

ITEM 08555.20 M - 35 MPa CONCRETE WITH CORROSION INHIBITOR

DESCRIPTION. Furnish and place ~~Portland cement concrete~~ with a minimum compressive strength of 35 MPa, and containing corrosion inhibitor, where specified on the Plans for structural concrete thrust blocks and arch construction. Follow §555, except as noted below.

MATERIALS. §555-2, except as modified herein.

Design Using materials meeting the requirements of 501-2.02 and as indicated below, design a concrete ~~mix~~ mixture(s) based on the following ~~performance~~ criteria:

1. Strength - ~~28~~ 56 day minimum compressive strength of 35 MPa.
2. Slump - 80 mm +/- 25 mm ~~at discharge point~~.

—A high range water reducing admixture may be used upon prior written approval from the Director, Materials Bureau. If adding a high range water reducing admixture, slump will be limited to 80 mm maximum before the addition. After the addition, slump will be limited to 200 mm maximum.

3. Entrained Air - 5 to 8%.
4. Water/Total Cementitious Material Ratio - 0.40 maximum.
5. Microsilica - 6 to 10% by weight of cementitious materials.
6. Fly Ash or Ground Granulated Blast Furnace Slag - ~~15~~ 20% to ~~20%~~ 50% by weight of cementitious materials

7. Corrosion Inhibitor ~~-calcium nitrite solution as approved by the Director, Materials Bureau, containing 30 ±1% calcium nitrite solids by mass and having a mass of 1.27 ± 0.01 kg/L. Calcium nitrite~~ meeting §711-13 and appearing on the Department's Approved List of Products. Corrosion Inhibitor acts as an accelerator. Compatible retarding admixtures may be used to control set time, as per the Manufacturer's recommendations, subject to Director, Materials Bureau, approval.

Engage a qualified independent testing laboratory, subject to approval of the Materials Bureau, to perform mix development testing in accordance with ASTM C143, C231, C192 and C39, to assure all performance criteria can be achieved during production and placement.

At least 1 month prior to the start of any concrete placement, provide a copy of the proposed ~~mix~~ mixture design(s) and trial batch test results to the Director, Materials Bureau, submitted through the Regional Materials Engineer, for evaluation. Submit sufficient data to permit the Director to offer an informed evaluation. Include at least the following:

- Concrete mix proportions.
- Material sources. Also include fineness modulus and specific gravity for all aggregates.
- Air content of plastic concrete.
- Slump of plastic concrete.
- Compressive strength at 7, 14, 28, and 28 56 days, and at any other age tested or deemed necessary.

Do not interpret having a valid ~~mix~~ mixture design as approval of the ~~mix design~~ mixture. Also, resubmit any proposed ~~mix~~ mixture design change to the Director, Materials Bureau, for evaluation. Multiple mixture designs may be used to address performance and placement issues as deemed necessary by the Contractor. Submit each mixture for evaluation, as indicated above, prior to use.

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CONSTRUCTION DETAILS. Follow §555-3, except as modified herein:

Replace §555-3.01 - Concrete Manufacturing and Transporting with:

§501-2.03 Concrete Batching Facility Requirements,-

§501-2.04 Concrete Mixer and Delivery Unit Requirements,

§501-3.02 Handling, Measuring, and Batching Materials, and

§501-3.03 Concrete Mixing, Transporting, and Discharging except that the maximum concrete temperature at the point of discharge shall be 20°C.

Use an automated system with the following requirements to dispense the corrosion inhibitor:

1. Meter accuracy - ±1% (by volume)
2. Programmable quantity - liters, nearest tenth
3. System interlocks
4. Batching tolerance - ±3% (by volume)
5. Print requirements:
 - a. Project and/or batch number
 - b. Date and time
 - c. Delivered quantity - liters, nearest tenth

Calibrate the dispensing system in accordance with procedures approved by the Director, Materials Bureau.

Add corrosion inhibitor as an aqueous solution at the rate of 25 ~~l/m³~~ l/m³ immediately after adding air entraining and retarding admixtures into the mixer. Count the water in the solution as part of the total mix water.

