
BACKFILL REGULATIONS FOR PUBLIC RIGHT-OF-WAYS

1. GENERAL

- 1.1 The following specifications apply to compaction of all water, sewer and shallow utility service cuts, repairs, replacements, mainbreaks, extensions, etc., and all shallow cuts by utility companies on all existing or proposed streets, lanes or easements for full width of the right-of-way where the City of Lethbridge is responsible for maintenance.
- 1.2 A trench or cut is defined as that portion of any excavation extending from within 300 mm below the pipe to the finished subgrade surface at a 1:1 side slope.
- 1.3 With regard to the area from the bottom of the bedding to 300 mm above the pipe, method of backfill and compaction and type of equipment used in water, sewer and shallow utility installations must comply with the Standard Specification, Environmental Utilities Department.
- 1.4 All trenches or cuts are backfilled in uniform lifts, and each lift is mechanically compacted and keyed into existing trench walls. Thickness of lifts are determined by testing procedures during the construction process. In addition all trench walls will be a minimum slope of 1:1 from the pipe zone to the top of subgrade unless agreed to by the Transportation Business Unit.
- 1.5 When soils removed from any trench appear unsuitable for replacement in the trench due to excessive moisture content, or for any other reason, and suitable material is not available on site, the trench shall be backfilled with granular material or non-shrinkable backfill. Under no circumstances shall frozen material be used for backfill.
- 1.6 An excavation permit must be obtained before beginning any excavation in the City of Lethbridge for the installation of utilities or other purpose regardless of whether the area is paved, graveled or unimproved. These excavation permits are to be obtained from the Technical Services Department at City Hall, 910 – 4th Avenue South, 5th Floor. The applicant will receive two copies of each excavation permit and as soon as the work involved is completed, one form is to be returned immediately so that the Streets Division or Maintenance Section, can carry out additional rehabilitation work required.

2. MOISTURE REQUIREMENTS

- 2.1 Soil used for trench or cut backfill must be within + or – three (3%) percent of its optimum moisture content.

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3. DENSITY REQUIREMENTS

3.1	PROCTOR LOCATION	PERCENT OF STANDARD DENSITY
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Pipe or Cable Zone	Minimum 95%
Above Pipe or Cable Zone	Minimum 98%

3.2 Requirements apply to the full width of the right-of-way with the exception of the boundary area from the property line up to one (1) meter from the constructed or designed surface installation. In the boundary area the soil must be compacted to a minimum of ninety (95%) percent of the soils' maximum density.

3.3 Service Connection trenches shall be tested from pipe zone to finished base course. Testing will also be taken adjacent to manholes and water valves.

4. WINTER COMPACTION

4.1 During these portions of the year, when specified densities cannot be obtained due to cold weather, a minimum density of ninety (95%) percent of maximum density above the pipe zone will be acceptable.

4.2 Non Shrink Backfill and Hot Sand is an approved alternate and recommended during winter backfilling operations versus the use of native materials.

4.3 A cold mix will be used for the surface and it will be replaced with asphalt in early spring. All settlements related to winter backfill operations must be repaired by the Utility Division/Company prior to the spring asphalt patching.

5. NON SHRINK BACKFILL

5.1 Specifications:

- .1 Compressive Strength – 0.2 to 0.5 Mpa.
- .2 Maximum 56 day strength – 0.5 Mpa

5.2 Aggregate Gradation:

- .1 Aggregate shall consist of washed sand conforming to the requirements of Section C.S.A. Standard CAN#-A23.1-M77.
- .2 Aggregate shall be graded within the following limits:

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SIEVE SIZE	PERCENT PASSING
10 mm	100
5 mm	95 - 100
2.5 mm	80 – 100
1.25 mm	50 – 100
630 um	25 – 65
315 um	10 – 35
160 um	2 – 15
80 um	0 - 10

5.3 Slump requirements:

- .1 Minimum slump – 75 mm
- .2 Maximum slump – 125 mm

5.4 Admixtures:

- .1 Calcium Chloride may be used.
- .2 Air entraining admixtures may be used to improve workability.

5.5 Cold Weather Requirements:

- .1 Non shrink backfill delivered in cold weather shall conform to the requirements specified in Section 18 of C.A.A. Standard CAN3-A23.1-M77.

5.6 Placing:

- .1 Non shrink backfill shall be rodded or vibrated to eliminate voids, rough areas, honeycombing and to ensure contact with the sides of the excavation.
- .2 Place materials using methods which do not lead to segregation.
- .3 Pumping of material is permitted with the approval of the City Engineer.
- .4 Temporary plating or other means of supporting traffic loads to be used to provide safe driving surface for traffic until pavement materials is replaced.
- .5 Protect freshly placed material from heavy rain to prevent washout.
- .6 A maximum curing period of 48 hours to ensure adequate strength is achieved.

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.7 Quality Control

- .1 Inspection and testing of non shrink fill will be carried out by a CSA certified laboratory designated by the City Engineer.

6. SITE PREPARATION

- 6.1 The Utility Divisions/Companies at their own expense shall clear and broom clean the surface of the pavement as may be necessary for full width and length of the work area and shall dispose of all refuse in a manner satisfactory to the City Inspector.

