PRSUS *Inc*

The Art of Concrete Restoration

Architectural Precast Repair Procedures

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The Art of Concrete Restoration

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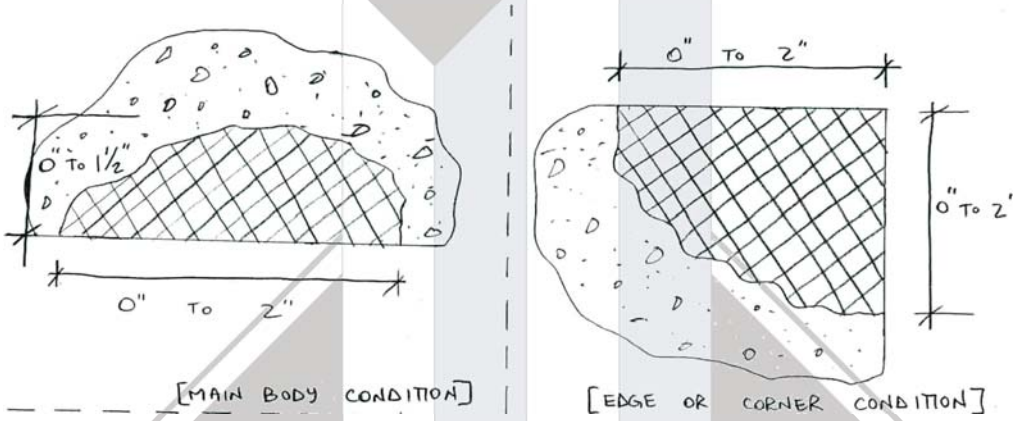
PRS ARCHITECTURAL REPAIR PROCEDURES INTRO

In spite of intensive efforts to eliminate chipping and other damage during handling and erection, edges and corners of precast concrete panels are fragile and damage does occur. Therefore, some repair is always required and patching has become a routine procedure for the industry. Suitable weather conditions are essential for this work. Repair procedures vary from one surface finish to another.

PROCEDURES:

Procedures used by Precast Restoration Services craftsmen in the repair of surface defects to precast panels, are outlined as follows:

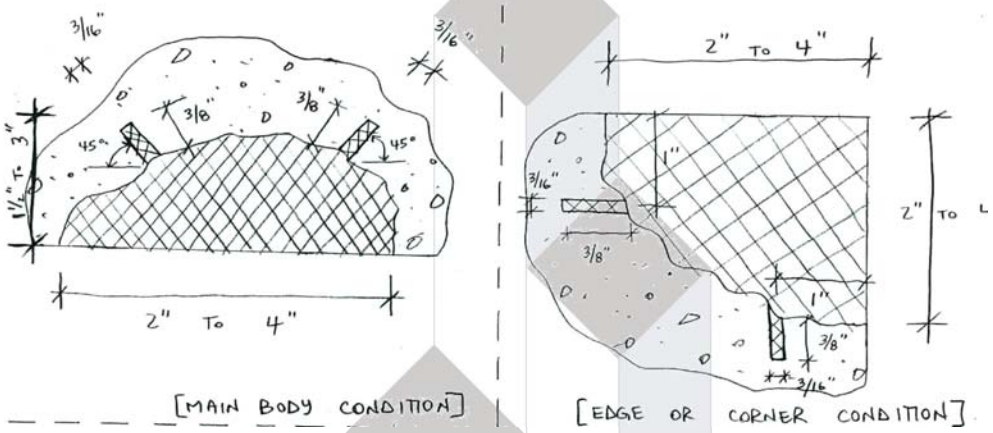
A. PATCHING SURFACE DEFECTS: CHIPS, SPALLS, HONEYCOMBING, ETC. LESS THAN 2" WIDE OR DEEP.



1. The area to be repaired is cleaned of all loose bits of concrete, etc.
2. Materials for patching are proportioned similar to the mix used for the concrete in the panel. The technician (based on his experience) will adjust or blend cements, sand and colorants to obtain a color that matches the adjacent finish. This is a trial and error procedure, until the color match is satisfactory.
3. When the technician has prepared the area to be repaired, he adds sufficient mixing water to the patching materials to bring them to the proper consistency. A latex bonding agent, is usually added to the mixing water to a ratio recommended by the bonding agent manufacturer.
4. The technician then applies the bonding agent in accordance with the bonding agent manufacturer's recommendations to coat the surface of the concrete being repaired.
5. He then applies the patching material to the area, flush with the surrounding surfaces. Depending upon the area to be repaired, temporary forms are clamped into position to provide straight edges and true surfaces.

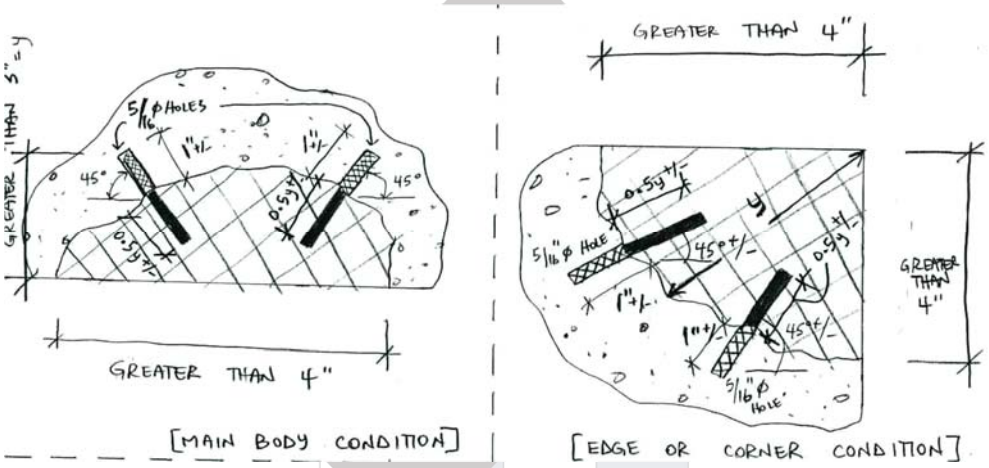
6. After the patched area has hardened, it is surfaced (textured) to blend with the surrounding area. If the surface has a sandblasted finish the repaired area will be permitted to harden for two or three days before texturing of the surface is performed.

