

## SECTION A1

### EXCAVATION AND BACKFILL

#### GENERAL

The work under this section shall include all excavation to such width and depth as shown on the drawings, specified herein, or ordered by the Engineer. Such excavation may be for the laying of pipes or appurtenances, the removal of pipes or appurtenances, the capping or plugging of pipes to be abandoned, test pits to locate existing utilities, or any other purpose for which excavation may be needed.

Wherever a percentage of compaction for backfill is indicated or specified, it shall be the percent of maximum density at optimum moisture as determined by Method D of ASTM Standard Methods of Test for Moisture - Density Relations of Soils Using 10-lb. rammer and 18-inch Drop, Designation D 1557-78.

#### CLASSIFICATION

Excavation shall be classified as follows:

TRENCH EXCAVATION - shall consist of all earth excavation, within the limits specified herein, required to lay all pipes and appurtenances as shown on the plans or ordered by the Engineer.

Normal depth of trench excavation shall be six inches (6") below the bottom of the pipe in earth.

Normal width of trench excavation in sheathed trenches up to 12 feet deep shall be measured between vertical planes which are a distance apart that is equal to the sum of the outside diameter of the pipe plus the total width of the sheathing including walers plus 2 feet. Such trench width shall in no case be less than 4 feet 2 inches or 5 feet if walers are used as part of the sheathing system.

Normal trench widths for trenches supported with approved trench boxes or hydraulic shoring systems shall be the sum of the outside diameter of the pipe plus 1 foot on either side of the pipe, the width of the wall shield (no greater than 8 inches), plus 1 foot of additional space to allow for installation of the trench box.

Normal width of trench excavation in unsheathed trenches shall be measured between vertical planes, which are a distance that is equal to the sum of the outside diameter of the pipe plus 2 feet.

Such trench width shall in no case be less than 3 feet except trenches for building services that shall be a maximum of 2 feet 6 inches wide.

Other trench widths for deeper excavations or special conditions may be specified in the contract drawings and will supersede these limits. However the Contractor in all cases will include with his plans for trench support a maximum trench width for approval by the Engineer.

See General Conditions; paragraph GC.23 for maximum payment limits and deductions for excess width.

MISCELLANEOUS TRENCH EXCAVATION shall consist of all excavation beyond the limits of normal trench excavation as ordered in writing by the Engineer, including test pits ordered or approved by the Engineer.

BELOW GRADE EXCAVATION shall be such excavation required to remove unsuitable materials below the normal trench depth (as defined above) as shown on the plans or ordered in writing by the Engineer.

ROCK EXCAVATION shall be any rock greater than 1 1/2 cubic yards in size as shown on the plan or ordered by the Engineer to be excavated. Limits of rock excavation shall be six (6) inches from the outside diameter of the pipe.

WOOD TIES AND RAILS shall consist of visible or buried and abandoned wood ties and steel rails, which must be removed in order to install the pipe.

## CONSTRUCTION METHODS

### GENERAL

Excavation shall be carried out to the lines and grades as set forth above as shown on the plans or as ordered by the Engineer. All excavation beyond such limits is done at the Contractor's expense. Furnishing, placing and compacting suitable backfill material for such over-excavation shall also be at the Contractors' expense.

Prior to excavation of all trenches in paved areas, the Contractor shall cut through the existing pavement and base course in neat straight lines with a minimum amount of vibration. Unless allowed in writing by the Engineer, all pavement, including sidewalks, shall be cut using a mechanical saw or a machine mounted hydraulic or mechanical tool fitted with a rotary-type blade, and shall result in sound vertical edges, thus avoiding any damage to the pavement or base course outside of the trench limits. Where the contract requires a permanent trench repair, pavement shall be cut six (6) inches beyond the width of the trench along each side of the trench on City of Boston streets and shall be cut twenty-four (24) inches beyond the width of the trench along each side of the trench on D.C.R. streets.

All excavations shall be sheathed and braced as set forth in section A7 herein, unless otherwise noted on the plans, in the Special Condition, or ordered in writing by the Engineer. All shoring trench support and excavation shall be in accordance with the requirements of the Department of Labor and Industries' Industrial Bulletin No. 12, Section 10 and all subsequent amendments.

All excavations shall be kept free of all water. The Contractor shall submit the method for dewatering at the pre-construction meeting for approval by the Engineer.

The following materials shall be considered earth excavation for purposes of measurement and payment:

Street or sidewalk pavement of all kinds including bituminous concrete, concrete, brick or other materials.

Obstructions visible in whole or in part before beginning work such as trees, hedges, stumps, roots and fences.

Obstructions indicated on the drawings.

Brick or other masonry of old foundations.

Catch basins, manholes, pipes and similar existing structures not in use.

Dry stone walls with stones less than one and one-half (1-1/2) cubic yards in volume.

Sheeting, shoring or bracing of existing structures including piles, pile caps and cradles.

All existing gas pipes, electric conduit, telephone conduit, cable TV conduit, telecommunications conduit, water, sewer or drain lines and any other structures, which are uncovered by the excavation, shall be carefully supported and protected from injury by the Contractor. The Contractor shall restore any items damaged by him to their original condition, and they shall be kept in repair during contract operations. The restoration of existing utility lines shall be done as promptly as practical and shall not be left until the end of the construction.

As excavation operations approach known underground structures, the excavation around the structure should be performed by means of hand tools to safely expose the structure as a normal part of trench excavation.

Where determination of the exact location or elevation of a pipe or other structure is necessary, the Contractor shall excavate test pits along the proposed alignment as part of normal trench excavation, to determine such locations far enough ahead of the work so that the pipe alignment can be properly determined. Test pits ordered by the Engineer beyond the limits of the trench work shall be paid for under Item A1-1, Miscellaneous Trench Excavation.

