

SECTION 02210 - EXCAVATION AND BACKFILL (SEWERS AND WATER MAIN)

PART 1 - GENERAL

SUMMARY

Section Includes. The Work shall include the excavation, trenching, the complete and continual dewatering of excavation, sheeting, bracing and shoring of sides of excavation, backfilling around structures and over pipe lines, and the disposal of excess excavated material.

RELATED SECTIONS

<u>Specification</u>	<u>Specification Section Title</u>
Section 02110	Site Clearing
Section 02140	Dewatering
Section 02345	Casing Pipe Construction
Section 02513	Asphalt Concrete Paving
Section 02520	Portland Cement Concrete Paving
Section 02660	Water Main Construction
Section 02720	Sewer Construction
Section 02740	Sewage Force Main Construction
Section 03315	Concrete Work

REFERENCES

MDOT	Michigan Department of Transportation
MDOT 6A	Stone Refill
MDOT 8.02.06	Granular Fill
ASTM D1557	Modified Proctor Test

DEFINITIONS

Earth. Earth, as a name for excavated material, shall include all glacial deposit whether cemented or not, except solid boulders one-half cubic yard or more in volume; it shall include all alluvial deposits and material of every kind that can be excavated with equal facility by the equipment and means used for other earth excavation in the Work.

Job-excavated Backfill. Job-excavated backfill shall be defined as job-excavated material, free from frozen earth, boulders, rocks, stones larger than 6 inches in size, debris and organic material.

Granular Fill. Granular fill shall be defined as sharp sand, gravel, or crushed stone, free from lumps of clay, soft or flaky material and shall conform to the MDOT Specification "Granular Materials - Class III".

Subgrade: The undisturbed earth or the compacted soil layer immediately below granular subbase, drainage fill, or topsoil materials.

Subbase: The layer of specified materials of designed thickness placed on the subgrade as part of the pavement structure.

Structure: Buildings, foundations, slabs, tanks, curbs, or other man-made stationary features occurring above or below ground surface.

SUBMITTALS

Test Reports. Submit the following reports directly to ENGINEER from the testing services, with copy to CONTRACTOR:

Test reports on borrow material.

Gradation analysis for granular backfill and subbase materials.

Field reports; in-place soil density tests will be performed by a representative of OWNER.

QUALITY ASSURANCE

Codes and Standards. Perform excavation work in compliance with applicable requirements of authorities having jurisdiction. Construct subbase in accordance with Michigan Department of Transportation Standard Specifications for Construction.

Testing and Inspection Service. OWNER will employ and pay for a qualified independent geotechnical testing and inspection laboratory to perform soil testing and inspection service during earthwork operations.

PROJECT CONDITIONS

Existing Utilities. Locate existing underground utilities in areas of excavation work. If utilities are indicated to remain in place, provide adequate means of support and protection during earthwork operations.

CONTRACTOR shall notify MISS-DIG - Utility Communications System, 1-800-482-7171, three working days prior to starting any excavation with power equipment.

Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult utility owner immediately for directions. Cooperate with OWNER and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility owner.

Do not interrupt existing utilities serving facilities occupied by OWNER or others, during occupied hours, except when permitted in writing by ENGINEER and then only after acceptable temporary utility services have been provided.

Provide minimum of three working days notice to ENGINEER, and receive written notice to proceed before interrupting any utility.

Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies for shutoff of services if lines are active.

Use of Explosives. Use of explosives is not permitted.

Protection of Persons and Property. Barricade open excavations occurring as part of this Work and post with warning lights.

Operate warning lights as recommended by authorities having jurisdiction.

Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

Perform excavation by hand within drip line of large trees to remain. Protect root systems from damage or dry out to the greatest extent possible. Maintain moist condition for root system and cover exposed roots with moistened burlap.

PART 2 - PRODUCTS

SOIL MATERIALS

Satisfactory soil materials are defined as those complying with ASTM D2487 soil classification groups GW, GP, GM, SM, SW, and SP.

Unsatisfactory soil materials are defined as those complying with ASTM D2487 soil classification groups GC, SC, ML, MH, CL, CH, OL, OH, and PT.

Bedding: MDOT Specification Granular Material 6A or Class I, except 100 percent must pass 1-1/2-inch sieve.

Granular Backfill: MDOT Specifications - Granular Materials Class III.

Subbase Material: MDOT Specifications - Granular Materials Class II.

Drainage Fill: Washed, evenly graded mixture of crushed stone, or crushed or uncrushed gravel, with 100 percent passing a 1-1/2-inch sieve and not more than 5 percent passing a No. 4 sieve.

Backfill and Fill Materials: Satisfactory soil materials free of clay, rock or gravel larger than 2 inches in any dimension, debris, waste, frozen materials, vegetation and other deleterious matter.

