

Appendix D

Roadway Construction Criteria and Testing Procedures

Roadway Construction Criteria

1. All independent testing firm work required by this appendix shall be performed by firms on the current City of Lebanon approved list. All costs of initial inspection and inspection required to correct faulty work shall be borne by the developer. The testing firm shall provide all specified testing reports outlined in this Appendix to the responsible staff person at the City of Lebanon, this person being designated by the City/Utilities Engineer. Any extraneous or repeated tests required by the City not outlined in these specifications or not due to poor workmanship shall be paid for by the City of Lebanon. The City of Lebanon Engineering Department retains full authority and discretion over the construction or public roadways and acceptance of work.
2. A list of approved testing agencies will be maintained on the City of Lebanon Engineering Dept. website.
3. All fill areas within the public Right-of-Way which are greater than 1 ft. in depth shall be constructed under the observation of an independent testing agency as it is being placed. The testing agency shall be responsible for ensuring correct lift thicknesses and density requirements as defined in this Appendix.
4. All roadways, after clearing, grubbing and topsoil removal shall be slope staked and/or centerline grade stakes placed prior to grading operations so that the testing firm and/or the City of Lebanon Roadway Inspector can determine the extents of the fill sections.
5. A representative of the City of Lebanon Engineering Department shall be onsite in addition to the independent testing firm to observe the proof-rolling of subgrade, base stone installation/proof-rolling and placement of asphalt as outlined in this Appendix. The developer and/or his representative will be required to notify the City's designated contact a minimum of 48 hours prior to performing the work. This contact information will be provided at the pre-construction conference and/or designated on the plans. The City may decide to allow the independent testing agency to observe the work with only periodic inspection by the City inspector depending on schedule constraints. Every effort will be made by the City to not impact the schedule of construction whenever possible. It is, however, the responsibility of the developer or his representative to maintain good communication with the City.
6. A registered surveyor shall provide and stamp a letter certifying that the compacted subgrade is within +/- 0.10 ft. of design elevation before any base stone is placed. This letter is to be received and approved by the responsible staff person with the City. Subgrade elevations should be verified at centerline and face of curb every 50 ft. of roadway.
7. The City of Lebanon Roadway Inspector shall be provided copies of all base stone and asphalt truck tickets showing the type of material and tonnage, stamped by a certified weigher. These total tonnages shall be used to ensure that the placed tonnage is reasonably close to calculated expectations.
8. Any areas of subgrade, base stone or asphalt that do not meet the specifications/criteria of this appendix or these Subdivision Regulations shall be removed and repaired at the

direction of and under the observance of the City Inspector and the testing agency. The extent of the repairs shall be estimated before the repair begins based on observation and test results.

9. Failing subgrade areas in either cut or fill areas shall be removed to a depth that the testing agency and City Roadway Inspector concur is necessary and refilled with 6" and down size shot rock/surge stone back to finished subgrade.
10. The City of Lebanon Roadway Inspector IS NOT the authority on changing plans, altering testing methods or criteria, making decisions on materials or final acceptance of work. The City/Utilities Engineer and/or his/her designated representative shall concur with all testing and recommendations from the testing firm and make any decisions regarding an alteration in plans. The City Inspector will observe the work in accordance with the guidelines herein and the plans approved by the Engineering Dept. then report findings back to the Engineering Department.
11. The testing firm shall record data including: project name/phase, name of observer/engineer, date, time of test/observation, type of fill, observations, location of fill/base stone/asphalt test locations (by roadway station), and other pertinent data to verify the requirements as set forth in this Appendix.
12. The City Roadway Inspector shall be made aware immediately of any failing tests and associated work stopped until a solution is determined. All testing reports shall be furnished to the City Engineering designated contact in PDF format via CD or e-mail. Reports are due either at the completion of a scope of work or monthly, whichever occurs first. The City will provide written confirmation that the scope of work is acceptable before proceeding with the next and will do so in as timely a manner as the data submission allows. For example, the subgrade will be accepted before base stone can be placed, etc.
13. If the contractor does not have the specified equipment as detailed below for compaction (i.e., a Cat D-8 or equivalent tractor), then the testing company and the City Engineering Dept. shall review the proposed equipment and make adjustments as necessary. Lift thickness, particle size, number of passes and other adjustments can be made to accommodate available equipment. There will be reasonable limits to this exception and any quantifiable compaction standards set forth in this Appendix will remain in force.

