

# **APPENDIX A**

## **TABULATION OF CONSTRUCTION TOLERANCES**

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Perform all work and furnish all materials in reasonably close conformity with the lines, grades, cross sections, dimensions, and material requirements, including tolerances shown on the plans or indicated in the specifications. The maximum limits of tolerances listed below do not necessarily represent total construction acceptability but are limits at which the Department may consider construction tolerances acceptable. It is intended that, in general, all work and materials be well within the tolerances given. The Department will not allow continued employment of equipment and methods which allow undue proportion of all work and materials approaching the tolerances limits.

SECTION	SUBJECT	TOLERANCE
109.01.03 D)	Automatic printing scales printed weight compared to scale display.	The printed weight is within 60 pounds of scale display.
204.03.07 A)	Surface for channel lining, class IV.	$\pm 6$ inches from a true plane.
204.03.10 1)	Distance from centerline to ditch line in cuts and to shoulder line in fills.	$\pm$ one foot from dimension shown on plans.
204.03.10 1)	Total width of roadbed.	$\pm$ one foot at any location.
204.03.10 2)	Specified slope limits for slope surfaces between ditch lines or shoulder lines and original ground.	Not to be inside specified slope limits more than 6 inches nor outside specified slope more than one foot, both measured horizontally.
204.03.10 3)	Cut bench elevation.	$\pm$ one foot of bench elevation established on plans or by the Engineer.
204.03.10 5)	Subgrade tolerance for road-way and drainage excavation.	Complete to within $\pm 0.1$ foot of designated grade at time of final acceptance, except when rock subgrade is specified, the tolerance is $\pm 0.2$ foot.
206.03.03	Moisture content of embankment or subgrade material.	$\pm 2\%$ of the optimum moisture content as determined by KM 64-511.
207.03.02	Subgrade prepared for base or surface courses.	$\pm 1/2$ inch from specified crown section.
302.03.06	Surface of finished gravel and DGA base.	$\pm 1/2$ inch from specified cross section; $\pm 3/8$ inch in 10 feet at any location from the specified longitudinal grade.

401.02.01 H)	Asphalt Binder control unit metering devices.	$\pm 1.0\%$ when tested for accuracy.
401.02.02 B)	Scales for weigh box or hopper or for weighting asphalt material.	Tolerance on over registration and under registration of not exceeding 0.5% of indicated weight when tested for accuracy. The change in load required to noticeably alter the position of rest of the indicating element(s) of a non-automatic indicating scale shall not be greater than 0.1% of the nominal scale capacity.
401.02.03	Batch tolerances for automatic batching or pro-portioning hot-mix asphalt plants. Material: Batch aggregate component Mineral filler Asphalt Binder Zero return (aggregate) Zero return (asphalt materials) Accumulated weight of batches.	$\pm 1.5\%$ of total batch weights. $\pm 0.5\%$ of total batch weights. $\pm 0.1\%$ of total batch weights. $\pm 0.5\%$ of total batch weights. $\pm 0.1\%$ of total batch weights. $\pm 2.0\%$ of that total batch weight.
401.03.01	Bituminous plant mixed pavements - JMF tolerances.	See specifications for individual mixtures.
403.03.06 A)	Asphalt base, initial treatment and resurfacing projects.	The rate of application shall not exceed designated rate by more than + 5%.
403.03.06 B)	Asphalt base, new construction payment on basis of: weight, or area.	Total combined thickness of all layers within $\pm 1/2$ inch of compacted plan thickness.  Deficient in thickness by more than $1/2$ inch of compacted plan thickness.
403.03.07	Transverse joints in all asphalt courses.	Deviations do not exceed tolerances described in Subsection 403.03.11 from a 10-foot straight edge after joint is complete and rolled.
403.03.11	Surfaces of finished courses; asphalt plant-mixed pavements.	Finished surfaces of base course and binder course shall not deviate more than $\pm 1/4$ inch from 10-foot straightedge.  Finished surface of final surface course shall not

