SECTION 706 -- CONCRETE BRIDGE FLOORS

706.01 -- Description

This work shall consist of providing all necessary materials and construction of concrete bridge floors in accordance with the plans and specifications.

706.02 -- Material Requirements

1. Reinforcement shall be furnished, handled, and placed in accordance with the requirements of Section 707.

2. White polyethylene film shall comply with the requirements of Section 1010.

3. Concrete retardants shall meet the requirements of Sections 1002 and 1007.

4. Concrete shall meet the requirements of Section 1002.

706.03 -- Construction Methods

1. a. Before placing concrete for bridge floors, the placement of top reinforcing steel shall be checked for clearance to the surface of the slab by measuring from the reinforcing steel to the strike-off screed.

b. Such checking shall be done by the Contractor in the presence of the Engineer and shall be repeated at a sufficient number of locations to demonstrate that concrete cover over the reinforcing steel as required in the plans will be obtained at all points on the slab.

c. Such checking does not preclude subsequent checks by the Engineer during and after concrete placement.

2. a. The Contractor shall perform bridge floor construction in accordance with the requirements of Section 704. Bridge floor concrete shall not be placed when the anticipated wind velociity during the concrete placement period is expected to exceed the limitations shown in Table 706.01.

Table 706.01

Temperature and Wind Velocity Limitations	
Air Temperature in the Shade (Degrees Celsius)	**Maximum Wind Velocity (kilometers per hour)**
30	15
25	25
20	35
15	45
10	65

b. Bridge floor concrete shall not be placed when the ambient air or concrete temperature is above 30°C.

3. a. The Contractor's sequence of placing shall be as shown in the plans.

b. Placement of bridge floor concrete shall be continuous, and no delays are allowed between successive loads for any reason except at an expansion or construction joint.

c. Concrete slab bridge floors shall be placed and finished at a rate of at least 3 m/h.

d. Concrete bridge floors on steel girders, prestressed concrete girders, or prestressed double-tee beams shall be placed and finished at a rate of at least 6 m/h.

4. a. The Contractor shall notify the Engineer before releasing any temporary structural supports.

b. The Contractor shall remove falsework before placing concrete floors on steel spans.

c. The Contractor's floor and curb forms shall be supported entirely by the steel frame.

5. When the plans require a construction joint between concrete curbs or railings and the concrete floors, the curbs or railings shall not be placed until the concrete floor has cured for at least 3 days.

6. a. The Contractor shall finish concrete bridge decks and approach slabs with an approved mechanical, self-propelled finishing machine.

b. The finishing machine shall consist of one or more devices mounted on a rigid frame and be capable of striking off and finishing the surface either transversely or longitudinally. Finishing machines shall be of sufficient size to finish the entire width of the bridge deck in one pass.

c. (1) The machine shall be supported on adjustable rails or tracks of sufficient strength to prevent deflection between rail supports.

(2) Preferably, the rails shall be installed outside the slab limits and shall be set and maintained true to the desired grade, line, and cross section during the entire finishing operation.

(3) Rail supports shall be unyielding, and falsework or forms shall be strengthened as necessary to support the imposed load without deflection.

(4) Rail supports located within the limits of the slab shall be constructed to allow their removal to at least 50 mm below the slab surface. The resulting holes in the concrete slab shall be acceptably filled during the final finishing operation.

(5) Supports shall not be welded to the girders.

d. The finishing machine shall make at least 2 passes over the bridge floor at such intervals as will give proper consolidation and produce the desired surface condition. The concrete shall not be disturbed or worked further, except that any remaining surface irregularities or mortar ridges shall be immediately removed by use of a long-handled float or straightedge.

e. The Engineer may require the Contractor to submit a complete description of the proposed method for handling, placing, and finishing the slab, including the equipment for transporting and delivering the concrete, the finishing machine, and complete details of the supports for such equipment. Approval by the Engineer will not relieve the Contractor of the responsibility for the satisfactory performance of his/her methods and equipment.

7. a. For finishing concrete slab widenings or other small or irregular deck areas, hand-finishing methods will be allowed.

b. (1) After the concrete has been consolidated, as specified in Subsection 704.03, the surface shall be carefully struck-off with an approved screed to conform to the grade and cross section shown in the plans and to accurately match adjacent existing concrete surfaces.

(2) The screed shall be advanced with a combined longitudinal and transverse shearing motion, moving always in the direction in which the work is progressing and manipulated so that neither end is raised from the side form or template during the process.

(3) Excess concrete shall be maintained in front of the cutting edge to avoid creation of surface low spots.

c. The surface shall be floated using approved methods and equipment to remove all surface irregularities and to seal the surface. Special attention shall be given to areas adjacent to construction joints to achieve proper consolidation and surface finish.

d. Immediately after floating, the surface shall be tested with a 3 m straightedge. Any depressions shall be filled with fresh concrete, struck off, consolidated, and refinished. High areas shall be cut down and refinished. Special attention shall be given to areas adjacent to deck joints so that these surfaces are especially smooth.

