with City of Mason Standard Drawings. Cast iron frame shall be Neenah R-1664, or approved equal, with "SANITARY" in large letters on the lid and shall be set on the cone with asphalt mastic. All joints shall be made watertight and all manhole lift holes shall be plugged. The top of the lid shall be set flush with the finished grade. There shall be a maximum of 400 feet between manholes. All manholes shall have an inflow protector installed. Manhole frame chimney seals shall be installed on any manhole located in pavement, within 50' of a stream, in a low lying area, or at the discretion of the Public Utilities Superintendent, or their representative. Risers shall not exceed 12-inches in adjustment. If adjustment over 12-inches is required, the manhole shall be reconstructed. Brick, block, slabs or mortar masonry shall not be permitted for adjustment to achieve final grade.

4.3.02 TESTING:

All new manholes shall be subject to vacuum testing for watertightness or damage prior to placing into service. These tests, including furnishing of all appurtenances thereof, shall be performed at the Contractor's expense. This work shall be done only in the presence of a City inspector. A minimum of 25% of all new manholes shall be tested. A representative of either the Engineering or Public Utilities Departments shall decide which manholes will be tested. If any manhole fails the testing procedure then 100% of all new manholes shall be tested. The vacuum test shall be performed by first inserting plugs into all pipes entering the manhole. The test head is then placed at the top of the manhole and a vacuum of 10 inches of mercury shall be drawn on the manhole. The valve on the vacuum line of the test head shall then be closed and the vacuum pump shut off. The time elapsed before the vacuum reading drops from 10 inches of mercury to 9 inches of mercury is noted and recorded. The manhole shall be considered acceptable if the elapsed time is greater or equal to the time listed for the corresponding manhole in the table provided in the City of Mason Construction Standards. If the manhole being tested fails the initial test, necessary repairs shall be made. The manhole shall then be retested until a passing test is obtained.