GUIDE SPECIFICATION
SECTION 03 05 00
CONCRETE INTEGRAL ANTIMICROBIAL ADMIXTURE
CONCRETE TOPICAL PENETRATING SEALER

NOTE TO SPECIFIERS of cast-in-place or precast concrete. Our long-form guide specification is provided for your review. Guide wording may be included at appropriate specification locations, modified, or omitted. Your consideration of including our products in your specification as an "or equal" or as Basis Of-Design (BOD) is appreciated. NOTES TO SPECIFIER are informational and may be removed. Please contact us with your question.
Respectfully submitted, Concrete Sealants, Inc.

NOTES TO BIDDERS are intended be maintained in Specification to explain new admixture technology and reduce Requests For Information (RFI).

NOTE TO SPECIFIER: Guide specification is based on ConBlock MIC admixture and ConBlock Topical sealer.
http://conseal.com/concrete-sealant-products/conblock-mic.html
http://conseal.com/concrete-sealant-products/conblock-topical.html
Manufactured by Concrete Sealants, Inc., 9325 State Route 201, Tipp City, OH 45371 www.ConSeal.com
Sales: 800-332-7325 or 937-845-8776 hello@conseal.com Fax: 937-845-3587
Technical questions: egebauer@conseal.com or slines@conseal.com

Concrete Sealants, Inc. near Dayton, Ohio has been in business since 1970. The "ConBlock" product line includes a Concrete Integral Antimicrobial Admixture and a Concrete Topical Penetrating Sealer to help protect concrete from the hydrogen sulfide gas phenomena in sewer pipes, manholes, septic tanks, and waste water treatment plants.

Also available is ConBlock CDA, our Permeability Reducing Admixture Hydrostatic (PRAH) and several topically applied penetrating concrete sealers. The "ConSeal" product family includes preformed butyl joint sealants, hydrophilic waterstops, self-adhesive sheet membranes, and water-based concrete coatings that contribute to water-tight utility structures. We are a global leader and ship products to six continents.

PART 1 – GENERAL

NOTE TO BIDDERS: The terms bacteria and microbes are interchangeable, as are the terms antibacterial and antimicrobial.

1.01 SECTION INCLUDES

A. Concrete Integral Antimicrobial Admixture to inhibit Microbially Induced Corrosion of Concrete (MICC).

1. Liquid antimicrobial admixture must have documentation from an independent lab that it inhibits microbe growth.
2. Antimicrobial must be registered with the Environmental Protection Agency (EPA).
    a. EPA registration number must be submitted for approval prior to use in the project.
    b. Product must be provided from a registered manufacturer of the antimicrobial, not a supplemental distributor.

NOTE TO SPECIFIER: An EPA registered manufacturer has direct control for the antimicrobial admixture. A supplemental distributor provides a product that is controlled by another manufacturer. To determine if the admixture is provided by an EPA registered manufacturer, the EPA number will have only one hyphen in the number, for example: 99999-9. A supplemental distributor will have an EPA number containing two hyphens, for example: 99999-9-99999.

B. Concrete Topical Penetrating Sealer containing a registered antimicrobial of the same type as the Concrete Integral Antimicrobial Admixture.

1. Sealer must have documentation from and independent lab that microbe growth is inhibited.
2. Topical penetrating sealer may contain a colorant for identification of application.

C. Manufacturer of antimicrobial biocide must be ISO 9001 certified.

1. ISO 9001 certification number must be submitted for approval prior to use in project.

NOTE TO BIDDERS: Concrete surfaces above sewer flow in sanitary sewers or combined sewers are susceptible to biogenic acid attack under unique conditions known as microbially induced corrosion of concrete (MICC). When concrete is initially cast, the concrete surface has a pH of approximately 13. There are three phases of MICC:

In PHASE ONE, the CARBONIZATION PHASE, *the concrete surface drops from a pH of 13 to a neutral pH of 7. MICC does not occur in Phase One.*

