WACA/WSDOT Meeting
Minutes for Wednesday, December 11, 2013

Bruce Chattin – WACA	Rob Shogren - Lafarge	Keith Muhich - Miles
Tamson Omps – CalPortland	Neil Guptill – CalPortland	Kevin Wolf – CalPortland
Craig Matteson – CPM-Oldcastle	Kurt Williams – WSDOT	Mike Polodna – WSDOT
Mark Gaines – WSDOT	Monica Jones – Lafarge	Tom Weist – Oldcastle
Peter Balick - Cadman		

Location: WACA's Office in Des Moines

Next WACA Meeting Date:
Wednesday, March 5, 2014 at WSDOT HQ Mats Lab, Main Conf Room, 9:30 AM – Noon

Future WACA Meetings Dates:
Wednesday, June 4, 2014 at WACA's Office in Des Moines, 9:30 AM – Noon
Wednesday, September 10, 2014 at WSDOT HQ Mats Lab, Main Conf Room, 9:30 AM – Noon
Wednesday, December 3, 2014 at WACA's Office in Des Moines, 9:30 AM – Noon

Meeting Minutes are available at:
http://www.wsdot.wa.gov/Business/MaterialsLab/WACAMinutes.htm

Announcements: *Kurt reviewed staffing changes at WSDOT. Tom Baker our former State Materials Engineer is now the State Bridge Engineer. Kurt Williams is now the State Materials Engineer.*

Mike asked that any comments on the September 11, 2013 WACA/WSDOT minutes be emailed to him by 12-17-13.

Issue: Standard Specification 9-23.8 Waterproofing –Jason Brewer/Scott Diloreto
Are changes needed to this specification? Should WSDOT be specifying ASTM C 1585 instead of ASTM C 642?

12-11-13 – Mike and Scott have worked on the spec. Mike still needs to review the test procedure proposed by BASF (DIN 1048 Part 5).

9/11/13 - Scott DiLoreto and Mike P will meet to work on the specification.

Action Plan: Continue the discussion at the next meeting.

Issue: Trial Batches for Concrete Overlay Mixes in WSDOT 6-09.3(3)B & C – Craig Matteson

The original concern about trial batches has been resolved. The remaining issue is whether a slag overlay will be included in the specifications.

12/11/13 – Kurt discussed this with the bridge office and they are going to performance specs for the overlay mixes. Rob Shogren will propose tests to include in the performance specs. A permeability limit will need to be included. Mark Gaines inquired about bond testing and will investigate if this should be included. Kevin Wolf said that ODOT used to run bond testing and no longer does so.

9/11/13 – Monica Jones distributed her thesis on the Tonasket Bridge Deck, Bridge Deck Cracking and Concrete Overlays for review. Kurt Williams will set up a meeting with Tom Baker, Rob Shogren, and Mark Gaines to discuss moving overlay mixes from prescriptive to performance specifications.

6/12/13 – John Harris will forward Monica Jones's thesis on slag overlays to WSDOT to aid in the decision on adding slag overlays to the standard specifications.

Action Plan: Continue the discussion at the next meeting.

Issue: Acceptance of Pumped Concrete – Bruce Chattin

It is well known that pumping can change the air content of the concrete. WSDOT requires that sampling be conducted from the end of the delivery system, after the concrete is pumped, and leaves it to the contractor to determine how to get it there within the required specification.

12/11/13 – Mark Gaines presented proposed changes to WSDOT Standard Specification 6-02.3(10)A Preconstruction Meeting and to WSDOT Construction Manual Section 6-2.3B Bridge Deck Construction requiring that a representative of the pumping company attend the preconstruction meeting. Minor changes to the wording of the specification were made during the meeting. No one objected to the changes so Mark was going to take the changes to the WSDOT/AGC meeting on Friday 12-13-13 and implement them if they are in agreement.

Bruce Chattin proposed adding language requiring the pumping equipment to be in "good working order". Kurt stated that WSDOT would need an enforceable standard and asked if there was one available. No one knew of such a standard. WACA will propose spec language to enforce "good working order".

