(i) FALSEWORK.

1. DESIGN AND CONSTRUCTION.

a. General.

For the purpose of this specification, falsework shall be divided into two classes as follows:

Class 1 - Common or simple falsework such as temporary bracing to provide stability for bridge girders, permanent steel bridge deck forms, deck overhang supports, screed rail support systems, or substructure supports attached to permanent parts of the structure (i.e. drilled shafts, columns, caps, etc.).

Class 2 - Unique or complex falsework such as that required for box girder construction, RCDG construction, structural cofferdams, or any falsework used in connection with steel erection.

The Contractor shall be responsible for designing and constructing safe and adequate falsework which provides the necessary strength and rigidity, supports all loads imposed, and produces a finished structure with lines and grades shown on the plans. Falsework shall be designed and constructed to withstand all imposed loads during erection, construction, usage, and removal.

The Contractor shall submit to the Construction Engineer working drawings and design calculations for falsework in accordance with Article 105.02.

For both classes of falsework drawings, the Construction Engineer will verify that the licensed Professional Engineer signature and stamp requirements of Subarticle 105.02(d) are met. Class 1 drawings will be stamped for distribution and then distributed. Class 2 drawings will be forwarded to the Bridge Engineer for review to determine if the results of the licensed Professional Engineer's calculations are in compliance with design criteria. If the design criteria are met, the submittal will be returned to the Construction Engineer to be stamped for distribution and then distributed.

All falsework will be inspected by the Project Manager using the distributed drawings. For all Class 2 falsework, the licensed Professional Engineer who signed the falsework submittal shall verify that the falsework as constructed meets all design criteria prior to any load being placed thereon. A signed statement from the licensed Professional Engineer covering the verification shall be furnished to the Project Manager by the Contractor.

When falsework of either class is to be used over highway, pedestrian, or railroad traffic, additional details will be required to provide for special protection to prevent debris from falling on the traffic below. These additional details will be required for both removal and construction work.

All falsework drawings shall include a description and size of all members, connections, and miscellaneous hardware. When pre-manufactured assemblies are used, all parts shall be easily identified as those shown on the drawings.

All falsework shall be designed and constructed to provide the necessary rigidity and to support the loads without appreciable settlement or deformation. Screw jacks and/or hardwood wedges shall be used to take up any settlement in the formwork either before or during the placing of concrete.

Any part of the permanent structure to which falsework will be attached shall attain a minimum compressive strength of 2400 psi {17 MPa} from cylinders prepared in conformity with AASHTO T 23 prior to the attachment.

Falsework that cannot be founded on a satisfactory footing shall be supported on piling, which shall be spaced, driven, and removed in an approved manner.

All spans shall be given a temporary camber to allow for deflection, shrinkage, and settlement. Bridges shall have a permanent camber only where so shown on the plans or directed.

b. Design Criteria.

Falsework shall be designed to withstand all imposed loads during erection, construction, usage, and removal. Designs shall be based on minimum loads, maximum stresses and deflections, and conditions in the following paragraphs. Allowable stresses are based on use of undamaged, high quality materials. The contractor shall reduce stresses if lesser quality materials are used.

Design Loads for falsework shall consist of the sum of dead and live vertical loads and assumed horizontal loads. Minimum total design load for any falsework shall not be less than 100 pounds per square foot {4.8 kN/m^2} for the combined live and dead load regardless of slab thickness.

Dead Loads shall include weight {mass} of concrete, reinforcing steel, forms, and falsework. Weight {mass} of concrete, reinforcing steel, and forms shall not be assumed to be less than 160 pounds per cubic foot {25 kN/m^3}.

Live Loads shall consist of the actual weight {mass} of any equipment to be supported by falsework applied as concentrated loads at the points of contact and a uniform load of not less than 20 pounds per square foot {0.960 kN/m^2} applied over the area supported plus 75 pounds per linear foot {1.1 kN/m} applied at the outside edge of deck overhangs.

Horizontal Loads applied shall be the sum of the actual horizontal loads due to equipment, construction sequence, or other causes and an allowance for wind, but in no case shall the design horizontal load to be resisted in any direction be less than two percent of the total dead load. Falsework shall be designed of sufficient rigidity to resist the design horizontal load prior to placement of concrete.

Falsework Foundations shall be designed to carry the loads imposed on them without exceeding allowable soil bearing values and anticipated settlements.