In PHASE TWO, the BIOFILM PHASE pH of 7 to pH of 4, *concrete surface conditions are favorable for colonization of several harmful Thiobacillus bacteria species. Thiobacillus consume sulfur from hydrogen sulfide gas and oxygen from the air above sewer flow. Thiobacillus excretes a weak sulfuric acid. The excreted acid lowers the pH of the concrete surface and a biofilm forms. As the phenomenon continues, more aggressive species of Thiobacillus produce stronger sulfuric acids and concrete surfaces are reduced to a pH of 4.*

In PHASE THREE, the DETERIORATION PHASE pH of 4 to pH of 0*, more aggressive species of Thiobacillus excrete stronger acids, and the corrosion of concrete surfaces accelerates. As concrete surfaces drop below a pH of 1, severe damage and erosion occurs. The excreted sulfuric acid reacts with the free lime (calcium hydroxide / CaOH) of the cement matrix and calcium sulfate (gypsum) is formed. Gypsum reacts with alumina in the concrete matrix and forms ettringite. Ettringite expansion cracks and spalls the concrete, resulting in deeper penetration of acids and acceleration of damage.*

The active ingredient in ConBlock MIC is the biocide named "3-Trimethoxy silyl propel dimethyl octadecyl ammonium chloride."
The antimicrobial admixture ConBlock MIC is referred to as a Quat Silane.
The label states, "Microbiostatic and Fungistatic Protection for Concrete that inhibits odor causing bacteria, mold and mildew, and algae." The Quat Silane binds to cement hydration products creating microscopic needles that attract microbes through an electro-physical mechanism and pierces them on contact.
ConBlock MIC is a permanent, non-leaching chemistry.
ConBlock MIC extends the lifespan of concrete structures exposed to H2S sewer gas by disrupting the chain of events that lead to microbial induced corrosion. It provides effective and long-lasting microbial inhibition within the concrete. It is not a "sacrificial coating product."

1.02 RELATED SECTIONS

A. [03] Concrete

1. 03 05 00 Concrete Color Pigment
2. 03 05 00 Concrete Integral Antimicrobial Admixture
3. 03 05 00 Concrete Topical Antimicrobial Penetrating Sealer
4. 03 05 00 Concrete Integral Waterproofing Admixture – PRAH
5. 03 15 13 Waterstops
6. 03 15 16 Waterproof Concrete Construction Joints
7. 03 30 00 Cast-in-Place Concrete
8. 03 31 26 Self-Consolidating Concrete
9. 03 40 00 Precast Concrete

B. [07] Thermal and Moisture Protection

1. 07 10 00 Damp proofing and Waterproofing
2. 07 14 00 Cold-Applied Waterproofing
3. 07 19 00 Concrete Sealer

NOTE TO SPECIFIER: ConSeal CS-1800 Waterproofing Membrane is chemically resistant in sulfuric acid immersion, so it is suitable for drop shafts and manholes where high levels of H2S gas are anticipated. It is a solvent-free, cold-applied, single component, acid resistant, waterproofing compound that forms a continuous, tough, elastic coating. It is applied at approximately 30 mils or more. It is available in white, gray, and black. http://conseal.com/concrete-sealant-products/cs-1800-solvent-free-waterproofing-membrane.html

1.03 REFERENCES

A. ACI International - American Concrete Institute (ACI):

1. ACI 212.3R - Report on Chemical Admixtures for Concrete
2. ACI 301 - Specifications for Structural Concrete
3. ACI 301M - Specifications for Structural Concrete
4. ACI 305.1 - Specification for Hot Weather Concreting
5. ACI 306.1 - Specification for Cold Weather Concreting
6. ACI 305R - Hot Weather Concreting
7. ACI 306R - Cold Weather Concreting
8. ACI 308.1 - Specification for Curing Concrete
9. ACI 309R - Guide for Consolidation of Concrete

B. ASTM International - American Society for Testing and Materials:

1. ASTM C39 / C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
2. ASTM C94 / C94M - Standard Specification for Ready-Mixed Concrete
3. ASTM C1602 / C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete
    a. Potable Water is required.
4. ASTM D1126 - Standard Test Method for Hardness in Water
    a. The concrete batch water hardness should be 600 ppm or lower.
5. International Standards Organization:
    a. ISO 9001 - Quality management systems.

