

City of Lincoln

Backfill Compaction in Right of Way Areas

Soil compaction is defined as the method of mechanically increasing the density of soil. If performed improperly, settlement of trench backfill and utility excavations can occur and result in unnecessary maintenance costs and/or failures in pavements, sidewalks, and structures.

City of Lincoln Standards:

- An Excavation Permit is required for all excavations and boring performed in ROW.
- Work shall be performed in accordance with Chapter 20 of the City of Lincoln Standard Specifications.
- All work shall be performed under the direction of a certified construction Site Supervisor or licensed plumber.
- Backfill shall be suitable soil with moisture content between -2% to +4% of optimum.
- Backfill shall not contain concrete, debris or frozen soil.
- Backfill shall be placed in lifts not to exceed 12 inches when fully compacted.
- Mechanical compaction to at least 96% of maximum density required in the ROW.
- Hand compaction methods within three (3) feet of valves, stop boxes, hydrants & manholes.
- Water soaking in ROW or in adjacent areas is not permitted.
- Contractor is responsible for settlements and damage during two year period.
- **Other Items:** City Street Maintenance is responsible for backfilling all excavations under City paving. Street Maintenance must be contacted when excavating through streets and curbs. Proper barricading is necessary when work conflicts with traffic.

Soil Types *

There are two basic soil groups in the Lincoln area: cohesive and granular.

- Cohesive = Suitable water content that is evenly distributed is critical for proper compaction. The soil needs to have an ideal (or optimum) amount of moisture to achieve maximum density. Cohesive soils usually require a force such as impact or pressure to be adequately compacted.
- Granular = Granular soils are known for their water-draining properties. Sands and gravels obtain maximum density in either a fully dry or saturated state.

Compaction *

- Why test in the lab and in the field?
 - ✓ Measures the effect of moisture on soil density.
 - ✓ Provides a moisture density curve identifying optimum moisture for cohesive soils.
 - ✓ Measures density of soil for comparing the degree of compaction vs. specifications.
- Moisture of the soil is vital to proper compaction. For cohesive soils, too little or too much moisture usually results in inadequate compaction. Field method to determine suitable moisture:
 - ✓ Pick up a handful of soil. Squeeze it in your hand. Open your hand.
 - ✓ If the soil is powdery and will not retain the shape made by your hand, it is too dry.
 - ✓ If it shatters when dropped, it is too dry.
 - ✓ If the soil is moldable and breaks into only a couple of pieces when dropped, it probably has the right amount of moisture for proper compaction.
 - ✓ If the soil is plastic in your hand, leaves traces of moisture on your fingers, and stays in one piece when dropped, it might have too much moisture for compaction.
- It is important to know and control the soil density during compaction. The City of Lincoln randomly tests backfill for adequate compaction and moisture content and requires improper backfill to be re-excavated and properly compacted. A good rule of thumb is to use a tile spade or probe rod. Proper compaction at the appropriate moisture content is when refusal is reached within approximately six (6) inches of penetration.



Equipment Applications *

Equipment Type	Granular Soils	Sand and Clay	Cohesive Soils
Rammers, Backhoe Sheepsfoot, & Rolling Sheepsfoot	Not Recommended	Acceptable for most applications	Provides optimum performance for most applications.
Vibratory Plates	Provides optimum performance for most applications.	Limited performance for most applications. Test section recommended.	Not Recommended
Vibratory Rollers	Provides optimum performance for most applications.	Limited performance for most applications. Test section recommended.	Not Recommended



Rammers

Pad-foot Roller



* Reprinted from "Soil Compaction – A Basic Handbook", Published by Multiquip, Inc.

Compaction of Excavations in ROW City of Lincoln Standard Specification, 20.03 (D)

All excavations mechanically compacted using

- Backhoe vibratory plate
- Backhoe sheepsfoot
- Rolling sheepsfoot
- Rammers

Hand compaction around valves and hydrants using

- Pneumatic tampers
- Rammers

Loose backfill lift approximately 18"

Granular Fill (L.S.P. 185)

Water or sewer

Vertical blocking

Compacted lift not to exceed 12"

Backfill Material:

- Moisture content of -2% to +4%
- No concrete, debris, or frozen soil
- No water soaking in ROW or adjacent areas

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