

EARTH EXCAVATION, BACKFILL, FILL AND GRADINGSECTION 102

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1. GENERAL

- (a) The Contractor shall make all excavations of every description for structures, roads and trenches, in whatever substance encountered, to the dimensions and levels shown on the drawings or as required by the Engineer.
- (b) The locations and depths of the proposed sanitary sewer force main and structures are shown on the drawings.
- (c) The Contractor is advised that lines and grades, as shown on plans and profiles, are subject to change. Although it is the intention to adhere to what is shown on plans, the Engineer reserves the right to make changes in lines and grades of water mains and locations of structures when such changes may be necessary or advantageous.
- (d) In open trenching on State, County, or local highways, the Contractor shall be governed by the conditions, restrictions and regulations made by the appropriate body. All such regulations shall be in addition to those set down in the specifications.

1. GENERAL (cont'd)

- (e) The excavation, dewatering, sheeting, and bracing shall be carried out in such a manner as to eliminate any possibility of undermining or disturbing the foundations of any existing structure or any work previously completed under this Contract, or as herein specified.
- (f) The Contractor shall backfill all excavations as necessary, as indicated on the drawings and as herein specified.

2. DESCRIPTION

- (a) The Contractor shall make excavations in such manner, and to such widths, as will give suitable room for building the structures or laying and joining pipe, but complying with the trench limits shown on the drawings; shall furnish and place all sheeting, bracing, and supports; shall do all pumping and draining; and shall render the bottom of the excavation firm and dry, and in all respects, acceptable.
- (b) In no case, except as provided for in the paragraph titled "Trench Limits", shall the earth be plowed, scraped, or dug by machinery so near to the finished grade as to result in disturbance of material below said grade. The last of the material to be excavated shall be removed with pick and shovel just before placing pipe, masonry, or other structures.
- (c) All excavations, except as otherwise specified or permitted, shall be open cut. The extent of excavation open at any one time will be controlled by the Engineer. The Contractor shall not have more than fifty (50) feet of trench open at any one time at each location during daylight hours or twenty (20) feet at night.
- (d) No tunneling will be permitted, except as provided elsewhere in these specifications.

3. SAFETY REQUIREMENTS

- (a) The Contractor shall provide and maintain barricades, signs, lights, etc., required for the protection of personnel, materials and property. Barricades, etc. shall conform with all codes and regulations, and shall be lighted at night with lanterns, flares and reflectorized paint as directed or required for safety, and shall be removed upon completion of the Contract.
- (b) The Contractor shall at all times maintain the excavations in a neat manner including sweeping at trench edges where directed by the Engineer.

4. SEPARATION OF SURFACE MATERIALS

- (a) From areas within which excavations are to be made, loam and topsoil shall be carefully removed and separately stored to be used again as directed; or, if the Contractor prefers not to separate surface materials, he shall furnish as directed and without additional compensation, clean backfill and loam and topsoil at least equal in quantity and quality to that excavated. When excavations are to be made in paved surfaces, the pavement shall be removed so as to provide a clean uniform edge with a minimum disturbance of remaining pavement.
- (b) If pavement is removed in large pieces, it shall not be mixed with other excavated material, but shall be disposed of away from the site of the work before the remainder of the excavation is

made.

- (c) The attention of the Contractor is directed to the specifications for replacing pavement.

