

4.5 ROADWAY CONSTRUCTION. This subsection covers roadway construction including subgrade, subbase, roadbase, recycled aggregate materials (RAM), prime coat, tack coat, plant mix bituminous surfaces (dense and open graded), construction staking and other related work.

4.5.1 GENERAL REQUIREMENTS. The Contractor shall furnish all labor, material, equipment, tools, transportation, traffic control and supplies required to complete the work in accordance with the approved plans and these specifications. The approved plans do not purport to show all the details of the work. The plans are intended to illustrate the character and extent of work required and therefore, they may be, if necessary, supplemented or revised as the work progresses. The Contractor shall keep the most current set of approved plans available on the job site at all times.

The Contractor shall arrange the work and shall place and dispose of the materials being used so as not to interfere with the public during the course of the project. The Contractor shall join the new work with that of existing in an acceptable manner and shall perform all work in proper sequence.

The Contractor shall provide and maintain or have provided for, all necessary work zone traffic control in accordance with the requirements of Section 2.5 of these specifications. The Contractor shall also maintain the job site and all adjoining private and public areas in a clean, safe manner. This maintenance shall constitute continuous and effective work prosecuted day-by-day, with proper equipment and adequate work forces to keep all areas related to and adjoining the job site in a condition satisfactory to the City's Representative. If, at any time, the Contractor fails to comply with these provisions the City's Representative will immediately notify the Contractor of such non-compliance. If the Contractor fails to remedy the unsatisfactory maintenance within twenty-four hours after receipt of such notice, the City's Representative may immediately proceed to cause correction(s) to the job site and adjoining areas. The entire cost of this corrective maintenance will be billed to the Contractor and shall be paid in full prior to the City's acceptance of the work.

If a condition develops due to a lack of maintenance by the Contractor that is dangerous to public safety, the Contractor shall proceed to immediately remedy the condition with whatever means are available. The entire cost of the corrective remedy will be the Contractor's responsibility.

4.5.2 CONSTRUCTION STAKING. Construction stakes shall be furnished and set, establishing lines and grades for roadway excavation including, but not limited to all cut and fill slopes finished subgrade, finished subbase and finished roadbase grades for streets, curb & gutter, cross-gutters, sidewalks, drive approaches, any contiguous structures and utilities (to help prevent conflicts of location). In

development related projects the Developer and his Engineer shall be responsible for all surveying and the accuracy thereof.

The line and grade stakes shall be, whenever possible, off-set from the construction area a minimum of five feet, and shall show the stationing (corresponding with the approved plans), off-set distance, required cut or fill to the finished grade, flow line, and TBC as indicated on the approved plans. Grade stakes with hubs set to the finished grade of the subgrade shall be painted appropriately. Stakes with hubs set to the finished grade of the subbase or roadbase shall be painted appropriately. Plastic "whiskers" may be used in connection with painted hubs. All stakes and grades shall be set by appropriate methods under the direction of the professional engineer whose seal is on the approved plans. The Contractor constructing the facilities should be provided with copies of the cut sheets generated during construction staking. Cut sheets shall include roadway stationing, reference elevations, grade elevations, etc.

The line and grade stakes and cut sheets along with the most current set of approved plans shall constitute the field control by which the work shall be executed.

The Contractor shall be responsible for preserving property markers, corner survey markers, construction survey stakes and marks for the duration of their usefulness.

If any construction survey stakes or markers are lost or disturbed and need to be replaced, such replacement shall be done at no expense to the City. At no time shall a permanent monument be removed without prior authorization by the City Engineer. When construction work encounters such monuments, the City Surveyor should be contacted immediately.

4.5.3 GRADE CONTROL SYSTEMS. Non-contact grade control systems may be used to establish the roadway elevations of subgrade, subbase and roadbase on public streets providing the following conditions are met.

4.5.3.1 The system shall be equipped with a "self diagnostic" function that continuously monitors all system functions and shuts the system down if an error in the system occurs. It shall also be equipped with a "thermistor" to electronically compensate for differences in air and ground temperature with a minimum operating range not less than zero to 160 degrees F. (-18 to 71 degrees C.).

