4-17.1 Form Method

4-17.1.1 Finishing Machines

Finishing machines are used to give the final cross section and finish to a pavement and, by the action of screeds, and consolidate the concrete. To accomplish this, each screed will require a certain amount of adjustment. When these adjustments are made they should be correlated such that each succeeding screed will carry forward a lesser amount of material, and the final float acts to remove minor irregularities left by the preceding screed with little or no material being carried ahead of it.

4-17.1.2 Screeding

Standard spec 415.3.11 requires the finishing machine to make as many trips as required to take advantage of the condition of the concrete, to give proper compaction, and to produce a surface of uniform texture true to grade and contour. Prolonged operation over a given area should be avoided. The final pass with a machine using a transverse screed should be delayed as long as practicable to permit some settlement in the concrete to take place. Unless every batch is uniform, the settlement in concrete is non-uniform, and early finishing results in irregular settlement, which causes poor riding qualities in a pavement.

The relation of forward speeds with the action of the transverse screed is important. With stiff mixes the screed speed should be fairly rapid and lengthy and the traction speed relatively slow. With more workable mixes, the screed action should be decreased in both speed and length and the traction speed increased accordingly. Any machine that is incapable of being adjusted to overcome a forward motion that is jerky and hesitant and causes racking of the forms should not be used.

4-17.1.3 Float Finishers

The float finisher is used to provide the final mechanical finish of the pavement surface. The primary purpose of the finisher is to remove minor irregularities and float the surface.

Two types of float finishers are in use. One has a screed and a float pan and is attached to and towed by a finishing machine. The satisfactory performance of this machine depends largely on the action of the finishing machine. For best results, it must move forward at a steady uniform speed.

The second type is a self-propelled unit equipped with a conventional screed in front with a screed and float pan in the rear. In each case, the rear screed and float pan is suspended from the frame and has no contact with the forms. The suspended screed shapes the final surface and the float pan irons out minor irregularities.

Precise correlation in adjustment is required. A slight roll should be carried by the screed and the float pan should rest on the surface with just enough pressure to iron the surface without cutting. The timing of this operation should be closely controlled. Finishing too soon is likely the reason why pavements, which straight-edge satisfactorily when placed, are rougher than expected the following day. It is also important that it be a continuous operation without any stops for a distance of at least 40 feet.

4-17.1.4 Final Finish

When finishing operations become difficult due to the rapid loss of the moisture in the concrete, it may be an indication the base is too dry and is absorbing water from the mix that is needed for finishing. A more thorough wetting of the base will help relieve this condition.

It may become necessary to increase the slump of the concrete or it may be in the interest of better workmanship for the finishing equipment to operate closer to the paver than normal. Temporary measures taken to overcome emergencies should continue only as long as the need exists and normal procedures should be restored as soon as possible.

Texturing and curing operations are covered in procedures CMM 4-18 and CMM 4-19, respectively.

Standard spec 415.3.11 allows a testing and floating procedure accomplished by a tube float in lieu of straight-edging when equivalent results are obtained.

Tube floats provide help in providing a uniform surface appearance. Their back and forth operation works a small amount of grout to the surface which can then be spread to fill minor surface imperfections. As with any concrete finishing operation, however, the surface should not be worked to the point that concrete quality is sacrificed.

If the tube float method of finishing is used, transverse machine operation should be smooth and continuous, with only one pass over the slab to prevent excess water being worked up. A very slight roll of concrete should

be carried ahead of the float, usually 1 inch or less. Water should not be sprayed from the float to ease finishing.

Standard spec 415.3.11 provides that only minimal amounts of water can be used in the operation of the tube float and in correcting deficiencies found in straightening when permitted by the engineer. Excessive amounts of water create a soupy roll of mortar which, when spread over the surface, can result in early scaling, rapid surface wear, and deterioration, especially in connection with chloride use.

Whether hand straight-edging is necessary to supplement the tube float and where it should be done in relation to the tube float is a matter of opinion. On some projects, hand straight-edging may prove indispensable; on others, it may be just another operation that increases the risk of overworking the fresh concrete. Most contractors have discontinued using the tube float in recent years in favor of hand straight-edging.

Frequently small air voids appear on the surface, and in an effort to remove them the surface is over manipulated. This is more detrimental to the concrete surface than leaving the air voids alone.

A very common practice that prevails among finishers is to sprinkle water on the surface to facilitate the finishing operation. This should not be tolerated. The additional water in conjunction with the surface manipulation dilutes the surface mortar to the extent that a loss of as much as 25% in surface strength results. A loss of air entrainment can also be expected, resulting in a pavement surface that offers less resistance to surface spalling and the extremes of freezing and thawing.

Workers should not be allowed to walk in or on the concrete. They should cross the slab by means of a finishing bridge.

The edges of the pavement should be finished to a 1/4 inch radius, or less, at this stage.

4-17.2 Slip-Form Method

In a slip-form operation the absence of side forms to retain the pavement edge plus the speed of the paving train may require some mechanical method of finishing, either in lieu of or to supplement hand methods.

Mechanical finishing may include a diagonal, tube-type float described above. The finishing operation may also include a metal V-shaped float that is pulled immediately behind the paver and in advance of the hand finishers. The float is used to iron out irregularities and smooth the surface and should not be cutting or pushing concrete.

The straightening and hand finishing operation behind a slip-form paver is the same as that behind a form paver as described above.

4-17.3 Straight-Edging and Hand Finishing

After the mechanical finishing is complete, but while the concrete is still plastic, the slab should be tested for trueness with a hand-held, 10-foot wide straight-edge. Irregularities (high spots and depressions) must be corrected and the area then retested.

Where necessary, excess water and laitance should be removed with the straight-edge and wasted. The straight-edge should be rigid enough to scrape off high spots, if necessary, instead of merely riding over the surface. Straight-edges should be periodically checked for trueness. Long handled floats may occasionally be necessary to close open-textured areas but their use should be discouraged. If open-textured areas persist, it is an indication that deficiencies exist in the mix proportions, and an effort should be made to correct them.

4-17.4 Pavement Stamping

Upon completion of finishing operations, while the concrete is still sufficiently plastic, and before the application of the curing compound, the inspector should stamp the station numerals in the pavement, if required. Station numerals should be stamped at intervals on the right-hand edge, advancing with the stationing, on all rural concrete pavement. Before start of paving operations, the engineer should procure from the region, the stamps for stamping the station numerals. On urban pavement, stamping of the station numerals may or may not, at the discretion of the engineer, be performed.

Standard spec 415.3.11 requires the contractor to stamp the contractor's name and the year of construction in the pavement at the beginning of each day's run and at the end of the job. This stamping should be done while the concrete is still plastic and before applying the curing compound.