9/11/13 – Craig Matteson reported his summer's experience with pumped deck concrete. They placed 1200 cy since June and lost no loads. They typically gained from 2 – 5 degrees through the pump. He reported that they had good pre-construction meetings where they discussed how to obtain samples prior to placement. He also noted that they only have 1 pumping company on the east side. Test pours help to fine tune the placement. Craig suggested that the WSDOT

cylinder test report include the truck ticket # to make it easier to trace the report back to the actual concrete load. WSDOT will consider this.

Bob Raynes reported placement of 6000cy on I-205 and I-5 with no lost loads. They pre-tested the concrete and the pump at the concrete plant. The increased communication has helped. He suggested that an FOP for sampling from the pump would be helpful.

Mark Gaines would like to see requirement that everyone involved in concrete placement attend pre-pour meetings. He will draft changes to the WSDOT Construction Manual and review the sampling procedure. Once completed Kurt will send it out to all for review.

6/12/13 – Two handouts from the 4/19/13 AGC & WACA Tech Committee Meeting were distributed. Bruce gave an update on the meeting. Bob Raynes reported that they had a good discussion with the pumpers. WACA will identify variables from the summer 2013 pumping season and develop a "best practices" list for discussion at the September AGC meeting. Bruce reported that Stuart Bennion was looking into research to test the air in hardened concrete and is working to secure funding.

Action Plan: Continue discussion at the next meeting.

Issue: WSDOT Standard Specification 1-06.3 Manufacturer's Certification of Compliance – Greg McKinnon

Greg McKinnon of Stoneway Concrete inquired if the "corporate official" part of this specification applies to concrete.

The Manufacturer's Certificate of Compliance must identify the manufacturer, the type and quantity of material being certified, the applicable Specifications being affirmed, and the signature of a responsible corporate official of the manufacturer and include supporting mill tests or documents. A Manufacturer's Certificate of Compliance shall be furnished with each lot of material delivered to the Work and the lot so certified shall be clearly identified in the certificate."

12/11/13 – Observe operation of a concrete plant in Dupont to determine how to proceed.

9/11/13 – Kurt proposed that WSDOT attend a field trip to watch an automated plant operate. Kevin Wolf will arrange a field trip to Dupont.

6/12/13 – Kurt Williams inquired about commercial concrete and all agreed that would be a truck ticket only with no signature. Manual plants would require a signature. Anthony Sarhan will check what other states are doing with Minnesota a possibility. Kurt will edit the spec with the goal of getting it into the 2014 book in January.

Action Plan: Continue the discussion at the next meeting.

Issue: Changes to the Concrete Mix Design Form – Mike Polodna

Items to be addressed include: location to enter chloride ion content; location for more break data and ACI 318 equations; add checkbox for 4000A mixes; contractor to indicate whether they

are using Combined Gradation to include the NMS, or AASHTO Gradations; update the Notes section; clean up confusion on ASR results row.

12/11/13 – Mike Polodna handed out proposed changes to the mix design form and asked for comments. He will make an electronic version available on the WSDOT forms website and asked people to experiment with it and let him know what they think.

9/11/13 – Bob Raynes suggested that the remarks section be made larger as well as adding a place for air content range and slump range. Others pointed out that when you check "other" it fills out the admixture section and that it would be nice if you could tab or enter through the form. Mike stated that these are FileMaker forms and he will see if the entry issues can be addressed when the form is updated. Bob would like better instructions on what is required to be included with the submittal. He said there is a federal form that works well and will send that to Mike for review.

Action Plan: Review comments at the next meeting.

Issue: Proposed Changes to WSDOT Std Spec 6-02.3(5)H Sampling and Testing for Compressive Strength and Initial Curing – Kurt Williams
The spec is being revised to provide better direction on the requirements for cure boxes. The proposed wording was provided in a handout.

12/11/13 – Kurt handed out the proposed changes. These changes will be discussed at the WSDOT/ACG meeting on 12-13-13. The final version will be distributed to WACA.

9/11/13 – John Harris attested to high temperatures in non-standard boxes.

Action Plan: Issue complete.

New Issues: Proposed Changes to WSDOT Standard Specifications

6-02.3(5)C Conformance to Mix Design
The conformance requirements are being adjusted to match the requirements in ACI 117 Section 2.4.