8. a. Before the concrete obtains initial set, the Contractor shall give all finished bridge floor surfaces a drag finish with wet burlap, carpet, or a soft bristled broom. The drag finish shall create a uniform, fine-grained finish on the sealed concrete surface.

b. (1) All concrete bridge floors and approach slabs except those which are to receive a subsequent concrete overlay surface course shall also be tine textured. Tining shall consist of creating uniform, transverse grooves in the final concrete surface.

(2) The grooves shall be approximately 3 mm wide by 3 mm deep, spaced 15 mm apart.

(3) Grooves shall be discontinued at 600 mm from the bridge curb or rail.

(4) Tines shall not be made with a garden rake.

(5) A corrugated bull float or a mechanical tiner shall be used to make the tine grooves.

9. The Contractor shall cure concrete bridge decks as follows:

a. Once finished, the concrete surfaces shall be immediately covered with wet burlap. However, judgement shall be exercised to ensure that the burlap is placed without damaging the concrete surface.

b. Burlap shall be kept in a uniformly saturated condition for at least 72 hours by continuous sprinkling. The Contractor has the option to discontinue sprinkling after 24 hours and cover the wet burlap with a white opaque polyethylene film for the remaining 48 hours.

c. When placing concrete in cold weather, the following alternate curing method is authorized:

(1) The finished concrete surface shall be covered with a layer of saturated, clean burlap. The wet burlap shall be immediately covered with a layer of white opaque polyethylene film.

(2) The curing system shall remain in place for at least 72 hours.

(3) All other requirements for cold weather concreting, as defined in Subsection 704.03, shall apply.

d. Concrete bridge curbs and rails shall be cured in accordance with Subsection 704.03.

10. a. The Contractor shall test the cured concrete for surface irregularities with either a 3 m straightedge placed or operated parallel to the centerline of the roadway or some other device for measuring deviations from a plane. Variations greater than 3 mm shall be plainly marked for removal, except that for decks which are to receive a subsequent concrete overlay course, where 6 mm variations are allowed.

b. The Contractor shall grind or cut irregularities that exceed the above limits. Grinding or cutting shall not be done until the concrete is at least 7 days old, and bush hammering or other impact methods are not allowed.

c. Concrete barrier curb, bridge rail, and median barrier curb:

(1) The barrier curbs and bridge rail shall present a smooth, uniform appearance conforming to the horizontal and vertical lines shown in the plans or ordered by the Engineer, and shall be free of lumps, sags, or other irregularities. The top and exposed faces of the barrier and bridge rail shall conform to the following requirements when tested with a 3 m straightedge laid on the surfaces.

(2) The top of the barriers shall not vary more than 6 mm from the edge of the straightedge, and the faces shall not vary more than 12 mm from the edge of the straightedge. Areas not conforming to the requirements in Paragraph 10.c.(1) of the Subsection shall be removed and replaced at no additional cost to the Department.

11. a. Retarders may be used to aid concrete finishing.

b. Retarders shall be used when the air temperature is 15°C and rising.

12. a. When the bridge floor is to receive a subsequent overlay course of high density, low slump concrete, the Contractor shall form test wells into the concrete floor surface. Wells shall be 250 mm by 250 mm and set 40 mm below the floor surface.

b. The Contractor shall place test wells at intervals not to exceed 15 m, except at the point where placing starts. Here, the first 3 wells will be placed at 1.5 m intervals.

13. Drainage:

a. The Contractor shall furnish and install deck drainage systems at the locations shown in the plans. This work includes drain boxes, pipes, anchors, supports, and connections.

b. Floor drains and appurtenances shall be fabricated from structural steel and/or galvanized standard steel pipe (schedule 40) meeting the requirements of ASTM A 36/A 36M or ASTM A 53 Grade B, respectively. After fabrication, floor drains and appurtenances shall be galvanized in accordance with the applicable sections of ASTM A 123.

14. The Contractor shall paint all exposed metal, except weathering grade steel, as prescribed in Section 709.

15. Time for Opening Bridge Floors to Public Traffic:

a. The Contractor shall not open the bridge floor to traffic until approval has been given by the Engineer. The Engineer may open the bridge when the concrete has reached a minimum age of 7 days and developed a minimum compressive strength as prescribed in the plans.

b. Construction equipment meeting legal load limits will be allowed on bridge floors after 5 days have elapsed from the time of placement provided a test specimen made during the progress of the work develops a compressive strength of at least 80 percent of the design strength as prescribed in the plans.

706.04 -- Method of Measurement

1. No field measurements are required when items are constructed according to the plan geometrics.

2. Drainage systems or floor drains will be measured as single units, complete and in place.

706.05 -- Basis of Payment

1.

Pay Item	Pay Unit
Concrete Class _____ for Bridges	Cubic Meters (m^3)
Drainage System at Station _____	Each (ea)
Floor Drains _____	Each (ea)

2. Finishing, curing, texturing, set retarders, and test wells are subsidiary to the concrete floor.

3. Miscellaneous items that are listed in the plans to be included in the complete structure, but for which separate items are not shown in the proposal and for which no direct payment has been provided, shall be incorporated in the structure and the necessary work performed by the Contractor. Direct payment for such items will not be made, and they shall be considered as subsidiary to the relevant pay item.

4. Payment is full compensation for all work prescribed in this Section.