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# GSA U.S. General Services Administration Poulticing Iron Rust Stains From Concrete

Procedure code: 371026S Source: Hstrc Concrete: Investigation & Rpr/Pre-Conf Training - 1989 Division: Concrete Section: Concrete Cleaning Last Modified: 08/04/2016

PREFACE: The cleaning or removal of stains from concrete may involve the use of liquids, detergents or solvents which may run off on adjacent material, discolor the concrete or drive the stains deeper into porous concrete. Use the products and techniques described here only for the combinations of dirt/stain and concrete specified.

# PART 1---GENERAL

#### 1.01 SUMMARY

- A. This procedure includes guidance on removing both surface and penetrating rust stains from concrete by poulticing with chemical solvents.
- B. Stains of a rust color on concrete are usually caused by rusting of steel in or on concrete, from use of curing water that contains iron in solution or from pyrites (iron sulfide particles) occasionally found in aggregate.
- C. Safety Precautions:
  - 1. DO NOT save unused portions of stain-removal materials.
  - 2. DO NOT store any chemicals in unmarked containers.
  - 3. EXCELLENT VENTILATION MUST BE PROVIDED WHEREVER ANY SOLVENT IS USED. USE RESPIRATORS WITH SOLVENT FILTERS.
  - 4. No use of organic solvents indoors should be allowed without substantial air movement. Use only spark-proof fans near operations involving flammable liquids.
  - 5. Provide adequate clothing and protective gear where the chemicals are indicated to be dangerous.
  - 6. Have available antidote and accident treatment chemicals where noted.
- D. See "General Project Guidelines" for general project guidelines to be reviewed along with this procedure. These guidelines cover the following sections:
  - 1. Safety Precautions
  - 2. Historic Structures Precautions
  - 3. Submittals

- 4. Quality Assurance
- 5. Delivery, Storage and Handling
- 6. Project/Site Conditions
- 7. Sequencing and Scheduling
- 8. General Protection (Surface and Surrounding)
  - These guidelines should be reviewed prior to performing this procedure and should be followed, when applicable, along with recommendations from the Regional Historic Preservation Officer (RHPO).

# PART 2---PRODUCTS

# 2.01 MATERIALS

NOTE: Chemical products are sometimes sold under a common name. This usually means that the substance is not as pure as the same chemical sold under its chemical name. The grade of purity of common name substances, however, is usually adequate for stain removal work, and these products should be purchased when available, as they tend to be less expensive. Common names are indicated below by an asterisk (\*).

# A. For Light Shallow Stains:

- 1. Oxalic Acid (COOH)2 or (H2C2O4):
  - a. A poisonous strong acid that occurs in various plants as oxalates and is used especially as a bleaching or cleaning agent and in making dyes.
  - b. Other chemical or common names include Ethanedioic acid.
  - c. Potential Hazards: TOXIC; CORROSIVE TO CONCRETE, STEEL, WOOD OR GLASS.
  - d. Available from chemical supply house, dry cleaning supply distributor, drugstore or pharmaceutical supply distributor, hardware store, or photographic supply distributor (not camera shop). (Often sold under a manufacturer's brand name; the chemical name may appear on the label.)
- 2. Ammonium Hydrogen Fluoride: USE EXTREME CAUTION WITH THIS MATERIAL.
  - a. Other chemical or common names include Acid Ammonium fluoride; Ammonium bifluoride.
  - b. Potential Hazards: TOXIC; CAUSTIC TO FLESH; CORROSIVE TO CONCRETE, STEEL, WOOD OR GLASS; FLAMMABLE.
  - c. Available from chemical supply house or dairy supply distributor.
  - d. USE EXTREME CAUTION WITH THIS MATERIAL.
- B. For Deep Penetrating Stains:
  - 1. Sodium Citrate (appears like enlarged salt granules):
    - a. Other chemical or common names include Citrate of soda\*.
    - b. Available from chemical supply house, drug store or pharmaceutical supply distributor.
  - 2. Glycerol:
    - a. Other chemical or common names include Glycerine; Glyceryl hydroxide; Glycyl alcohol; 1,2,3propanetriol; Propenyl alcohol.
    - b. Potential Hazards: FLAMMABLE.
    - c. Available from chemical supply house, drug store or hardware store.
  - 3. Hydrogen Peroxide (H202):
    - a. An unstable compound used especially as an oxidizing and bleaching agent, an antiseptic, and a propellant.
    - b. Other chemical or common names include Peroxide of hydrogen\*; Solution of hydrogen dioxide\*;
      Superoxol\*; (hydrogen peroxide is commonly sold as a 3% solution; Superoxol is a 30% solution;
      Superoxol causes flesh burns; 3% hydrogen peroxide does not).

