6-02.3(2)A2 Self-Consolidating Concrete (SCC) – Mix Design Checklist for Cl 3000, Cl 4000, Cl 4000P, and Cl 4000W as of January 2022

No.	Requirement	Yes	No	Specification
1	Is the mix design submittal on the most current DOT For 350-040EF? Concrete mix design forms can be accessed at the following link: DOT Form 350-040 Concrete Mix Design (wa.gov)			6-02.3(2)A
2	Is the proposed Batch Plant prequalified? Batch Plant certification can be viewed at the following link: Certifications - NRMCA			6-02.3(4)
3	Is the Concrete Class appropriate for the Bid Item(s) indicated?			6-02.3(1)
4	Is the combination of the Mix Design Number and Plant Number unique to the combination of pit source, Cementitious and admixtures sources, types of admixtures, water/Cementitious ratio, and amount of aggregates?			
5	Is the total water soluble or acid soluble chloride ion contents provided?			6-02.3(2)
6	**Cement**			9-01
	a. Is the cement source and plant participating in the Cement Acceptance Program as evidenced by being listed on the QPL?			9-01.3
	b. Is the amount of cement correct? See table on page 5.			6-02.3(2)
	c. Is the type of cement correct? (Type III cement may be used)			6-02.3(2), 6-02.3(2)A2
	d. If required for ASR, is the cement low-alkali?			9-03.1(1)
	e. Does the mill certification match the source and plant listed on the mix design?			
7	**Fly Ash**			9-23.9
	a. Is the fly ash source and plant participating in the Fly Ash Acceptance Program as evidenced by being listed on the QPL?			9-23.9(1)
	b. Does the fly ash comply with 9-23.9 including optional chemical requirements in AASHTO M 295, Table 2 (available alkalis)?			9-23.9
	1. If not, do test results indicate compliance with Section 9-03.1(1)? (ASTM C 1567 expansion of 0.20% or less). A "yes" here would override section 7.b.			9-23.9
	c. Does the quantity of fly ash comply with 6-02.3(2)? See table on page 5.			6-02.3(2)
	d. Does the mill certification match the source and plant listed on the mix design?			
8	**Ground Granulated Blast Furnace Slag (GGBFS)**			9-23.10
	a. Is the GGBFS source and plant participating in the Ground Granulated Blast Furnace Slag Acceptance Program as evidenced by being listed on the QPL?			9-23.10(1)
	b. Does the GGBFS comply with AASHTO M 302, Grade 100 or Grade 120?			9-23.10
	c. Does the quantity of GGBFS comply with 6-02.3(2)? See table on page 5.			6-02.3(2)
	d. Does the mill certification match the source and plant listed on the mix design?			

9	**Microsilica Fume**			9-23.11
	a. Is the microsilica fume from an approved source by evidence by being listed on the QPL?			
	b. Does the microsilica fume comply with AASHTO M 307			9-23.11
	c. If being used for ASR mitigation, does it comply with the optional physical requirements for Reactivity with Cement Alkalies in the AASHTO M 307, Table 3?			9-23.11
	d. Does the quantity of microsilica fume comply with 6-02.3(2)? See table on page 5.			6-02.3(2)
	e. Does the mill certification match the source and plant listed on the mix design?			
10	**Natural Pozzolan (Metakaolin or Ground Pumice)**			9-23.12
	a. Is the Natural Pozzolan from an approved source by evidence by being listed on the QPL?			
	b. Does the Natural Pozzolan comply with AASHTO M 295 Class N including the optional chemical requirements as set forth in Table 2?			9-23.12
	c. Does the quantity of Natural Pozzolan comply with 6-02.3(2)? See table on page 5.			6-02.3(2)
	d. Does the mill certification match the source and plant listed on the mix design?			
11	**Fine Aggregate** (skip to Item 13 if using Combined Aggregate Gradation)			9-03.1(2)
	a. Is the source approved for use as a fine aggregate for concrete?			ASA database
	b. Is ASR mitigation required for the aggregate source(s)? If "yes" see Item 14.			ASA database, 9-03.1(1)
	c. Does the fine aggregate satisfy the Deleterious Substance requirements in Section 9-03.1(2)A?			9-03.1(2)A
	d. Is the class of fine aggregate indicated on the mix design?			9-03.2(2)B
	e. If Class 2 fine aggregate is proposed, is the fineness modulus included?			9-03.1(2)B
	f. Is the lbs/cy of the fine aggregate indicated on the mix design?			6-02.3(2)A
12	**Coarse Aggregate** (skip to item 13 if using Combined Aggregate Gradation)			9-03.1(4)C
	a. Is the source approved for use as a coarse aggregate for concrete?			ASA database
	b. Is ASR mitigation required for the aggregate source(s)? If "yes" see item 14.			ASA database, 9-03.1(1)
	c. Does the coarse aggregate satisfy the Deleterious Substance requirements in Section 9-03.1(4)A?			9-03.1(4)A
	d. Is the AASHTO Grading indicated on the mix design?			9-03.1(4)C
	e. Is the Nominal Maximum Size (NMS) correct for the Class of Concrete?			6-02.3(2)A
	f. Is the lbs/cy of coarse aggregate indicated on the mix design?			6-02.3(2)A