Maximum allowable stresses, loadings, and deflections used in design of falsework shall be as follows:

TIMBER	
Compression perpendicular to the grain (Dense Select Structural Grade Southern Pine)	450 psi {3 MPa}
Compression parallel to the grain but not to exceed 1600 psi {11 MPa}	480,000/(L/D)^2 psi {3300/(L/D)^2 MPa}
Flexural stress reduced to 1500 psi {10 MPa} for members with a nominal depth of 8 inches {200 mm} or less.	1800 psi {12 MPa}
Horizontal shear (Dense Select Structural Grade Southern Pine)	90 psi {0.620 MPa}
Deflection due to weight {mass} of concrete.	1/240 of clear span irrespective of the fact that the deflection may be compensated for by camber strips.
Timber piles, maximum loading (12 inch {300 mm} Butt Diameter)	24 tons {213 kN}

STEEL	
Deflection due to weight {mass} of concrete irrespective of the fact that the deflection may be compensated for by camber strips.	1/240 of clear span
Stresses shall not exceed those specified in the Manual of Steel Construction as published by the AISC. When the grade of the steel cannot be positively identified, design stresses shall conform to either those specified in said AISC Manual for ASTM A 36 steel or the following:	
Tension, axial and flexural.	22,000 psi {152 MPa}
Compression, flexural (But not to exceed 22,000 psi {152 MPa})	12,000,000 / (LD/bt) psi {83 000/ (LD/bt) MPa}
Compression, axial.(Except L/r shall not exceed 120.)	16,000 - 0.38(L/r)^2 psi {110 - 0.38(L/r)^2 MPa}
Shear on gross section of the web of rolled shapes.	14,500 psi {100 MPa}
Web crippling for rolled shapes	27,000 psi {186 MPa}

In the foregoing formulas, L is the unsupported member length, D is the least dimension of rectangular columns, or the width of a square of equivalent cross sectional area for round columns, or the depth of beam, b is the width of member, t is the thickness of the compression flange and r is the radius of gyration of the member. E, modulus of elasticity, used for timber shall be 1.6 X 10^6 psi {11 GPa} and for steel shall be 30 X 10^6 psi {200 GPa}.

Any additional design criteria, which may be needed, shall be developed by the Contractor's licensed Professional Engineer designer and included with the calculations of the falsework submittal.

Falsework over or adjacent to roadways or railroads which are open to traffic during construction shall be designed and constructed such that it is stable if subjected to vehicular impact or

features shall be provided to protect falsework supports from vehicular impact. Protection shall be designed such that it does not present a hazard to vehicular traffic.

Design criteria for permanent steel bridge deck forms shall be as shown elsewhere in this Section.

2. REMOVAL OF FALSEWORK.

No falsework supporting concrete shall be removed or wedges loosened without the consent of the Engineer.

If adequate test cylinders have been made, falsework may be removed when the cylinders indicate that the concrete has developed a minimum compressive strength of 2400 psi {17 MPa}, otherwise falsework shall be removed according to the following time limitations.

Falsework may be removed after expiration of 14 days exclusive of days when for four hours or more the temperature is below 40 °F {5 °C}. Falsework under slabs of less than 6 foot {2 m} span may be removed after seven days with the same temperature limitations.

Falsework shall be gradually and uniformly released in such a manner as to avoid injurious stresses in any part of the structure. Wedges shall be removed first under slabs and transverse beams, starting at the center of the span and working both ways; then wedges under longitudinal girders and beams shall be removed also starting at the center of the span and working both ways simultaneously.

All falsework piles, at the time of removal or cleanup, shall be pulled out or cut off at an elevation not more than 6 inches {150 mm} above the bed of the stream. Piles not in water shall be removed or cut off flush with or below the ground surface of stream bed. Piles within roadbed limits shall be cut off at least 3 feet {1 m} below subgrade elevation. Other piles within roadway limits shall be cut off at least 12 inches {300 mm} below the finished surface of the front slope, ditch, or backslope.

(j) CURING CONCRETE.

1. EXPOSED SURFACES.

Whenever the Engineer determines that weather conditions are such that evaporation from the surface may cause shrinkage cracking, a fog or mist spray may be required at intervals as needed during and after finishing until curing material can be applied so that the surface will be at all times damp but not excessively wet.