Roadway Testing Procedures and Material Specifications

- I. Grading/Subgrade soils
 1. Cut sections shall be cut to grade and proof-rolled by a loaded tri-axle dump truck or equivalent piece of equipment (determined by testing agency and the City Inspector). Areas showing any pumping or rutting under the moving load shall be repaired in accordance with the assessment of the testing firm and the City Inspector. No repair is to be performed that is not inspected by the testing firm and/or the City Inspector. Areas of severe failure may require the opinion of a geotechnical engineer from the testing firm.
 2. Fill areas:
 - a. Before the placement of fill material, the areas to receive fill shall be treated as follows:

- All topsoil and organic material shall be removed. Topsoil is defined as soil material with a pH between 5.5 and 7.5 and organic content between 5 and 25% by weight.
 - The City Inspector and testing firm shall assess the surface where fill is to be placed and any determinations made if undercutting is required. Fill areas which will receive more than 3 ft. of material will not necessarily require stripping or undercutting if the City Inspector and testing firm agree that the underlying material can be bridged with the proposed type of fill.
 - Swampy and wet areas should be dewatered and rehabilitated based on recommendations from the geotechnical engineer from the testing firm. The City Inspector must concur.
 - Any fill placed without observation and documentation by the testing firm is subject to removal and replacement.
 - No fill is ever to be placed on surfaces with standing water or frozen material
 - Any fill, regardless of the fill material to be placed, which is less than 2 ft. deep, shall be placed in lifts no greater than 8" and the particle size shall not exceed 8".
- b. Soils: Fill material comprised of soils with less than 20% rock content must be placed in 8" compacted lifts, with the compaction effort being made by a sheepsfoot roller, at the direction of and under the observation of the testing firm as follows:
- Soil fill shall consist of a fine-grained soil with a UCS designation of ML, CL or CH. The soil shall consist of no more than 5% by weight of organic material and no rocks larger than 4". The plasticity index shall be less than 35 (ASTM D 4318)
 - The soils shall be compacted to a minimum of 95% of the maximum density by the standard proctor method (ASTM D 698).
 - The proctor density test to establish the maximum density will be performed by the testing firm. If the consistency, moisture content or other properties of the soils change within the project, a new standard proctor test value will need to be determined.
 - Testing of the in-place soil fill shall be performed at a minimum rate of every 150 feet of roadway for each lift of fill. Tests should be made in varying locations along the cross-section of the roadway.
 - Soils with excess moisture, organic materials or phosphates are not acceptable for roadway fills. The testing firm shall evaluate the soils and is responsible for determining suitable soils and obtaining concurrence from the City Engineering Department.
 - Upon achieving finished subgrade elevation, the roadways will be proof-rolled in accordance with the same procedure as in Section I (1) above.
- c. Shot Rock: Fill material comprised of shot rock with less than 20% fine particles (limestone rock/dust or soil particles less than 1/4" in size) shall be placed in lifts as follows:

- Fill sections greater than 10 ft.: Max particle size is 36", maximum lift thickness is 36". The top 2 feet of fill should be constructed in the same manner as specified for fill sections less than 10 ft.
 - Fill sections less than 10 ft.: Max particle size is 18" and lift thickness should be no more than 24".
 - Larger rocks shall be placed flat and not overlap each other.
 - All shot rock fills shall be placed with at least 6 passes with a Caterpillar D-8 or equivalent size tractor.
 - Fill lifts should be level and smaller size rocks filling voids
 - Upon achieving finished subgrade elevation, the roadways will be proof-rolled in accordance with the same procedure as in Section I (1) above.
- d. Soil/rock mixtures: Placement of soil/rock mixtures outside the above proportion criteria shall be placed as follows based on soil/rock ratio:
- 20-50% Soil/Fine Material:
 - Maximum particle size should not exceed 12"
 - Fill shall be placed in lifts no greater than 18".
 - Upon achieving finished subgrade elevation, the roadways will be proof-rolled in accordance with the same procedure as in Section I (1) above.
 - These fills shall be placed with at least 6 passes with a Caterpillar D-8 or equivalent size tractor.
 - 50-70% Soils Fine Material:
 - Maximum particle size should not exceed 6"
 - Fill shall be placed in lifts no greater than 12"
 - Upon achieving finished subgrade elevation, the roadways will be proof-rolled in accordance with the same procedure as in Section I (1) above.
 - These shall be placed with at least 6 passes with a Caterpillar 815 or equivalent size compactor.
- e. The testing firm and City of Lebanon Engineering Department may assess soil/rock combination fill material and adjust the maximum particle size and lift thickness based on the condition of the material and size of the fill.

II. Roadway Base Stone

1. Base stone shall not be placed until all underground utilities are installed and/or applicable casings placed for future installations. Any roadway cuts made after base stone placement shall be approved by the City Engineering Department. These cuts shall be backfilled to subgrade with #57/67 graded stone and mechanically tamped base stone to existing base stone grade. Base stone replaced in trenches shall be tested for compaction to the same standards listed below for roadway.
2. Materials: The aggregate base course gradation and material composition shall be in accordance with current TDOT specifications for Mineral Aggregate Base Course, Type A, Grading D (Section 903.05)