1.04 SUBMITTALS

A. General: If any portion of Contract Documents do not conform to manufacturer's standard recommendations, submit notification of portions of design variance with manufacturer's specifications.

B. Product Data: Submit manufacturer's Submittal Packet with data sheets including guide specification, test data, technical data sheets, and general recommendations.

1. for Concrete Integral Antimicrobial Admixture
2. for Concrete Topical Penetrating Sealer

1.05 QUALITY ASSURANCE

A. Source Quality - Single Manufacturer

1. Obtain a proprietary Concrete Integral Antimicrobial Admixture.
2. Obtain a proprietary Concrete Topical Penetrating Sealer that contains a registered antimicrobial.

B. Manufacturer Qualifications:

1. Company that manufactures a specialty Concrete Integral Antimicrobial Admixture that is a biocide, which becomes a permanent part of the concrete matrix.
2. Manufacturer must be ISO 9001 registered.
3. Manufacturers who cannot provide performance test data specified will not be considered for the project.

1.06 QUALITY ASSURANCE PLAN

A. Concrete Producer must:

1. Submit a mix design thru Contractor to Engineer and to the Manufacturer, Concrete Sealants, Inc.

a. Submit materials and quantities per cubic yard or cubic meter of concrete.

b. Submit Water Quality Analysis.

c. Submit materials batch sequence.

2. Record lot numbers of ConBlock MIC in daily batch records.

3. Retain batch records of concrete with ConBlock MIC for 7 years.

B. Concrete producer must validate prior to trial batching, based on manufacturers data, that materials and processes will not impede the efficacy of the antimicrobial admixture. If necessary, concrete samples can be sent to an approved testing lab for microbial efficacy testing, per ISO 22196 test modified for concrete.

C. Concrete producer must complete their own Certificate of Conformance

1. Submit document that the batching process and required specifications for ConBlock MIC treatment will be correctly followed to the Contractor who will forward it to the Consultant and to Concrete Sealants, Inc.

D. Perform testing of ConBlock MIC with planned air entraining and water reducing admixtures to verify compatibility.

1. No known accelerating admixtures are compatible with ConBlock MIC. Perform testing with ConBlock MIC to verify compatibility prior to use.

1.07 Verification of ConBlock MIC in hardened concrete.

A. Integral colorant for concrete is available from Concrete Sealants, Inc.

1. Other colorant manufacturers are not approved.

B. Color tint for ConBlock Topical sealer is available from Concrete Sealants, Inc.

1. Color tinting of ConBlock Topical sealer at project site is not approved.

1.08 Certificate of Conformance: Concrete manufacturer will submit documentation how the ConBlock MIC admixture was added during concrete batching.

A. Certificate of Conformance sample form is available in ConBlock MIC Submittal Packet.

1.09 Direct Stain Test may be required.

A. Contact Concrete Sealants, Inc. for ConSeal Direct Stain Test Kit.

B. No other Direct Stain Test is acceptable.

1.10 Bacteria Inoculation Testing may be required.

A. Have concrete laboratory specimens tested by an independent lab for antimicrobial efficacy, per ISO 22196 test modified for concrete. The specimens will be made with materials in the same volumes used in the mix design including the antimicrobial admixture.

B. The time-period of this testing may require 3 - 4 months to complete because concrete samples must be conditioned, to achieve equilibrium pH of 6.5 to 7, prior to inoculation.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Ordering: Comply with manufacturer's lead time requirements for testing samples and batch plant inventory to avoid construction delays.

B. Delivery: Deliver liquid containers to concrete production facility in original undamaged containers with manufacturer’s labels and seals intact.

C. Identification: Containers fully identified with manufacturer's label listing EPA Registration Number, type, grade, class, and other qualifying information. Provide Safety Data Sheet.

D. Storage: Store liquid materials so that they are protected from freezing, as required by manufacturer.

1.12 TRIAL MIXES

A. Produce test batches with ConBlock MIC at least 15 calendar days prior to first concrete placement, using admixture samples provided by the manufacturer.