The Contractor shall give careful attention to the proper curing of the concrete. All surfaces not covered by forms shall be protected with an approved membrane curing compound, from List II-30 of the MSDSAR manual, dampened burlap, Polyethylene Film* (White Opaque), White Burlap - Polyethylene Sheet*, cotton mats, or wetted sand, as soon after placing the concrete as possible without marring the surface, except for bridge deck slabs which shall be treated as noted in Item 2 below. Immediately upon removal of forms, other surfaces shall be treated by one of the approved curing methods.

Unless membrane curing compound is used, all curing materials shall be kept wet and shall remain in place for seven days, except that small portions may be temporarily removed during actual finishing operations.

*NOTE: When polyethylene film or white burlap-polyethylene sheeting is used, it shall be installed and maintained in such a manner that a complete, moisture-tight enclosure over the surface to be cured will be provided. These materials shall meet the requirements noted in Section 830.

2. BRIDGE DECK SLABS.

a. General.

Prior to placing a bridge deck slab, the evaporation rate shall be determined by use of the graph in Figure 1, “Evaporation Rate of Surface Moisture”, and recorded on form BMT-171, *“Evaporation Rate Record”*. The Contractor shall furnish the equipment necessary to measure the air temperature (ambient), wind velocity, and humidity. The equipment or a manufacturer's certificate of calibration showing the equipment’s model number and serial number shall be submitted to the Division Materials Engineer no less than 14 days prior to their use. The equipment shall consist of the following instruments with the following specifications.

1. Anemometer: Range – 0-25mph {0-40 km/hr}.
   Accuracy – plus or minus 1.5%.
   Units – U.S. Customary and Metric.
2. Hygrometer: Range – 10-95% relative humidity.
   Accuracy – plus or minus 1.5%.
   Units - U.S. Customary and Metric.
   Certified and traceable to N.I.S.T.

3. Thermometer: range – 0-140 °F {0-60 °C}.
Accuracy – plus or minus 2 °F {plus or minus 1 °C}
Units - U.S. Customary and Metric.

Combination instruments such as anemometer and thermometer or hygrometer and thermometer will be accepted provided they meet the above requirements.

If the placement is expected to last more than two hours, the evaporation rate shall be checked and recorded on form BMT-171 at two-hour intervals or less. To prevent plastic shrinkage cracking, the expected evaporation rate shall not exceed 0.2 pounds per square foot per hour {1.0 kg/m^2/hour}. When the evaporation rate exceeds this amount, the Contractor shall be required to effectively reduce the rate to within the allowable limits by taking one or more of the following actions:

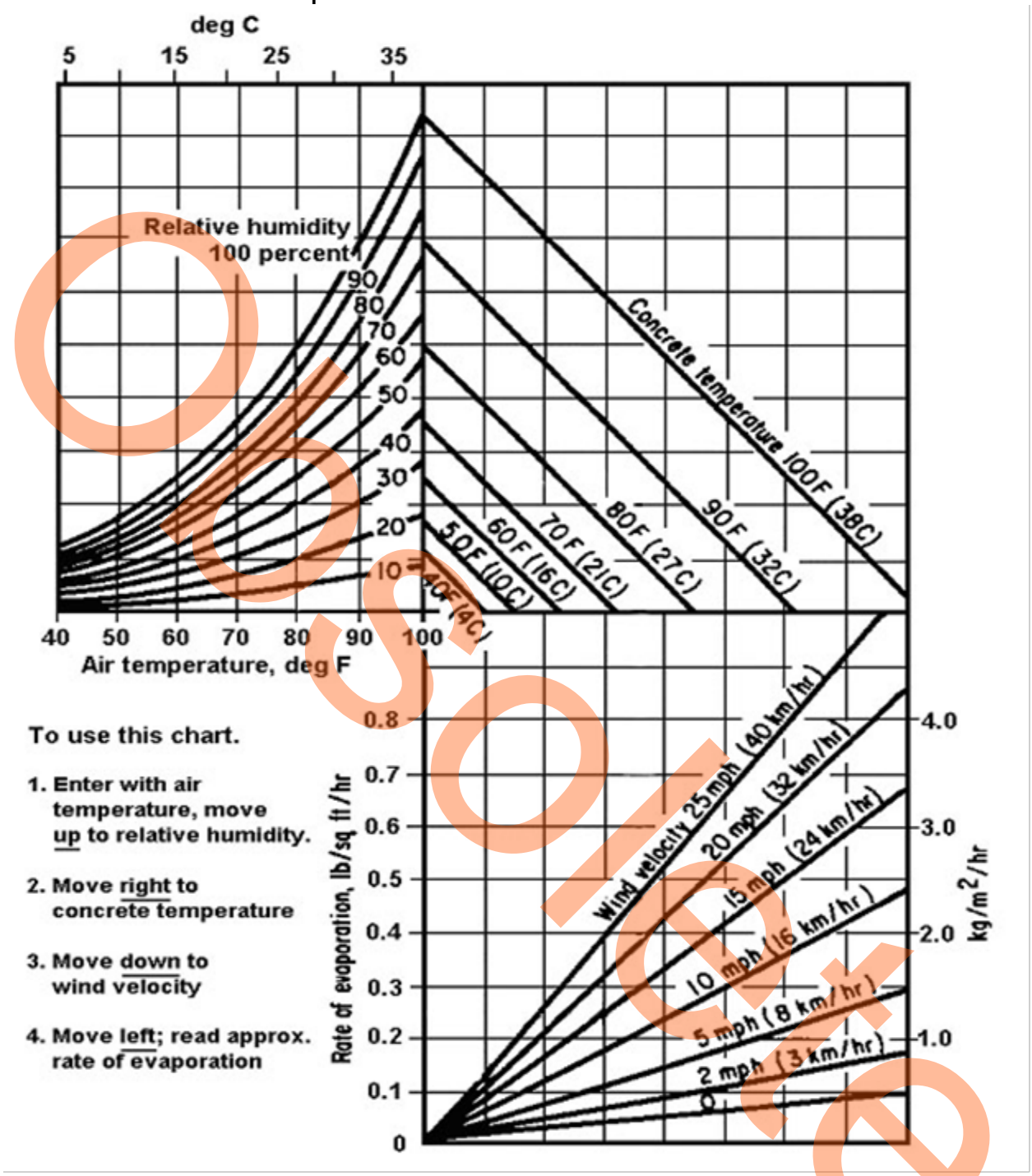
(1) Construct windbreaks or enclosures to effectively reduce the wind velocity throughout the area of placement.

(2) Use fog sprayers or sprinklers upwind of the placement operation to effectively increase the relative humidity.

(3) Reduce the temperature of the concrete.

The Department will evaluate plastic shrinkage cracks that occur. Remedial measures shall be performed as directed by the Engineer. Plastic shrinkage cracks shall never be troweled over or filled with slurry.

FIGURE 1. Evaporation Rate of Surface Moisture



b. Evaporation Control After Screeding.

Continuous fogging or an evaporation barrier (monomolecular) material shall be used for all bridge deck curing beginning immediately after the screeding operations have been completed for sections of the deck not to exceed five feet from the starting location.

If fogging is to be used, a continuous fog or mist spray shall be maintained until the moist curing procedures described elsewhere in this Section begin. Intermittent fogging is not acceptable if there is drying of the concrete surface. If water begins to pond on the deck, the Contractor shall adjust the rate of fogging to minimize the ponding of water.

If an evaporation barrier material is to be used, it shall be applied immediately behind the screeding operation and in accordance with the manufacturer's recommendations. The entire top

portion of the concrete slab shall be covered with the barrier material applied under pressure at a rate of one gallon {liter} to not more than 200 square feet {5 m^2} of fresh concrete. Application shall be done with an industrial type sprayer in such a manner as to cover the surface being treated with a uniform film.

c. Moist Curing After Finishing.

Immediately after the finishing operation, concrete bridge decks shall be moist cured for seven days by maintaining a moist condition for the entire curing period. This may be accomplished by one of the following methods:

(1) Fog spraying or sprinkling with nozzles or sprinklers. When using this method, the Contractor shall maintain a complete and continuous moist condition of the concrete surface. Intermittent sprinkling is not acceptable. Care shall be taken that erosion of the surface does not occur.

(2) Saturated burlap, saturated plastic coated burlap, or cotton mats. These curing materials shall be clean and free from any injurious substances that can cause deleterious effects to the concrete or cause discoloration. The burlap or cotton shall be completely saturated before being placed on the concrete and shall be maintained in that condition for the entire curing period. Should tears or holes appear in the mat sheets, they shall be repaired immediately. All edges of burlaps and mats shall extend at least 18 inches {450 mm} beyond the concrete surface. Where two individual sheets join, their edges shall overlap at least 12 inches {300 mm}. All edges and overlaps shall be secured to ensure that the concrete surface is completely covered during the entire curing period. These curing materials shall be kept in contact with the concrete surface at all times. Alternate cycles of wetting and drying shall be avoided because this may result in pattern cracking.

