WACA/WSDOT Meeting
Minutes for Wednesday, March 9, 2011

Attendees:

<table>
<thead>
<tr>
<th>Attendee</th>
<th>Company/Position</th>
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<tbody>
<tr>
<td>Mike Polodna, WSDOT</td>
<td>Tom Weist, Oldcastle</td>
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<td>Kevin Wolf, Calportland</td>
<td>Tom McGraw, Lafarge</td>
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<td>Kurt Williams, WSDOT</td>
<td>Craig Matteson, Central Pre-Mix</td>
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<td>Jason Brewer, BASF</td>
<td>Darryl Lindsley, HardRock Inc</td>
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<td>Eric Clark, Corliss</td>
<td>Tom Howerton, Comar Enterprises/Kryton</td>
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<td>Bruce Chattin, WACA</td>
<td>Robert Raynes, Cemex</td>
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<td>Steve Keyser, Xypex</td>
<td>Allan Kramer, Lehigh Cement</td>
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<td>Dave Burg, Ash Grove Cement</td>
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Location: WSDOT HQ Mats Lab, Main Conf Room

Next WACA Meeting Date:
Wednesday, June 8, 2011, at WACA’s Office in Des Moines, 9:30 AM – 12:00 Noon

Future WACA Meetings Dates:
Wednesday, September 7, 2011 at WSDOT HQ Mats Lab, Main Conf Room, 9:30 AM – 12:00 Noon
Wednesday, December 7, 2011, at WACA’s Office in Des Moines, 9:30 AM – 12:00 Noon

Meeting Minutes are available at: [http://www.wsdot.wa.gov/biz/mats/](http://www.wsdot.wa.gov/biz/mats/)

Issue: Performance Specifications for Concrete Mix Designs - Mo Sheikhzadeh

Develop performance specification parameters for concrete.

3/9/11 Mo was not in attendance today and is retiring from WSDOT before the next meeting. Mark Gaines will be taking Mo’s position and will be invited to the next meeting.

Action Plan: Continue to give updates to WACA at quarterly meetings.

Issue: Degradation for concrete Aggregate/Base Course – Kurt Williams

A research study is on-going to test the effect of using aggregate with low degradation values in concrete mixes.

3/9/11 –Mike Polodna reported that testing is still under way.

Action Plan: Continue to give updates to WACA at quarterly meetings.
**Issue: Water for Concrete - Bob Raynes**

WSDOT Standard Specification 9-25.1 Water for Concrete requires that in order to use recycled water the lab that tests their water must meet R-18. No one is currently using recycled water because of the R-18 requirement.

3/9/11 – Bob presented proposed changes to WSDOT Standard Specification 9-25.1 Water for Concrete. The proposal eliminates the requirement for AASHTO R-18 laboratory certification. Kurt stated that WSDOT will review the proposal internally.

**Action Plan:** Continue the discussion at the next meeting.

**Issue: Standard Specification 9-23.8 Waterproofing –Jason Brewer**

Are changes needed to this specification? Should WSDOT be specifying ASTM C 1585 instead of ASTM C 642?

3/9/11 – Steve Keyser presented information from ACI 212.3-10 regarding Permeability Reducing Admixtures (PRAs) and the differences between PRAHs and PRANs. Steve stated that hydrostatic testing is needed to determine the effectiveness of these products. Per ACI 212.3-10 Section 15.4, PRAHs are appropriate for water-containment structures, below-grade structures, tunnels and subways, bridges and dams, and aquatic centers, and PRANs are normally used for repelling rain and minimizing dampness. One measure of effectiveness is the percent reduction in permeability of samples using the admixture versus samples that are not. Kurt noted that it appears that WSDOT would need to establish a baseline criteria for permeability in order to develop a standard specification.

Damian Vines suggested that different specifications for PRAHs and PRANs be developed. He and Steve Keyser will check with other DOTs (Wisconsin, Pennsylvania) to see if they have standard specifications and will provide them by the next meeting.

