

151 - COMPACTION EQUIPMENT

SECTION 151

COMPACTION EQUIPMENT

151.1 GENERAL

Use rollers and compaction equipment of standard manufacture. Use self-propelled rollers capable of reversing direction without backlash. Use rollers with positive, accurate steering control. Use adequately powered trucks or tractors for towed-type rollers. Equip rollers with self-cleaning devices that prevent material from adhering to the wheels, drums or tamping surfaces.

If a numerical density is specified, the Engineer may waive the roller weight requirement if the roller compacts the material to the specified density. If a numerical density is not specified, the Engineer may waive the roller weight requirement, if the roller performed satisfactorily on a previous KDOT project.

151.2 TAMPING (SHEEPSFOOT) ROLLERS

Use either towed or self-propelled tamping rollers that can obtain the required compaction.

Additional requirements for non-vibratory, tamping rollers:

- A metal roller, drum or shell with tamping feet projecting a minimum of 6 ½ inches from the surface of the roller, drum or shell;
- The cross-section area of each tamping foot, measured perpendicular to the axis of the tamping foot, shall be 4 to 12 square inches;
- Tamping feet spaced 6 to 12 inches, measured diagonally center to center; and
- If the tamping roller is used to obtain Type B compaction, the weight is such that the load on each tamping foot is a minimum of 200 pounds per square inch.

151.3 PNEUMATIC-TIRED ROLLERS

Use either towed or self-propelled pneumatic-tired rollers that can obtain the required compaction. Equip with scrapers to remove material buildup from drum surface. Provide the Engineer with a suitable gauge to check the tire pressure of pneumatic-tired rollers.

Additional requirements for pneumatic-tired rollers:

a. Light Pneumatic-Tired Rollers

- Tires with wide, smooth treads and uniform air pressure;
- Tires on the front and rear axles staggered to provide complete coverage of the area the roller travels over; and
- Sufficient weight to provide a minimum of 225 pounds per inch of tire width.

b. Heavy Towed-Type Pneumatic-Tired Rollers

- Tires with wide, smooth treads and uniform air pressure;
- Single axle rollers; and
- A weight of 10 to 50 tons.

c. Heavy Self-Propelled Pneumatic-Tired Rollers

- Tires with wide, smooth treads and uniform air pressure;
- Tires on the front and rear axles staggered to provide complete coverage of the area the roller travels; and
- A weight of 8 to 30 tons.

151.4 SMOOTH-FACED STEEL ROLLERS

Use either towed or self-propelled smooth-faced steel rollers that can obtain the required compaction.

Additional requirements for smooth-faced steel rollers:

a. Smooth-Faced Steel Trench Rollers

- Smooth faces on all steel rollers;

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- Equip with water tanks and sprinkling devices to wet the rollers;
- Equip with scrapers to remove material buildup from drum surface; and
- Sufficient weight to provide a minimum of 300 pounds per inch of steel roller width.

b. Towed-Type Smooth-Faced Steel Rollers

- Smooth faces on all steel rollers;
- A minimum of 48 inches effective steel roller width;
- Equip with water tanks and sprinkling devices to wet the rollers;
- Equip with scrapers to remove material buildup from drum surface; and
- Construct so that the weight can be varied from 200 to 300 pounds per lineal inch of steel roller width.

c. Self-Propelled Smooth-Faced Steel Rollers

(1) Two-Axle Tandem Smooth-Faced Steel Rollers

- Smooth faces on all steel rollers;
- Equip with water tanks and sprinkling devices to wet the rollers;
- Equip with scrapers to remove material buildup from drum surface; and
- A weight of 8 to 12 tons.

(2) Three-Axle Tandem Smooth-Faced Steel Rollers

- Smooth faces on all steel rollers;
- Equip with water tanks and sprinkling devices to wet the rollers;
- Equip with scrapers to remove material buildup from drum surface; and
- A minimum weight of 12 tons.