~~Provide the Regional Materials Engineer with calcium nitrite inclusion test kits.~~ Sampling and testing of corrosion inhibitor will be performed according to procedures approved by the Director, Materials Bureau. ~~The Regional Materials Engineer will verify corrosion inhibitor in the mix by:~~

- ~~1. Checking concrete batch tickets for the appropriate dosage of corrosion inhibitor, and~~
- ~~2. Testing each placement to ensure the presence of corrosion inhibitor in the plastic concrete.~~

~~Concrete lacking the appropriate dosage as per the batch tickets, or failing the presence test, will be rejected.~~

Prior to placing any concrete required by this specification, do a trial placement of at least 5 cubic meters using the proposed mix/mixture design(s). This trial placement(s), when approved by the Engineer, may be incorporated into the project as a substitute for the placement of another Class of concrete placement shown on the plans. The Department will make and test concrete cylinders from the trial placement(s) to verify laboratory test results.

Curing - §555-3.09: Modify §555-3.07 - Concrete Joints: Thrust blocks may be constructed in stages using construction joints. Construction joints will not be allowed in any concrete of the structural arches.

Modify §555-3.09 - Curing: After the minimum curing period, concrete may ~~be placed in service prior to 28 days upon reaching the minimum strength.~~

receive construction loads prior to reaching the required minimum 35 MPa compressive strength. Loading limitations are as follows:

Thrust block 15 MPa prior to placing arches, 35 MPa prior to placing superstructure.

Arches 35 MPa prior to placing superstructure.

All concrete for this item shall achieve 35 MPa prior to opening the structure to traffic. Compressive

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strengths shall be determined from cylinders stored and cured in the same manner as the concrete it represents. The average compressive strength of each cylinder set shall be greater than the desired compressive strength, with no individual cylinder less than 90% of the desired compressive strength.

Modify §555-3.11 - Damaged or Defective Concrete: The contractor shall control materials, placement, and curing of the concrete to prevent cracking. Any cracks in the thrust block or arch greater than 0.40 mm shall be repaired using epoxy injection at no additional cost to the Department. The effectiveness of repairs shall be determined by the contractor using evaluation methods acceptable to the Department.

METHOD OF MEASUREMENT. Cubic meter as per §555-4.

BASIS OF PAYMENT. §555-5, except also include the cost of the mix design, laboratory testing and approval in the unit bid price per cubic meter.

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INHIBITOR**

WordPerfect Document Compare Summary

Original document: T:\Documents & Resources\Special Specifications\BYREGION\08\08555200.000

Revised document: C:\TEMP\08555xx.wpd

Deletions are shown with the following attributes and color:

~~Strikeout~~, Blue RGB(0,0,255).

Deleted text is shown as full text.

Insertions are shown with the following attributes and color:

Double Underline, Redline, Red RGB(255,0,0).

The document was marked with 30 Deletions, 60 Insertions, 0 Moves.

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--- Revision List ---

Location is Old Page:Old Paragraph New Page:New Paragraph.

Paragraph numbers shown as zero refer to the part of a paragraph that is carried over from the previous page. The {Hrt/Hpg/Tab/Spc} codes are generic symbols which refer to categories of end-of-line, tab/indent, or space codes.