**Action Plan:** Review specs from other DOTs at the next meeting.

**Discussion Item: Aggregate Source Approvals for Sources to be Blended with Others –Dick Boss**

An Aggregate Source Approval is required for each pit. Since WSDOT is now sampling and testing only processed material instead of pit run or blended material, source owners have issues supplying samples of processed, non-blended aggregates.

3/9/11 – There was no discussion on this topic today.

**Action Plan:** Discuss at next meeting.

R-Value and Swell Pressure testing of Gravel Base material are run as part of the ASA approval and neither of these tests is currently used by WSDOT’s for highway design. Both of these tests have been kept on as legacy tests, when the application for WSDOT has ceased to exist and WSDOT is proposing that both tests be removed from the specifications. Any Industry concerns with this proposal?

Proposed Standard Specification Changes are shown below:

3-01.4(4) Gravel Base

If the Contract requires the Contractor to provide the source of Gravel Base, or if the Contractor elects to furnish said material from sources other than those provided by the Contracting Agency, the material shall be produced from approved sources in accordance with the requirements of Section 3-01. The grading and quality shall be as specified in Section 9-03.10.

When Gravel Base is specified, Gravel Borrow may be used in lieu of Gravel Base provided the stabilometer value of the Gravel Borrow is a minimum of 67 and 0.1-foot of crushed surfacing top course is substituted for the top 0.1-foot of the depth specified for Gravel Base.

Measurement and payment will be in accordance with Section 4-02.

Section 4-02.4 Measurement

Gravel base will be measured in the same manner prescribed for the measurement of crushed surfacing materials as set forth in Section 4-04.4 except as follows:

Where gravel base is specified, the Contractor may elect to substitute materials as described in Section 3-01.4(4). Crushed surfacing and gravel borrow, used in lieu of gravel base, will be measured and paid for as gravel base. In no case shall crushed surfacing, used in lieu of gravel base, be included in any Bid items for crushed surfacing.

9-03.10 Aggregate for Gravel Base

Gravel base shall consist of granular material, either naturally occurring or processed. It shall be essentially free from various types of wood waste or other extraneous or objectionable materials. It shall have such characteristics of size and shape that it will compact readily and shall meet the following test requirements:

- Stabilometer “R” Value — 72 min.
- Swell pressure — 0.3 psi max.

The maximum particle size shall not exceed \( \frac{2}{3} \) of the depth of the layer being placed.

Gravel base shall meet the following requirements for grading and quality when placed in hauling vehicles for delivery to the roadway or during manufacture and placement into a temporary stockpile. The exact point of acceptance will be determined by the Engineer.

<table>
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<tr>
<th>Sieve Size</th>
<th>Percent Passing</th>
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<tbody>
<tr>
<td>2&quot;</td>
<td>75-100</td>
</tr>
<tr>
<td>No. 4</td>
<td>22-100</td>
</tr>
<tr>
<td>No. 200</td>
<td>0-10</td>
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</table>
Dust Ratio: ⅔ max.

Sand Equivalent 30 min.

All percentages are by weight.
Gravel base material retained on a No. 4 sieve shall contain not more than 0.20 percent by weight of wood waste.

9-03.12(1)B Class B
Gravel backfill for foundations, Class B, shall conform to the requirements of Section 9-03.10 except that the requirements for stabilometer “R” value and swell pressure do not apply.

3/9/11 – No one objected to the changes to the specifications.

Action Plan: The changes will be adopted as presented. Issue Resolved

New Discussion Item: Proposal for 15% Limestone Addition to Portland Cement – Allan Kramer
3/9/11 - Allan presented an announcement that Portland-Limestone Cement (PLC) is now referenced for use in the Ontario Building Code, and that it is currently approved by the Canadian Standards Association (CSA). Anthony Sarhan said that he would provide WACA with some research information on this topic.

Action Plan: Continue the discussion the next meeting.

