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GUIDE SPECIFICATION #PKWM - GUNNED APPLICATION OVER STEEL INCLUDING A WIRE MESH ANCHORING SYSTEM

NOTE: This guide specification points out various installation procedures but can not cover all variations in field conditions. Therefore, experienced applicators may sometimes deviate from these procedures to suit specific field and service conditions.

SERVICES REQUIRED -- to furnish and install a corrosion resistant mortar lining in accordance with the following specifications. This work to be completed as close as possible to the anticipated start-up date. All work is to be inspected at each stage by the party responsible for quality control.

SCOPE

- a. The corrosion resistant mortar lining shall be applied to protect the concrete in accordance with these specifications. The application shall include preparation of the surface, placing a wire mesh anchorage system, mixing and apply the mortar lining using specified materials and application procedures.
- b. The installation of the lining shall be accomplished by a franchised representative of the manufacturer of the corrosion resistant mortar or by crews experienced in the field installation of gunned mortar linings.
- c. Installation is to be accomplished when the concrete temperature is between 40°F to 90°F for a majority of the time -- excursions for short times are permitted. If temperatures will be below or above this range for a majority of the time, heating or cooling of the area should be included to insure a sound lining application.

MATERIALS

LINING

- a. The lining shall be a corrosion resistant cement Pre-Krete as manufactured by Pocono Fabricators, 160 Gamma Drive, Pittsburgh, PA. The mortar lining shall contain no free lime and not less than 25% silica.
It shall be composed of a low water soluble hydraulic binder, which is completely inorganic and non-toxic.

The mortar lining material shall be pre-mixed in the plant of the manufacturer so that it is totally homogeneous and completely uniform. The mortar lining material shall be delivered to the job site in 50 lb. paper bags. Only the addition of clean, cool water will

be used, no other ingredients will be added. Use of portland cement will not be permitted.

- b. Prior to installation, certified laboratory data shall be submitted which verifies that the mortar lining meets the following minimum requirements:
 1. The water absorption of the mortar lining (when tested in accordance with Military Specification MIL-T-12295) shall not be more than 10% of its dry weight. The dry density shall be at least 135 pounds per cubic foot.
 2. The compressive strength of the mortar lining (when tested in accordance with ASTM Method C109-78) shall be at least 5,000 psi after 3 days. The tensile strength (when tested in accordance with ASTM Method C190-77) shall be at least 600 psi after 3 days.
 3. The lining shall have approximately the same coefficient of expansion as medium steel. This shall be verified by tests where the mortar lining has been applied to medium steel rings, heated up to 350°F, then plunged into tap water at 40°F. Tests shall be repeated 100 times and shall indicate that the lining is unaffected by this temperature variation.

SURFACE PREPARATION

- a. The steel surface shall be cleaned to remove oil, dirt, grease and loose powdery contaminants or other coatings. Cleaning can be accomplished by:
 1. Abrasive blasting equipment using dry, hard sharp sand or grit to remove contaminants.
 2. High pressure water blaster is acceptable if it can clean the steel so it will exhibit a tight cohesive surface suitable for bonding of mortar lining.

Rust bloom is perfectly acceptable and will aid in mechanical bond. A white metal surface is not recommended.
- b. On old steel, any holes shall be repaired prior to installing the lining.

MIXING

Pre-Krete is mixed at the rate of _ to 1 gallon of water per 50-lb. bag. Water shall be cool and free from quantities of silt, organic matter, alkali, salts and other impurities. The amount of water required is dependent on the weather conditions. On hot days, more water is needed than on damp days. Formula G-8 usually requires slightly less mixing water than C-17. Do not add all the water at one time. Start off with about _ gallon of water and add more as required. Mix the Pre-Krete to a normal, mortar-like consistency. Do not get the Pre-Krete too dry or too soupy. If necessary, add more Pre-Krete to a watery mixture. The consistency should be such that if you put a quantity of Pre-Krete

(about the size of a golf ball) on your fingers press it down lightly, then turn your hand over -- the Pre-Krete should stay adhered to your fingers.

WIRE MESH SYSTEM

ANCHORS

- a. The anchor system can be "C" slotted studs or _" diameter steel wavy rods. All anchoring material shall be fabricated from mild steel.
 1. C slot anchors can be Nelson #R6P or equal. Studs are to be welded on 12" centers vertically and horizontally.
 2. Wavy rods to be a maximum _" in diameter and have a _" crimp every 18". Rods to be placed 18" apart on side walls and floors and 12" apart on overhead sections. Rods shall be soundly welded to the steel surface at each crimp. Wire mesh to be tied to the rods on 12" centers using #16 gauge tie wire. Tie wire to be bent over so as to be below the surface of the wire mesh.
 3. Other anchor systems are suitable as long as it ensures that the wire mesh will be held parallel to the surface being lined.

