

424-09-02

DATE: June 22, 2009

SUBJECT: Maximum Cement Factors for Accelerated Concrete Patching

TO: DISTRICT EXECUTIVES

FROM: Tucker Ferguson, P.E., Director
Bureau of Construction and Materials



This letter is time neutral.

Change 4 to Publication 408/2007, Section 704 was recently issued and subsequent concerns have been raised by a number of Engineering Districts and Industry partners regarding the maximum cement factor in Table A for AA accelerated patching concrete mixes. Based on the concerns raised, a Clearance Transmittal (C-09-013) was circulated on May 20, 2009. Comments were received by June 5, 2009.

Effective immediately the maximum cement factor listed in Table A will be revised to 475 kg/m³ (Metric) and 800 lbs/CY (English). This change will be incorporated into the next available change to Publication 408. Districts should use these new values listed above when evaluating mix designs submitted for contracts under change 4 of Publication 408/2007.

Contracts under specifications prior to Change 4 are not governed by this specification change and mix designs can be approved on a project specific basis so long as they meet the requirements of that contract.

Questions regarding this specification change should be directed to Garth Bridenbaugh, BOCM Quality Assurance West at (814) /696-7194.

Attachments

425/WJM/GDB/acs

CC: Scott Christie, P.E., Deputy Secretary for Highway Administration
Danielle Spila, Policy Director
Highway Administration Bureau Directors
Assistant District Executives-Construction
Construction and Materials Division/Section Chiefs
Associated Pennsylvania Constructors
Federal Highway Administration
PA Turnpike Commission
J. P. Gardiner, P.E., BOMO
District Materials Engineers/Managers
G. D. Bridenbaugh, P.E., BOCM
D. H. Cough, P.E., FHWA
F. J. Kempf, Jr., P.E., PaTurnpike
R. E. Latham, P.E., APC
J. M. Becker, P.E., ACPA
P. T. Viahos, PACA
W. J. Miller, P.E.
R. Klopp

TABLE A (Metric)
Cement Concrete Criteria

Class of Concrete	Use	Cement Factor ⁽³⁾⁽⁵⁾ (kg/m ³)		Maximum Water Cement Ratio ⁽⁶⁾ (kg/kg)	Minimum Mix ⁽²⁾ Design Compressive Strength (MPa)			Proportions Coarse ⁽¹⁾ Aggregate Solid Volume (m ³ /m ³)	28-Day Structural Design Compressive Strength (MPa)
		Min.	Max.		Days				
					3	7	28		
AAA	Bridge Deck	376 ⁽⁴⁾	446	0.43	—	25	31	—	28
AA	Slip Form Paving ⁽⁷⁾	349	446	0.47	—	21	26	0.40-0.49	24
AA	Paving	349	446	0.47	—	21	26	0.37-0.49	24
AA	Accelerated Patching ⁽⁸⁾	349	446 <u>475</u>	0.47	----	----	26	0.37-0.49	24
AA	Structures and Misc.	349	446	0.47	—	21	26	0.37-0.49	24
A		335	446	0.50	—	19	23	0.38-0.50	21
C		234	390	0.66	—	10	14	0.42-0.56	14
HES		446	502	0.40	21	—	26	0.34-0.44	24

Notes 1 and 3 pertain to structure and miscellaneous concrete only.

- (1) Proportions shown in the table are shown on the reverse side of Form TR 4221-B and are controlled by class of concrete, fineness modulus of fine aggregate (PTM No. 501) and the solids percent in coarse aggregate (PTM No. 617).
- (2) Test Procedures: Slump—AASHTO T 119; Strength—PTM No. 604, Compressive.
- (3) For use in miscellaneous or structural concrete, if the Fineness Modulus (FM) is between 2.3 and 2.5, increase the minimum cement factor for the class of concrete 28 kg/m³. This requirement may be waived after adequate strength data is available and analyzed according to the mix-design section in Bulletin 5.
- (4) If mixing bridge deck concrete with a truck mounted volumetric plant, use a minimum cement factor of 390 kg/m³.
- (5) For exception, see Section 704.1(c).
- (6) If a portion of the cement is replaced by pozzolan, use a water to cement plus pozzolan ratio by mass.
- (7) For slip form paving, provide No. 57 coarse aggregate that has a minimum of 35% passing the 12.5 mm sieve. Base these results on the average of three samples, with no single sample result below 30% passing. Conduct testing at the concrete plant according to the QC Plan. Segregated stockpiles may be reworked and retested if material fails to conform to this requirement.
- (8) For accelerated cement concrete, submit mix design, as specified, Section 704.1 (c), having a minimum target value of compressive strength of 10MPa (1,500 pounds per square inch) at 7 hours when tested according to PTM No. 604.

TABLE A (English)
Cement Concrete Criteria

Class of Concrete	Use	Cement Factor ⁽³⁾⁽⁵⁾ (lbs/cu. yd.)		Maximum Water Cement Ratio ⁽⁶⁾ (lbs/lbs)	Minimum Mix ⁽²⁾ Design Compressive Strength (psi)			Proportions Coarse ⁽¹⁾ Aggregate Solid Volume (cu. ft./cu. yd.)	28-Day Structural Design Compressive Strength (psi)
		Min.	Max.		Days				
					3	7	28		
AAA	Bridge Deck	634.5 ⁽⁴⁾	752	0.43	—	3,600	4,500	—	4,000
AA	Slip Form Paving ⁽⁷⁾	587.5	752	0.47	—	3,000	3,750	11.00-13.10	3,500
AA	Paving	587.5	752	0.47	—	3,000	3,750	9.93-13.10	3,500
AA	Accelerated Patching ⁽⁸⁾	587.5	752 800	0.47	---	---	3,750	9.93-13.10	3,500
AA	Structures and Misc.	587.5	752	0.47	—	3,000	3,750	9.93-13.10	3,500
A		564	752	0.50	—	2,750	3,300	10.18-13.43	3,000
C		394.8	658	0.66	—	1,500	2,000	11.45-15.10	2,000
HES		752	846	0.40	3,000	—	3,750	9.10-12.00	3,500

Notes 1 and 3 pertain to structure and miscellaneous concrete only.

- (1) Proportions shown in the table are shown on the reverse side of Form TR 4221-B and are controlled by class of concrete, fineness modulus of fine aggregate (PTM No. 501) and the solids percent in coarse aggregate (PTM No. 617).
- (2) Test Procedures: Slump—AASHTO T 119; Strength—PTM No. 604, Compressive.
- (3) For use in miscellaneous or structural concrete, if the Fineness Modulus (FM) is between 2.3 and 2.5, increase the minimum cement factor for the class of concrete 47 lbs/cu. yd. This requirement may be waived after adequate strength data is available and analyzed according to the mix-design section in Bulletin 5.
- (4) If mixing bridge deck concrete with a truck mounted volumetric plant, use a minimum cement factor of 658 lbs/cu. yd.
- (5) For exception, see Section 704.1(c).
- (6) If a portion of the cement is replaced by pozzolan, use a water to cement plus pozzolan ratio by weight.
- (7) For slip form paving, provide No. 57 coarse aggregate that has a minimum of 35% passing the 1/2-inch sieve. Base these results on the average of three samples, with no single sample result below 30% passing. Conduct testing at the concrete plant according to the QC Plan. Segregated stockpiles may be reworked and retested if material fails to conform to this requirement.
- (8) For accelerated cement concrete, submit mix design, as specified, Section 704.1(c), having a minimum target value compressive strength of 10 MPa (1,500 pounds per square inch) at 7 hours when tested according to PTM No. 604.