SECTION 4415: Aesthetic Concrete Wall Repair

100 DESCRIPTION

1. This specification describes installation of custom concrete patching compounds.

101 GENERAL

1. Wherever the words "approved by", "equivalent" or similar phrases are used in this specification, they shall be understood to mean that the material, process or item referred to shall require the written approval of the patching system manufacturer.

2. This specification shall be read in conjunction with project specifications, sketches, photographs and/or drawings indicating the precise extent of work and the use and location of specific materials.

3. Contractor shall make a pre-bid field visit to verify all work shown or not shown on the drawings.

103 WORK INCLUDED

1. Provide all labor, equipment and materials necessary to complete the following concrete repair work:

    a. Preparation of all surfaces to receive patching compound.
    b. Mixing and transportation of patching compound.
    c. Repairs to delaminated and scaled areas of existing concrete.
    d. Priming of repair areas and placement of patching compound.
    e. Finishing and curing of patches.
    f. Repair of cracks.

2. Related work, described elsewhere:
   (Optional)
    a. Repair/replacement of joint fillers and sealants. Section 07900.
    b. Consolidant/water repellent: Section 07180.
    c. Special Coatings: Section 09800.

102 QUALITY ASSURANCE

1. Restoration Specialist: Work must be performed by a firm having not less than 5 years successful experience in comparable concrete repair projects and employing personnel skilled in the restoration process and operations indicated.

    a. Only skilled journeyman masons and/or cement finishers who are familiar and experienced with the materials and methods specified and are familiar with the design requirements shall be used for concrete restoration.

    b. One skilled journeyman mason or cement finisher, trained and certified by the concrete repair system manufacturer shall be present at all times during concrete restoration and shall personally direct the work.

2. Field Construction Mock-Ups: Prior to start of general concrete restoration, prepare the following sample panels and sample areas on building were directed by Architect or Owner's Representative. Obtain Architect or Owner's Representative approval of sample before proceeding with the work. Retain accepted panels/sample areas in undisturbed condition, suitably marked, during restoration as a standard for judging completed work.

    a. Cleaning: Demonstrate materials and methods to be used for cleaning for each type of concrete surface and condition on sample panels each approximately 25 sq. ft. in area. Test adjacent non-masonry materials for possible reaction with cleaning materials. Allow waiting period of duration indicated, but not less than 7 calendar days after completion of sample panels for negative reactions.

    b. Paint, Graffiti, and Metallic stain removal: Demonstrate materials and methods to be used for paint, graffiti, and stain removal for each type of surface and condition on sample panel 4 sq. ft. in area. The removal method or methods shall be tested on an inconspicuous area of the building.

    c. Crack Repair: Prepare a sample area for each type of crack repair required for stone (i.e. hairline cracks and microscopic cracks 1/64"-1/16" in size; cracks and voids larger than 1/8"). Repair shall demonstrate methods and quality of workmanship expected for crack repair.

    d. Patching: Prepare on-building sample of each type of construction to be patched, rebuilt and/or replaced (e.g. one balcony surface, one deck area, one cornice unit, one windowsill; one wall area). Patching shall demonstrate methods and quality of workmanship expected of repair work.

    e. The samples of each type of repair work shall be done in an area that will be exposed to the same weathering conditions as the building. Allow samples to cure at least three days before obtaining acceptance of color, texture and detailing match. Samples shall be viewed from an approved distance.

3. Source of Materials: Obtain materials for Patching, coating, sealing and crack repair from a single source manufacturer to ensure match quality, color, texture and detailing.

103 SUBMITTALS

1. Product Data: Submit manufacturer's technical data for each product indicated including recommendations for their application and use. Include test reports and certifications substantiating that products comply with requirements.

2. Submit the following items in time to prevent delay of the work and to allow adequate time for review and resubmittals, if needed. Do not order materials or start work before receiving the written approval.

    a. Written certificates from the patching materials manufacturer should be submitted stating that all installers of the patching material have successfully completed a training workshop for installation of the patching material, or have met alternative workmanship qualifications acceptable to the manufacturer.

    b. Material Safety Data Sheets (MSDS) for all specified materials.

    c. Certificates, except where the material is labeled with such certification, by the producers, of the materials, that all materials supplied comply with all the requirements of these specifications and the appropriate standards.

    d. Written verification that all specified items will be used. Provide purchase orders, shipping tickets, receipts, etc. to prove that the specified materials were ordered and received.

