

2020 Standard Specifications for Construction

Division 10 – Concrete Mixtures

Why bring back Concrete Mixtures Division?

- Intended to put all general concrete information in one place
- Roll 12SP-604B into the 2020 Spec Book
- Combine inspection guidelines, batch plant and mixing requirements, concrete grades, and other mixtures
- Not covered is precast, construction specifications, and “Unique” mixes (like 5000psi mixes)

General Outline

- 1001 – Concrete Equipment and Facilities (601)
- 1002 – Contractor Quality Control for Concrete (604/12SP604B)
- 1003 – Quality Assurance (Acceptance) for Concrete (605/12SP604B)
- 1004 – Portland Cement Concrete Mixtures (601/701/12SP604B)
- 1005 – Mortar and Grout Mixtures (702)
- 1006 – Patching, Repair, and Overlay Mixtures (703)

1001 – Concrete Equipment and Facilities

- Covers most of 601 with small editorial changes
- Covers the concrete production process from the bins to the allowable water that may be added at the jobsite.
- Does not address mix designs or work progress specimens.

1001 – Concrete Equipment and Facilities

Notable Change:

The low temperature for time was increased from 60° to 65°

Table 1001-1 Time Between Charging Mixer and Placing Concrete (a)			
Type of Unit	Concrete Temperature (ASTM C 1064)		
	<65 °F	65 °F – 85 °F	>85 °F
Open Top Trucks (b)	60	45	30
Open Top Agitating Units (b)	60	60	30
Closed Top Agitating Units and Truck Mixers	90	60	45
Truck Mixers and Closed Top Agitating Units with Concrete Containing Retarding Admixture (c)	120	90	70

a. Times shown in this table are in minutes.
b. Not allowed for structural concrete.
c. Superstructure concrete must meet the time limits for closed top agitating units and truck mixers.

1002 – Contractor Quality Control for Concrete

- Almost entirely from 12SP-604B with a few snippets from 601
- All QC related information from 12SP-604B except what is directly involved with PWL analysis.

1003 – Quality Assurance (Acceptance) for Concrete

- Entirely from 12SP-604B
- All QA related content from 12SP-604B except that is directly about PWL analysis

1004 – Portland Cement Concrete Mixtures

- Comprised of 12SP-604B and sections 601 and 701 from the Standard Specifications
- Condensed 11 grades of concrete down to 7
- Cover all concrete grade information (cementitious materials, optimized aggregate, etc.)

1004 – Portland Cement Concrete Mixtures

Significant Changes:

- Replaced modified (M) with high performance (HP)
- Optimized Aggregate required for pumped concrete, except tremie
- Nomenclature of concrete grades (e.g. Grade 3500 instead of P1)

Mix Table Conversion

New Concrete Grades	3000	3500	3500HP	4000	4000HP	4500	4500HP
Old Concrete Grades	S3, P2	S2, P1, T	S2M, P1M	S1	S1M	D	DM
Applications	Base Course, shoulders, temporary pavement, storm sewers, drainage structures, sidewalk, ramps, glare screen, foundations for lights and sign supports, shared use paths, fencing, sign support foundations, slope protection, paved ditches	Pavement, miscellaneous pavement, overlay, miscellaneous overlay, base course, shoulders, temporary pavement, structure concrete placed under water, substructure, drilled shafts, underwater drilled shafts, pavement repair, pipe culverts, driveways, steel bridge rehabilitation, curb, gutter, divider, sidewalk, ramps, steps, cantilever and truss sign support foundations, encased conduit	High performance Pavement, miscellaneous pavement, overlay, miscellaneous overlay, base course, shoulders, temporary pavement, pavement repairs, filler walls, pavement repair, pipe culverts, driveways, steel bridge rehabilitation, curb, gutter, divider, sidewalk, ramps, steps, cantilever and truss sign support foundations, encased conduit	Cast-In-Place (CIP) piles	Cast-In-Place (CIP) piles	Superstructure, bridge railings, filler walls	Superstructure, bridge railings, filler walls

