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SECTION 3.4 – TRENCHING AND BACKFILLING

3.4.1 SCOPE

The work described in this section pertains to trenching and backfilling in conjunction with water and sewer installation.

3.4.2 DEFINITIONS

Where soils are referred to in the City of Whitehorse Servicing Standards Manual, they are to be as defined in the "Guide to the Field Description of Soils for Engineering Purposes", Technical Memorandum 37, published by the National Research Council. The Consultant is to approve Sand and gravel before being used.

3.4.2.1 SAND

Particles conforming to Technical Memorandum 37, smaller than the 5.000 mm sieve but larger than the 0.080 mm sieve are to be classified as sand.

3.4.2.2 GRAVEL

Particles conforming to Technical Memorandum 37, smaller than 75 mm in diameter but larger than the 4.750 mm sieve are to be classified as gravel.

3.4.2.3 COMMON EXCAVATION

The excavation of all deleterious materials including hardpan, quicksand, and frozen earth; and rock, concrete or masonry less than 0.75 cubic m in volume are to be classified as common excavation.

3.4.2.4 ROCK EXCAVATION

The excavation of rock, concrete or masonry exceeding 0.75 cubic min volume; and solid ledge rock, concrete or masonry which requires for its removal drilling, blasting, wedging, sledging, barring or breaking with a power-operated hand tool, are to be classified as rock excavation.

Soft or disintegrated rock, concrete or masonry which can be removed with a hand pick, power operated excavator or shovel; and loose, shaken or previously blasted rock will not be classified as rock excavation.

3.4.3 EXCAVATION

If, during excavation, material appearing to be rock is encountered, the Developer is to notify the Consultant. The Developer is to provide ample opportunity for the Consultant to investigate and make such measurements as are necessary to determine the volume.

Rock encountered in the excavation area is to be shattered 0.50 m below top subgrade and 0.20 m below ditch bottom. Rock is to be removed to a depth of 0.20 m below top of subgrade.

3.4.3.1 GRADE AND ALIGNMENT

The trench is to be excavated so that the pipe can be laid to the alignment, grade, and depth required.

3.4.3.2 UNIFORMITY

The subgrade is to provide a uniform and continuous support for the pipe and fittings on solid, undisturbed ground. Any over-excavation by the Developer below the required grade is to be backfilled with an approved compacted material.

3.4.3.3 ROCK

Where excavation is made in a material which cannot provide an even, uniform and smooth surface; or where large stones are encountered in the trench, such material is to be removed to provide a clear distance between any part or projection of such material and the surface of all pipe and fittings of not less than 150 mm for 600 mm outside diameter pipe or less, and 200 mm for pipe having an outside diameter greater than 600 mm. The subgrade is to then be made by backfilling with an approved granular material compacted in 200 mm compacted lifts to 95% Standard Proctor Density. Excavated rock is not to be used for backfill. The finished subgrade surface is to be shaped by hand tools to provide a uniform and continuous support for the pipe.

3.4.3.4 UNSUITABLE PIPE FOUNDATION MATERIAL

The Developer is to excavate material unable to properly support the pipe and materials harmful to the pipe such as ashes, cinders, refuse or organic material. The Developer is to excavate such material to the width, depth, and length ordered by the Engineer, and dispose of the material as directed. The material is to then be replaced with an approved sand or gravel. The finished surface is to be shaped by hand tools to provide a uniform and continuous support for the pipe. Where replacing unsound material with compacted sand cannot make proper support, the Developer is to construct a foundation for the pipe as directed by the Consultant.

3.4.4 TRENCH WIDTH

The minimum trench width below the crown of the pipe is to be as per the standard drawings in Appendix 2.B. Where the maximum trench width is exceeded, the Developer is to, at their own expense, provide special bedding or take other precautions as directed by the Consultant.

3.4.5 TRENCH SHORING

Open-cut trenches are to be sheeted and cross-braced to protect the work and workers, as required by the current territorial Occupational Health and Safety Board and by municipal ordinances.

3.4.5.1 SAFETY REQUIREMENTS

Trench walls, bracing, and shoring are to be made in accordance with current territorial Occupational Health and Safety Regulations. When closed sheeting is required, it is to be so driven as to prevent adjacent soil from entering the trench either below or through such sheeting. The Consultant reserves the right to order the sheeting driven to the full depth of the trench or to such additional depths as may be required for the protection of the work.