Prior to the start of the curing operation, the contractor shall have an approved curing system that ensures continuous moist curing of the concrete for 24 hours per day.

If water or the chosen curing material stains or discolors concrete surfaces, which are permanently exposed, the contractor shall be responsible for cleaning the surfaces. When wooden forms are left in place during curing, they shall be kept wet at all times. If steel forms are used in hot weather, non-supporting vertical forms shall be broken loose from the concrete and curing water continually applied in this void. If the forms are removed before the end of the curing period, curing shall be carried out as on unformed surfaces.

3. PROTECTION OF CONCRETE DURING CURING.

Green concrete shall be protected against jarring or other movement that might cause damage. No traffic or other superimposed load will be permitted over bridges or culverts until the following criteria have been met:

(1) Bridges - The deck concrete shall have reached a minimum 4000 psi {28 MPa} compressive strength as determined from test cylinders.

(2) Culverts - The culvert concrete shall have reached a minimum of 4000 psi {21 MPa} compressive strength as determined from test cylinders or 28 days have passed since the last concrete was placed exclusive of days when for 4 hours or more the temperature is below 40 °F {5 °C}.

(k) FINISHING CONCRETE.

1. GENERAL.

The details set forth hereinafter in this Subarticle cover the requirements for the several classes of surface finishes which shall be applied to the various parts of concrete structures.

These various classes of surface finishing will be used in accordance with the following:

Class 1 - required on all concrete surfaces except wearing surfaces and surfaces placed in direct contact with natural ground or embankment.

Class 2 - required on all exposed concrete surfaces within the requirements noted elsewhere in this Section unless another class is specified.

Class 3 - may be used on designated bridge structures when specified by plan details.

Wearing surface finish for bridge deck travelway shall be as specified in Subitem 510.03(c)6.c. and for sidewalks as specified in Item 510.03(c)7.

Exposed surfaces or sidewalks, driveways, curbs, and gutters shall have a textured finish obtained by the use of a burlap or cotton drag, brush, or broom so that a uniform gritty texture is obtained. Exposed surfaces of concrete flumes and slope paving shall have a float finish.

2. CLASS 1 FINISH (ORDINARY SURFACE FINISH).

This class finish will require the concrete surface to be free from objectionable projections, swells, fins, ridges, depressions, waves, holes, and other defects. This will require that immediately after the forms are removed, metal ties shall be removed for a minimum depth of 1 inch

{25 mm} from the face of the concrete. All cavities or depressions resulting from this removal, or from other causes, shall be carefully filled and pointed with a mortar of sand and cement, and the surface left smooth and even. The proportion of cement to sand, measured by volume, shall be one to two unless otherwise specified. The surface film of all pointed areas shall be carefully removed before setting occurs. Any fins, ridges, or projections shall be struck off smooth with the surface of the concrete. Particular care shall be taken throughout the progress of this operation to use one of the curing methods covered elsewhere in this Section.

If a Coated Surface Finish is to be applied in a later finishing operation, the coating material may be used in lieu of mortar to fill small air holes in the concrete surface; however, this must be given time to take a set prior to applying the Coated Surface Finish.

3. CLASS 2 SURFACE FINISH.

a. General.

This class surface finish requires that, in addition to a Class 1 finish, the exposed surfaces of bridges, culverts, headwalls, inlets, etc. as defined in the Subitem d. below, receive an additional surface finish in accordance with the following:

If only one brand and type of cement from the same mill is used in a structure or unit (substructure or superstructure), the Contractor may elect to either apply a Rubbed Surface Finish or apply an approved coated Surface Finish.

If more than one brand of cement is used in a structure, the Contractor shall apply a Coated Surface Finish.

The same type of surface finish shall be used throughout the entire structure unless otherwise authorized in writing by the Engineer.

b. Rubbed Surface Finish.

As soon as the Class 1 surface finish has been completed and the pointing has set sufficiently to permit it, the entire surface except chamfers shall be wetted with a brush and rubbed with a No. 16 carborundum stone or an abrasive of equal quality, bringing the surface to a paste. The rubbing shall be continued sufficiently to remove all form marks and projections, producing a smooth dense surface without pits or irregularities. The material, which in the above process has been ground to a paste, shall then be carefully spread or brushed uniformly over the entire surface and allowed to take a reset. Curing shall continue on this surface as noted to be required elsewhere in this Section.