New Discussion Item: NMS of Coarse Aggregate for 4000P – Neil Guptill and Dick Boss
3/9/11 - Neil and Dick pointed out that the NMS of coarse aggregate changed from ½” to 3/8” in the 2010 Specification. Kurt will refer this issue to Mark Gaines.

Action Plan: Continue the discussion the next meeting.
February 9, 2011

Washington State Department of Transportation
Materials Laboratory
P.O. Box 47365
Olympia, WA 98504-7365

Attention: Mike Poldna

RE: Modification of Section 9-25.1 of the WSDOT Standard Specifications; Water for Concrete

Dear Mike,

I am writing you this letter as a representative of the WACA Technical Committee to propose changes to section 9-25.1 of the WSDOT Standard Specifications; Water for Concrete. We want to make you aware of the fact that many ready mix suppliers in the state of Washington already have an in-house water testing program per ASTM C1602 specifications. Utilization of water from concrete production operations is essential to operating an environmentally compliant and commercially viable business in this day and age. Maintaining and assuring process control on water quality is a common practice and has become part of our daily operations.

The WSDOT Standard Specifications do currently allow ready mix suppliers to utilize their water from concrete production operations, but because of the current language of the section; does not allow them to utilize their in-house water testing program. If the WSDOT standard specifications limited the requirement primarily to ASTM C1602, Specifications for Mixing Water Used in the Production of Hydraulic Cement Concrete, and eliminated the additional requirements in the section, then the ready mix suppliers could supply concrete utilizing their water from concrete production operations.

The primary impediment in the specifications that is not permitting our use of our in-house testing programs is the requirement of the AASHTO R-18 laboratory certification. Further, the six requirements listed in 9-25.1 could be modified to eliminate the duplication of requirements addressed in ASTM C1602, thus removing confusion and allowing the prudent use of water from concrete production operations.

Attached is our proposed re-write of section 9-25.1 for your consideration. We look forward to discussion of this topic in the next joint meeting of WSDOT and WACA.

Sincerely,

[Signature]

Robert Raynes
Regional Manager of Technical Services,
Pacific Rock Products, LLC, dba CEMEX

Attachment

CC: Bruce Chattin, WACA
9-25 WATER

9-25.1 Water for Concrete

Water for concrete, grout, and mortar shall be clear, apparently clean, and suitable for human consumption (potable). If the water contains substances that cause discoloration, unusual smell or taste, or other suspicious content, the Engineer may require the Contractor to provide test results documenting that the water meets the physical test requirements and chemical limits described in ASTM C1602 for non-potable water.

Water from mixer washout operations may be used in concrete provided it meets or exceeds the requirements of ASTM C1602 as well as the following additional requirements:

1. Concrete with water from mixer washout operations shall not be used in bridge roadway deck slabs, flat slab bridge superstructures, modified concrete overlays, or prestressed concrete.

2. Shall be free of coloring agents.

Agency reviews of the laboratory facility, testing equipment, personnel, and all qualification, calibration, and verification records will be conducted at the Contracting Agency's discretion.

9-25.2 Water for Plants

Water for plants shall not contain dissolved or suspended matter which will be harmful to the plant material on which it is to be used.
Xypex Chemical Corporation Introduction and Comments Regarding Waterproofing Admixture Specification Language for WSDOT as Proposed by BASF

When coming up with a specification for DOT structures it should be noted that due to the importance of durability it can be considered that the proper amount of rebar cover should be 2" as per standard accepted practice for critical structures.

Bridge decks should be considered as structures requiring waterproofing due to protection of the rebar and reduction in chloride ions getting down to the reinforcing steel. It should also be noted that vehicles passing over top of puddle water will create a hydrostatic pumping action that will force water down into an unprotected substrate. The average car will exert pressures of up to 20 psi or 46 feet of head pressure.

Waterproofing specifications for these types of structures should acknowledge that hydrostatic pressure will be present and thus the specifications should include testing under pressure.