B. If inoculation testing is required prior to concrete placement per paragraph 1.10, be advised that 3 – 4 months is required.

1. Batch one cubic yard / cubic meter minimum and conduct concrete field tests to determine if mix adjustments are required.

a. Concrete Sealants, Inc. will supply complimentary ConBlock MIC for test batches.

b. Concrete Sealants, Inc. understands that larger batches better simulate concrete production, and will supply volume of ConBlock MIC needed.

2. Cast a minimum of four compression test specimens for testing two specimens at 7 days and two at 14 days.

3. Submit Batching Test Results to the General Contractor who will relay the information to the Consultant and to Concrete Sealants, Inc.

a. admixture names, types, and dosages; temperature, slump, air content, unit weight and compressive strength results.

NOTE TO BIDDERS: Responsibility to Ensure Compatibility. ConBlock MIC was tested and proved compatible with some air entraining admixtures.

Incompatibility has occurred between some air entraining admixtures and ConBlock MIC. When the two chemicals come into direct contact, a precipitate may be formed which can deactivate the active ingredient in ConBlock MIC. Advance testing must be performed by the concrete producer to assure air entrainment and water reducer compatibility.

ConBlock MIC should never come into direct contact with an air entraining admixture. ConBlock MIC performs best when it is diffused into the head water during the mixing operation. Advanced testing is required to determine compatibility. Testing options to verify admixture compatibility are testing by contractor and concrete supplier QC staff.

Concrete Sealants, Inc. makes no representations or warranties regarding such compatibility with additives or admixtures. It is the responsibility of the Contractor to take precautions necessary, including advanced testing, to ensure compatibility of ConBlock MIC with other additives or admixtures being used in the concrete mixture.

1.13 PRE-PLACEMENT CONFERENCE

A. Pre-Placement conference with ready mixed concrete at least 7 calendar days prior to first concrete placement of ready mixed concrete with ConBlock MIC.

1. General Contractor will convene and conduct pre-placement conference with owner's representative, concrete contractor, and concrete supplier.

a. Discuss project requirements as prescribed in Contract Documents.

b. Discuss manufacturer's product data, recommendations and instructions.

c. Discuss time-line and precautions in hot and cold weather.
d. If necessary, ConBlock MIC manufacturer's representative will attend via conference call.

B. Pre-Placement Conference in precast concrete plant at least 7 calendar days prior to first precast concrete placement with ConBlock MIC.

1. General Contractor will convene and conduct pre-placement conference with owner's representative, subcontractor involved, concrete supplier, and entity who will purchase ConBlock MIC.
a. Discuss project requirements in Contract Documents.
b. Discuss manufacturer's product data, recommendations etc.
c. Discuss time-line and precautions in hot and cold weather.
d. If necessary, ConBlock MIC manufacturer's representative will attend via conference call.

1.14 WARRANTY

A. Manufacturer's Warranty: Concrete Sealants, Inc. www.conseal.com

1. This information is presented in good faith, however Concrete Sealants, Inc. cannot anticipate all conditions under which this information and our products, or the products of other manufactures in combination with our products, may be used.
2. Concrete Sealants, Inc. accepts no responsibility for results obtained by the application of this information or the safety and suitability of our products, either alone or in combination with other products. Users are required to make their own tests to determine the safety and suitability of each such product or product combinations for their own purposes. It is the users' responsibility to satisfy himself or herself as to the suitability and completeness of such information for this particular use.
3. Concrete Sealants, Inc. sells ConBlock MIC without warranty. Buyers and users assume all responsibility and liability for loss or damage arising from the handling and use of this product, whether used alone or in combination with other products.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

NOTES TO SPECIFIER: The system developed by Concrete Sealants, Inc. includes ConBlock MIC and ConBlock Topical used separately or used together. Best practice is to use them together.