12/11/13 – See handout for proposed changes. Kurt asked for help updating this specification to match the NRMCA tolerances. Kevin Wolf stated that the tolerances are a guide for batching consistency and that producers are not 100% in tolerance all day and that slight variations should not be cause for rejection.

Action Plan: Tabled. Remove from agenda.

6-02.3(17)O Early Concrete Test Cylinder Breaks
Many early break cylinders are being sent to labs for curing. This change emphasizes the requirement for field curing.

12/11/13 – See handout for proposed changes.During our Materials Management Training we learned that a lot of the early break cylinders are being initially cured in the field cure boxes and being sent to the lab for final curing. This change is to emphasize that they should be cured in the field, not in the lab moist room.

Action Plan: Issue complete.

6-10.3(2) Cast-In-Place Concrete Barrier
This change eliminates slump testing. Acceptance will be based on measurements of the barrier as it is placed. Sagging or sluffing of the concrete will be cause for rejection.

12/11/13 – See handout for proposed changes. Change to include slip-form only.

Action Plan: No changes will be implemented. Issue complete.

9-03.1(2)B Grading
Acceptance of concrete aggregate will be based on statistical methods eliminating the need for the allowable variations.

12/11/13 – See handout for proposed changes. Since we have gone to statistical acceptance for all aggregate, this section is not needed.

Action Plan: WSDOT conducting further review.

9-03.1(2)C Use of Substandard Gradings
Acceptance of concrete aggregate will be based on statistical methods eliminating the need for this section.

12/11/13 – See handout for proposed changes. Since we have gone to statistical acceptance for all aggregate, the table with the allowable variations and the wording below are not needed.

Action Plan: Issue completed.

9-03.1(4)C Grading
Acceptance of concrete aggregate will be based on statistical methods eliminating the need for the allowable variations.

12/11/13 – See handout for proposed changes. Since we have gone to statistical acceptance for all aggregate, the notes below the table are not needed.

Action Plan: Issue completed.

9-03.1(5)B Grading
Clarified wording in the footnotes.

12/11/13 – See handout for proposed changes.

Action Plan: Issue completed.

New Issue: Proposed Changes to Cement Acceptance Program (CAP) – Kurt Williams
Review the proposed changes to CAP.

12/11/13 – Kurt proposed meeting with the cement suppliers before the next meeting to review the changes.

Action Plan: Review the status at the next meeting.

New Issue: Proposed Changes to the Pervious Concrete Specification – Bruce Chattin

12/11/13 – Bruce will send proposed changes to Kurt.

Action Plan: Review the proposed changes at the next meeting.

Discussion Topic: Scaling Test for Performance Deck *Concrete - Bruce Chattin spoke for Allan Kramer who wasn't in attendance that he doesn't agree with the scaling test for the performance deck concrete. We discussed that we have already changed the rating from a 1 to a 2 to provide a wider range of acceptance, and that the number of cycles is now specified. Rob Shogren also said that it was important to use good finishing practices per ACI. WSDOT plans no changes to the specification.*

Action Plan: Topic complete.

6-02.3(10) Bridge Decks and Bridge Approach Slabs

6-02.3(10)A Preconstruction Meeting

A pre-concreting conference shall be held 5 to 10 working days before placing deck concrete to discuss construction procedures, personnel, ~~and~~ equipment to be used, and deck curing operations. Those attending shall include ~~:~~the superintendent, foremen in charge of placing and finishing concrete, a representative from the concrete supplier and the pump truck operator.

~~1. (Representing the Contractor) The superintendent and all foremen in charge of placing the concrete, finishing it; and~~

~~2. (Representing the State) The Project Engineer, key inspection assistants, and the State Construction Office.~~

If the project includes more than one bridge deck ~~or slab~~, and if the Contractor's key personnel change between concreting operations, or at request of the Engineer, ~~an~~ additional conference~~s~~ shall be held ~~just~~ before each deck ~~or slab is~~ placement~~d~~.