13	**Combined Aggregate Gradation** (skip if using separate fine and coarse aggregate gradations – see Items 11 and 12)			9-03.1(5)
	a. Are the aggregate sources approved for fine and/or coarse aggregate for concrete?			ASA database
	b. Is ASR mitigation required for the aggregate source(s)? If "yes" see Item 14.			ASA database, 9-03.1(1)
	c. Does the combine aggregate satisfy the Deleterious Substance requirements in Section 9-03.1(5)A?			9-03.1(5)A
	d. Is the NMS of the aggregate indicated on the mix design?			6-02.3(2)
	e. Is the NMS of the aggregate correct for the Class of Concrete?			6-02.3(2)A
	f. Are the percentages and lbs/cy of each component indicated on the mix design?			6-02.3(2)A
	g. Are the gradations for each component and the combined gradation included in the gradation chart?			9-03.1(5)B
	h. Is the combined gradation calculated correctly?			9-03.1(5)B
	i. Does the combined gradation meet the requirements for the indicated NMS?			9-03.1(5)B
14	**Alkali Silica Reactivity (ASR)** See page 5 on guidance ASR mitigation.			9-03.1(1)
	a. Is ASR mitigation required for the aggregate source(s)? If "no" skip to item 15.			ASA database, 9-03.1(1)
	b. Is the proposed mitigation measure included with the mix design?			
	c. Does the proposed mitigation measure comply with the specification, or is it the same as that approved by the State Materials Laboratory?			9-03.1(1)
15	**Admixtures**			9-23.6
	a. If required by the Class of concrete, are the appropriate admixtures included in the mix design?			6-02.3(2)A
	b. Do the proposed admixtures meet the appropriate specification?			9-23.6
	c. Are they listed on the QPL?			QPL
	d. Are the proposed dosages within the manufacturer's recommended limits?			
	e. If the admixtures are from different sources has the Contractor, the included test reports complying with ASTM C 457 indicating that the air void system of the hardened concrete has not been adversely affected?			6-02.3(3)
	f. Type S Specific Performance Admixture			9-23.6(9)
	1. Does the mix design indicate the use of a Type S Admixture? If "No" here proceed to No. 16.			
	2. Is the Type S Admixture being used for either ASR-mitigating, viscosity modifying, shrinkage reducing, rheology-controlling, and workability-retaining admixtures?			9-23.6(9)
	3. Does the mix design contain a report on the performance characteristics of the Type S Admixture?			9-23.6(9)
16	**Water**			9-25
	a. Is the maximum lbs/cy of water indicated on the mix design?			6-02.3(2)A
	b. Is the maximum water/cementitious ratio provided equal to the total water divided by the total Cementitious materials indicated on the mix design?			6-02.3(2)A
	c. If reclaimed water is proposed for use, does it comply with 9-25.1?			9-25.1