PART 3 - EXECUTION

LIMITS OF EXCAVATION

General. Trenches for pipes shall be excavated so that there will be a minimum clearance of 6 inches on each side of the pipe barrel and a maximum width at the level on the top of the pipe of not more than O.D. of the pipe plus 12 inches on each side. Trenches shall be at all times of sufficient width to permit the pipe to be laid by first-class construction methods. Sufficient space shall be provided in the trench to permit the joints to be properly made. Before excavation is started in either bituminous or concrete paved streets, the paving shall be cut by means specified under this Section.

The bottom of the trench in granular material shall be loosened to a depth of 3 inches below bottom of the pipe. Where the trench excavation for pipe is in rock, the trench bottom shall be undercut a minimum of 6 inches below the final location of the pipe and bedding material, hereinafter specified, shall be placed and compacted along the haunch of the pipe.

Excavation for structures shall be made to the outside lines and surfaces of such structures wherever it is practicable to build directly against the sides or bottoms of excavations. In such cases, care shall be taken not to disturb the original foundation or backing, with the final excavation or trimming being done by handwork just before the construction work. If excess excavation is made or the material becomes disturbed so as to require removal beyond the prescribed limits, the resulting space shall be refilled with bedding, as specified hereinafter, solidly machine tamped into place, to the required compaction, before construction work proceeds.

Excavation for structures shall be extended sufficiently beyond the limits of the structure to provide ample room for form construction and other construction methods to be followed, wherever necessary.

Bedding. At least the bottom half of the pipe shall be laid in bedding. Bedding in haunch area shall be compacted in layers not to exceed 6 inches in depth to 95 percent of its maximum unit weight.

LENGTH OF TRENCH OPENING

In excavating for pipelines, the excavation shall at all times be finished to the required grade for an adequate distance in advance of the completed pipeline. Unless otherwise permitted by ENGINEER, not more than 50 feet of trench in advance of the pipe or 200 feet of total trench shall be open at one time. The length of street which may be occupied by the construction work at any one time will be based on the requirements of use of the street by the public. No more than 600 consecutive feet of length of the street shall be occupied at one time, and vehicle traffic through the street shall not be entirely stopped without the permission of ENGINEER.

METHOD OF EXCAVATION IN EARTH

All excavation shall be by open cut from the surface except in special cases where tunneling under pavement or structures may be required, or where tunneling under the root system will be required for tree root protection. All excavation shall be made in such a manner and to such depth, length and width as will give ample room for building the structures, for bracing, sheeting and supporting the sides of the excavation, for pumping and drainage of groundwater and sewage which may be encountered, and for the removal of all materials excavated. Special care shall be taken so that the soil below the bottom of structures to be built shall be left undisturbed to provide a firm bed for construction.

STABILITY OF EXCAVATIONS

General. Comply with local codes, ordinances, and requirements of agencies having jurisdiction.

Slope sides of excavations to comply with local codes, ordinances, and requirements of agencies having jurisdiction. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated. Maintain sides and slopes of excavations in safe condition until completion of backfilling.

STORAGE OF EXCAVATED MATERIALS

Stockpile excavated materials acceptable for backfill and fill where directed. Place, grade, and shape stockpiles for proper drainage.

Locate and retain soil materials away from edge of excavations. Do not store within drip line of trees indicated to remain.

Dispose of excess excavated soil material and materials not acceptable for use as backfill or fill.

BACKFILLING TRENCHES

After the pipes have been laid and inspected, the trench shall be backfilled. Under the haunches, at the sides and top, from the bedding to a level at least one foot above the top of the pipe, sand or pea gravel, as specified hereinbefore for bedding under "Limits of Excavation," shall be deposited and carefully compacted by hand or machine tamping in layers not to exceed 6 inches in depth, required compaction.

All trenches in paved streets, shoulders, traveled roadways, parking areas and driveways shall be backfilled with job-excavated backfill or granular fill, as shown on the Drawings, from the level one foot above the top of the pipe to the specified road surface subgrade. The job-excavated backfill or granular fill shall be placed in not more than 6-inch layers and thoroughly and uniformly compacted by machine tamping, required compaction. With the approval of ENGINEER, water jetting on granular fill may be accepted in lieu of tamping in 6-inch layers.

Trenches under concrete sidewalks shall be backfilled from a level one foot above the top of the pipe to a level 4 inches below the finished grade of the sidewalk with job-excavated backfill or granular fill and compacted to the required maximum unit weight.

Trenches not in paved streets, shoulders, traveled roadways, parking areas, driveways and under sidewalks, shall be backfilled from a level one foot above the top of the pipe to the ground surface with job-excavated backfill and shall not require tamping other than that required to prevent trench settlement, unless otherwise noted on the Drawings.

Any depression resulting from settlement of the trench backfill previous to the date of total acceptance of all Work under this Contract shall be brought to proper grade and surface, and made to match the adjacent surface.

Wherever gas mains, water mains, sewers, etc., are located in the trench area, granular fill shall be used for backfill from the bottom of the trench up to the spring line of these pipes. Granular fill shall be placed full trench width with two horizontal to 1 vertical side slopes and compacted in 6-inch layers to 95 percent of its maximum unit weight so as to thoroughly support the pipe within the trench area. Granular fill so required shall be considered included in the unit prices bid for other items of the Work. When directed by ENGINEER, dry mix Class C concrete will be substituted for granular fill. The installation of any dry mix Class C concrete shall be considered a change in the Work.

