

## Section 09699

### Water Vapor Emission Control Systems

#### Part 1 – General

##### 1.1 RELATED DOCUMENTS

- A. Drawings, documents, and general provisions of the Contract, including, but not necessarily limited to, General Conditions and Division 1 Specification Sections, apply to this Section.
- B. Related Sections- Coordinate work of this Section with work of other Sections to properly execute the work requirements and maintain satisfactory progress of work in other Sections.
  - 1. Section 03300: Cast-In Place Concrete Installation and curing requirements according to ACI 302.
  - 2. Section 09620: Specialty Flooring, Installation requirement.
  - 3. Section 09640: Wood Flooring, Installation requirement.
  - 4. Section 09650: Resilient Flooring, rubber sheet and vinyl tile installation requirements.
  - 5. Section 09660: Static Control Flooring, Installation requirements.
  - 6. Section 09670: Fluid Applied Flooring, Installation requirements.
  - 7. Section 09680: Carpet, Installation requirements.

##### 1.2 SUMMARY

- A. This Section includes the furnishing, testing, and application of systems for the reduction of moisture vapor transmission and alkalinity control for Interior concrete slabs requiring the installation of VCT, vinyl flooring, rubber flooring, wood, carpet, and/or epoxy flooring systems.

##### 1.3 SUBMITTALS

- A. General: Submit each item in this Article according to the, requirements and Conditions of the Contract in Division 1. Specification Sections.
- B. Product data for each type of product and process specified, which shall include:
  - 1. Manufacturer's Specification
  - 2. Installation Instructions
  - 3. Independent Test Data
  - 4. Certification Requirements
  - 5. Warranty Information
- C. Submit anhydrous calcium chloride testing according to ASTM F 1869-98, that shall be performed by the Owner's Special Inspector to the Architect, Owner, General Contractor, and Water Vapor Reduction System Manufacture's Representative.

##### 1.4 QUALITY ASSURANCE

- A. Qualifications of Applicator
  - 1. Employ an Applicator currently approved by the manufacturer, experienced In surface preparation and application of the material and subject to inspection and control of the manufacturer.
  - 2. Installer shall have no less than five (5) years experience installing the fluid based coating systems.\

**B. Manufacturer's Qualifications**

1. Manufacturer shall have no less than ten (10) years experience in manufacturing water vapor reduction systems. The water vapor reduction system must be specifically formulated and marketed for water vapor reduction and alkalinity control without change of system design for a minimum period of five (5) years.
2. Manufacturer shall provide the Owner with their standard ten (10) year warranty at no additional cost. Applicator of water vapor reduction system shall provide standard installation warranty for workmanship.
3. Manufacturer must provide Independent lab test reports documenting performance per the following:
  - a. ASTM E 96, Water Vapor Transmission (wet methods) Performance shall be documented by an independent testing laboratory at a minimum of 80% for Koester VAP I pH System, water vapor transmission reduction.
  - b. ASTM D 1308; Insensitivity to alkaline environment up to pH 14.
  - c. Certify acceptance to continuous topical water exposure after final cure.
4. Submit independent test documentation to verify the following vapor reductions: from 10 lbs per 1000 ft<sup>2</sup> per 24 hours to 3lbs per 1000 ft<sup>2</sup> per 24 hours or 12 lbs per 1000 ft<sup>2</sup> to 5 lbs per 1000 ft<sup>2</sup> per 24 hours when tested according to ASTM 1869.98 or ASTM E 96 wet method.

**1.5 DELIVERY, STORAGE AND HANDLING**

- A. Deliver products to the job site in their original unopened containers, clearly labeled with the manufacturer's name and brand designation.
- B. Store products in an approved ventilated dry area; protect from dampness, freezing, and direct sun light. Product should not be stored in areas with temperatures in excess of 90 °F or below 50 °F.
- C. Handle product in a manner that will prevent breakage of containers and damage products.

**1.6 PROJECT/SITE CONDITIONS**

**A. ENVIRONMENTAL CONDITIONS**

1. Do not apply moisture vapor reduction system to unprotected surfaces or when water is accumulated on the surface of the concrete.
  2. Do not apply water vapor reduction system when temperature is lower than 50° F or expected to fall below this temperature within 24 hours from time of application.
  3. Allow continuous ventilation and indirect air movement at all times during application and curing process of the water vapor reduction system.
- B. Protection: Protect water vapor reduction system to prevent damage from active rain or topical water for a minimum period of 24 hours from time of application.