The final finish shall be obtained by a complete rubbing with a No. 30 carborundum stone or an abrasive of equal quality. This rubbing shall continue until the entire surface is of a smooth texture and uniform in color.

c. Coated Surface Finish.

Only Departmental approved coated finishing materials may be used. The coating material shall be one of the coating materials shown on List III-3, "Surface Coatings for Portland Cement Concrete". This list is given in the Department's Manual, "Materials, Sources, and Devices with Special Acceptance Requirements".

The application of the coating shall be in an approved manner (normally in accordance with the manufacturer's recommendations) by competent and experienced personnel. The overall coated finish shall be uniform in coverage, texture, and color after the coating material has taken set and cured. Failure to obtain uniformity of coverage, texture, and color shall be cause for the Engineer to require such remedial action as deemed necessary to obtain the desired results.

The following actions shall be taken before the application of any coated finish:

A Class 1 surface finish applied and all pointing completely set.

Surface clean and free from foreign matter.

If membrane curing compound was used to cure the concrete, the curing compound shall have weathered for a minimum time period of six weeks. Special care shall be taken to ensure that areas not to be treated are protected to prevent treatment from overlapping onto these designated areas.

d. Exposed Surfaces.

Exposed surfaces for this class finish is defined as all surfaces, including bottom chamfers and fillets except (1) the wearing surface of roadway slabs and sidewalks, (2) those surfaces having immediate contact with embankment or excavation, (3) those surfaces below low water level and/or below newly established ground line after backfilling excavation or excavated channels, (4) underside and interior faces of girders, beams, and slabs, and underside of sidewalks where the edge beam extends 3 inches {75 mm} or more below the bottom of the sidewalks, (5) top and bottom surfaces

of all type caps, and (6) those parts of minor structures, box culverts, and bridge culverts that are not readily visible from a travelway.

4. CLASS 3 SURFACE FINISH.

This class surface finish requires that, in addition to the Class 1 surface finish, only the designated exposed surfaces of a bridge structure noted below be given an additional finish of either a rubbed or coated finish in accordance with the requirements given elsewhere in this Section.

Exposed surfaces shall be defined as the inside, top, and outside surfaces of barrier rail to bottom of slab overhang, and all portions of the bridge abutments outside the edge of the exterior girders that are not in immediate contact with embankment or excavation. All other structure surfaces, exposed and unexposed, shall receive a Class 1 finish immediately after the forms are removed.

(l) CONCRETE FOR PRECAST NON-PRESTRESSED AND PRESTRESSED MEMBERS.

Concrete for precasting shall meet the requirements given in this Section unless amended by concrete requirements given in other Sections.

Additional requirements are given in Section 512 and ALDOT-367 for the concrete required for precast non-prestressed concrete bridge members. Additional requirements are given in Section 513 and ALDOT-367 for the concrete required for precast prestressed concrete bridge members.

501.04 Inspection.

(a) GENERAL.

The Contractor shall give the Engineer sufficient advance notice before starting to place concrete in any section of a structure to permit the inspection of forms, placing of steel reinforcements, and of preparation for placing. Any defective falsework or forming shall be corrected, or removed and replaced as necessary to the satisfaction of the Engineer, all at the expense of the Contractor.

Authorization of the Engineer shall be secured before concrete is placed in any portion of a structure. Any concrete placed in violation of this provision, or in the absence of the Inspector, shall be removed and replaced at no additional cost to the State.

(b) REMOVABLE FORMS.

After the forms have been removed, any defective work discovered shall be removed and replaced in a satisfactory manner. If the surface of the concrete is bulged, sagged, uneven, or honeycombed to such an extent that it cannot be satisfactorily repaired, the entire section shall be removed and replaced, at no additional cost to the State.

(c) STAY IN PLACE STEEL FORMS.

After the deck concrete has been in place for a minimum period of two days, the concrete, if deemed necessary by the Engineer, shall be tested for soundness and bonding of the forms by sounding with a hammer as directed by the Engineer. The number and locations of the forms to be tested shall be as selected by the Engineer. If areas of doubtful soundness are disclosed by this procedure, the Contractor will be required to remove the forms from such areas for visual inspection after the concrete has attained a minimum compressive strength of 2400 psi {17 MPa}. Care shall be exercised to distinguish the sound of broken bond from the sound of defective concrete.

