Appendix C UTILITY TRENCH TESTING REQUIREMENTS

B.01 General Requirements

a. The placement of water, sewer, force main and stormwater pipe lines in excavated trenches requires compaction of trench backfill as the pipe laying operation is occurring.

b. Compaction of backfill materials shall be accomplished using mechanical tamps. Heavy rollers, vehicles, or other equipment shall not be used for compacting backfill nor allowed to cross over completed work except at points adjudged capable of adequately protecting the pipelines.

c. The Developer or developer's Contractor shall appoint, employ, and pay for specified services of an independent firm to perform testing for compliance with compaction requirements and as otherwise required by the City of Belmont. Said testing firm shall be subject to the approval of the City.

d. Testing and source quality control may occur on or off the Site.

e. Reports shall be submitted by the independent firm to the City and the Contractor indicating the firm's observations and the results of tests. The reports shall indicate compliance or non-compliance with the compaction requirements. Reports must be submitted to the City and Contractor within 7 days of performing tests.

f. The Contractor shall cooperate with the independent firm; furnish samples of materials, design mix, equipment, tools, storage, safe access, and assistance by incidental labor as requested.

g. The Contractor shall notify the City of Belmont and independent testing firm 24 hours prior to the expected time for operations requiring compaction testing services.

B.02 Compaction Requirements and Testing Procedures

a. Contractor shall be responsible for, and shall pay for testing based on the excavation location per the table below. The independent firm soils technician will be required to be on site only during actual backfill/compaction operations according to the following requirements:

EXCAVATION LOCATION	MIN. SOILS TECHNICIAN TIME ON SITE AND TESTING REQUIREMENTS
Under existing or proposed pavement	2 hours/day or 50% of backfill time
Outside of pavement but within 1:1 slope area	1 hour/day or 30% of backfill time
Outside 1:1 slope area	1 hour/day or 25% of backfill time
In bore pits	When required by the Engineer
At structures or point excavations	When required by the Engineer
In unstable soils or when directed by the Engineer	Full time testing as directed by the City

b. Longitudinal Testing Requirements: At the completion of a project, the number of tests must equal a minimum of one test per 100 linear feet of excavated trench and one test per structure and mainline valve, and must be random in both depth and location along the excavation. The City reserves the right to have an inspector on site during all testing, and to direct specific tests at specific locations and depths throughout the project, as may meet the requirements of the City, regardless of the minimum testing requirements indicated.

c. General Requirements: The Contractor shall be responsible for scheduling the soils technician in order to meet the Contractor's daily backfill and compaction schedule, and to meet location and performance requirements as specified. The Contractor and the soils technician will agree in writing, daily on the actual starting and ending times the soils technician was on site. Should the soils technician not be on site during actual backfill/compaction operations to obtain any required tests, then the Contractor will excavate the backfilled trench to any required depths and at required random locations to permit testing to be completed. The Contractor is responsible for insuring that the excavation complies with all OSHA safety standards before the soils technician enters the excavation to perform the testing. Water main and/or sewer testing or activation will not be permitted until all in-place density requirements have been met. Any and all failing tests shall require corrective action by the Contractor, as necessary to obtain minimum soil density. Any and all failing tests shall require a corresponding retest, confirming passing results, after corrective actions by the Contractor.

d. Testing Standards: A "standard proctor curve", which establishes the relationship between moisture content and the dry density for soils, will be determined (for each soil type encountered) by the method described in ASTM D-698 or AASHTO Method T-99. Field density tests will be performed using either (1) the sand cone method (D-1556/T-191), (2) the rubber balloon method (D-2167/T-205), (3) the drive cylinder method (D-2937/T-204), or (4) by nuclear moisture/density gauge method (D-2922/T-238). Each field test shall be performed according to the appropriate ASTM/AASHTO standard. All backfill material shall have a minimum in place density as specified or as may be

required by encroachment agreements. Maximum density shall be as determined by the "standard proctor curve" for the material in use. Minimum in place density shall be based on the "standard proctor curve" for the material in use. One-point field proctor tests shall be required to confirm that the backfill material is consistent with the standard proctor. Moisture content shall be determined in the field by standard industry approved methods - Gas Pressure Tester Method (ASTM D-4944) or Direct Heating Method (ASTM D-4959).

e. Testing does not relieve Contractor to perform Work to the requirements of the plans or as directed by the project design engineer.

f. Re-testing required because of non-conformance to specified requirements shall be performed by the same independent firm on instructions by the City. Contractor shall be responsible for and shall pay for re-testing.

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