Excavating equipment shall be operated with care to prevent damage to trees, overhead branches, overhead utilities and other structures. Wherever work will disturb existing trees, the Contractor will notify the Tree Warden of the Boston Parks Department before he cuts any roots or branches of existing trees. Branches and roots shall not be cut until obtaining permission of the Engineer. All cutting shall be done neatly by approved methods without splitting or crushing.

Plantings and trees shall be adequately protected or removed and later re-established in their original position and condition. Where injury is such as to diminish their beauty or usefulness, they shall be replaced by items of kind and quality at least equal to that existing at the start of the work.

The Contractor shall not use any equipment whose movement will cut or otherwise injure paved surfaces.

Where material is found to or below the grade to which excavation is carried which is unsuitable for foundation in the opinion of

the Engineer, the Contractor shall remove and dispose of such material to the required width and depth and replaced with thoroughly compacted screened gravel or gravel as directed by the Engineer.

The Contractor shall maintain the area of his activities to control dust by sweeping and/or sprinkling of the streets or as otherwise determined to be necessary by the Engineer.

As soon as practicable after the pipes have been laid, except as provided hereinafter, the backfilling shall be started around the pipe to the limits and with the material indicated on the drawings. Unless indicated otherwise on the drawings, all backfill material shall be newly bought gravel or approved processed gravel. This material shall be filled evenly on both sides of the pipe to the indicated grades and rammed with suitable tools so as to be compacted to at least 95 percent.

Backfill shall not be placed on frozen material.

The trench above a level one foot over the top of the pipe shall be backfilled and compacted by mechanical tamping or rolling (maximum weight of roller 1 ton within 3 feet of pipe) in accordance with the nature of the material and as approved by the Engineer. Puddling may only be used when the material does not contain so much clay or loam as to delay or prevent satisfactory drainage.

Backfilling of the entire trench before the pipeline has successfully passed any specified tests required shall be at the Contractor's option and risk. The Contractor shall be responsible for removing and later replacing such backfill, at his own expense, should he be ordered to do so in order to locate and repair improperly placed pipe or to repair leakage or defective joints or pipe.

The material shall be deposited in layers of not more than 8 inches in depth before compaction. Each layer shall be tampered or rolled as required to obtain a thoroughly compacted mass. Care shall be taken that the material shall first be wet by sprinkling as directed or approved. However, no compaction shall be done when the material is too wet.

#### TRENCH EXCAVATION

Trench excavation shall be carried out to the lines and grades as specified herein and shown on the plans.

Trenches may be excavated to their full depth by machinery provided that the material remaining at the bottom of the trench is no more than slightly disturbed.

The Contractor should anticipate that due to existing utility lines, hand excavation will be required.

Trench excavation shall result in a flat or shaped trench bottom, true to grade so that the pipe will have uniform and continuous bearing on a firm support. Trenches shall be made as narrow as practicable, and every effort shall be made to keep the sides of the trenches firm and undisturbed until backfilling and compaction are completed.

#### MISCELLANEOUS TRENCH EXCAVATION

This excavation shall be carried out in a similar manner to trench excavation, but to limits beyond the established limits for normal trench excavation as determined by the Engineer.

#### BELOW GRADE EXCAVATION

This excavation shall be carried out in a similar manner to trench excavation, but to depths below the established lower limit of trench excavation as determined by the Engineer.

All materials excavated by Below Grade Excavation shall be removed from the job site and shall not be used for any backfill purposes.

#### ROCK EXCAVATION

Only such rock, as in the opinion of the Engineer, that requires blasting for its removal, and boulders over one and one-half (1-1/2) cubic yards in volume will be measured and paid for as rock excavation.

Rock shall also include monolithic concrete, reinforced concrete, stone structures greater than 1 1/2 cubic yards as a solid mass including solid masses of previously placed flowable fill. In the case of flowable fill the designation of it as rock shall be made by the Engineer.

Rock in pipe trenches shall be excavated so as to be not less than 6 inches from the outside wall of the pipe. Before the pipe is laid, the trench below the pipe, where rock excavation has



ITEM A1-2                      Below Grade Excavation ..... C.Y.

This item shall include only such excavation below the normal trench depth, which is ordered by the Engineer, specified herein or shown on the plans. Such excavation shall include all existing materials as set forth above and all incidentals as specified under Item A1-1.

ITEM A1-3                      Rock Excavation ..... C.Y.

This item shall include all rock excavation necessary to lay the pipe at the grade specified. Such excavation shall extend to a point at least six (6) inches around the outside diameter of the pipe. The amount paid under this item shall include all mechanical means to excavate rock, blasting, and any other work necessary to remove the rock.

For purposes of payment boulders at least one and one-half cubic yards in volume shall be considered as Rock Excavation. Boulders less than one and one-half cubic yards shall be considered normal earth excavation.

ITEM A1-4                      Rails and Wood Ties ..... L.F.

This item shall include the excavation removal, transportation and disposal of all wood ties and rails necessary to lay the pipe or any appurtenances. The amount paid shall be per linear foot and shall include all equipment, labor and materials necessary to remove all rails, ties and rail sub-base in order to lay the pipe. Rails are defined as a set of two tracks supported by wooden ties.

This item shall include all rails and ties shown on the plans or not shown on the plans.

The Engineer has attempted to record the location of all abandoned rails. However, these records may not be accurate or available to ensure the exact location on the existence of the rails.

The Contractor shall cut and remove rails and wood ties only within the approved limits of the excavation. No work will be allowed outside of the trench limits as noted in Section A-1 of this contract.

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