4.5.3.2 The system shall meet the following minimum specifications:

- Blade slope sensor resolution 0.01% slope
- Main fall sensor resolution 0.01% slope

- Rotation sensor resolution 0.1 degree
- Tractor grade controller ± 0.015 foot(4.5 mm) accuracy
- Cross-slope resolution 0.1% slope or 0.01 foot/10 foot (3 mm in 3m).
- Cross-slope system accuracy 0.02 foot/10 feet (6 mm in 3

4.5.3.3 A system meeting the above requirement must be properly installed on a "tight"* properly maintained motor-grader.

*Meeting the equipment manufacturer's service specification tolerances for all controlling surfaces and connecting points that effect the ability of that specific type of equipment to provide proper grade control.

With all the above conditions met the system will be permitted to be used, providing a preset grade and line for curb & gutter, edge of pavement or curb grade line has been established by the Engineer.

The City's Representative has the right to prohibit the use of such equipment, if in his opinion, the equipment has not been properly maintained or is not being properly operated.

4.5.4 GEOTECHNICAL INVESTIGATION. A geotechnical investigation shall be conducted under the direction and control of a Geotechnical Engineer experienced in flexible pavement design. The investigation shall include a thorough exploration and sampling program of the subgrade to determine the nature and engineering properties of the on-site soils within the roadway construction areas. The minimum sampling and testing requirements shall be as outlined in Section 3.2.5 and where otherwise outlined in these specifications.

The structural details shown on the plans and/or Standard Drawings, and Table 4.2 are minimum requirements. The actual structural section for each roadway shall be designed by accepted engineering design methods for flexible pavement (i.e., AASHTO, UDOT, Caltrans). Required subgrade soil properties shall be obtained from an on-site geotechnical investigation. Required traffic design traffic information is provided in Table 4.2. When, in the opinion of the City Engineer the traffic information listed is inappropriate for the street under consideration the Traffic Index will be adjusted accordingly.

4.5.5 ROADWAY SUBGRADE. This subsection shall govern the preparation of natural, filled or excavated material prior to placement of subbase. The preparation of subgrade shall extend a minimum of one foot beyond the proposed construction limits. This includes roadways, curbs & gutters, drive approaches, sidewalks or any other roadway structures.

4.5.5.1 PREPARATION. The subgrade soils shall be prepared by scarifying and processing to a minimum depth of one foot unless otherwise recommended by the geotechnical firm approved by the City representative.

Unsuitable material found below the processing depth such as saturated soils from groundwater, expansive soils, soluble soils, deleterious and/or organic materials shall be addressed by a Geotechnical Engineer who shall provide a written recommendation to the City's Representative for approval prior to performing any work in the areas being addressed.

TABLE 4.2
Minimum Roadway Structural Requirements

Classification	Traffic Index	(3)(4) Roadway Minimum Asphalt Pavement (inches)	(4) Required Roadway Road-Base (inches)	(5) Required Roadway Sub-base (inches)	Sidewalk Minimum Concrete Thickness (inches)	Sidewalk Minimum Road-Base Thickness (inches)	Driveway Minimum Concrete Thickness (inches) (5)	Driveway Minimum Road Base Thickness "residential" (inches) (6)
Residential - Local	5	2.5 (1)	6	varies	4	4	6	6
Residential - Standard	5	2.5 (1)	6	varies	4	4	6	6
Residential - Collector	5.5	3	6	varies	4	4	6	6
Major Collector	6	3	6	varies	4	4	6	8
Minor Arterial	7	3.5	7	varies	4	4	8	8
Major Arterial	8	4	8	varies	4	4	8	8
Commercial Local	10	4	8	varies	4	4	8 (2)	8
Industrial Local	10	5	12	varies	4	4	9 (2)	8

(1) Asphalt pavements containing more than 1% gypsum (CaSO₄+2H₂O calcium sulfate, dehydrate) shall be a minimum of 3" thick; consisting of 2" of 3/4" dense-graded asphalt base course containing no more than 2% gypsum and 1" of 1/2" dense-graded asphalt wearing course with less than 1% gypsum. This road classification does not require a prime coat unless otherwise specifically designated by the City Representative.