5. EXCAVATED MATERIAL

- (a) Excavated material shall be so placed as not to interfere with travel on the streets and driveways by the occupants of adjoining property. Excavated material shall not be deposited on private property until written consent of Owner or Owners thereof, has been filed with the Engineer.
- (b) It is expressly understood that no excavated materials shall be removed from the site of the work or disposed of by the Contractor except as directed or approved by the Engineer or as noted below.
- (c) Suitable excavated material may be used for fill or backfill on other parts of the work, if specifically approved by the Engineer.
- (d) Upon completion of the backfilling, the streets or property shall be cleaned, surplus material removed and the surfaces restored to the condition in which it was before ground was broken. All materials left over in public highways shall become the property of the Contractor. If the Contractor fails to promptly remove such surplus material, the Engineer may have the same done, and charge the cost thereof as money paid to the Contractor.
- (e) Material excavated from private property shall belong to the property owner or his representative, and shall be disposed of by the Contractor, as required by said Owner or representative. If the Contractor fails to promptly remove such surplus material, the Engineer may have the same done and charge the cost thereof as money paid to the Contractor.
- (f) The City of Middletown Northend Sanitary Landfill has been closed. The Contractor shall acquire an alternate site for disposal of surplus material (both suitable and unsuitable). The Contractor shall inform the City of Middletown in writing where the disposal site is located.
- (g) The Contractor shall be responsible for the proper disposal of all unsuitable excavated materials. The Engineer shall determine what is suitable or unsuitable material where questions arise. Generally, unsuitable material shall include, but not be limited to, pavement (bituminous and concrete), large boulders, pipe, conduit and metal.

6. SHEETING AND BRACING

- (a) Refer to Section 122 "Sheeting and Staybracing" for Excavation Requirements.

7. DRAINAGE

- (a) At all times during construction, the Contractor shall temporarily provide, place and maintain ample means and devices with which to remove promptly, and dispose properly of, all water entering trenches and other excavations, or water that may flow along or across the site of the work; and keep said excavations dry until the structures, pipes, and appurtenances to be built therein have been completed to such extent that they will not be damaged. At this time, the Contractor shall remove such temporary means and devices.
- (b) Every precaution necessary to obtain water-tight construction of all joints in pipe must be taken.

The same precaution must be taken for all connections with structures.

- (c) All ground water which may be found in the trenches, and any water which may get into them from any cause whatsoever, shall be pumped or bailed out, so that the trench shall be dry during pipe laying and backfilling.
- (d) All water pumped or drained from the work shall be disposed of in a manner satisfactory to the Engineer, without undue interference with other work or damage to pavements, other surfaces, or property.

8. BUILDING OR STRUCTURE EXCAVATION

- (a) The Contractor shall excavate to the exact elevations shown on the plans, or as directed by the Engineer. If the Contractor excavates below the elevations specified, he shall bring the excavation back to the proper elevation (except as hereinafter noted) by backfilling with bank run gravel, free of organic matter, and tamping to provide a compact base, as specified in the backfill specification. The backfill material must be approved by the Engineer before being placed. If the Contractor excavates below the elevations specified for footings and for other structures that may be designated by the Engineer, he shall not backfill the excavation to bring it to the proper elevation, but the footing design will be revised in order that the footing will bear on undisturbed soil. These revisions shall be to the satisfaction of the Engineer. Any increase in cost resulting from backfilling, or increasing the size of the footings or foundations because of over-excavation in depth, shall be borne by the Contractor.

9. SLABS ON EARTH

- (a) Where slabs on earth occur, all loams, organic or other undesirable materials shall be removed as required by the Engineer, and the area grubbed to a depth of at least six (6) inches below the finished subgrade elevation. This material shall be replaced, without additional compensation, in accordance with the compacted backfill Specification described hereafter. Where slabs on fill occur, the fill will also be placed in accordance with the compacted backfill Specification.

10. TRENCH EXCAVATION

- (a) In general, trenches shall be excavated as shown on the contract drawings, to such depth as will provide a proper cover as indicated, from finished grade to the top of the pipe barrel. Deeper trenches shall be provided where necessary on account of the conformation of the ground and to permit the alignment of the pipe without undue deflection of joints.
- (b) Trenches shall be excavated by hand or machinery to the width and depth indicated on the drawings and specified herein under "Trench Limits". All loose materials shall be removed from the bottom of the trench so that the bottom of the trench will be in an undisturbed condition.
- (c) Particular care shall be taken that no stone 6 inches or larger in any diameter, protrudes more than 3 inches from the bottom or side of the trench.