STONE REFILL

In locations where the soil at the bottom of the trench is unstable, when ordered by ENGINEER, CONTRACTOR shall excavate below the trench bottom and refill with crushed stone, slag, or crushed gravel equivalent in grading to MDOT 6A.

BACKFILLING AROUND STRUCTURES

As soon as practical after concrete structures have set, forms and debris shall be removed and the surface of the concrete pointed. After the structure has been inspected and approved, the excavated area around the structure shall be backfilled up to the specified subgrade with granular fill or job-excavated backfill, as called for on the Drawings for the adjacent trench. The fill shall be made in layers not to exceed 6 inches in depth and thoroughly compacted by machine tamping. No large boulders or masonry shall be placed in backfilling. No backfilling will be placed against manhole walls within 24 hours after the plaster coat has been applied to the outside of the walls, nor shall backfilling be placed about concrete structures until the concrete has attained at least 75 percent of its design strength, and approval of ENGINEER has been obtained.

CONCRETE CUTS

When the trench must be cut through pavement, driveway or sidewalk, particular care shall be taken not to unnecessarily damage the adjoining areas of pavement, driveway or sidewalk. All cuts through existing surfaces shall be made with a concrete saw, sawing deep enough to allow a straight cut parallel to longitudinal or transverse construction or contraction joints.

The saw cuts shall not be nearer than five feet to a transverse joint, to the centerline of the pavement, or to the edge of pavement or curb; i.e., no replacement shall be less than five feet in width. If the damaged pavement is nearer than five feet to a joint, to the centerline of pavement, or to the edge of pavement, surfacing or curb, the removal and replacement shall be extended to said joint, centerline, edge of pavement, surfacing or curb. These same requirements with reference to existing joints shall also apply to the cutting and replacement of concrete driveways.

If a square or block of sidewalk is cut, broken or cracked, the entire block or square shall be removed and replaced.

CROSSING EXISTING STRUCTURES

During construction, it may be necessary to cross under certain sewers, drains, culverts, water lines, gas lines, electric conduits, and other underground structures. Every effort shall be made to prevent damage to such underground structures. Wherever such structures are disturbed or broken, they shall be restored to good condition by CONTRACTOR, unless otherwise noted on the Drawings.

COMPACTION

Specified compaction shall be acquired with the use of a bulldozer, sheepsfoot roller, mechanical tamper, or other similar and effective equipment. Whenever compaction is specified, it shall mean not less than 95% (not average 95 percent) of the maximum unit weight. If the excavated material is not suitable to obtain 95% minimum compaction, CONTRACTOR shall, at CONTRACTOR's expense, remove unstable materials or add granular materials, or both, to obtain 95 percent minimum compaction as previously specified.

The maximum unit weight of soil referred to in these Specifications shall be determined by the ASTM D-1557, Modified Proctor Test.

DISPOSAL OF EXCAVATED MATERIAL

Excavated material, where suitable, shall be used in backfilling around pipelines and structures. All material in excess of the quantity required for backfilling or unsuitable material shall be disposed of by CONTRACTOR. CONTRACTOR shall obtain such spoil sites as may be required. CONTRACTOR shall provide all labor and equipment for spreading such material at the place of dumping and shall leave the area in a neat condition satisfactory to ENGINEER.

TREE ROOT PROTECTION

Machines shall freely excavate no closer to the base of a tree than the radius of the tree in inches converted to feet for trees less than 24 inches in diameter; and no closer than 12 feet if the tree is more than 24 inches in diameter. Tunneling under the root system will be required between the points so determined. Approaches closer than the previously stated distance, or tree removal, may be authorized by ENGINEER. Trees removed shall be disposed of at CONTRACTOR's expense.

ROADSIDE DITCHES AND CULVERTS

All roadside ditches and driveway culverts shall be cleaned, repaired and replaced to the same condition, or better, as existed before trenching operations commenced. Repair and/or replacement costs shall be included in other portions of the Work unless otherwise noted on the Drawings.

FIELD QUALITY CONTROL

Quality Control Testing During Construction. Allow testing service to inspect and approve each subgrade and fill layer before further backfill or construction work is performed.

EROSION CONTROL

Provide erosion control methods in accordance with details shown on the Drawings and/or requirements of authorities having jurisdiction.

MAINTENANCE

Protection of Graded Areas. Protect newly graded areas from traffic and erosion. Keep free of trash and debris.

Repair and reestablish grades in settled, eroded, and rutted areas to specified tolerances.

Reconditioning Compacted Areas. Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, reshape, and compact to required density prior to further construction.

Settling. Where settling is measurable or observable at excavated areas during general Project warranty period, remove surface (pavement, lawn, or other finish), add backfill material, compact, and replace surface treatment. Restore appearance, quality, and condition of surface or finish to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

END OF SECTION 02210