3. Restoration Program: Submit written program for each phase of restoration process including protection of surrounding material on building and site during operations. Describe in detail material, methods and equipment to be used for each phase of restoration work.

    a. If alternative methods and materials to those indicated are proposed for any phase of restoration work, provide written description, including evidence of successful use on other, comparable projects, and program of testing to demonstrate effectiveness for use on this project.

104 DELIVERY, STORAGE AND HANDLING:

1. Deliver materials to site in manufacturer's original unopened containers and packaging, bearing labels as to type and names of products and manufacturers.

2. Deliver and store restoration material in manufacturer's original, unopened containers with the grade, batch and production data shown on the container or packaging.

3. Protect restoration materials during storage and construction from wetting by rain, snow or ground water, and from staining or intermixture with earth or other types of materials.

4. Protect materials from deterioration by moisture and temperature. Store in a dry location or in waterproof containers. Keep containers tightly closed and away from open flames. Protect liquid components from freezing. Comply with manufacturer's recommendations for minimum and maximum temperature requirements for storage.

5. Comply with the manufacturer's written specifications and recommendations for mixing, application, and curing of grouts and patching materials.

6. 105 PROTECTION / SITE CONDITIONS

7. Protect persons, vehicles, building site and surrounding buildings from injury resulting from concrete restoration work.

8. Clean concrete surfaces only when air temperatures are above 40 degrees F (4 deg. C) and will remain so until concrete has dried out.

9. Do not perform any patching unless air temperatures are between 40 degrees Fahrenheit (10 deg. C) and 86 degrees Fahrenheit (30 deg. C) and will remain so for at least 24 hours after completion of work.

10. Do not perform any patching work if precipitation is expected. In case of unexpected precipitation, work shall cease, and all uncured material shall be adequately protected with an impermeable polyethylene sheet.

11. If either the ambient or subsurface temperature is expected to fall between 35F (2C) and 40F (4C) during curing and ultimate drying of the patching compound, then the cold weather precautions outlined in item 7, below, of this section of the specification shall be followed.

12. If ambient or surface temperature is expected to rise above 86F (30C) during application and curing of the patching compound, then the hot weather precautions outlined in item 8 of this section of the specifications shall be followed

13. Cold Weather Precautions:

    a. CUSTOM SYSTEM 45 RL-6 liquid component shall be substituted for RL-1 grade.
    b. Curing times shall be extended to compensate for lower temperature cure.
    c. Do not proceed if temperatures will drop below freezing before patching compound has reached final set. Any material disrupted by early freezing must be removed and replaced under appropriate controls or conditions.
    d. If auxiliary heating will be used to protect freshly placed materials from freezing, equipment must not directly vent exhaust gases onto the repair materials or into repair enclosure air. This may cause carbonation and low strength. Use moderate temperatures and heated air or radiant heat.

14. Hot Weather Precautions:

    a. CUSTOM SYSTEM 45 TYPE CN with RL-5 liquid component shall be substituted for RL-1 grade.
    b. All materials shall be kept cool, stored out of direct sun.
    c. Pre-cooling of subsurface shall be carried out by continuous wetting at least one hour before placing patching compounds. This shall be done by covering or draping the entire repair area with burlap and by continuously keeping the burlap wet. The burlap shall be removed just prior to the patching of each area, as work proceeds.
    d. In hot, dry, windy weather, repair areas shall be covered or draped with burlap for a minimum of 3 hours after patch placement, to avoid rapid drying of the patches. Maximum wet cure time shall not exceed 24 hours.

15. Prevent masonry patching materials from staining the face of other surfaces to be left exposed. Immediately remove all patching materials that come in contact with such surfaces.

16. Cover partially completed work when work is not in progress.

17. Protect sills, ledges and projections from droppings.

106 SEQUENCING / SCHEDULING:

1. Perform concrete restoration work in the following sequence:

   a. Remove paint, stains and plant material from all surfaces.

   b. Remove existing unsound materials from areas indicated to be restored.

   c. Pressure wash building and repair surfaces as indicated.

   d. Patch and repair existing concrete structures as indicated.

   e. (Optional): Provide consolidation/water repellent treatment for concrete structures as indicated. Water repellents/consolidants are specified in Section 07180.

   f. (Optional): Provide special coating over indicated sections as specified in Section 09800.

107 SUPERVISION & INSPECTIONS:
(Optional)

1. Contractor shall engage manufacturer's technical representative at contractor's expense, to provide: (Select one)

   a. Periodic inspections of work in progress: As a minimum, manufacturer's technical representative shall be present to review conditions and methods prior to start of work, and again when surface preparation has been substantially performed, but prior to patching, again when patching work is approximately 50% complete, and a final inspection shall be performed upon substantial completion of work.

   b. or: b. A technical representative of the manufacturer shall be present to supervise execution of the work to the extent deemed necessary by the manufacturer, in order to assure that all work is carried out in strict accordance with this specification.

