

VDOT General Density Testing Requirements

(See the Materials Section's Manual of Instructions or other applicable manuals for testing frequencies. References are to the 2007 Road & Bridge Specifications and to the Virginia Test Methods (VTM)).

1. Fills.

a. Embankments (Section 303.04 (h)).

i. Predominantly soil embankment.

- i. 8 inch layers before compaction.
- ii. Compacted at plus/minus 20% of Optimum Moisture & 95% of Theoretical Maximum Density derived from:
 - i. VTM-1 or
 - ii. VTM-12.
- iii. Test by Nuclear Gauge direct drive (VTM-10) or Sand Cone Method (AASHTO T-191).

ii. Rock fills.

- i. No greater than 4 foot rock within 10 feet of subgrade.
- ii. No greater than 2 foot rock within 2 feet of subgrade.
- iii. Within 2 feet to 1 foot of subgrade, 8 inch loose layers.
- iv. No greater than 3 inch rock within 12 inches of subgrade.
- v. Density requirements waived for rock fill.

b. Backfill

i. Pipes (Section 302.03 (a)(2)(g))

- i. Class I backfill shall be crusher run aggregate, No.25 or 26; aggregate base material, Size 21A or 21B; or flowable fill.
- ii. Placed and compacted in 6 inch loose layers.
- iii. Compacted at optimum moisture to plus 2 percentage points derived from VTM-1.
- iv. Theoretical Maximum Density derived from VTM-1.
- v. Target per cent of Theoretical Maximum Density derived from VTM-10 (3D).
- vi. Test by Nuclear Gauge direct drive (VTM-10) or Sand Cone Method (AASHTO T-191).

ii. Structures (Section 303.04 (g))

- i. Backfilled with suitable material removed for the structure.
- ii. Placed in 6 inch loose, horizontal layers.
- iii. Compacted at plus/minus 20% of Optimum Moisture & 95% of Theoretical Maximum Density derived from:
 - i. VTM-1 or
 - ii. VTM-12.
- iv. Test by Nuclear Gauge direct drive (VTM-10) or Sand Cone Method (AASHTO T-191).

- c. Subgrade (Section 305.03(a)(1))
 - i. Consists of the top six inches of fill to two feet beyond proposed edge of pavement.
 - ii. Compacted at plus/minus 20% of Optimum Moisture & typically 100% of Theoretical Maximum Density derived from:
 - i. VTM-1 or
 - ii. VTM-12.
 - iii. Stabilized subgrade
 - i. Section 306.03 (Lime)
 - ii. Section 307.05 (Cement)
 - iv. Test by Nuclear Gauge direct drive (VTM-10) or Sand Cone Method (AASHTO T-191).
- 2. **Subbase and Base Aggregate** (Sections 308 & 309).
 - a. If compacted thickness is greater than 6 inches, must be placed in two equal layers.
 - b. Compacted at plus/minus 2 percentage points of Optimum Moisture either derived from VTM-1 or supplied by the producer.
 - c. Testing method.
 - i. Roller Pattern and Control Strip (VTM-10).
 - i. Nuclear gauge used in backscatter position.
 - ii. Average of Control Strip should compare within 3 lb/cu.ft. of Roller Pattern's maximum density.
 - iii. Verify Control Strip by Nuclear Gauge direct drive or by Sand Cone (AASHTO T-191).
 - ii. Nuclear test sections (VTM-10)
 - i. Five readings.
 - ii. No reading less than 95% of the Control Strip average.
 - iii. Average of the five – equal to or greater than 98% of the Control Strip average.
 - iv. When test section readings are more than plus/minus 8 lb/cu.ft. of target value, another Control Strip will be established.
 - v. Test by Nuclear Gauge direct drive (VTM-10) or Sand Cone Method (AASHTO T-191) if section is too short for Roller Pattern/Control Strip.
- 3. **Asphalt Concrete** (Section 315.05 (e)).
 - a. Density.
 - i. Nuclear.
 - i. Thin Lift nuclear gauge with printer (VTM-81).
 - ii. Roller Pattern and Control Strip (VTM-76).
 - iii. Average of control strip should compare within 3 lb/cu.ft. of Roller Pattern's maximum density (VTM-10)
 - iv. Sawn plugs/cores (VTM-22) shall be taken according to VTM-76, Section 3.7 to confirm Control Strip results and must adhere to Table III-3 of Section 315.05.
 - v. Test Sections (Section 315.05(e)(1)(b))
 - i. Ten readings per lot or two per subplot.
 - ii. Must be between 98% and 102% inclusive.
 - iii. Payment in accordance with Table III-4 of Section 315.05.

- ii. Sawn plugs/cores.
 - i. If nuclear is unavailable.
 - i. Five plugs/cores per lot.
 - ii. Payment is in accordance with Table III-4 on the basis of the percentage of the Table III-3 value achieved (Section 315.05(e)(1)(e)(b)).
 - ii. If lack of sufficient quantity of material to run Roller Pattern/Control Strip (Section 315.05(e)(2)).
 - i. Sawn plugs/cores must meet 91.5% of the Theoretical Maximum Density (VTM-22).
 - ii. Payment in accordance with Table III-5 (Section 315.05(e)(2)).