~~The Contractor shall not place bridge decks until the Engineer agrees that:~~

~~1. Concrete producing and placement rates will be high enough to meet placing and finishing deadlines,~~

~~2. Finishers with enough experience have been employed,~~

~~3. Adequate finishing tools and equipment are at the site, and~~

~~4. Curing procedures consistent with the Specification requirements are employed.~~

6-02.3(10) Bridge Decks and Bridge Approach Slabs

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A pre-concreting conference shall be held 5 to 10 working days before placing deck concrete to discuss construction procedures, personnel, equipment to be used, and deck curing operations. Those attending shall include the superintendent, foremen in charge of placing and finishing concrete, a representative from the concrete supplier and ~~the pump truck operator.~~ representative of the pump company.

If the project includes more than one bridge deck, and if the Contractor's key personnel change between concreting operations, or at request of the Engineer, additional conferences shall be held before each deck placement.

Washington State Department of Transportation

Concrete Mix Design

Contractor	Submitted By	Date
Joe's Bulldozing	Joe	12/6/2013
Concrete Supplier	**Plant Location**	
Joe's Ready Mix	Behind Joe's House	
Contract Number	**Contract Name**	
009999	The Road to Nowhere - Phase 1	

This mix is to be used in the following Bid Item No(s): 100.24, 100.25

Concrete Class: Other - Define in Remarks

Remarks: Performance-based mix that will have a 28-day strength of 7500 psi, shrinkage of less than 300 microstrain, and chloride ion permeability of less than 1000 coulombs.

Mix Design No. 999-24-13b **Plant No.** 1

Cementitious Materials	Source	Plant	Type, Class or Grade	Sp. Gr.	Lbs/cy
Cement	Generic Cement	Tumwater	AASHTO M 240 Type IS(30)	3.15	564
Fly Ash [a]	Generic Ash	Seattle	☒ F ☐ C Alkali % 1.20	2.19	100
GGBFS (Slag) [a]			☐ 100 ☐ 120		

Concrete Admixtures	Manufacturer	Product	Est. Range (oz/cy)
Air Entrainment			
Accelerating Type C	Faster Concrete Products	FastSet	10-20
Specific Performance Type S	Shrinkage Reducing	SRA 100	50

Water (Maximum) 280 lbs/cy

Is any of the water Recycled or Reclaimed? ☐ Yes[d] ☒ No

Water Cementitious Ratio (Maximum) 0.43

Mix Design Density (pcf) (Concrete Pavement Only)

Design Performance (Attach Test Data)

Average 28-day compressive strength (psi) 4500

Average 14-day flexural strength (psi) (Concrete Pavement Only)

Concrete Chloride Ion Content (% by mass of cement) 0.015 ☒ Water Soluble ☐ Acid Soluble

Agency Use Only (Check appropirate Box)

☐ **This Mix Design MEETS CONTRACT SPECIFICATIONS and may be used on the bid items noted above**

☐ **This Mix Design DOES NOT MEET CONTRACT SPECIFICATIONS and is being returned for corrections**

Reviewed By: _____ _____

PE Signature Date

DOT Form 350-040 EF
Revised 6/06

Distribution: Original - Contractor
Copies To - State Materials Lab-Structural Materials Eng. ; Regional Materials Lab; Project Inspector

Mix Design No. 999-24-13b **Plant No.** 1

Aggregate Gradation ☒ AASHTO ☐ Combined **Nominal Maximum Size (In)** 1 1/2

Aggregates	1	2	3	4	5	Total
WSDOT Source No. [b]	B532	B321				
Source Expiration Date [b]	12-12-12	1-13-12				
ASR Expansion (%) [b] ☒ 14 Day ☐ 1 Year	0.21%	0.67				
Is ASR Mitigation Required?	Yes	Yes				
Stock Pile Grading [c]	Class 2	467				
Percent of Total Aggregate	35	65				100
Specific Gravity	1.678	1.721				
Lbs/cy (ssd)	1500	2500				4000

Include Percent Passing for each aggregate component. Include Total only for Combined Gradations.	**Percent Passing**					**Total**
2 inch						
1-1/2 inch		100				
1 inch		95				
3/4 inch		65				
1/2 inch		50				
3/8 inch		25				
No. 4	100	3				
No. 8	95					
No. 16	60					
No. 30	40					
No. 50	20					
No. 100	8					
No. 200	2					

Fineness Modulus: 2.85 (Required for Class 2 Sand)

Proposed ASR Mitigation Method : 15% Class F fly ash - see attached ASTM C 1567 test results.

