

SECTION 210—SUBGRADE

210.1 DESCRIPTION—This work is preparation of the roadbed to establish the subgrade.

210.3 CONSTRUCTION—

(a) General. Form roadbed to the established subgrade elevation and compact to specified density requirements, using equipment specified in [Section 108.05\(c\)3.a, 3.b, 3.e, or 4.](#)

(b) Density Requirements. Compact subgrade to 100% of the determined dry-mass (dry-weight) density. Dry-mass (Dry-weight) density for material in place in the field will be determined, according to [PTM No. 106](#), Method B. In-place density or compaction will be determined, according to AASHTO T 191 or T 310 where directed, for each 2500 m² (3,000 square yards), or less, of completed subgrade. When material is too coarse (more than 20% retained on the 19 mm (3/4-inch) sieve and less than 35% passing the 75- μ m (No. 200) sieve, or more than 30% retained on the 19 mm (3/4-inch) sieve) to use these methods, compaction will be determined based on nonmovement of material under compaction equipment specified in [Section 210.3\(a\)](#). Compact until embankment does not rut under a loaded triaxle (GVW 34 tonne (75,000 pounds)).

Maintain material to within minus 3% of optimum and the optimum moisture content at the time of compaction. For subgrades displaying pronounced elasticity or deformation under rolling, maintain a moisture content not greater than optimum at the time of compaction or at the time of placing the overlaying construction. When unable to obtain the specified stability, excavate material in the area to a depth that, when replaced and recompacted with a moisture content not exceeding optimum, the subgrade will have required stability.

(c) Subgrade Requirements. Complete, maintain, and protect subgrade in continuous lane construction. Promptly reshape and recompact, or remove and replace, [damaged or unsatisfactory areas](#) before placement of pavement structure.

Install reference grade lines with ample supports, or grade stakes, offset along each side of the subgrade, to control the elevation. Maintain reference grade lines until after completing the surface and correcting deficiencies.

Check subgrade for grade and slope. Test the finished surface for irregularities by using a string line stretched tautly, transversely across the subgrade area, between the reference grade lines. Measure the vertical distance from the string line to the finished grade, at various points along the string line, from one side of the surface to the other. Test for surface irregularities at longitudinal intervals of not more than 7.5 m (25 feet).

As an alternative or whenever the Representative suspects an area is deficient or irregular, check the finished surface with a template and 3 m (10-foot) straightedge. Test the finished surface for irregularities by using a template cut to the required cross-section of the surface. Equip the template with metal or other vertical extensions attached to the top of each end to support a leveling device for checking the cross slope. The bottom of the template is to be at the elevation of the top of the subgrade. Use a 3 m (10-foot) straightedge to test for longitudinal irregularities in the surface. Hold the straightedge parallel to the road centerline in contact with the surface. Move the straightedge from one side of the surface to the other. Advance along the surface in 1.5 m (5-foot) increments.

Where subgrade is constructed using an automatic grading machine that cuts the subgrade and is controlled by a reference line or lines, the longitudinal interval for checking the surface cross-section may be increased to not more than 15 m (50 feet).

Where subgrade is constructed using grading equipment controlled by Survey Grade Global Positioning System (GPS), laser technology, and/or combination thereof, the longitudinal interval for checking the surface cross-section may be increased to not more than 150 m (500 feet) provided the requirements of [Section 210.3\(d\)](#) are met.

Correct surface irregularities exceeding 12 mm (1/2 inch) by loosening the surface and removing or adding material as required. Compact the corrected area and surrounding surface by rolling. Recheck the corrected subgrade area for grade and slope.

(d) GPS or Laser-Controlled Equipment. At least 1 week before the preconstruction conference, submit a machine control grading QC Plan to the Department in accordance with [Section 106.03\(b\)](#). As a minimum, the QC Plan must demonstrate that the grading control equipment meets the performance requirements within acceptable tolerances.

At a minimum, set construction stakes at right angles to the centerline on tangents and radial offsets on curves at 150 m (500 foot) intervals the entire length of mainline. In addition, set a minimum of two construction stakes on each ramp, on each intersecting roadway, and on projects less than 300 m (1000 feet) in length. Tabulate and provide offsets and elevations of all stakes using Form D-413 to the Representative. Rough grade and fine grade stakes will be accompanied by a guard stake for easy identification.

Provide control points and conventional grade stakes at critical locations such as, PC's, PT's, superelevation points, and other critical points required for the construction of drainage and roadway structures.

Provide other points of reference necessary to establish quality control or for verification of accuracy by the Department.

Provide the same Survey Grade GPS network to the Department as that used during construction. The Department will review the network and monitor the project.

Check and recalibrate, if necessary, the GPS or laser machine control system at the start of each work day.

Test the finished surface at all hinge points and/or centerline, edge of lane, and edge of shoulders on the cross-section at all critical locations and as established in the QC Plan.

Correct surface irregularities exceeding 12 mm (1/2 inch) by loosening the surface and removing or adding material as required. Compact the corrected area and surrounding surface by rolling. Recheck the corrected subgrade area for grade and shape.

Upon successful quality control testing, notify the Representative the subgrade is ready for acceptance. At a minimum, the Representative will test the finished surface at all hinge points and/or centerline, edge of lane, and edge of shoulders on the cross-section at a random locations every 150 m (500 feet) for acceptance. Correct all areas exceeding 12 mm (1/2 inch). If more than 10% of all acceptance tests are determined to exceed 12 mm (1/2 inch) in any phase of the project, the Representative may require stakes and stringline be established as specified in [Section 210.3\(c\)](#).

Provide all electronic data files used for the construction of the fine-grade of the roadway to the Representative.

210.4 MEASUREMENT AND PAYMENT—

(a) Subgrade. Subgrade is incidental to the immediate overlying pavement structure. If required for shaping and finishing unpaved classes of work, subgrade is incidental to those items of work.