Standard hydrostatic pressure tests are CRD C 48-92 and DIN 1048. CRD C 48-92 can be amended and modified so that it becomes and “output” test rather than an “input” test. This is done by comparing a control mix and a treated sample where the concrete sample is two inches thick and any water passing through the sample is collected and measured. This parallels DIN 1048 which is based on depth of penetration. DIN 1048 testing has pass/fail criteria which is 50mm or 2” and is based on the standard depth of concrete cover for a critical structure.

ASTM 1585 is an absorption test which does not measure any ability to resist hydrostatic pressure. This test would be acceptable for a product classified as a PRAN (permeability reducing admixtures exposed to non-hydrostatic conditions) under ACI 212.8R-10 but would not be acceptable for a condition of service calling for a PRAH (permeability reducing admixtures exposed to hydrostatic conditions). ACI 212 makes reference to both CRD C 48-92 and DIN 1048 as tests suitable to determine permeability under hydrostatic pressure.
Xypex Recommendations and Talking Points for Waterproofing Admixture for WSDOT

BASF is recommending the following for inclusion in the WSDOT spec:

A. Shall satisfy the following requirements, when used at the manufacturer’s recommended dosage:
   1. Reduction in capillary absorption: Not less than 40 percent relative to a companion untreated concrete mixture, when tested in accordance with ASTM C 1585.
   2. Reduction in water penetration: Not less than 40 percent relative to a companion untreated concrete mixture, when tested in accordance with DIN 1048.
   3. The admixture shall not affect the setting time, strength or durability properties of concrete.

Xypex proposes the following changes and for the following reasons:

1) Require that all test results produced to meet the WSDOT specifications come from independent laboratories.

   a) Most manufacturers have had their products tested by independent laboratories and should be able to provide this data

   b) Independent testing eliminates any concerns regarding bias on behalf of the testing agents

2) Eliminate “Reduction in capillary absorption: Not less than 40 percent relative to a companion untreated concrete mixture, when tested in accordance with ASTM C 1585.”

   a) This test has no hydraulic head associated with it and most concrete waterproofing applications have hydraulic head. In bridges this can be caused by tire pumping pressure on the bridge surface as well as wave action against concrete in the splash zone.

   b) This test essentially only measures the penetration of water into the surface 1/8 – ¼” of the concrete. Structural durability the ability to resist penetration at 2” – 3” is more relevant as this is the depth of reinforcing steel. Hence this test has little relevance to measuring the overall durability of the concrete.

   c) ACI 212.3R – 10 does not reference this test or discuss it in terms of relevance to concrete permeability reduction

   d) Xypex is only aware of one manufacturer of crystalline waterproofing that has test results that meet this criterion thus greatly restricting the available sources of materials for WSDOT or their concrete providers.
3) Replace Criteria 1) with “Scanning Electron Microscope studies showing the presence of a robust and distinctive crystalline structure within the cement matrix. Crystals shall be identifiable at no less than 3000X magnification.”
   a) Most manufacturers of crystalline waterproofing can provide SEM studies proving the presence of a unique dendritic crystalline structure in the cement matrix modified with their products.
   b) 3000X magnification is expected to be high enough to allow several manufacturers of crystalline products to meet the threshold. This should be confirmed.

4) In Criteria 2 “Not less than 40 percent relative to a comparison” changed to “not less that 60 percent relative to a comparison”
   a) ACI 212.3R-10 Table 15.1 shows data indicating a 70% reduction in permeability versus control
   b) A brief review of technical data of Xypex and other manufacture’s indicates that this is achievable by at least 2 leading manufactures.

5) In Criteria 2 change “in accordance with DIN 1048” to “in accordance with DIN 1048, the COE CRD48 Modified, BS EN 12390-8 or other directly applied water under hydraulic head test as deemed appropriate by the specifying agency”
   a) All of these tests apply direct water pressure to the concrete and thus measure the relative water proofness of the concrete against a control. Thus any of them should be acceptable if the given reduction is achieved
   b) These tests are what are referenced in the new ACI 212.3R-10.