Table 1004-1 Concrete Mixtures

Concrete Grade		3000	3500	3500HP	4000	4000HP	4500	4500HP	M	X
Compressive Strength (psi)	7 day	2200	2600	2600	3000	3000	3200	3200	Commercial grade concrete containing 517 lb/cyd. Portland cement may be replaced with an SCM.	Unless otherwise specified, Grade X concrete contains 282 lb/cyd of cement.
	28 day	3000	3500	3500	4000	4000	4500	4500		
	70%	2100	2450	2450	2800	2800	3150	3150		
Flexural Strength (psi)	7 day	500	550	550	600	600	625	625		
	28 day	600	650	650	700	700	750	750		
	70%	420	455	455	490	490	525	525		
Slump (in)		a, b, d, f	a, b, d, f, h, i, j, k, l	a, b, d, f, h, i, j, k, l	c, e, g	c, e, g	b, d, f	b, d, f		
Cementitious Material Content (lbs/cyd)		489-517	517-611 m	470-564 m	517-611	517-611	517-658	517-658		
Class of Coarse Aggregate		n, r, s								
Maximum w/cm Ratio		0.45								
Air Content Range (percent)		5.5–8.5								
Section Reference		402, 403, 602, 803, 804, 806, 808, 810, 813, 814, 819	401, 602, 603, 705, 706, 712, 713, 718, 801, 802, 803, 810, 819	401, 602, 603, 706, 712, 713, 718, 801, 802, 803, 810, 819	705, 922	705, 922	706, 711, 712	706, 711, 712	N/A	N/A
a. 0-3 inch slump for mixtures for pavements. b. 0-3 inch slump without admixtures or with Type A or D admixture. c. 3-5 inch slump without admixtures or with Type A or D admixture. d. 0-6 inch slump after the addition of Type MR admixture. e. 3-6 inch slump after the addition of Type MR admixture. f. 0-7 inch slump after the addition of Type F or G admixture. g. 3-7 inch slump after the addition of Type F or G admixture. h. 3-7 inch slump for tremie applications without admixture or with Type A or D admixture. i. 3-7 inch slump for tremie applications after the addition of Type MR admixture. j. 3-8 inch slump for tremie applications after the addition of Type F or G admixture. k. 6-8 inch slump for dry placed drilled shafts. l. 7-9 inch slump for wet placed drilled shafts. m. For concrete pavement repair mixtures, use 658 lbs/cyd of cement when the weather is forecast to be above 50°F. or 752 lbs/cyd when the weather is forecast to be 50° or below.					n. Use aggregates from only geologically natural sources for pavement, Shoulder, miscellaneous pavement (including ramps), concrete pavement overlay, Bridge approach slab, structural concrete, drilled shaft, Bridge railing, and Bridge Sidewalk applications. o. HP stands for High Performance. p. HP mixtures require optimized gradation meeting subsection 1004.03.C. q. HP mixtures require 25 to 40 percent replacement of Portland cement with a SCM. r. Unless otherwise required, use Coarse Aggregate 6AA or 17A for exposed structural concrete in Bridges, retaining walls, and pump stations. s. The flexural and compressive strengths are not part of the Specifications but are listed for informational purposes only and are the minimum strengths anticipated for the mix proportions specified for the various grades of concrete when cured under standard conditions.					

1005 – Mortar and Grout Mixtures

- Moved in its entirety from Section 702 of the 2012 Standard specifications for construction.
- Two differences:
 - Rewording of the third paragraph of 702.03 (now 1005.03)
 - Maintain a temperature of 45°F or higher during curing period.

1006 – Patching, Repair, and Overlay Mixtures

- Moved in its entirety from Section 703 of the 2012 Standard Specifications for Construction
- Major change is the addition of Grade P-NC Pavement Repair Mixture
- Minor changes in the sequence, such as where latex curing is located

Questions?

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