Notes:

a Fly ash or GGBFS is required for Class 4000D and 4000P mixes.

b Enter data from WSDOT ASA Database. ASR Mitigation is required for sources with 14-day expansions greater than 0.20%. No mitigation is required if the 1-year expansion is 0.04% or less. Proposed mitigation methods for 14-day expansions greater than 0.45% require ASTM C 1567 tests proving that the method is effective. See WSDOT Standard Specification 9-03.1.

c Stockpile gradation: AASHTO No. 467, 57, 67, 7, 8; WSDOT Class 1, Class 2; or combined gradation stockpile sizes. See WSDOT Standard Specification 9-03.1.

d Attach test results indicating conformance to Standard Specification 9-25.1.

6-02.3(5)H Sampling and Testing for Compressive Strength and Initial Curing

Acceptance testing for compressive strength shall be conducted at the same frequency as the acceptance tests for temperature, consistency, and air content.

The Contractor shall provide and maintain a sufficient number of cure boxes in accordance with WSDOT FOP for AASHTO T 23 for curing concrete cylinders. The cure boxes shall be readily accessible and no more than 500 feet from the point of acceptance testing, unless otherwise approved by the Engineer. The Contractor shall also provide, maintain and operate all necessary power sources and connections needed to operate the cure boxes. The cure boxes shall be in-place and functioning at the specified temperature for curing cylinders prior to concrete placement. Concrete cylinders shall be cured in the cure boxes in accordance with WSDOT FOP for AASHTO T 23. The cure boxes shall have working locks and the Contractor shall provide the Engineer with one key to each of the locks. Once concrete cylinders are placed in the cure box, the cure box shall not be disturbed until the cylinders have been removed. The Contractor shall retain the cure box Temperature Measuring Device log and provide it to the Engineer upon request.

The Contractor shall protect concrete cylinders in cure boxes from excessive vibration and shock waves during the curing period in accordance with Section 6-02.3(6)D.

All cure box costs shall be incidental to the associated item of work.

Batch Volumes less than or equal to 4 cubic yards		
Cement	+5%	-1%
Aggregate	+10%	-2%
Batch Volumes more than 4 cubic yards		
Cement	+5%	-1%
Aggregate	+2%	-2%

If the total cementitious material weight is made up of different components, these component weights shall be within the following tolerances:

1. Portland cement weight plus 5 percent or minus 1 percent of that specified in the mix design.
2. Fly ash and ground granulated blast furnace slag weight plus or minus 5 percent of that specified in the mix design.
3. Microsilica weight plus or minus 10 percent of that specified in the mix design.

Water shall not exceed the maximum water specified in the mix design.

6-02.3(5)D Test Methods

Acceptance testing will be performed by the Contracting Agency in accordance with the WSDOT *Materials Manual* M 46-01. The test methods to be used with this Specification are:

WSDOT FOP for AASHTO T 22	Compressive Strength of Cylindrical Concrete Specimens
WSDOT FOP for AASHTO T 23	Making and Curing Concrete Test Specimens in the Field
WSDOT FOP for AASHTO T 119	Slump of Hydraulic Cement Concrete
FOP for WAQTC TM 2	Sampling Freshly Mixed Concrete
WAQTC FOP for AASHTO T 152	Air Content of Freshly Mixed Concrete by the Pressure Method
WSDOT FOP for AASHTO T 231	Capping Cylindrical Concrete Specimens
WSDOT FOP for AASHTO T 309	Temperature of Freshly Mixed Portland Cement Concrete

6-02.3(5)E Point of Acceptance

Determination of concrete properties for acceptance will be made based on samples taken as follows:

Bridge decks, overlays, bridge approach slabs, and barriers at the discharge of the placement system. All other placements at the truck discharge.