11. TRENCH EXCAVATION IN FILL

- (a) If pipe is to be laid in new embankments or other new fill areas which are more than 12 inches deep below the invert of the pipe, the fill material shall be placed and properly compacted to final grade or to a height of at least 3 feet above the top elevation of the pipe, whichever is the

lesser, before laying pipe. Particular care shall be taken to ensure maximum consolidation of material under the pipe location. The pipe trench then shall be excavated as though in undisturbed material.

12. TRENCH LIMITS

- (a) Trenches shall be excavated to the required depths, adding, however, to such depths the thickness of the pipe and, where applicable, the thickness of the stone bedding. If in the opinion of the Engineer, the material at or below the depth to which excavation for structures and pipes would normally be carried is unsuitable for foundation, it shall be removed to such widths and depths as directed and replaced with suitable material. Such work shall be paid for under appropriate items. The width of the trench at the bottom shall always be wide enough to make the joints properly. When, in the option of the Engineer, it is necessary to lay a concrete foundation, the excavation shall be made 1/4 O.D. or (6" min.) deeper, or as ordered by the Engineer.
- (b) Trench widths shall be 3 feet greater than the outside diameter of pipe for such diameters of 36 inches or less. For diameters greater than 36 inches, the width shall be 4 feet greater than outside diameter. These limits may be adjusted for field conditions at the direction of the Engineer.
- (c) In earth excavation in sections where stone backfill is excluded, the bottom of the trench shall be shaped so as to conform to the outside of the pipe, particular care being taken to recess the bottom of the trench in such a manner as to relieve the bell of all load.
- (d) Where, by mistake of the Contractor, the bottom of the trench has been taken out to a greater depth than above specified, it shall be refilled to the proper grade using screened gravel. Said material shall be placed by the Contractor who shall receive no additional compensation whatever therefore. Refilling with earth to bring the bottom of the trench to the proper grade will not be permitted.
- (e) The Contractor shall at all times exercise care not to excavate outside the trench limiting lines indicated above unless otherwise authorized by the Engineer.
- (f) Bedding for pipe will be as detailed on the drawings.

13. TUNNELING

- (a) In general, excavation shall be made in open cut from the surface and the Contractor shall not be allowed to do any tunneling without obtaining permission from the Engineer, and then only according to methods approved by him and at no additional cost to the Owner. This permission will only be given where a line is to be laid to a point behind the curb, across a paved street, or where, in the opinion of the Engineer, it is necessary to tunnel short sections on account of proximity of adjacent walls, utilities, structures, to avoid important roots of trees or large masses of roots, or to ensure against root damage endangering the life of trees near the pipeline location. Such excavations then can be made in alternate section of open cut and tunnel, the length of the tunnel sections to be specified by the Engineer. These tunnel sections shall be cut underneath to a wedge with its edge horizontally across the water main, and backfilled tightly by ramming and tamping from each end.

14. EXCAVATION NEAR EXISTING STRUCTURES

- (a) Attention is directed to the fact that there are water pipes, drains, and other indicated utilities in certain locations. Some of these have been indicated on the drawings, but no attempt has been made to show all of the lines and services, and the completeness or accuracy of the information given is not guaranteed.
- (b) The Contractor is required to call "Call Before You Dig" (telephone number 1-800-922-4455), to have all existing underground utilities identified in the field prior to commencing work.
- (c) All water, or other utility conduits, shall be located on the ground by the applicable utility company with pipe finding equipment well ahead of the work at all times. All such locations shall be plainly marked by coded paint symbols on pavement or by marked stakes in the ground. Such locations shall be established at least 2,000 ft. in advance of all trench excavation. All such location work shall be coordinated between utility companies by the Contractor to the satisfaction of the Engineer at no extra cost. Once utility lines have been marked, it will be the responsibility of the Contractor to maintain the markings until he completes his work in that area.
- (d) As the excavation approaches pipes, conduits, or other underground structures, digging by machinery shall be discontinued and the excavation shall be done by means of hand tools, as directed. Such manual excavation where incidental to normal trenching excavation shall be done to the satisfaction of the Engineer at no extra cost.