7. PAVEMENT OR SIDEWALK REMOVAL

- 7.1 Trenching across existing paved streets or lanes will be allowed only when it has been ascertained that coring/auguring is impossible or impractical.
- 7.2 The Utility Division/Company shall sawcut the asphalt to a minimum depth of 100 mm or when the depth of asphalt is greater than 100 mm, one-half the pavement thickness is required to ensure a neat edge. The Utility Division/Company will be responsible for all costs arising for sawcutting, replacing the asphalt structure, concrete for sidewalks, curb and gutters (both temporary and permanent) and damage occurring beyond the limits of the excavation.
- 7.3 Longitudinal excavations shall be a minimum of two (2) metres in width to facilitate the use of proper compaction equipment and an asphalt paving machine. Excavations greater than 100 m² in area shall be replaced by means of an asphalt paving machine.
- 7.4 Asphalt concrete shall not be placed in lifts greater than 150 mm and each lift shall be thoroughly compacted and cured prior to placing another lift of asphalt.

8. CONSTRUCTION JOINTS

- 8.1 Prior to backfilling, the excavation shall be completely free of debris, ponding water or drifted snow.
- 8.2 Materials unsuitable for backfill shall be removed from the site and disposed of at an approved site. Examples of unsuitable material are as follows:

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- .1 organic material
- .2 frozen soil
- .3 soil with a moisture content is in excess of 4% above optimum
- .4 broken concrete, pavement or other construction debris.

8.3 On existing paved streets and lanes, clay backfill shall be brought up to the existing subgrade only. The pavement and base structure shall be rebuilt with properly compacted 75 mm size crushed granular sub-base, 25 mm size crushed granular base and hot-mix asphalt to match the existing structure. On existing graveled streets and lanes, the gravel surface shall be replaced to its original condition prior to completion of the work. If the roadway adjoining the trench has been contaminated by excessive amounts of moisture, this material shall be removed also and replaced with clean fill.

8.4 The Utility Division/Company will be responsible for the rehabilitation costs of failures due to settlement of the backfill within two years of excavation completion date. If any obvious major settlement occurs, the City may require the trench to be re-compacted for its full depth and length.

9. TESTS FOR COMPACTION CONTROL

9.1 The maximum density and optimum moisture content for each soil type is determined by A.S.T.M. Designation D698 (Moisture Density Relationships of Soils).

9.2 The field density of soils is determined by A.S.T.M. Designation D2933 (Determining Density of Soil and Soil Aggregate in Place by Nuclear Methods Shallow Depth).

9.3 For spot checks, the following methods are also acceptable:

.1 A.S.T.M. Designation D1556 Density of Soils in Place by Sand Cone Method.

.2 A.S.T.M. Designation D2167 Density of Soils in Place by Rubber Balloon Method.

.3 A.S.T.M. Designation D2216 Laboratory Determination of Moisture Content of Soil.

9.4 Rapid drying of the soils to determine their field moisture content is permitted with a corresponding sample laboratory dried.

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10. TESTING SERVICES AND REPORTS

10.1 The following is the minimum testing frequency:

- .1 Trenches more than 15 metres in length shall require a minimum of three (3) density tests per 500 mm of trench depth per 75 metres of trench length.
- .2 Trenches less than 15 metres in length shall require a minimum two (2) density tests evenly distributed throughout the length of the trench, per 500 mm of trench depth.
- .3 Maintenance excavations less than 6 square metres in area shall require one (1) density test per 500 mm of depth.
- .4 Backfill adjacent to valves, manholes, catch basins and other structures shall require a minimum of two (2) density tests for every 500 mm of trench depth.
- .5 Density tests shall be representative of the entire length, width and depth of trench backfill, including around catch basins, manholes, valves and service connections.
- .6 The Engineer or the City Inspector may determine additional testing as necessary.

11. UTILITY MAINS – TESTING REQUIREMENTS

11.1 All sewer, watermain and shallow utility installations within the City right-of-way are subject to continuous testing and inspection to verify compliance with current backfill and compaction specifications. Copies of all results shall be sent by the Testing Agency to the Transportation Department.

12. BACKFILL COMPLIANCE

12.1 It is the responsibility of the Consulting Engineer to submit a signed and sealed "Letter of Certification" signifying that all City of Lethbridge Backfill Regulations have been met or exceeded. This Letter of Certification must be accompanied by copies of all soil moisture/density tests and its related moisture and proctor testing, concrete material, asphalt material, and other such materials testing as deemed necessary by the City of Lethbridge in accordance with its published Specifications.

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- 12.2 In the event that the entire street serviced area is deficient or irregular in testing coverage or fails to maintain the design cross-section and/or grade at any period prior to the issuing of a F.A.C., that portion of the right-of-way may be retested under observation by the Engineer or his representative prior to the issuing of a C.C.C. for the paving and concrete surface work. If such action is not undertaken, or the re-tests do not indicate compliance, the value of the surface improvements to be constructed in the affected area may be computed and a deposit in this amount may be required to serve as a guarantee against the failure of the surface improvement due to failures in the sub-base. The term of such a deposit is five (5) years and the deposit is required prior to construction of surface improvements.

13. EXCAVATIONS ON NEWLY CONSTRUCTED AND RE-SURFACED ROADS

- 13.1 Utility excavations shall not be permitted on roads that are either newly constructed or resurfaced within the past two (2) years. Exceptions shall be granted only where it can be proved that the excavation was beyond the control of the utility involved. Proposed excavations within the two (2) year period other than emergencies or redevelopment/development servicing shall be reviewed by the Streets Manager.