It shall be the Contractor's responsibility to provide adequate and representative samples of the fresh concrete to a location designated by the Engineer for the testing of concrete properties and making of cylinder specimens. Samples shall be provided as directed in Sections 1-06.1 and 1-06.2. Once the Contractor has turned over the concrete for acceptance testing, no more mix adjustment will be allowed. The concrete will either be accepted or rejected.

6-02.3(5)F Water/Cement Ratio Conformance

The actual water cement ratio shall be determined from the certified proportions of the mix, adjusting for on the job additions. No water may be added after acceptance testing or after placement has begun, except for concrete used in slip forming. For slip-formed concrete, water may be added during placement but shall not exceed the maximum water cement ratio in the mix design, and shall meet the requirements for consistency as described in Section 6-02.3(4)C. If water is added, an air and temperature test shall be taken prior to resuming placement to ensure that Specification conformance has been maintained.

SPECIFICATION

2.4—Concrete batching

Refer to Table 2.4.

Table 2.4—Concrete batching tolerances (ASTM C94/C94M)

Material	Tolerance
Cementitious materials	
30% of scale capacity or greater	±1% of required mass
Less than 30% of scale capacity	–0 to +4% of the required mass
Water	
Added water or ice, and free water on aggregates	±1% of the total water content (including added water, ice, and water on aggregates)
Total water content (measured by weight or volume)	±3% of total water content
Aggregates	
Cumulative batching:	
Over 30% of scale capacity	±1% of the required mass
30% of scale capacity or less	±0.3% of scale capacity or 3% of the required mass, whichever is less
Individual material batching	±2% of the required mass
Admixtures	±3% of the required amount or plus or minus the amount of dosage required for 100 lb of cement, whichever is greater

2.5—Concrete properties

2.5.1 *Slump*

Where slump is specified as "maximum" or "not to exceed"
For all values.....+0 in.

Specified slump 3 in. or less.....–1-1/2 in.

Specified slump more than 3 in.....–2-1/2 in.

Where slump is specified as a single value
Specified slump 2 in. and less..... ±1/2 in.

Specified slump more than 2 in. but not greater than 4 in.....±1 in.

Specified slump more than 4 in.....±1-1/2 in.

Where slump is specified as a range.....no tolerance

COMMENTARY

R2.4—Concrete batching

Refer to ASTM C94/C94M and ACI 304.6R for additional information regarding concrete batching. ASTM C685/C685M provides information for concrete made with materials continuously batched by volume. The Volumetric Mixer Manufacturers Bureau (VMMB 100) provides standardized information concerning volumetric mixers.

R2.5—Concrete properties

R2.5.1 Where the specification has specified slump as a maximum, the Project Specifications should provide for one addition of water at the job site for slump adjustment, per ASTM C94/C94M, Section 6. Concrete slump should include a tolerance that allows for both plus or minus deviations so that concrete slumps are not underdesigned to avoid rejection. The water added at the job site should be within the water-cementitious material ratio (*w/cm*) limitations of the specifications or approved mixture proportions.

Flowing concrete achieved by the incorporation of high-range water-reducing admixtures (HRWRAs) (also called superplasticizers) are regularly used at specified slumps of 7-1/2 in. or greater. In addition, it is difficult to measure high slumps accurately. Consideration should be given to eliminating a maximum slump when a HRWRA is used to achieve flowing concrete. When HRWRAs are used, concrete slump should be specified for the concrete mixture prior to the addition of the HRWRA.

The slump specified should always be evaluated to determine if it is suitable for delivery, placing, and reinforcement clearance.

6-02.3(17)O Early Concrete Test Cylinder Breaks

The fabrication, curing, and testing of the early cylinders shall be the responsibility of the Contractor. Early cylinders are defined as all cylinders tested in advance of the design age of 28 days whose purpose is to determine the in-place strength of concrete in a Structure prior to applying loads or stresses. The Contractor shall retain a testing Laboratory to perform this Work. Testing Laboratories' equipment shall be calibrated within 1 year prior to testing and testers shall be either ACI certified or qualified in accordance with AASHTO R 18.

The concrete cylinders shall be molded in accordance with WSDOT FOP for AASHTO T 23 from concrete last placed in the forms and representative of the quality of concrete placed in that pour.

The cylinders shall be cured in the field in accordance with WSDOT FOP for AASHTO T 23 Section 10.2 Field Curing.