200 MATERIALS

1. This specification describes the materials used in, and in conjunction with concrete patching.

201 PRODUCTS

1. Cleaning products shall be non-ionic, detergent-based masonry building wash. Material shall be non-corrosive, non-toxic, and water soluble.

   a. “E-Wash 30”, by Edison Coatings, Inc., Plainville, CT, (860)-747-2220, or approved equal.

2. Patching compound shall be a prepackaged, 2-component, reactive acrylic latex polymer modified blend of portland cement, specially graded aggregates and admixtures, designed for low shrinkage, low stress cure, and compatibility with existing host concrete.

   a. Patching compound shall develop a minimum 200 psi direct tensile adhesion with host substrate, when applied in accordance with these specifications.

   b. Tensile strength of patching compound shall be a minimum of 300 psi. Flexural modulus shall be 1.1 x 10^6 psi. Material must be vapor permeable, with a minimum permeance of 8 perms at 1/2" depth as measured by ASTM E-96.

   c. Water used for cleaning, mixing and finishing shall be clean, potable, free from oil, acid, injurious amounts of vegetable matter, alkali or other salts.

   d. No colorants, accelerators, bonding agents or other additives shall be added to the patching compound without express written direction of the manufacturer.

   e. Acceptable products: CUSTOM SYSTEM 45 TYPE CN, as manufactured by Edison Coatings, Inc., (800) 341-6621, or approved equal.

3. Crack Sealants
   a. Low viscosity crack sealant for small cracks shall be a 100% solids, 2-component elastomeric epoxy with 110% elongation and minimum 1200 psi tensile strength as measured by ASTM D412. Acceptable products: Flexi-Seal 510 as manufactured by Edison Coatings, Inc. (800) 341-6621, or approved equal.
   b. Paste grade crack sealant for larger cracks shall be a 100% solids, 2-coponent flexibilized epoxy-urethane filler with 10% elongation and minimum 1200 psi tensile strength. Acceptable products shall be Flexi-Fill 530 as manufactured by Edison Coatings, Inc. (800) 341-6621.

4. Primer and reinforcing steel primer/corrosion inhibitor shall be an alkaline, silica fume modified, latex modified cementitious coating.

   a. Acceptable products: SYSTEM 49 CPBA, as manufactured by Edison Coatings, Inc., (800) 341-6621, or approved equal.

5. Retarder for exposed aggregate finish replication shall be System 22 as manufactured by Edison Coatings, Inc., (800) 341-6621.

6. Penetrating corrosion inhibitor coating shall be designed to penetrate to the minimum depth of the reenforcing steel, to protect against carbonation, chlorides, and other contaminants.

    a. Acceptable products: SYSTEM 99 – CI, as manufactured by Edison Coatings, Inc., (860) 747-2220, or approved equal.

7. The products specified herein shall be assumed to meet the performance criteria specified. If a proposed equal is submitted, thorough lab testing shall be required to establish equivalent performance levels. An independent testing laboratory shall be utilized as determined by the Architect and shall be paid for by the submitting party.

300 EXECUTION: SURFACE PREPARATION & DETAILING

1. This section describes the preparation required for various surfaces which are to receive patching compound.

301 CLEANING

1. Proceed with cleaning in an orderly manner, work from top to bottom of each staging area and from one end of each elevation to the other.

2. Use only those cleaning methods indicated for each masonry material and location.

3. Perform each cleaning method indicated in a manner which results in uniform coverage of all surfaces, including corners, moldings, interstices and which produces an even effect without streaking or damage to masonry surfaces.

4. Rinse off chemical residue and soil working upwards from bottom to top of each treated area at each stage or scaffold setting.

302 SURFACE PREPARATION

1. Prior to patching, all surfaces must be prepared in accordance with this section of the specifications.

2. Remove all unsound concrete, using lightweight demolition hammers, not to exceed 18 pounds in weight. All removals to be performed in accordance with ICRI Guideline #03730, which shall be a part of these specifications, with regard to removal geometry, exposing, undercutting and cleaning of embedded reinforcement, and conditioning of edges and surfaces. Following demolition, test surfaces for alkalinity/carbonation with a 1% solution of phenolphthaline. Surfaces which do not indicate alkalinity (solution turns pink) shall require further demolition.

3. Pressure wash all indicated surfaces using 3000-4000 psi water, as required to remove all dust and dirt. Abrasive shall be used in combination with water when cleaning repair cavities, as required to eliminate micro-cracked surface materials resulting from demolition. No water with concrete dust shall be allowed to remain on any surface following washing, and must be immediately removed, prior to drying and re-hardening.