**1.7 SCHEDULING**

- A. Before installation of the flooring systems over the interior concrete slabs, anhydrous calcium chloride testing shall be performed as per ASTM F 1869-98 by the Owner's Special Inspector as outlined In Article 3.1 below to determine the level of water vapor transmission In the slab and the type of moisture vapor reduction system required.
- B. The Owner's Special Inspector will coordinate with the Owner scheduling water vapor reduction system testing and allowing enough time to test, submit and install the water vapor reduction system before installation of floor finish.

- C. The Owner's Special Inspector will allow for as much time as is reasonable for the concrete slab to dry before installing anhydrous calcium chloride tests. All mastics, glues, and/or contaminants shall be removed to provide a clean, sound, concrete substrate prior to installing anhydrous calcium chloride tests as per ASTM F 1869-98. No Exceptions!

## **PART 2 – PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Water vapor reduction system, which may be Incorporated In the work, shall be the product of a single manufacturer, no substitutions. Manufacturer's offering approved products such as:
1. Koester VAP I pH System by Koester American Corporation; Corporate Headquarters: (757) 425-1206. Western Regional Office: (541) 548-0210.
- B. Terminology hereafter is based upon the products of Koester American Corporation.

### **2.2 MATERIALS**

- A. General: Use materials of one manufacturer throughout the project as hereinafter specified.
- B. Water-based VAP I pH coating, containing specifically formulated chemicals and resins to provide the following characteristics and properties.
2. ASTM E 96, Water Vapor Transmission (wet methods) Performance shall be documented by an independent testing laboratory at a minimum 80% for Koester VAP I pH System water vapor transmission reduction compared to untreated concrete.
  3. ASTM C 309; Liquid Membrane -Forming Compounds for Curing Concrete.
  4. ASTM D 1308; Insensitivity to alkaline environment up to pH 14.
  5. Certify acceptance and exposure to continuous topical water exposure after final cure.

### **2.3 KOESTER VAP I pH SYSTEM**

- A. This system consists of one (1) coat of VAP I pH water based, solvent free to be applied to a properly prepared concrete surface. Anhydrous calcium chloride testing performed by the Owner's Special Inspector having water vapor transmission levels greater then 3 lbs/24hrs. per 1000/sf. and less then 10 lbs/24 hrs per 1,000/sf. (depending on Individual conditions) shall determine where this system Is utilized and the coverage rates required. The Owner shall specify a floor covering system and adhesive having the ability to withstand water vapor transmission levels up to 3 lbs/ 24 hrs per 1,000/sf. The water vapor reduction system shall be required to reduce vapor emissions by a minimum of 80% after final cure. Verify water vapor reduction by anhydrous calcium chloride testing according to ASTM F 1869-98 prior to proceeding with any floor covering Installation.

### **2.4 KOESTER VAP I pH SYSTEM**

- A. System consists of one (1) coat of VAP I pH. Anhydrous calcium chloride testing according to ASTM F 1869 – 98 performed by the Owner's Special Inspector having water vapor transmission levels greater than 3 lbs./ 24 hrs per 1000/sf. and less than 10 lbs/24 hours per 1000/ sf. (depending on individual conditions) shall determine where this system is utilized and the coverage rates required. The Owner shall specify a floor covering system and adhesive having the ability to withstand water vapor transmission levels up to 3lbs/24hrs. per 1000/sf. The water vapor reduction system shall be required to reduce water vapor emissions by a minimum of 80% after final cure, as well as alkalinity reduction to acceptable pH levels. Verify water vapor reduction by anhydrous calcium chloride testing prior to proceeding with any floor covering installation.

## 2.5 AREA NOT REQUIRING VAPOR REDUCTION SYSTEM

- A. Anhydrous calcium chloride testing performed by the Owner's Special Inspector for interior concrete slab areas receiving VCT, sheet vinyl, rubber flooring, wood, carpet, and or epoxy flooring systems will determine where this system might be required. Water vapor reduction system might be required on concrete floors with water vapor transmission level in excess of 3 lbs/24 hrs per 1,000 sf. or 5 lbs for some specific flooring systems verify with flooring system manufacturer.
- B. Water vapor reduction system is not required on Interior concrete slabs without floor finishes.