The concrete cylinders shall be tested for compressive strength in accordance with AASHTO T 22. The number of early cylinder breaks shall be in accordance with the Contractor's need and as approved by the Engineer.

The Contractor shall furnish the Engineer with all test results, proof of equipment calibration, and tester's certification. The test results will be reviewed and approved before any forms are removed. The Contractor shall not remove forms without the approval of the Engineer.

All costs in connection with furnishing cylinder molds, fabrication, curing, and testing of early cylinders shall be included in the unit Contract prices for the various Bid items of Work involved.

Rational, during our Materials Management Training, we learned that a lot of the early break cylinders are being cured in the field cure boxes and being sent to the lab for curing until they are broke. This change is to just emphasize the field curing.

6-10.3(2) Cast-In-Place Concrete Barrier

Forms for cast-in-place concrete barrier, including traffic barrier, traffic-pedestrian barrier, and pedestrian barrier on bridges and related Structures, shall be made of steel or exterior plywood coated with plastic. The Contractor may construct the barrier by the slip-form method.

The barrier shall be made of Class 4000 concrete that meets the requirements of Section 6-02, except the following:~~that~~

1. The fine aggregate gradation used for slip-form barrier may be either Class 1 or 2.
2. The Contractor may use portland cement Type III at no additional expense to the Contracting Agency.
3. The testing for slump is not required. The materials shall be mixed with sufficient water to produce a stiff concrete which will hold its shape. Any sagging or sluffing of the concrete in excess of ¼ inch shall be corrected before the concrete has hardened. If the sagging or sluffing of the concrete on any 1 foot or greater length of hardened concrete exceeds 1 inch, the concrete shall be repaired or removed and replaced.

Rational: The consistency of concrete used for slip form will be selfgoverning, if it is too wet: it will not hold its shape. The slump test serves no purpose and should be eliminated.

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9-03.1(2)B Grading

Fine aggregate shall be graded to conform to the following requirements expressed as percentages by weight:

	Class 1 Percent Passing		Class 2 Percent Passing	
Sieve Size	**Min.**	**Max.**	**Min.**	**Max.**
⅜"	99	100	99	100
No. 4	95	100	95	100
No. 8	68	86		
No. 16	47	65	45	80
No. 30	27	42		
No. 50	9	20	10	30
No. 100	0	7	2	10
No. 200	0	2.5	0	2.5

~~For fine aggregate Class 1, individual test variations under the minimum or over the maximum will be permitted as follows, provided the average of three consecutive tests is within the Specification limits:~~

~~Sieve Size~~	~~Permissible Percent of Variation in Individual Tests~~
No. 30 and coarser	2
~~No. 50 and finer~~	~~0.5~~

~~Within the gradation limits for fine aggregate Class 2, uniformity of gradation shall be limited to a range of plus or minus 0.20 of the reference fineness modulus. The reference fineness modulus shall be determined from a representative sample from the proposed source as submitted by the Contractor.~~

Rationale: Since we have gone to statisticial acceptance for all aggregate, his section is not needed.

Since fineness modulus is a measure of the workability of the concrete, and we do not check the fineness modulus for combined gradation and class 1 sand, it should be up to the Contractor to design a mixture that they can use and gives a satisfactory finish. Therefore this section should be removed.

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9-03.1(2)C Vacant ~~Use of Substandard Gradings~~

~~Fine aggregate with more than the maximum percentage passing any sieve may be accepted provided the cement content of the finished concrete is increased at the Contractor's expense, ½ percent for each 1 percent the fine aggregate passing each sieve is in excess of the maximum.~~

~~Under no circumstances shall fine aggregate Class 1 be used which has a grading finer than the following:~~

~~Sieve Size~~	~~Percent Passing~~
~~No. 8~~	~~95~~
~~No. 16~~	~~80~~
~~No. 30~~	~~60~~
~~No. 50~~	~~25~~
~~No. 200~~	~~2.5~~
~~All percentages are by weight.~~	

Rational: Since we have gone to statisticial acceptance for all concrete aggregate, his section is no longer needed.