15. PROTECTION OF EXISTING STRUCTURES

- (a) All existing pipes, poles, wires, fences, curbing, property-line markers, and other structures which, in the opinion of the Engineer, must be preserved in place without being temporarily or permanently relocated, shall be carefully supported and protected from injury by the Contractor, and in case of injury, the Contractor shall notify the appropriate party so that proper steps may be taken to repair any and all damage done. When the owners do not wish to make the repairs themselves, all damage shall be repaired by the Contractor, or, if not promptly done by him, the Engineer may have the repairs made at the expense of the Contractor.
- (b) All utility services shall be supported by suitable means so that the services shall not fail when tamping and settling occurs. No separate item is provided for service supports and the Contractor must cover same in the unit price bid for water main construction.

16. RELOCATION AND REPLACEMENT OF EXISTING STRUCTURES

- (a) Whenever the Contractor encounters certain existing structures as described below and is so ordered in writing, he shall do the whole or such portions of the work as he may be directed, to change the location or, remove and later restore, or replace such structures, or to assist the Owner thereof in so doing. For all such work, the Contractor shall be paid under such items of work as may be applicable, otherwise as Extra Work.
- (b) In removing existing structures, the Contractor shall use care to avoid damage to material, and the Engineer shall include for payment only those new materials which, in his judgment are necessary to replace those unavoidably damaged.
- (c) The structures to which the provisions of the preceding two paragraphs shall apply include structures which (1) are not indicated on the drawings or otherwise provided for, (2) encroach

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upon or are encountered near and substantially parallel to the edge of the excavation, and (3) in the opinion of the Engineer will impede progress to such an extent that satisfactory construction cannot proceed until they have been changed in location, removed (to be later restored), or replaced. (See Item 25, "Sub-Surface Obstructions" also).

- (d) When fences interfere with the Contractor's operations, he shall remove and (unless otherwise specified) later restore them to at least as good condition as that in which they were found immediately before the work was begun, all without additional compensation. The restoration of fences shall be done as promptly as possible and not left until the end of the construction period.

#### 17. CARE AND RESTORATION OF PROPERTY

- (a) Excavating machinery and cranes shall be operated with care to prevent damage to trees.
- (b) Branches, limbs, and roots shall not be cut except by permission of the Engineer. All cutting shall be done by, or under the direction of, a CT Licensed Arborist. In case of unavoidable damage to branches, limbs, and trunks of trees, the damaged portions shall be inspected by a CT Licensed Arborist and repairs made by, or under the direction of, him.
- (c) Cultivated hedges, shrubs, and plants which might be injured by the Contractor's operations shall be protected by suitable means or shall be dug up and temporarily replanted and maintained. After the construction operations have been substantially completed, they shall be replanted in their original positions and cared for until growth is re-established. If cultivated hedges, shrubs, and plants are injured to such a degree as to affect their growth or diminish their beauty or usefulness, they shall be replaced by items of kind and quality at least equal to the kind and quality existing at the start of the work.
- (d) On paved surfaces, the Contractor shall not use or operate tractors, bulldozers, or other power-operated equipment, the treads or wheels of which are so shaped as to cut or otherwise damage such surfaces. All surfaces which have been damaged by the Contractor's operations shall be restored to a condition at least equal to that in which they were found immediately prior to the beginning of operations. Suitable materials and methods shall be used for such restoration or as described in Section 605 on Replacing Existing Pavement.
- (e) The restoration of existing property or structures shall be done as promptly as practicable and shall not be left until the end of the construction period.

#### 18. DUST CONTROL

- (a) During the progress of the work, the Contractor shall conduct his operations and maintain the area of his activities so as to minimize the creation and dispersion of dust. If the Engineer decides that it is necessary to use calcium chloride or approved equal for more effective dust control, the Contractor shall furnish the material, load, deliver, and spread it as directed.