## 2.6 MIX DESIGNS

- A. Use clean containers and mix thoroughly as per Manufacturer's requirements to obtain a homogeneous mixture. Use a low speed motor less than 400 rpm and a two bladed Jiffy mixing blade only. DO NOT AERATE. Mix ratios are measured by volume.
- B. VAP I pH Mix Ratio: Mix Component A and B at a ratio of 4:1 by volume.

## PART 3 – EXECUTION

### 3.1 EXAMINATION

- A. Calcium Chloride test requirements:
  - 1. Anhydrous calcium chloride testing shall be performed by the Owner's Special Inspector as outlined in Section 01410 - Quality Requirements.
  - 2. Provide anhydrous calcium chloride tests according ASTM F 1869 - 98 In accordance to all surface preparation methods outlined. Tests shall be installed onto freshly abraded contaminant free concrete. No exceptions!
  - 3. Only conduct calcium chloride tests at the same temperature and humidity expected during normal use. If this is not possible, then the test conditions should be 75°F +-10°F and 50+-10% relative humidity. Maintain these conditions 48 hours prior to and during tests. Water vapor transmission levels are directly affected by ambient room temperature and readings conducted without a sustained ambient temperature are NOT acceptable.
  - 4. Owner's Special Inspector shall provide test results with a marked up floor finish plan showing test results. Owner's Special Inspector shall provide a written clarification on status of the ambient air temperature and humidity before and during the testing procedures.
  - 5. Owner's Special Inspector shall provide a marked up floor plan showing areas with vapor reduction system recommendations.
- B. Initial calcium chloride tests:
  - 1. Before installation of VCT, sheet vinyl, rubber flooring, wood, carpet, and / or epoxy flooring systems over interior concrete slabs, the Owner's Special Inspector shall make known the level of water vapor transmission in the slab in accordance to ASTM F 1869-98 to all parties involved. The Owner's Special Inspector will document the test results and provide recommendations on the type of moisture vapor reduction system to be utilized.
  - 2. Testing for concrete deficiencies and contaminates like un-reacted silicates, chlorides, A.S.R. (alkali-silica reaction), etc. is strongly recommended by Koester to avoid project failures.
- C. Floor treatment calcium chloride tests:
  - 1. After proper cure of the final coat of the water vapor reduction system the Owner's Special Inspector shall provide calcium chloride tests to determine if the level of water vapor transmission and alkalinity are reduced to the Owner's specified levels in conjunction with the flooring manufacturer's installation requirements. Contact Owner and water vapor reduction system Manufacturer's Representative concerning areas with a water vapor transmission level greater than the Owner's specified levels.

D Adhesion tests:

1. Koester VAS Adhesives or approved equal. The Owner's Special Inspector shall verify proper adhesion of flooring adhesives, coatings, and leveling compounds to the final vapor reduction coating system for acceptability. Contact Manufacturer's Representatives for recommendations.

### 3.2 PREPARATION

- A. Inspect all surfaces with regard to their suitability to receive moisture vapor reduction system with manufacturer's representative prior to application of moisture reduction system.
- B. Clean all surfaces to receive moisture vapor reduction system. Shot blast all floors and clean surfaces with Shop Vac to remove all residue off the substrate. Remove ALL defective materials, and foreign matter such as dust, adhesives, leveling compounds, paint, dirt, floor hardeners, bond breakers, oil, grease, curing agents, form release agents, efflorescence, laitance, Shot blast bee bees, etc. Repair all cracks, expansion joint, control Joints, and open surface honeycombs and fill in accordance with Manufacturers recommendations. Inform vapor reduction system manufacturer if concrete additives like chlorides or any other soluble compounds that can contaminate surfaces have been used in the concrete mix. Reinforcing fibers must be burned off, scraped and vacuumed, after shot blasting, leaving no fibers left on the concrete surfaces. Provide uncontaminated, absorptive, sound surface. **DO NOT ACID ETCH!**
- C. Repair concrete prior to moisture vapor reduction system installation by utilizing Koester SB Bonding Emulsion with approved concrete repair materials. Comply with all requirements as listed in Manufacturer's technical data information. No exceptions. Consult with vapor reduction manufacturer.
- D. Make sure that surfaces to be treated with moisture vapor reduction system have NOT previously been treated with other materials like underlayments, screeds, penetrating sealants, etc. If this is the case, consult with the Manufacturers Representative prior to any application of moisture vapor reduction system.
- E. Make sure that the substrate surface does not deteriorate due to the presence of sulphurous compounds or alkaline aggregate/silica reaction encountered in certain areas.
- F. Any testing for concrete deficiencies / contamination like alkaline silica reaction, untreated silicates, organic residue, etc. is the responsibility of the Building owner.
- G. Koester American Corp. strongly advises that surfaces to be treated with Koester material inspected and evaluated by an experienced firm prior to application of Koester Systems to determine its suitability to receive the VAP I<sup>®</sup> System
- H. Only a surface substrate that REMAINS uncontaminated, absorptive, and sound is fit to receive a water vapor reduction system. Comply with all requirements as listed in Manufacturer's technical data information. No exceptions.
- I. Proper removal of contaminants can render surfaces too rough for certain flooring systems. Therefore shot blast a small test area and verify with the flooring applicator that the surfaces are fit to receive the specified flooring system without the application of an underlayment on top of the VAP I pH System.