17	**Design Performance**			
	a. Compressive Strength			6-02.3(2)A
	1. Are the break data and ACI equations supporting the concrete class attached?			6-02.3(2)A
	2. Does the calculated average compressive strength meet the requirements for the concrete class?			ACI 301, Chapter 4 Section 4.2.3.3
	b. Slump Flow			6-02.3(2)A2
	1. Does the mix design provide the targeted slump flow?			WSDOT FOP for ASTM C 1611
	2. Does the mix design indicate a Visual Stability Index (VSI) less than or equal to 1? Shall be determined using filling procedure B.			Appendix X1 ASTM C 1611
	3. Does the mix design indicate a T50 flow rate less than or equal to 6 seconds? Shall be determined using filling procedure B.			Appendix X1 ASTM C 1611
	c. Column Segregation			6-02.3(2)A2
	1. Does the mix design indicate a Maximum Static Segregation less than or equal to 10%?			ASTM C 1610
	2. Does the mix design indicate a Maximum Hardened Visual Stability Index (HVSI) less than or equal to 1?			AASHTO PP 58
	d. Passing Ability of Self-Consolidating Concrete by J Ring			WSDOT FOP for ASTM C 1621
	1. Does the mix design indicate J Ring results equal to or less than 1.5 inches?			6-02.3(2)A2
	e. Rapid Assessment of Static Segregation Resistance of Self-Consolidating Concrete Using Penetration Test			ASTM C 1712
	1. Does the mix design indicate a penetration depth equal or less than 15 mm?			6-02.3(2)A2
	f. Air Content of Freshly Mixed Self-Compacting Concrete by the Pressure Method			WSDOT Test Method T 818
	1. Does the mix design indicate air content between 4.5% - 7.5%? (Verify if entrained air is required)			6-02.3(2)A, 6-02.3(2)A2
	g. Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete			AASHTO T 121
	1. Does the mix design indicate the unit weight (lbs/ft^3)?			6-02.3(2)A2
	h. Temperature of Freshly Mixed Portland Cement Concrete			AASHTO T 309
	1. Does the mix design indicate the temperature of the freshly mixed concrete? Is the temperature between 55ºF - 90ºF?			6-02.3(2)A2
	i. Static Modulus of Elasticity			ASTM C 469
	1. Does the mix design indicate the modulus of elasticity in psi at 28 days?			6-02.3(2)A2

ASR Mitigation Section 9-03.1(1)
If the ASA database indicates "ASR Mitigation Required" and the **ASR – 14 Day** test results is 0.21 to 0.45% the design must include at least one of the following:

1. Low Alkali Cement per Section 9-01.2(1)A.
2. Fly Ash Class F, 25% minimum by weight of the total cementitious materials.
3. An alternative mitigation measure that has been approved by the State Materials Laboratory – Submit proposed mitigation measures to the Materials Quality Assurance Section for review and approval.

If the ASA database indicates "ASR Mitigation is Required" and the **ASR – 14 Day** test results is greater than 0.45%, the design must include both of the following:

1. Low Alkali Cement per Section 9-01.2(1)A.
2. An alternative mitigation measure that has been approved by the State Materials Laboratory – Submit proposed mitigation measure to the Materials Quality Assurance Section for review and approval.

Unless otherwise indicated in the ASA database, no mitigation is required with **ASR – One Year** test results less than 0.04%. **The one-year results override the 14 – Day results.**

Cementitious materials, Aggregates, and Admixtures

Class	3000	4000	4000P	4000W
Cement Minimum	564 lbs/cy	564 lbs/cy	600 lbs/cy	564 lbs/cy
Fly Ash, percent replacement for Cement Note 1	0 – 35%	0 – 35%	15 – 35%	0 – 35%
Ground Granulated Blast Furnace Slag, percent replacement for Cement Note 1	0 – 50%	0 – 50%	15 – 50%	0 – 50%
Microsilic Fume and Natural Pozzolan, percent replacement for Cement Note 2	0 – 10%	0 – 10%	0 – 10%	0 – 10%
Fine Aggregate	Class 1 or 2	Class 1 or 2	Class 1 or 2	Class 1 or 2
Coarse Aggregate Note 3			3/8" NMS	
Retarding Admixture	Optional	Optional	Required	Optional

Note 1 When both ground granulated blast furnace slag and fly ash are included in the concrete mix, the total weight of both of these materials is limited to 50 percent by weight of the total cementitious material for all other classes of concrete.

Note 2 Need written concurrence from the Engineer to use Microsilica Fume and Natural Pozzolan.

Note 3 NMS = Nominal Maximum Aggregate Size