Note that the above listed changes should be vetted through other crystalline admixture industry experts to validate and confirm for the general concrete industry use.
Salt spray effects on untreated concrete

Ramp wall - Pattern of corrosion strongly suggests heavy exposure to high velocity salt spray.
Specification Language for Waterproofing admixture for WSDOT

WATERPROOFING ADMIXTURE

A. Shall be an integral crystalline capillary waterproofing admixture for concrete.

B. Dosage shall be as recommended by the manufacturer.

C. Shall satisfy the following requirements, when used at the manufacturer's recommended dosage:
   1. Reduction in capillary absorption: Not less than 40 percent relative to a companion untreated concrete mixture, when tested in accordance with ASTM C 1585.
   2. Reduction in water penetration: Not less than 40 percent relative to a companion untreated concrete mixture, when tested in accordance with DIN 1048.
   3. The admixture shall not affect the setting time, strength or durability properties of concrete.

REFERENCES

ASTM International (ASTM):
   1. ASTM C 1585 - Standard Test Method for Measurement of Rate of Absorption of Water by Hydraulic-Cement Concretes

DIN (Deutsches Institut Fur Normung, Germany):
   1. DIN 1048 Part 5 “Testing Concrete – Testing of hardened concrete (specimens prepared in mould)”
A New Class Of Cement Called Portland-Limestone Cement (PLC) Will Become Mainstream In Canada

March 1, 2011

The Ontario Ministry of Municipal Affairs and Housing recently announced that PLC is now referenced for use in concrete in the Ontario Building Code (OBC). In Quebec, the Régie du Bâtiment du Québec approved PLC for use in concrete as an 'alternative solution' to using CSA Type General Use (GU) portland cement.

PLC has strong environmental and sustainable construction benefits. Manufacturing PLC generates significantly lower greenhouse gas emissions and up to 10 per cent fewer atmospheric carbon dioxide emissions. These reductions are achieved as up to 15 percent of the clinker used to produce regular portland cement can be replaced by limestone. Additionally, PLC shows comparable strength performance and can use similar amounts of Supplementary Cementing Materials (SCMs) in concrete as CSA Type GU (ASTM / AASHTO Type I-II) portland cement.

The manufacture of 10% limestone PLC at a typical cement plant producing 1 million tonnes of cement per year is expected to reduce atmospheric CO2 emissions by 100,000 tonnes per year, which is the equivalent to taking more than 19,000 cars per year off the road or planting 2,500,000 trees per year, as well as reducing the dependence on virgin raw materials.

PLC produces concrete that is as strong and durable as that made with regular CSA Type GU (ASTM / AASHTO Type I-II) portland cement. Manufacturing PLC generates significantly lower greenhouse gas emissions and up to 10% fewer CO2 emissions. The Canadian building materials industry is currently pursuing the recognition of PLC in the LEED® sustainable building rating system.

Last year, the Ministry of Transportation of Ontario carried out two trials on existing Central Region concrete construction contracts utilizing PLC. The first trial used PLC in a cast-in-place concrete barrier wall section located on the westbound lane of the QEW Highway between Brant St. and Burloak Drive in Burlington, Ontario. Based on the favourable outcome of the QEW Highway concrete barrier wall project, a second concrete trial was performed in September 2010 using PLC in slipformed concrete pavement in Mississauga, Ontario on an exit lane to Hurontario Street of Highway 401 eastbound. Both trials represented the first field applications of the new PLC cement in structural and pavement concrete applications by a public agency in Canada.

PLC is currently approved by the Canadian Standards Association (CSA A 3001 and A 23.1) and was referenced for use in the National Building Code of Canada on November 29, 2010. PLC was approved for use in concrete by the Régie du Bâtiment du Québec on February 15, 2011, as an 'alternative solution' for using CSA Type GU portland cement, and on February 17, 2011, PLC was adopted into the Ontario Building Code for use in concrete.