#### 19. BACKFILLING-GENERAL

- (a) In general, or unless other material is indicated on the drawings or elsewhere specified, material used for backfilling trenches and excavations around structures shall be suitable material which was removed in the course of making the construction excavations. Backfilling shall be done as promptly as is consistent with non-injury to the pipe or structures, but no backfilling shall be done before the Engineer gives permission. Where the trench is in a paved area or an area to be

paved, or the shoulder of a paved roadway, backfill shall be bank-run gravel as shown on the drawings or as otherwise specified elsewhere in the Contract Documents.

- (b) The backfill material shall be free from cinders, ashes, refuse, boulders, rocks, or stones greater than 6" in any dimension, unsuitable organic material or other material which, in the opinion of the Engineer, is unsuitable.
- (c) Frozen material shall not be placed in the backfill, nor shall backfill be placed upon frozen material. Previously frozen material shall be removed, or shall be otherwise treated as required, before new backfill is placed.
- (d) Trenches shall be backfilled daily. Steel plates are not allowed. Temporary pavement will be required on Fridays. Cold patch will be allowed only in emergency situations.

20. BACKFILLING AROUND STRUCTURES

- (a) No backfill shall be deposited against concrete until the concrete has obtained sufficient strength to withstand the earth pressure placed upon it and in no case less than seven days, nor before carrying out and satisfactorily completing the tests for watertight structures specified elsewhere. Compaction of backfill against concrete structures shall not be carried out by motorized equipment closer to structure than the depth of the structure below grades.
- (b) In addition, where pipe is connected to the structure, the backfilling procedure shall be carried out as specified in "Backfilling in Open Trench".
- (c) The remainder of the excavation around the structure shall be backfilled in accordance with "Backfilling in Open Trench", of this Section.

21. BACKFILLING IN OPEN TRENCH\*

- (a) As soon as practical after the pipe has been placed in accordance with the appropriate sections and the pipe joints have been properly made, the backfilling shall begin, and shall continue without delay. If a screened gravel or concrete envelope is not used, the selected material\*, free from large lumps and stones having any dimension greater than 2-inches, shall be placed simultaneously on both sides of the pipe, so that there will be no tendency to displace the pipe alignment. In placing the material, care shall be taken that stones do not strike the pipe.
- (b) The backfill at the sides of the pipe\* up to the top of the pipe shall be hand-placed and thoroughly compacted using approved hand-operated tampers.
- (c) The backfill up to a level of 1-foot above the top of the pipe\* shall be placed in 6-inch layers, leveled along the length and width of the trench and thoroughly compacted with approved static tampers.
- (d) At a point (24) twenty four inches above the pipe, a utility warning tape shall be placed along the entire length of the pipe. Warning tape shall be of the "DETECTABLE" type, (6) six inches wide and of suitable color assigned to the type of facility for surface markings in section 16-345-5(h) of the State of Connecticut General Statutes. Tape shall be durably imprinted with the appropriate warning or message. Tape installation and use shall be in accordance with Section 16-345 of the State of Connecticut General Statutes and all other state regulations.

\* See drawings for additional or superseding trench backfill requirements.

22. MATERIAL FOR FILLING AND EMBANKMENTS

- (a) Approved selected materials available from the excavation and not required for backfill around pipes or against structures may be used for filling and building embankments except as otherwise specified. Material needed in addition to that available from construction operations shall be obtained from approved gravel banks or other approved deposits as specified in Section on "Bank Run Gravel" or Section on "Screened Gravel".
- (b) All material, whether from the excavations or from borrow, shall be of such nature that after it has been placed and properly compacted, it will make a dense, stable fill. It shall not contain vegetation, roots, stones over 6-inches in diameter, or porous matter. Organic matter shall not exceed minor quantities (2%+) and shall be well distributed.

23. PREPARATION OF SUBGRADE FOR FILL AREAS

- (a) The Contractor shall remove loam and topsoil, loose vegetable matter, stumps, large roots, etc., from areas upon which embankments will be built or material will be placed for grading. The subgrade shall be shaped as indicated on the drawings and shall be so prepared by forking, furrowing, or plowing that the first layer of the new material placed thereon, will be well bonded to it.