### 3.3 APPLICATION

A. **VAP I pH System Application:**

1. The coverage rates for this Single Coat system depend on the surface texture and porosity of the substrate as well as the measured level of moisture, from Section 3.1 Examination. On average, coverage of 200 sq.ft./gal. can be expected.
2. Apply one coat of VAP I pH at an average coverage of 200 sq.ft./gallon using an air/airless spray equipment with pressures not exceeding 20 psi and back broom to achieve even coverage, leaving **NO** areas untreated.

**B. VAP I pH System Application:**

1. Dampen uncontaminated concrete surface, (SSD) Surface Saturated Dry leaving NO standing water. Surfaces must be damp, not wet to the touch. Always use clean potable water to pre-dampen concrete surfaces. Only pre-dampen concrete prior to the first VAP I pH coat.
2. Spray VAP I pH leaving no areas untreated. Backbrush thoroughly.
3. Avoid puddling and pinholes when backbrushing.
4. Provide continuous ventilation and air movement during curing process. **NO EXCEPTIONS.**
5. Apply first VAP I pH coat at a rate of 200 sq.ft. per gallon and allow to cure a minimum of 12 hours.(See additional application instructions in Koester's technical data sheets.)
6. Apply one coat of VAP I pH at an average coverage rate of 200 sq. ft. /gallon using air/airless spray leaving no areas untreated. Allow to cure a minimum of 12 hours before installing flooring system. (See additional application instructions in Koester technical data sheets.)

C. Cementitious underlayment system Level-Pro and primer Level-Pro Primer E manufactured by Koester American or an approved equal if required by the Owner, Floor Covering Installer, or the Floor Covering Manufacturer may be used to level any smooth surfaces after Shotblasting the floor on top of the water reduction system. The underlayment system utilized must be tested and approved by **(no exceptions)** by the manufacturer of the water vapor reduction system prior to installation. No underlayment system containing gypsum will be allowed. When water based adhesives are utilized in the floor covering installation, use an approved underlayment system with primer prior to the installation of the flooring system. Please consult the adhesive manufacturer for their minimum recommended thickness of cementitious underlayment to absorb excess moisture in the adhesive. Leveling of the substrate shall not be considered part of the water vapor reduction system. **No exceptions.**

D. For installation of resilient flooring directly over the water vapor reduction system, the contractor responsible for installing the floor covering system shall use Koester VAS Adhesives or equal. Use 100% solids flooring adhesives or contact type adhesives with long working times that can be applied to substrates with a pH up to 10. The method of use is to apply the contact type adhesives to the substrate and allow the materials water to flash off prior to the flooring installation. Always test proper adhesion of adhesives to water vapor reduction system prior to installation of entire flooring system. **No exceptions.**

**3.4 CLEANING**

- A. Clean all tools and equipment with water immediately after use when using the VAP I pH System for water vapor reduction.
- B. Remove all debris resulting from water vapor reduction system installation from project site.

**3.5 PROTECTION**

- A. Protect each coat during specified cure period from any kind of traffic, topical water and contaminants.

**END SECTION 09699**