(2) #4 rebar to be placed three inches above the bottom of concrete spaced 12 inches on center each way.

(3) All wearing courses shall have less than 1% gypsum content.

(4) Thickness may vary based upon structural section design by a registered professional engineer experienced in flexible pavement design. Minimum values are shown.

(5) Roadway sb-base is required. The thickness varies based upon the structural section designed by the engineer.

(6) Thickness' shown here do not apply outside the public right of way or behind the back of sidewalk unless otherwise designated.

[r.a. r.1 5/01]

4.5.5.1 (continued) Uniform pervious soils that allow the immediate penetration of water to a depth of one foot, will not require scarifying and processing unless a condition previously stated requires it. When scarifying and processing are not required, the moisture content of the top one foot of the subgrade material shall be brought to not less than two percent (2%) of optimum by the addition of water on the surface, and the material shall be compacted by approved equipment to the specified compaction requirements.

When scarifying and processing, the roadbed shall be loosened to a depth of at least one foot, then alternate blading, moistening and rolling will be required to provide a smooth, even and uniformly compacted course true to cross-section and grade. Moisture content at the time of processing and testing shall be not less than two percent (2%) of optimum. All rocks larger than six inches in diameter shall be removed.

4.5.5.2 TOLERANCES. When subbase material is placed on the subgrade the subgrade tolerance shall not vary more than 0.10-foot from the specified grade and cross-section. However, when roadbase or recycled aggregate materials (RAM) placed on the subgrade the subgrade tolerances shall not vary more than 0.05-foot from the specified grade and cross-section.

4.5.6 SUBBASE - CLASS I AND CLASS II. All gravel pits supplying aggregate shall be UDOT approved pits. Subbase for all roadways and associated areas shall consist of select materials, either natural or crushed. Aggregate wear shall be less than fifty percent (50%) when tested by AASHTO T-96. The material passing the 40 (4.75 mm) sieve shall be non-plastic per AASHTO T-90. The subbase shall contain no more than three percent (3%) gypsum or any other deleterious or organic materials by weight. The test for gypsum shall follow City of St. George Chemical Quantitative Analysis of Gypsum in Aggregates, Test Procedure S-3171-96.

Prior to delivering any subbase to any site the supplier shall submit, in writing, a job-mix gradation to the City Engineer for approval. The job-mix gradation shall have definite single values for the percentage of aggregate passing each specified sieve based on the dry weight of the aggregate. Dry weight values shall fall within the band limits shown in Table 4.3.

Annual job-mix gradations shall be submitted in writing to the City Engineer for approval prior to January 31 each calendar year or upon selection of new aggregate sources. Any revisions to the approved job mix gradations shall fall within the requirements listed above.

If a supplier does not have an approved job-mix gradation that is current for the aggregate source or calendar year, the "Ideal Gradation" in Table 4.3 will apply.

The subbase mixture placed on projects during one day's operation shall come from a single source. Intermixing from more than one source will not be permitted.

Subbase material shall be deposited and spread in uniform lifts not to exceed eight inches compacted thickness for Class I and six inches compacted thickness for Class II without segregation of size. Each layer shall be compacted for the full width and depth by mechanical means of compaction. When mixing, moistening and placing subbase the moisture content shall be not less than two percent (2%) below

optimum. However, caution shall be used to avoid over watering to a state of instability. Alternate blading and rolling will be required to provide a smooth, evenly moistened and uniformly compacted course true to cross-section and grade. Locations inaccessible to rolling shall be compacted with mechanically operated hand tampers. The subbase shall be compacted to not less than ninety-five (95%) percent maximum dry density as determined by ASTM D1557-78 or AASHTO T-180 Method D. Subbase tolerances when compacted shall not vary more than 0.05-foot from the specified grade and cross-section.