	Cross slope of all courses.	deviate more than + 1/8 inch from 10-foot straightedge.  Do not deviate more 1/4 inch in 5 feet from required cross slope.
405.03.04	Rate for applying cover material for asphalt seal coat.	Not to exceed designated rate by more than 5%.
407.02.02	Asphalt mixture for pavement wedge.	Asphalt binder content shall be maintained within $\pm 0.5\%$ .
408.03.01	Asphalt pavement milling and texturing surface tolerance.	Finished surfaced after final cut does not deviate more than $\pm 1/8$ inch from a 10-foot straightedge and that the cross slope does not deviate more than $3/8$ inch in 10 feet. Correct all irregularities exceeding these limits.
413.03.01	Asphalt content in Microsurface.	$\pm 0.5\%$ from mix design.
413.03.06	Dry aggregate in leveling course.	$\pm 2$ lb/yd <sup>2</sup>
413.03.10 A)	Emulsified asphalt-to-dry aggregate proportion.	Conform to approved mix design within a tolerance of $\pm 2$ gal/ton
413.03.10 A)	Yield of microsurface.	Quality control tolerance from the specified application rate is $\pm 2$ lbs/sy
501.03.04	Coal ash incorporated in concrete mixes for JPC pavement.	$\pm 2.0\%$ of specified weight.
501.03.17 D)	JPC pavement; Transverse contraction joints.	Not to deviate from true alignment more than 1/4 inch in one lane width.
501.03.19	JPC Pavement and Base Surface Tolerances. Pavement abutted by subsequent or JPC shoulder; edge slump with edge forms or tailing forms or fixed forms;	Not to exceed 1/8 inch.
	Pavement not abutted by pavement or shoulders edge slump;	Does not exceed 1/4 inch.
	High spot 6 inches or more from pavement edge.	Do not to exceed 1/8 inch from a 10-foot straightedge.

502.03.01	Dowel bar location. Horizontal offset Longitudinal translation Horizontal skew Vertical skew Vertical depth	<p>±1 inch ±3 inches ½ inch, max ½ inch, max</p> <p>The minimum distance below the concrete pavement surface must be: <math>DB = T/3 + \frac{1}{2}</math> inch Where: DB = vertical distance in inches, measured from the concrete surface to any point along the top of the dowel bar; and T = actual concrete pavement thickness at joint location, in inches. The maximum distance below the surface to any point along the dowel bar should be <math>2T/3</math>.</p>
508.03.01	Permanent Concrete Median Barriers. Top surface cast-in-place barriers (fixed form).	<p>± 1/4 inch when tested longitudinally by a 10-foot straightedge.</p> <p>No deviation more than 1/2 inch from the line established by the reference wire between any 2 reference wire supports.</p>
508.03.02	Top surface cast-in-place barriers (slip form).	
511.03.01	Masonry drill bits for drilling holes of installation of steel dowels into existing concrete by use of grout.	Diameter no less than 1/8 inch greater nor more than 1/2 inch greater than diameter of dowels.
601.02.14	Scales for weighing water, aggregates, cement, and fly ash for concrete for structures.	Within + 0.5% of net load on scales.
601.03.03	Concrete for structures air-entraining admixture net air content (by volume).	Volume of 6% ± 2% by volume.
601.03.03	Concrete for structures; accuracy of individual ingredient materials for each batch.	<p>± 2.0% for aggregates. ± 1.0% for water &amp; cement. ± 1.0% for cement in batches of 4 cubic yards or greater. ± 1.0% for total cementitious materials in batches of 4 cubic yards or greater. 0.0% to + 4.0% for cement in batches less than 4 cubic yards. 0.0 % to + 4.0 % for total cementitious materials in batches less than 4 cubic yards. ± 3.0% for admixtures.</p>
601.03.03 B)	Air content of mortar or grout.	Volume of 8% ± 2%.