(3) Three-Wheeled Smooth-Faced Steel Rollers

- Smooth faces on all steel rollers;
- Equip with water tanks and sprinkling devices to wet the rollers;
- Equip with scrapers to remove material buildup from drum surface; and
- A weight of 8 to 12 tons.

151.5 SELF-PROPELLED VIBRATORY ROLLERS

Use vibratory rollers that can achieve the required density. Operate the vibratory roller at the frequency and amplitude necessary to achieve the desired compaction without causing objectionable undulations, fracturing of aggregates or surface defects. If pneumatic tires are used on the vibratory roller, equip the roller with smooth tires.

Provide vibratory rollers for use on earthwork and aggregate bases meeting the speed and frequency ranges (vibrations per minute) shown in **TABLE 151-1**. Operate rollers at high amplitude, unless otherwise directed. Coordinate the roller speed and the vibrations per minute to achieve a minimum of 6 impacts per linear foot.

TABLE 151-1: AGGREGATE BASE AND EARTHWORK								
Impacts per Linear Foot								
Roller Speed MPH (ft./Min)	Vibrations Per Minute							
	1000	1200	1400	1600	1800	2000	2200	2400
1.0(88)	11.4	13.6	15.9	18.2	20.5	22.7	25.0	27.3
1.5(132)	7.6	9.1	10.6	12.1	13.6	15.2	16.7	18.2
2.0(176)	--	6.8	8.0	9.1	10.2	11.4	12.5	13.6
2.5(220)	--	--	6.4	7.3	8.2	9.1	10.0	10.9
3.0(264)	--	--	--	6.1	6.8	7.6	8.3	9.1
3.5(308)	--	--	--	--	--	6.5	7.1	7.8
4.0(352)	--	--	--	--	--	--	6.3	6.8
4.5(396)	--	--	--	--	--	--	--	6.1

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On hot mix asphalt pavement, operate the vibratory rollers at a speed and frequency range to provide a minimum of 10 impacts per linear foot, as shown in **TABLE 151-2**. Provide amplitude adjustable rollers. Operate rollers at low amplitude, unless otherwise directed. Provide rollers with a minimum of 1800 vibrations per minute (VPM) and a static force on drums of 135 pounds per linear inch (PLI) of roller width.

TABLE 151-2: HOT MIX ASPHALT PAVING												
Impacts per Linear Foot												
Roller Speed MPH (ft./Min)	Vibrations Per Minute											
	1800	2000	2200	2400	2600	2800	3000	3200	3400	3600	3800	4000
1.0(88)	20.5	22.7	25.0	27.3	29.5	31.8	34.1	36.4	38.6	40.9	43.2	45.5
1.5(132)	13.6	15.2	16.7	18.2	19.7	21.2	22.7	24.2	25.8	27.3	28.8	30.3
2.0(176)	10.2	11.4	12.5	13.6	14.8	15.9	17.0	18.2	19.3	20.5	21.6	22.7
2.5(220)	8.2	9.1	10.0	10.9	11.8	12.7	13.6	14.5	15.5	16.4	17.3	18.2
3.0(264)	6.8	7.6	8.3	9.1	9.8	10.6	11.4	12.1	12.9	13.6	14.4	15.2
3.5(308)	5.8	6.5	7.1	7.8	8.4	9.1	9.7	10.4	11.0	11.7	12.3	13.0
4.0(352)	5.1	5.7	6.2	6.8	7.4	8.0	8.5	9.1	9.7	10.2	10.8	11.4
4.5(396)	4.5	5.1	5.6	6.1	6.6	7.1	7.6	8.1	8.6	9.1	9.6	10.1
5.0(440)	4.1	4.5	5.0	5.5	5.9	6.4	6.8	7.3	7.7	8.2	8.6	9.1

Operate rollers at a speed and frequency range above the bold line.

151.6 MECHANICAL AND HAND TAMPERS

Use mechanical or hand operated tampers of standard manufacture that can obtain the required compaction in small, irregular areas where the use of conventional equipment is impracticable.