A. Basis of Design Admixture Product: ConBlock MIC http://conseal.com/concrete-sealant-products/conblock-mic.html

B. Approved Manufacturer: Concrete Sealants, Inc., www.conseal.com

1. Located at 9325 State Route 201, Tipp City, OH 45371

a. Sales questions: 800-332-7325 or 937-845-8776 hello@conseal.com Fax: 937-845-3587

b. Technical questions: egebauer@conseal.com or slines@conseal.com

C. Subject to compliance with requirements, a Substitution Request may be submitted to provide products by one of the following:

1. ConShield, ConShield HD, www.conshield.com
2. Bio-San C500, www.xypex.com

D. Basis of Design Concrete Topical Sealer Product: ConBlock Topical by Concrete Sealants, Inc., http://conseal.com/concrete-sealant-products/conblock-topical.html

1. No substitutions permitted.

E. SUBSTITUTION REQUESTS: Submit no later than 15 calendar days prior to bid date, to allow time for review and response.

1. If Substitution Form is not located under Instruction to Bidders section in Division One, utilize CSI form 13.1 – Substitution Request (During the Bidding Phase).
2. A sample is posted on the internet. shaynephillips.com/images/Substitution_Request_Form1-blank.doc

2.02 MATERIALS

A. System Description:

1. Antimicrobial Admixture: is an EPA registered pesticide

a. ConBlock MIC - EPA Reg. No. 87907-1 http://conseal.com/concrete-sealant-products/conblock-mic.html

2. Concrete treated with antimicrobial admixture must show significant reduction in bacterial activity compared to control samples, as tested by an Independent Laboratory.

a. ASTM D4783 - Adapted for determination of antibacterial resistance of concrete to Thiobacillus species on concrete of 9.0 pH.

1. ConBlock MIC achieved reduction of Bacteria growth in the 24-hour test. See page 2 of Technical Data Sheet for ConBlock MIC.

b. ISO 22196 - Measurement of antibacterial activity on plastics and other non-porous surfaces (Modified Test for Concrete).

2. ConBlock MIC demonstrates reduction of Thiobacillus species bacteria growth on concrete pre-conditioned to pH 6.5 to pH 6.8. See Test Data on ConSeal website or Technical Data Sheet for ConBlock MIC, page 2.

NOTE TO SPECIFIER:

- *H_2S of 10 parts per million (ppm) will initiate MICC.*
- *H_2S of 20 ppm is the General Industry Ceiling Limit for Workers https://www.osha.gov/SLTC/hydrogensulfide/hazards.html*
- *H_2S of 30 ppm to 60 ppm is the range that municipal sewer systems reported in a US EPA Study that experience MICC corrosion.*
- *H_2S above 100 ppm is Immediately Dangerous to Life or Health (IDLH) per NIOSH. https://www.cdc.gov/niosh/idlh/7783064.HTML*
- *H_2S below 70 ppm average concentration is optimum range of effectiveness ConBlock MIC and ConBlock Topical; determined by the research team at Concrete Sealants, Inc.*

ConBlock MIC specifiers: Click here for more detailed test data.

B. Dosage Rate:

1. General: Add ConBlock MIC to concrete mix at the batch plant.
2. ConBlock MIC admixture dosage is 23 ounces per hundred pounds of cementitious materials (per CWT) if ConBlock Topical will not be specified.
3. ConBlock MIC admixture dosage is 12 ounces per hundred pounds of cementitious materials (per CWT) if ConBlock Topical will be specified for application on sewer side of cast surfaces.
4. Apply ConBlock Topical after concrete surface has reached ambient temperature and is surface dry.

NOTES TO SPECIFIER: Concrete with ConBlock MIC admixture may include a colorant to verify presence.
1. If ConBlock MIC admixture is used alone in the concrete mixture, it should have integral colorant.
2. If ConBlock Topical is used alone, or in combination with ConBlock MIC admixture, it should have color tint.
3.If ConBlock MIC admixture is used in combination with tinted ConBlock Topical, the requirement for integral colorant in the concrete mixture may be waived.