- c. Potential Hazards: TOXIC (when concentrated); CAUSTIC TO FLESH; FLAMMABLE (in high concentration).
- d. Available from chemical supply house, drugstore, pharmaceutical supply distributor, or hardware store.
- 4. Sodium Thiosulfate white sal or "hypo" of photographic fixing agent (NA2S2O3):
  - a. A hygroscopic crystalline salt used especially as a photographic fixing agent and a reducing or bleaching agent.
  - b. Other chemical or common names include Sodium hydrosulfite; Sodium Hyposulfite; Sodium subsulfite; Antichlor\*; Hypo\*; Hyposulfite of soda\*.
  - c. Potential Hazards: TOXIC; CORROSIVE TO CONCRETE, STEEL, WOOD OR GLASS.
  - d. Available from chemical supply house, dry cleaning supply distributor, drugstore or pharmaceutical supply distributor, photographic supply distributor (not camera shop), or water and sanitation supply distributor.
- C. Soap Powder
- D. Filler material such as diatomaceous earth, talc or cotton wadding
- E. Mineral water
- F. Plastic sheeting
- G. Clean dry towels for blotting the area after treatment
- H. Masking tape
- I. Clean, potable water
- J. Accessible source of water, soap and towels for washing and rinsing in case of emergencies associated with the use of chemicals

# 2.02 EQUIPMENT

- A. Stiff bristle brushes (non-metallic)
- B. Glass or ceramic container for mixing the solution
- C. Wooden utensil for stirring the ingredients
- D. Wood or plastic spatula

# PART 3---EXECUTION

# 3.01 PREPARATION

- A. Protection:
  - 1. Provide adequate wash solutions (i.e. water, soap and towels) before starting the job.
  - 2. Whenever acid is used, the surface should be thoroughly rinsed with water as soon as its action has been adequate. Otherwise it will continue etching the concrete even though the stain is gone.

# 3.02 ERECTION, INSTALLATION, APPLICATION

NOTE: DO NOT TRY MORE THAN ONE TREATMENT ON A GIVEN AREA UNLESS THE CHEMICALS USED FROM PRIOR TREATMENT HAVE BEEN WASHED AWAY.

- A. For Light Surface Stains:
  - 1. Mix 1 pound oxalic acid in 1 gallon of water. CAUTION: OXALIC ACID IS TOXIC. OBSERVE WARNINGS ON THE LABEL.
  - 2. Swab the stained area with the solution.
  - 3. To quicken the stain removal action, add 1/2 pound of ammonium acid fluoride to the solution. CAUTION: AMMONIUM ACID FLUORIDE GENERATES HYDROFLUORIC ACID, WHICH IS HIGHLY AGGRESSIVE AND TOXIC TO SKIN, EYES AND MUCOUS MEMBRANES. THE EFFECTS ARE FAIRLY LONGLASTING, SO THIS COMPOUND SHOULD

BE HANDLED WITH EVEN MORE CARE THAN MOST MINERAL ACIDS.

- 4. Allow the solution to sit on the stained concrete for 2 or 3 hours.
- 5. Thoroughly rinse the surface by scrubbing with a stiff bristle brush and clean, clear water.
- 6. Repeat the treatment as necessary to achieve the desired level of cleanliness.
- B. For Deep Penetrating Stains:
  - 1. Dissolve 11 ounces by weight of sodium citrate in 2 quarts of lukewarm water and add 2 quarts and 12 ounces of glycerol.
  - 2. Mix the solvent solution above with diatomaceous earth or talc to form a thick paste having the consistency of oatmeal.
  - 3. Thoroughly wet the concrete surface to be treated with clean, clear water.
  - 4. Apply the poultice to the stained area using a wood or plastic spatula and allow to dry. Be sure to spread the poultice well beyond the stained area. The liquid portion of the paste will migrate into the concrete where it will dissolve some of the staining material. Then the liquid will gradually move back beyond the concrete surface and into the poultice, where it will evaporate, leaving the dissolved staining material in the poultice.
  - 5. When the poultice has dried, brush or scrape it off with a wooden scraper.
  - 6. Using a stiff bristle brush, scrub the surface with scouring powder and clean water to remove any residual staining.
  - 7. Thoroughly rinse the area with clean, clear water and allow to dry.
  - 8. Repeat the process as necessary to sufficiently remove the stain.
    - -OR-

NOTE: THIS METHOD REQUIRES GOOD VENTILATION TO REMOVE THE ACRID FUMES OF SULFUR DIOXIDE GIVEN OFF.

- 9. Dissolve 22 ounces by weight of sodium citrate in 1 gallon of lukewarm water.
- 10. Saturate a bandage of cotton wadding in the solvent solution and apply the bandage for 30 minutes, or brush the solution on the surface every 5 or 10 minutes.
- 11. For stains on horizontal surfaces:
  - a. Sprinkle a thin layer of sodium thiosulfate over the surface and moisten it with a light mist of water from a spray nozzle.
  - b. Cover the treated area with a poultice made with diatomaceous earth or talc moistened with water.
- 12. For stains on vertical surfaces:
  - a. Place a poultice of diatomaceous earth or talc mixed with water on a trowel.
  - b. Sprinkle sodium thiosulfate crystals on the poultice and moisten slightly.
  - c. Trowel the poultice mixture onto the surface so that the crystals are in direct contact with the stained surface.
  - d. NOTE: If the thiosulfate crystals turn the brown stains to black, brush apply a diluted solution of hydrogen peroxide to the stained area and repeat the thiosulfate treatment.
- 13. After 1 hour, remove the poultice. Repeat the treatment with fresh materials as necessary to achieve the desired level of cleanliness.
- 14. Scrub the surface thoroughly with clean, clear water and apply another treatment of the sodium citrate solution to prevent the stain from coming