- 1:1 1:1 Change {Bld}{Hrt}DESCRIPTION. -To- {Bld}{Und}DESCRIPTION.
- 1:1 1:1 Change Furnish -To- {Und}Furnish
- 1:1 1:1 Change place portland -To- place Portland
- 1:1 1:1 Insert for structural concrete ...
- 1:2 1:2 Change {Bld}MATERIALS. -To- {Bld}{Und}MATERIALS{Und}.
- 1:3 1:3 Delete Design
- 1:3 1:3 Insert Using materials meeting t...
- 1:3 1:3 Change concrete mix based -To- concrete mixture(s) based...
- 1:3 1:3 Change following performance cri... -To- following criteria:
- 1:4 1:4 Change 28 day -To- 56 day
- 1:4 1:4 Change MPa -To- MPa.
- 1:5 1:5 Change mm at discharge point -To- mm.
- 1:5 1:5 Change {Tab}A -To- A
- 1:6 1:5 Change maximum.{Hrt}Entrained -To- maximum.Entrained
- 1:7 1:6 Change 8% -To- 8%.
- 1:8 1:7 Change maximum -To- maximum.
- 1:9 1:8 Change materials -To- materials.
- 1:10 1:9 Change 15 to -To- 20% to
- 1:10 1:9 Change to 20% by -To- to 50% by
- 1:11 1:10 Change materials{Hrt}{Bld}{Bld}{Hrt}Corrosion -To- materials{Hrt}Corrosion
- 1:11 1:10 Delete - calcium nitrite solutio...
- 1:11 1:10 Insert meeting §711-13 and appea...
- 1:11 1:10 Change {Hrt}{Hrt}Engage -To- {Hrt}Engage
- 1:13 1:12 Change proposed mix design -To- proposed mixture design(s...
- 1:13 1:12 Change design and -To- design(s) and
- 1:14 1:13 Change proportions{Hrt} -To- proportions.{Hrt}
- 1:16 1:15 Change concrete {Hrt} -To- concrete.{Hrt}
- 1:17 1:16 Change concrete{Hrt} -To- concrete.{Hrt}
- 1:18 1:17 Change 14, and -To- 14, 28, and
- 1:18 1:17 Change and 28 days, -To- and 56 days,
- 1:18 1:17 Change tested{Hrt} -To- tested or deemed necessar...
- 1:19 1:18 Change valid mix design -To- valid mixture design
- 1:19 1:18 Change the mix design. -To- the mixture.
- 1:19 1:18 Change proposed mix design -To- proposed mixture design
- 1:19 1:18 Insert Multiple mixture design...
- 1:20 1:19 Change {Bld}CONSTRUCTION -To- {Bld}{Und}CONSTRUCTION
- 1:20 1:19 Change DETAILS. -To- DETAILS{Und}.
- 1:20 1:19 Change except replace -To- except as modified herein...
- 1:20 1:19 Change replace -To- except as modified herein...
- 1:20 1:20 Change 3.01 Concrete -To- 3.01 - Concrete
- 1:20 1:20 Change with:{Hrt}§501 -To- with:{Hrt}{Tab}§501
- 1:21 1:21 Change Requirements, {Hrt} -To- Requirements,{Hrt}

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1:21 1:21 Insert {Tab}§501-2.04 Concrete Mixer...
1:22 1:23 Change {Hrt}§501 -To- {Hrt}{Tab}§501
1:23 1:24 Insert except that the maximum ...
1:23 1:24 Change {Hrt}{Hpg}{Hrt}Use -To- {Hrt}Use
2:2 2:2 Change inhibitor:{Hrt}1. -To- inhibitor:{Hrt}{Tab}1.
2:2 2:2 Change volume){Hrt}2. -To- volume){Hrt}{Tab}2.
2:4 2:3 Change tenth{Hrt}3. -To- tenth{Hrt}{Tab}3.
2:4 2:4 Change interlocks{Hrt}4. -To- interlocks{Hrt}{Tab}4.
2:5 2:5 Change volume){Hrt}5. -To- volume){Hrt}{Tab}5.
2:7 2:7 Change {Tab}a. -To- {Tab}{Tab}a.
2:8 2:8 Change {Tab}b. -To- {Tab}{Tab}b.
2:9 2:9 Change {Tab}c. -To- {Tab}{Tab}c.
2:11 2:11 Change 25 l/m³ immediately -To- 25 l/m³{Att}3{Att} immediately
2:12 2:12 Delete Provide the Regional Mate...
2:12 2:12 Insert Sampling and testing of c...
2:12 2:12 Delete The Regional Materials ...
2:16 2:13 Change proposed mix design. -To- proposed mixture design(s...
2:16 2:13 Change design. -To- design(s).
2:16 2:13 Change placement, -To- placement(s),
2:16 2:13 Change for another -To- for the placement of anot...
2:16 2:13 Change concrete placement shown -To- concrete shown
2:16 2:13 Change placement to -To- placement(s) to
2:17 2:14 Delete {Bld}Curing{Bld} - §555-3.09.
2:17 2:14 Insert Modify §555-3.07 - Concre...
2:17 2:15 Delete be placed in service prio...
2:17 2:15 Insert receive construction load...
2:18 2:20 Change MEASUREMENT. -To- MEASUREMENT{Und}.
2:19 2:21 Change {Bld}BASIS -To- {Bld}{Und}BASIS
2:19 2:21 Change PAYMENT. -To- PAYMENT{Und}.