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9-03.1(4)C Grading

Coarse aggregate for portland cement concrete when separated by means of laboratory sieves shall conform to one or more of the following gradings as called for elsewhere in these Specifications, Special Provisions, or in the Plans:

Passing	AASHTO Grading No. 467		AASHTO Grading No. 4		AASHTO Grading No. 57		AASHTO Grading No. 67		AASHTO Grading No. 7		AASHTO Grading No. 8	
Sieve Size	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
2"	99	100	99	100								
1½"	95	100	90	100	99	100						
1"			20	55	95	100	99	100				
¾"	35	70	0	15			90	100	99	100		
½"					25	60			90	100	99	100
⅜"	10	30	0	5			20	55	40	70	85	100
No. 4	0	5			0	10	0	10	0	15	10	30
No. 8					0	5	0	5	0	5	0	10
No. 16											0	5
All percentages are by weight.												

~~In individual tests, a variation of four under the minimum percentages or over the maximum percentages will be permitted, provided the average of three consecutive tests is within the Specification limits. Coarse aggregate shall contain no piece of greater size than two times the maximum sieve size for the specified grading measured along the line of greatest dimension.~~

~~When the Engineer approves, the coarse aggregate may be blended from other sizes if:~~

~~1. The resulting aggregate meets all requirements for the approved grading;~~

~~2. Each size used makes up at least 5 percent of the blend; and~~

~~3. The Contractor supplies the Engineer with gradings for the proposed sizes, along with their proper proportions.~~

Rational: Since we have gone to statisticial acceptance for all concrete aggregate, his section is no longer needed.

9-03.1(5)B Grading

If a nominal maximum aggregate size is not specified, the Contractor shall determine the nominal maximum aggregate size, using ACI 211.1 as a guide. In no case will the maximum aggregate size exceed one-fifth of the narrowest dimension between sides of the forms, one-third the depth of slabs, nor three-fourths of the minimum clear spacing between individual reinforcing bars, bundles of bars, or pretensioning strands.

The combined aggregate shall conform to the following requirements based upon the nominal maximum aggregate size.

Nominal Maximum Aggregate Size	3	2-½	2	1-½	1	¾	½	⅜	No. 4
3½"	99-100								
3"	93-100*	99-100							
2½"		92-100*	99-100						
2"	76-90		90-100*	99-100					
1½"	66-79	71-88		87-100*	99-100				
1"	54-66	58-73	64-83		82-100*	99-100			
¾"	47-58	51-64	55-73	62-88		87-100*	99-100		
½"	38-48	41-54	45-61		57-83		81-100*	99-100	
⅜"	33-43	35-47	39-54	43-64		60-88		86-100*	99-100
No. 4	22-31	24-34	26-39	29-47	34-54	41-64	48-73		68-100*
No. 8	15-23	16-25	17-29	19-34	22-39	27-47	31-54	39-73	
No. 16	9-17	10-18	11-21	12-25	14-29	17-34	20-39	24-54	28-73
No. 30	5-12	6-14	6-15	7-18	8-21	9-25	11-29	13-39	16-54
No. 50	2-9	2-10	3-11	3-14	3-15	4-18	5-21	6-29	7-39
No. 100	0-7	0-7	0-8	0-10	0-11	0-14	0-15	0-21	0-29
No. 200	0-2.0	0-2.0	0-2.0	0-2.0	0-2.0	0-2.0	0-2.0	0-2.0	0-2.5

*Nominal Maximum Size
All percentages are by weight.

Nominal maximum size for concrete aggregate is defined as the smallest standard sieve opening through which the entire amount of the aggregate is permitted to pass. Standard sieve sizes shall be those listed in ASTM C 33.

The Contracting Agency may sample each ~~component~~ aggregate component prior to introduction to the weigh batcher or as otherwise determined by the Engineer. Each ~~separate~~ component will be sieve analyzed ~~alone~~ separately per WSDOT FOP for WAQTC/AASHTO Test Method T ~~27/11~~27/11. All material aggregate components will be mathematically re-combined by the proportions (~~Weighted Average~~percent of total aggregate by weight). ~~on the concrete mix design~~ supplied provided by the Contractor on the Concrete mMix dDesign Form 350-040.