4. The result of this preparation shall render a surface clean, meaning having complete exposure of sound original material without any deposits of contaminants, foreign matter or loose material, which could affect the bond or long-term durability of the surface and the patching compound.

303 CRACK REPAIR

1. Patching compounds are not to be used to bridge working cracks or joints.

2. Crack repair for small cracks less than 1/16" (62 mils, 1.5 mm) shall be performed following pressure washing and drying by gravity filling with elastomeric crack sealant. Cracks wider than than 1/16" shall be grooved out to a nominal 1/4" x 1/4" (6mm x 6mm), and filled with crack sealant.

3. Expansion joints are not included under this section of the specification.

304 PRIMING OF REINFORCING STEEL

1. Any steel reinforcement exposed in the course of removing unsound materials shall be cleaned and prepared in accordance with the above specifications. The result of this cleaning shall be a steel surface free from visible rust or scale.

2. Following cleaning and prior to patching, apply cementitious corrosion inhibitive primer and bonding agent to all steel surfaces in accordance with manufacturer's instructions. Care must be taken to create a continuous coating on the full surface, including the underside of the undercut reinforcement. Observe manufacturer's guidelines with regard to inimum and maximum timing "windows" for patching after application of primer.

305 CONCRETE PATCHING

1. Following preparation, as specified above, contractor shall maintain work area in a clean condition, including materials, equipment and workers' footwear, to avoid tracking in of contaminants, dirt, dust, mud or other materials which may interfere with adhesion and durability of repairs.

2. Prior to patching, all repair areas to be patched shall be kept continuously wet for at least 20 minutes prior to application of patching compound. Before placing patch, excess water shall be blown, vacuumed or otherwise removed from the surface, leaving the surface damp or saturated/surface dry.

3. Vigorously brush-apply a slurry coat of cementitious primer / bonding agent with into all cavity surfaces.

4. Immediately after primer application, and while primer is still wet, mix and place patching compound in accordance with manufacturer's instructions.

5. Mix the liquid component with the patching compound dry component to obtain the proper mix consistency. DO NOT ADD WATER. Mix using slow speed drill (450 rpm maximum) with mud or paddle mixer. Motorized mortar mixers may be used for mixing larger quantities. Mix for precisely 4 minutes, using a mix timer. Mix to a uniform consistency, free of lumps or dry material. Do not whip air into the mix. Do not over-mix.

6. When placing the patching compound, care shall be taken to assure that all corners and gaps under reinforcing steel and entire cavity profile is completely filled and properly compacted to prevent formation of voids or unbonded areas. Work the material into corners and gaps, and onto cavity sidewalls using pressure on the trowel to assure good contact between patch and substrates.

7. Patches deeper than 1½" (25 mm) may be applied in multiple lifts. Leave the surface of the previous application rough and grooved with an open “V” groove profile and allow material to reach initial set before applying the subsequent lift. Apply additional lifts with 3 days of initial application. If base materials dry out before subsequent lifts are applied, dampen with water prior to the next application.

8. Do net retemper material which has begun to set. Discard any unused material after 30 minutes. Do not excessively wet patch surfaces after placement or as an aid to trowelling. Limit surface water addition to light misting and do not wet or rework repeatedly.

9. Exposed aggregate finish formulations are extended with coarse aggregates. To expose the aggregate, mist freshly placed patches with System 22 retarder, and maintain damp surface condition until patching material just below the surface has begun to set, typically 1-2 hours after initial mixing. Then scrub the surface paste from the surface of the embedded stone using a damp nylon bristle brush, taking care not to disrupt base materials or to smear patching compounds onto adjacent surfaces.

10. Observe the curing requirements for each day's working conditions, as specified herein. Do not extend wet curing beyond the maximum specified. Do not open to traffic or expose to weather until adequate strength has been reached, as affected by working and curing conditions.

306 PENETRATING CORROSION INHIBITOR

1. Allow repairs to cure 1-7 days, depending on patch depth and curing conditions before application.

2. Apply material to clean, dry concrete or masonry substrates, free of grease, oil, efflorescence, dirt, coatings, water repellents, or other materials which may interfere with penetration. Use product as supplied.

3. Apply in **ONE COAT**, at a rate of **150 SQFT/GALLON. TWO COATS** may be required for over head surfaces or extremely dense concrete.

4. May be applied by brush, roller, or sprayer.

5. The coating must not be exposed to rain for a minimum of 8 hours after application.