C. ConBlock MIC Integral Colorant Internal must be added to the concrete during batching.

1. To tint concrete with ConBlock MIC integrally, add ConBlock MIC Integral Colorant at the dosage rate of 1.25 lbs. (16 fluid ounces) of colorant per cubic yard of concrete.
    a) ConBlock MIC Integral Colorant is available in 1.25-pound kits (#5601) and 40-pound (#5431) pails.
2. Do not add the colorant directly to ConBlock MIC.
3. Add integral colorant at any point in the batching process.
4. Mix concrete at least two minutes to disperse the colorant throughout the concrete. Adjust integral colorant amount by using 1.25 pounds for less tint and 2.5 pounds for more tint. If required, document the addition of the colorant on the ConBlock MIC Quality Assurance Certificate of Conformance.
    a. Review ConBlock MIC colorant instruction sheet
5. alternate pigments are not approved

3. ConBlock Topical is available in clear or color tinted.

A. ConBlock topical contains ConBlock MIC, an EPA registered antimicrobial, that is prepared by the manufacturer.

B. Job site color tinting of ConBlock Topical is not approved

1) ConBlock Topical is a penetrating sealer that contains ConBlock MIC. University research confirms that ConBlock Topical applied to concrete containing the ConBlock MIC admixture is an optimum defense for Microbial Induced Corrosion of concrete.

PART 3 – EXECUTION

3.01 Manufacturer's Instructions

A. Comply with manufacturer's submittal packet which includes product data, technical data sheets, and product instructions.

3.02 Application Procedures

A. General: Concrete water reducing admixture shall conform to ASTM C494 Types A and F.

B. Concrete admixture type recommended is Polycarboxylate (PCE) High Range Water Reducer / Superplasticizer.

C. Add ConBlock MIC to concrete mix at the batch plant

1. Ready Mix Batch Plant – ConBlock MIC must be added to the concrete mixer at batch plant with the head water.

a. ConBlock MIC should not come in direct contact with air entrainment admixtures.

b. Batching and mixing of materials in accordance with ASTM C 94 / C 94M.

c. If ConBlock MIC cannot be added with the head water in the batching process, ready-mix supplier must contact Concrete Sealants to discuss.

2. Precast Batch Plant - ConBlock MIC must be added to the concrete mixer at batch plant with the head water.

a. If ConBlock MIC cannot be added with the head water in the batching process, precast supplier must contact Concrete Sealants to discuss.

NOTE TO BIDDERS: It is a generally accepted practice that air entraining admixtures are batch sequenced with aggregates to facilitate friction generation to produce microscopic air entrained bubbles.

3.03 Project Conditions

A. Conform to ACI 305R when concreting during hot weather.

B. Conform to ACI 306R when concreting during cold weather.

NOTES TO BIDDERS: Concrete Set Times. Depending on many factors, the set time of the concrete may be delayed or accelerated due to chemical and physical composition of ingredients, brand and quantity of Portland cement and supplementary cements, admixtures, concrete temperature and climatic conditions.

3.04 CURING

A. Concrete must be cured in accordance with ACI 308.1 - Specification for Curing Concrete

3.05 PREPARATION

A. Provide reasonable auxiliary services to accommodate field testing and inspections, acceptable to testing agency, including the following:

1. Facilitate daily access to the work
2. Incidental labor and facilities necessary to facilitate tests and inspections

3.06 PROTECTION

A. Protect installed product and finished surfaces from damage during construction.

B. Provide security and protection for test samples and for testing and inspection equipment at Project site during initial curing and field curing of test samples.

C. Include equipment and continuous electrical power at project site to maintain curing temperatures between 60 degrees F and 80 degrees F during initial curing period of compression strength test specimens.

3.07 FIELD QUALITY CONTROL

A. Examination for Defects: Do not bury or conceal concrete with ConBlock MIC before inspection by testing technicians, owner’s representatives, or other designated entities to look for structural defects such as faulty construction joints, cold joints, cracks, and honeycomb areas. Defects to be repaired in accordance with concrete manufacturer's repair procedures.

B. Backfilling: Use normal backfilling procedures after concrete has reached 75% of specified compressive strength.

1. If backfill takes place within seven days after concrete placement, backfill material must be moist so moisture is not drawn from the concrete.

###