24. PLACING AND COMPACTING FILL

- (a) After the subgrade has been prepared as hereinbefore specified, the material shall be placed thereon and built up in successive layers until it has reached the required elevation.
- (b) Layers shall not exceed 12-inches in thickness before compaction. The layers shall be slightly convex toward the center. In general, the finer and less pervious materials shall be placed in the center, and the coarser and more pervious materials, upon the outer parts of embankments.
- (c) Each layer of material shall be compacted by the use of approved static rollers or other approved means so as to secure a dense, stable, and thoroughly compacted mass. At such points as cannot be reached by mobile mechanical equipment, or where such equipment is not permitted, the materials shall be thoroughly compacted by the use of suitable power-driven static tampers or other non-vibratory power-driven equipment.
- (d) Previously placed or new materials shall be moistened by sprinkling, if required, to ensure proper bond and compaction. No compacting shall be done when the material is too wet, from either rain or too great an application of water, to compact it properly; at such times the work shall be suspended until the previously placed and new materials have dried out sufficiently to permit proper compaction, or such other precautions shall be taken as may be necessary to obtain proper compaction.
- (e) When gravel fill or other material is used for foundation of structures, it shall be spread in layers of uniform thickness not exceeding 6-inches before compaction and moistened or allowed to dry as directed. Each spread layer shall be thoroughly compacted by means of suitable power-driven static tampers or other non-vibratory power-driven equipment.
- (f) Compaction of each layer of backfill shall be compacted to a uniform density of not less than 95%

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of the maximum density obtained, as measured by Method D, AASHTO T-180. In-place field unit weight may, at the discretion of the Engineer, be determined in accordance with AASHTO T-238.

- (g) The Contractor is responsible for providing periodic density testing as directed by the Engineer to ensure compliance to the specifications at no cost to the Owner. One copy of the test results shall be provided to the Engineer.

25. SUB-SURFACE OBSTRUCTIONS

- (a) As a general rule, sub-surface obstructions encountered along the route of the pipeline shall be considered as follows:
  - 1) Crossing Obstruction: All pipes, wires, etc. of whatever nature whose centerline lies at an angle of 20 degrees or greater to the centerline of the pipe being installed shall be considered as crossing obstructions and shall be protected, or repaired or replaced if damaged, or relocated, all at no additional cost to the Owner.
  - 2) Interfering Obstructions: All pipes, wires, etc. of whatever nature whose centerline lies at an angle of less than 20 degrees but more than 5 degrees to the centerline of the pipe being installed shall be considered as interfering obstructions. Costs for supporting such obstructions in place during installation of the new pipe shall be paid for by the Owner. Costs for supporting interfering obstructions shall not be construed to include any costs for excavation. Repairing or replacing damaged interfering obstructions, or relocation shall be accomplished at no additional cost to the Owner.
  - 3) Parallel Obstructions: All pipes, wires, etc. of whatever nature whose centerline lies at an angle of 5 degrees or less or is truly parallel and less than 0.5 feet offset from outside of normal trench limits\* of the pipe being installed shall be considered as parallel obstructions. Costs for supporting such obstructions in place during installation of the new pipe, including excavation may be paid for by the Owner, or the Owner may elect to pay for the cost of replacing such obstructions. Should the Owner first elect to pay the cost of supporting the obstruction and then elect to pay the cost of replacing the obstruction, approved costs for supporting the obstruction, including excavation, incurred prior to electing replacement costs shall also be paid. After the Owner elects to pay replacement costs, only replacement costs will be paid for all additional work in the vicinity of the parallel obstruction.
  - 4) Angle measurement between centerline of obstruction pipe, wire, etc. and centerline of the pipe being installed shall be taken as between the horizontal projection of the center- lines at ground surface. Parallel offset distance between centerline of obstructive pipe, wire, etc. and the outside of normal trench limits of the pipe being installed shall be taken as between the horizontal projection of the center- lines and outside trench limit at ground surface.

\* "Normal Trench Limits" refers to the trench widths specified in Section 102-12(b).

END OF SECTION