3.4.5.2 REMOVAL OF SHORING

Trench cross-bracing may be removed when backfilling has reached the level of such cross bracing. Sheeting is to be removed as backfilling proceeds. Backfilling of holes left by sheeting below the trench bottom is to be carefully compacted, and thereafter backfilling and withdrawal of sheeting is to proceed together. No voids are to be left in the backfill by the withdrawal of the sheeting.

3.4.5.3 SHORING LEFT IN PLACE

The Consultant may order shoring to be permanently left in place. Shoring that has been ordered left in place is to be cut off and removed to a depth of 900 mm below the existing or future proposed grades, whichever is the lower, or to an elevation designated by the Consultant.

3.4.6 EXCAVATED MATERIAL

All excavated material is to be piled at least 0.6m clear of the trench top and in such a way as to prevent material from falling back into the excavation. The material is to be piled in such a manner that it will not endanger the work or obstruct other work or rights-of-way. Sufficient clear space must be left on one side of the trench to accommodate survey stakes.

Gutters and natural drainage channels are not to be obstructed. Where this is impractical, satisfactory provisions are to be made for alternative drainage.

3.4.7 TRENCH DRAINAGE

The trench is to be drained in such a way that the workers may work safely and efficiently. All water encountered in trenches is to be pumped or bailed out, and in no case is the pipe to be used as a drain for such water. It is essential that the discharge of the trench dewatering pumps be conducted away from the site of the work and into natural drainage channels, drains, or storm sewers. No direct discharge into a surface watercourse will be allowed unless prior approval has been granted under the Yukon Waters Act.

3.4.8 BLASTING

Blasting for excavation will be permitted only with the approval of the Consultant and only when proper precautions are taken for the protection of persons or property. The Developer's method of blasting is to conform to the Occupational Health and Safety, General Safety Regulations. The Developer will be responsible for public notification.

3.4.9 BACKFILLING AND COMPACTION

Bedding and initial backfilling is to be as specified by the Consultant for the particular pipe installed.

The Developer is to be responsible for adequate compaction of the trenches and for the correction of settlement during the maintenance period of the Development Agreement. Sufficient cover is to be maintained when using compaction equipment in order to prevent damage to the pipe. Backfilling is to commence after the Consultant has approved initial backfilling and bedding.

Unless otherwise specified, all trenches are to be backfilled using the excavated native material, providing it is suitable.

Unsuitable foundation is to be replaced with an approved sand or gravel.

All material placed in the trench 1.0m or deeper below the surface is to be compacted to a density not less than 95% Standard Proctor Density tested at optimum moisture content in 200 mm compacted lifts. All material placed within 1.0m of subgrade is to be compacted to a density not less than 98% Standard Proctor Density at optimum moisture content. Trenches that do not extend beneath the road surface, compact to 95% Standard Proctor Density at optimum moisture content. Backfill is to be placed within 2% of the optimum moisture content.

No boulders larger than 300 mm, rock, ice, snow, organic material, or debris is to be permitted in the trench. These unsuitable materials are to be hauled away.

All surplus excavated material is also to be hauled away or disposed of. In the event of deficiency of backfill material, the Developer is to supply suitable material. The contractor is not to dispose of construction materials in the trench.

3.4.9.1 OPEN TRENCH

All trenches be backfilled as the work proceeds and no more than 50 m is to be left open at the end of each day's work for a maximum period of 24 hours.

3.4.9.2 BENEATH GROUND UTILITIES

All ditches and trenches crossings over which any underground utilities, such as gas lines, water lines, sewer lines or pressure pipelines of any type exist or are to be constructed are to be compacted to 98% Standard Proctor Density.

All road crossings for shallow underground utilities, such as gas lines, power lines, telephone lines or cable television lines are to be compacted to 98% Standard Proctor Density.

3.4.9.3 TESTING

If a density test indicates insufficient compaction at any depth, additional compaction is required before an additional test will be taken to confirm compaction.

The frequency of field density and moisture content tests are to be as indicated in Section 3.26 of this Manual.