601.03.03 E) 1)	Measuring cement.	When the weight of entire shipment of cement in bags varies more than 2% from 94 pounds per bag. Weigh the cement in bulk on scales.
601.03.03 E) 3)	Water metering systems for mixing concrete for structures.	+ 1% of required amount of water per batch.
601.03.08 C) 1)	Truck mixing of concrete for structures, quantity of mixing water.	Measure and Control to $\pm 1\%$ .
601.03.09 A)	Variation of finished surface of bridge seats.	Not to vary more than 1/32 inch above or below true level plane.
601.03.18	All exposed finished concrete surfaces unless specified elsewhere in the contract.	Not to vary more than 1/4 inch in 10-feet as measured from a straightedge.
602.03.04	All steel reinforcement except that placed in bridge decks.	$\pm 1/2$ inch of position, and specified spacing. $\pm 1/4$ inch of specified clearance from face of concrete.
602.03.05	Epoxy Coated Tie Wires, Chairs, etc.	
	Film thickness of epoxy coating.	$\pm 7$ mils.
	Film thickness of vinyl type coating.	$\pm 10$ mils.
	Thickness of flexible plastic or vinyl coating for tie wires.	$\pm 7$ mils.
604.03.08 A)	Bearing piles that will be exposed.	
	Variance from vertical during driving.	$\pm 1/4$ inch per foot from vertical or batter position specified in the Plans.
	Variance from plan position after driving.	$\pm 4$ inches from plan position at the pile cut-off elevation.
	Stringline stretched between exterior piles in the exposed portion of the pile bent or group.	$\pm 2$ inches.
604.03.08 B)	Bearing piles that will be unexposed in the finished structure.	

	Variance from vertical during driving.	$\pm 1/4$ inch per foot from vertical or batter position specified in the Plans.
	Variance from plan position after driving.	$\pm 6$ inches from plan position at the pile cut-off elevation.
605.03.05 D) 2)	Calibration of hydraulic jacks for prestressing.	$\pm 2\%$ .
605.03.08	Prestressed or precast concrete members dimensional tolerances of I-beams, box beams with cast-in-place slab, precast barrier unit, deck units, and piling.	Refer to tables in Subsection 605.03.08.
606.02.10 E)	Concrete bridge deck overlays; accuracy of latex and water meters used in measurement for mixing.	$\pm 1\%$ .
608.03.16	Concrete bridges. Lines of finished concrete, except bridge slabs, and precast piles.	$\pm 1/4$ inch per 10 feet or vary from plan lines more than 0.1% of the distance between extremities of the unit considered.
609.03.03	Reinforced concrete bridge slabs; placement of steel reinforcement.	$\pm 1/4$ inch vertically and horizontally of the position shown.
609.03.08	Reinforced concrete bridge slabs; slab surface variations.	$\pm 1/8$ inch in 10 feet.
609.05	Reinforced concrete ridge slabs; thickness of concrete cover over top mat of steel reinforcement.	See schedule for Adjusted Quality for Depth of Cover Deficiency Subsection 609.05.
612.03.06	Field assembled structural plate pipes; vertical elongation.	$\pm 25\%$ of specified elongation.
612.03.07 A)	Asphalt paving for pipe and pipe arches; aggregate and asphalt binder temperature.	$\pm 60$ °F.
612.03.07 B)	Concrete paving for pipe and pipe arches; uniform pavement thickness.	$\pm 1/2$ inch.
703.03.01 B)	Slope protection; reinforced concrete slope wall.	No surface variation from a true plane of more than 1/2 inch per 4 feet.

703.03.01 C)	Slope protection; cyclopean stone riprap; finished slope.	No surface variation of more than 6 inches from a true plane.
703.03.01 D)	Slope protection; crushed aggregate slop protection.	No surface variation of more than 1 1/2 inches per 4 feet from a true plane.
703.03.02 A)	Slope protection; channel lining classes II and III.	No surface variation of more than 3 inches from a true plane.
703.03.02 B)	Slope protection; channel lining class IV.	No surface variation of more than 6 inches from a true plane.
710.03.04	Cored hole drainage connector; diameter of hole shall be equal to the outside diameter of pipe.	+ 1/2 inch.