At locations where sections of the forms are removed, the Contractor will not be required to replace the forms, but the adjacent metal forms and supports shall be repaired to present a neat appearance and assure their satisfactory retention. As soon as the forms are removed, the concrete surfaces will be examined for cavities, honeycombing, and other defects. If irregularities are found, and in the opinion of the Engineer these irregularities do not justify rejection of the work, the concrete shall be repaired as the Engineer may direct. If the concrete where the forms are removed is unsatisfactory, additional forms, as necessary, shall be removed to inspect and repair the slab, and the Contractor's methods of construction shall be modified as required to obtain satisfactory concrete in the slabs. All unsatisfactory concrete shall be removed or repaired as directed by the Engineer.

The Contractor shall provide all facilities as are reasonably required for the safe and convenient conduct of the Engineer's inspection procedures. No additional compensation will be allowed the Contractor for compliance with the above inspection procedures.

501.05 Acceptance of Concrete.

(a) GENERAL.

Certified Concrete Technicians, as required by the Department, shall perform all concrete inspections and testing. Procedures for technician certifications and laboratory qualifications are

described in ALDOT-405, "Certification and Qualification Program for Concrete Technicians and Concrete Laboratories".

Fresh concrete will be accepted on the basis of slump, total air content, and temperature meeting the requirements specified for the Class of concrete.

Hardened concrete shall be accepted on the basis of compressive strength meeting the requirements specified in Item 501.02(c)2 for that Class of concrete.

Compressive strength from concrete cylinders will be accepted when the average of two consecutive cylinder test results, obtained at the same age, equals or exceeds the specified 28-day compressive strength, and neither cylinder test result is below 95% of the specified 28-day compressive strength.

(b) SUBSTANDARD CONCRETE.

1. GENERAL.

The Department will investigate any concrete not meeting the acceptance requirements outlined in Subarticle 501.05(a). Concrete investigations will be used to determine the suitability of potentially substandard concrete. This investigation may include any or all of the procedures outlined in ALDOT-170.

The combined results of the Department's investigations will be used to assess the acceptability or rejection of potentially substandard concrete.

If the investigation results show that the concrete fails to meet the contract requirements, the Contractor shall be responsible for the cost of the investigation to include, but not limited, to per-diem, travel expenses, and sampling and testing.

2. IN-PLACE COMPRESSIVE STRENGTH.

If the Department deems it necessary to evaluate only the in-place compressive strength of substandard concrete, a core investigation as described in ALDOT-170 will be performed.

Price adjustments will be applied to the applicable pay item for the number of cubic yards represented by the low cylinder breaks and will be determined as follows.

If the average compressive strength of the cores is equal to or greater than 100% of the specified 28-day compressive strength, the concrete will be accepted with no price adjustment.

If the average compressive strength of the cores is 85% or greater but less than 100% of the specified 28-day compressive strength, and the Bridge Engineer deems the concrete to be structurally acceptable, the concrete will be accepted with a price adjustment. The price adjustment will be applied to the applicable pay item for the number of cubic yards represented by the low breaks. The price adjustment shall be determined from the following formula:

Price Adjustment (In Percent) = 100 X (1.0 – [(f'c – fc AVG) / (0.30 f'c)])

f'c = Required 28-day Compressive Strength (psi) {MPa};
fc AVG = Average Compressive Strength of Test Cores (psi) {MPa};
The price adjustment shall be rounded to the nearest tenth of a percent;
The price adjustment is valid where: 50% ≥ Price Adjustment < 100%.

SECTION 510
BRIDGES

510.05 Basis of Payment.

(d) Payment will be made under Item No.:

Subarticle 510.05 (d) shall be replaced by the following:

(d) Payment will be made under Item No.:

510-A Bridge Substructure Concrete - per cubic yard {cubic meter}
510-B Bridge Concrete, Class ___ - per cubic yard {cubic meter}
510-C Bridge Concrete Superstructure, __*, __**, ___*** - per lump sum
510-E Grooving Concrete Bridge Decks - per square yard {square meter}

* Station Number, Bridge Identification Number (BIN), Ramp Number, etc.