3. Local sources of the base stone must have TDOT approved gradation reports and density on file with the City dated no less than 6 months prior to the scheduled work. It is the responsibility of the developer or his/her testing firm to coordinate with the City to ensure these reports are current and use the information contained within to evaluate the base stone gradation/density. The developer, at his/her option and cost may have the testing firm sample stone from the quarry and run their own density/gradation report and present the results to the City for approval as basis for the work on the project. Testing method shall be AASHTO T99, Method D.
4. The density of the base stone will be measured by use of a properly calibrated nuclear gauge. The average density shall not be less than 97% of the maximum density as shown on the TDOT density report or City approved test by the testing firm with no individual test less than 94% of maximum density.
5. Density samples should be taken in a random pattern across the cross-section of the roadway with a frequency of every 100 ft. of roadway. Density tests should be performed on each lift of stone. Areas not meeting the density requirements shall be re-compacted or removed/replaced.
6. A gradation sample shall be pulled and tested for every 500 ft. of roadway. A minimum of one gradation sample will be made per day. Material not falling within the gradation limits set for Grading D mineral aggregate base shall be rejected.
7. Base stone shall be placed in lifts not exceeding 6" of compacted thickness.
8. Base course shall be proof-rolled under the criteria of Section I (1) above. The proof-roll of the base course shall not precede placement of prime coat and aggregate for cover material ("chips") by more than 3 days. Proof-roll shall be repeated at the discretion of the City Roadway Inspector if inclement weather has occurred between the proof-roll and prime/chip placement.

III. Asphalt

1. General Guidelines:

- Sources of the asphalt must have approved mix designs on file with the City dated no more than 6 months prior to the scheduled work. It is the responsibility of the developer or his/her testing firm to coordinate with the City to ensure these reports are current and to use the information contained within to evaluate the asphalt.
- All asphalt shall come from TDOT approved plant facilities with personnel and lab facilities as required by current TDOT standards. Application can be made to the City for non-TDOT approved asphalt facilities and the City shall examine the credentials of the facility to determine if they have the necessary experience and equipment to consistently produce asphalt mixes that meet TDOT criteria.
- Anti-strip additive is not required unless specifically stated on plans.
- The independent testing firm shall be expected to make periodic checks (at least once for each type of mix to be placed) of the plant facility producing the asphalt to ensure quality control. These inspections are to be random.

- Upon completion of an acceptable proof-roll of the finished base course and prior to asphalt paving, prime coat and chip course shall be installed on finished base stone in accordance with Sections 402-01 and 402-02, respectively, of the current TDOT specifications.
 - Tack coat shall be applied to previously placed asphalt mix before the successive course is placed. Tack coat shall be applied in accordance with Section 403 of the current TDOT specifications.
2. Asphaltic Binder/Base Course:
- Asphaltic binder course shall be 307-BM in accordance with Section 307 of the current TDOT specifications. Aggregate content/gradation shall be according to Section 903.06 for Grading BM. Asphalt cement shall be PG64-22 unless otherwise specified on plans. Compacted lift thickness for 307-BM shall not exceed 3”.
 - Asphaltic black base course, when specified, shall be 307-A in accordance with Section 307 of the current TDOT specifications. Aggregate content/gradation shall be according to Section 903.06 for Grading A. Asphalt cement shall be PG64-22 unless otherwise specified on plans. Compacted lift thickness for 307-A shall not exceed 4”.
 - Binder/black base shall be placed, at a minimum, in compacted lift thicknesses as specified on the plans. Compacted thickness shall be measured during placement and cores shall be taken every 250 ft. of roadway. A minimum of one core will be made for every day of paving operations.
 - Density tests will be made from the cores and the acceptable density shall be an average of 91% of the theoretical density on the mix design. No test less than 89% of the maximum will be accepted.
 - Nuclear gauge density tests may be performed in lieu of cores. If this method is employed, at least one core per day or one core every 500 ft. must be made and used to verify thickness. The testing firm must certify that the compacted thickness was measured in the field during placement.
 - Samples will be pulled from delivery trucks or asphalt hoppers to be lab tested for gradation. Samples shall be pulled for every 200 tons of asphalt or at least once per paving day. Samples which fail gradation may result in some or all of that day’s pavement to be removed and replaced. It shall be at the option of the developer to core that day’s paving to perform extraction tests and present the results to the City. The City Engineering Staff will examine the results to determine if the roadway section is acceptable.
3. Asphaltic Surface Course
- Asphaltic surface course shall be either 411-D or 411-E in accordance with Section 411 of the current TDOT specifications. Aggregate content/gradation shall be according to Section 903.11 for Grading D or E. Asphalt cement shall be PG64-22 unless otherwise specified on plans.

- Surface course shall be placed in lift thicknesses as specified on the plans at or greater than the specified compacted thickness. Compacted thickness shall be measured during placement.
- Samples will be pulled from delivery trucks or asphalt hoppers to be lab tested for gradation. Samples shall be pulled for every 200 tons of asphalt or at least once per paving day. Samples which fail gradation may result in some or all of that day's pavement to be removed and replaced. It shall be at the option of the developer to core that day's paving to perform extraction tests and present the results to the City. The City Engineering Staff will examine the results to determine if the roadway section is acceptable.
- Surface course shall not be placed until:
 - At least 75% of homes in the phase/subdivision are complete.
 - All sidewalks are installed.
 - All inspections have been made by the City Engineering Dept. and all specified repairs and other "punch list" items completed.
 - Any and all other requirements as set forth in the Subdivision Regulations are met