WIRE MESH

- a. The wire mesh can be 14 gage or 12 gage, electric welded wire fabric, galvanized or plain steel.

The openings shall be no smaller than 2" x 2" or no greater than 4" x 4" if the operating temperature is below 400°F.

For operating temperatures over 400°F, use 4" x 4" openings.
- b. Sheets of wire mesh are to be overlapped one (1) square to prevent void areas.
- c. The length of the anchoring system will provide a minimum distance of 1/2" to 5/8" to the top of the wire mesh.
- d. The wire mesh must be anchored to prevent it from floating to the surface of the mortar lining and at the same time, the wire mesh must support the weight of the lining and not collapse against the shell. Wire mesh to be concentric to surface to be lined.

APPLYING MORTAR LINING BY GUN OVER WIRE MESH

- a. The lining shall be air placed to a thickness of 1-1/2" minimum, making several continuous passes until the specified thickness is deposited. The mortar lining shall be placed as dry as possible with a minimum water content. The wire mesh and/or the anchoring system must be covered by a minimum of 1/2" of mortar lining if operating temperatures are below 400°F or by 1" of mortar lining if temperatures can exceed 400°F.
- b. If the surface of the mortar lining is uneven or porous after being air placed, it may be wiped while damp with a cement brush dipped in water to even out the hills and valleys. No sharp irregularities in the surface of the mortar lining will be permitted. Inside angles shall be rounded smoothly. Any exposed edges of the mortar lining shall be protected by means of a flat bar, the width of the lining, welded in so that the mortar lining can butt against it.
- c. The application of the mortar lining is to be made with either a wet or dry mix gun, the size, specifications and operating procedure of which must be in accordance with the recommendations of the manufacturers of the equipment. Only competent and experienced personnel who are thoroughly familiar with the pneumatic application of mortar linings shall be employed in the application of this lining.
- d. Under no circumstances is any rebound material to be used. If working from the top down in vertical areas, blow rebound out from behind wire mesh before applying mortar lining.
- e. At the end of each days work, or if a lengthy work stoppage occurs, the mortar lining in place shall be undercut to the wire mesh at a point where full thickness has been applied. The mortar lining behind the wire mesh should be scored and loose material removed and discarded. Loose rebound material should not be permitted to accumulate and harden.

PRE-KRETE MAY BE CURED TO ONE OF THE FOLLOWING METHODS:

1. CURING COMPOUND

NOTE: CONCRETE SEALER SHOULD NOT BE USED IN POTABLE WATER SERVICE.

Use of a resin-based membrane compound such as Concrete Sealer, as supplied by Pocono Fabricators, can be spray, brush, and/or roller applied to the fresh mortar lining. It should be applied as soon as possible after the surface moisture has disappeared. Coverage is approximately 150-200 sq. ft./gallon. Mortar lining should be allowed to set untouched for 24 hours.

2. MOISTURE CURE

Pre-Krete Systems can be moisture cured by creating a moist environment within the lined equipment. This is done by securely covering **ALL** manholes and nozzles with

plastic and tape. It is imperative that ALL openings be tightly sealed. In large equipment, a punctured garden hose producing a fine mist or a simple garden sprinkler of the oscillating type can be placed in the upper elevations of the equipment. This will also create the moist environment required. In extreme conditions of very low humidity (less than 40%) and high temperatures (skin temperature above 90°F) humidifiers are required to prevent water loss during application. This equipment is also known as swamp coolers. If you have difficulty finding this type of equipment in your area, contact Pocono Fabricators.

3. IMMERSION CURE

After the tank is completely lined, let it set untouched for 4 to 8 hours. After the lining has gotten firm, SLOWLY fill the tank with water, making sure you are not "washing out" any of the lining. Allow the lining to set for 12 to 24 hours completely immersed in water. Drain and flush the tank. The tank is now ready to be placed into service.

4. HEAT-UP PROCEDURE

When a Pre-Krete lining is installed in a boiler stack, breeching, etc. there is always some residual moisture remaining after a 24-hour curing period. When operating temperatures are above 250°F and a 5 to 7 day cure at 60°F is unattainable, it is important that the installed Pre-Krete lining be heated up gradually so that the residual moisture is not steamed. This could result in spalling and other damage. The following heat-up procedure is only required when a newly lined unit is first placed into service: After you apply the lining allow it to cure for 24 hours using Concrete Sealer or allowing it to set in a moisture laden atmosphere. After that time, bring the temperature up to 250°F and allow it to remain there for 1 hour, then increase the temperature by 50°F and again hold for 1 hour for each inch of thickness. Continue that procedure until you reach the operating temperature.