** Lane, if applicable

*** Approximate quantity of superstructure concrete in cubic yards {cubic meters}

SECTION 815
CEMENT

Section 815 shall be replaced with the following:

SECTION 815
CEMENT

815.01 Type I Portland Cement.

Type I Portland Cement shall meet the requirements of AASHTO M 85 and the additional requirements shown below.

815.02 Type II Portland Cement.

Type II Portland Cement shall meet the requirements of AASHTO M 85 and the additional requirements shown below.

815.03 Type III Portland Cement (High Early Strength).

Type III Portland Cement shall meet the requirements of AASHTO M 85 and the additional requirements shown below.

815.04 Type IS Portland Blast Furnace Slag Cement.

Type IS Portland blast furnace slag cement (for use in soil-cement stabilization) shall meet the requirements of AASHTO M 240, Blended Hydraulic Cement.

815.05 Blank.

815.06 Masonry Cement.

Masonry cement shall meet the requirements of ASTM C 91.

815.07 Chemical Properties.

The Specifications for all cements as covered by Articles 815.01 to 815.06, inclusive, are amended to the effect that the total alkali content of any cement used, calculated as the percentage of sodium oxide (Na_2O) plus the product of 0.658 times the percentage of potassium oxide (K_2O), shall not exceed 0.60 percent.

In addition to the above, for Type II cement covered by Article 815.02, the standard chemical requirement shown in Table 1 of AASHTO M 85 for Tricalcium Silicate (C_3S) is hereby waived.

815.08 Testing of Cement.

All cement furnished for use shall be tested before use or be from an approved producer meeting the requirements of ALDOT-227, Quality Control of Portland and Blended Hydraulic Cements, and listed on List I-2, PRODUCERS OF PORTLAND AND BLENDED CEMENT, of the Department's "Materials, Sources, and Devices With Special Acceptance Requirements" Manual. Refer to Subarticle 106.01(f) and ALDOT-355 concerning this list.

815.09 Flash Set And False Set.

Flash set and false set, as determined by ASTM C 451, shall be cause for rejection of the cement.

815.10 Unusual Appearance.

Unusual appearance as to color, etc. shall be sufficient grounds for rejection of the cement.

815.11 Use, Care, And Handling.

(a) USE.

1. Bulk cement will be permitted provided the bulk cement is handled as follows:

a. Portland cement shall be measured by weight {mass}, considering that one bag of cement is equivalent to 94 pounds {42 kg} net of cement.

b. Handling equipment and the equipment used for weight {mass} determination shall be inspected by the Engineer prior to use. Cement shall be fully protected from contamination or damage during handling.

c. Bulk cement shall be batched by weight {mass}, and scales may be of either the beam or springless dial type and shall be the product of a reputable manufacturer. Scales shall be accurate to within a tolerance of 5 pounds per 1000 pounds {2 kg per 455 kg} net load in the hopper. The value of the minimum gradation of any scale shall not be greater than 0.1 percent of the scale capacity.

d. Provisions shall be made to indicate to the operator that the required load in the hopper or container is being approached, such as a springless dial indicator or tare beam. Such device shall indicate at least the last 50 pounds {22 kg} of load.

e. After the required weight {mass} of the cement is batched, it shall be protected from loss in handling or in transit.

2. Only cement of the same "Type" shall be used in the construction of any structure or unit (substructure or superstructure) except as permitted in writing. All cement in any container having lumps of cement or caked cement, or cement which for any reason has become damaged or partially set, shall be rejected. Cement salvaged from discarded or used bags shall not be used. Cement shall not be used while its temperature is more than 150 °F {65 °C}.

3. The Contractor shall keep accurate records of the deliveries of cement and its use in the work including that from ready-mix plants. Copies of these records shall be furnished the Engineer at the close of each day's work or 8 hour run, in such form as he may require, showing the quantity used during the day or run at each part of the work.

(b) CARE AND HANDLING.

1. The Contractor shall provide suitable means for storing and protecting the cement against dampness. Cement not for immediate use shall be stored in suitable weather proof buildings. Buildings shall be placed in approved locations. Provisions for storage shall be ample and the shipment of cement as received shall be separately stored in such a manner as to provide easy access for identification and inspection of each shipment. On small structures, storage in the open may be permitted by authorization, in which case a raised platform and ample waterproof covering shall be provided. Stored cement shall meet the test requirements at any time after storage when a retest is ordered.

2. Cement of different types, even if tested and approved, shall be stored separately and shall not be mixed.