B. PATCHING SURFACE DEFECTS: CHIPS, SPALLS, HONEYCOMBING, ETC. BETWEEN 2" WIDE OR DEEP & 4" WIDE OR DEEP.



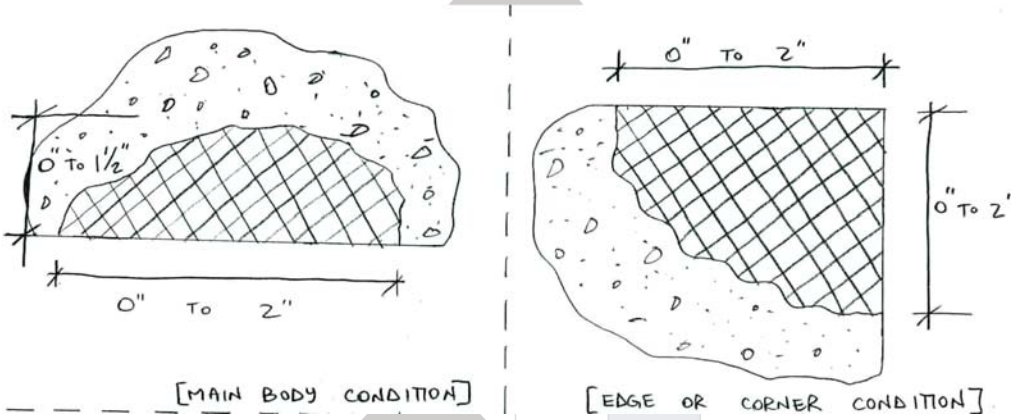
1. Saw cut repair area at 2 locations and at 45˚ +/- to the main surface as indicated for main body condition and parallel to main surfaces for edge/corner conditions. (Saw cut dimension to be 3/16" wide x 3/8" deep 1 ½" long +/-)
2. Optionally, stainless steel Helifix Patch Pins screws may be used in place of the saw cuts.
3. The area to be repaired is cleaned of all loose bits of concrete, etc.
4. Materials for patching are proportioned similar to the mix used for the concrete in the panel. The technician (based on his experience) will adjust or blend cements, sand and colorants to obtain a color that matches the adjacent finish. This is a trial and error procedure, until the color match is satisfactory.
5. When the technician has prepared the area to be repaired, he adds sufficient mixing water to the patching materials to bring them to the proper consistency. A latex bonding agent, is usually added to the mixing water to a ratio recommended by the bonding agent manufacturer.
6. The technician then applies the bonding agent in accordance with the bonding agent manufacturer's recommendations to coat the surface of the concrete being repaired.
7. He then applies the patching material to the area, flush with the surrounding surfaces. Depending upon the area to be repaired, temporary forms are clamped into position to provide straight edges and true surfaces.
8. After the patched area has hardened, it is surfaced (textured) to blend with the surrounding area. If the surface has a sandblasted finish the repaired area will be permitted to harden for two or three days before texturing of the surface is performed.

C. PATCHING SURFACE DEFECTS: CHIPS, SPALLS, HONEYCOMBING, ETC. GREATER THAN 4" WIDE OR DEEP.



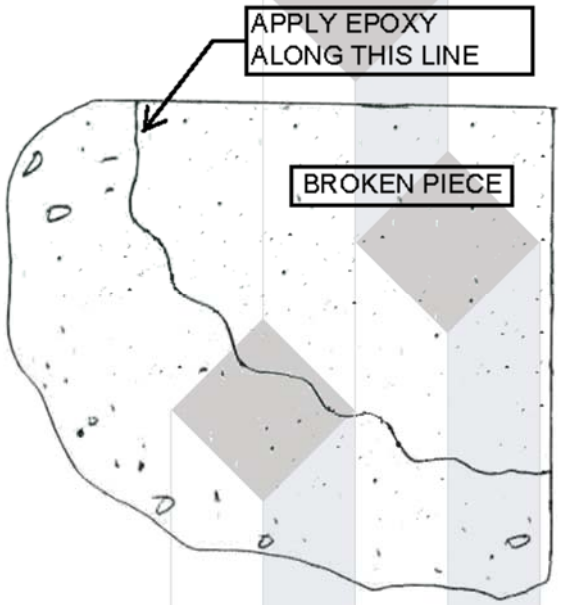
1. Drill 5/16" Ø x 1" deep +/- holes at 45˚ to the main surfaces of the panel.
2. Blow holes clean with compressed air.
3. Inject epoxy into holes and set 3/16" stainless steel pins with 0.5y projection as shown. Install 2 pins per 32 sq. inches.
4. Optionally, install stainless steel Helifix Patch Pins screws instead of 3/16" steel pins. Install 3 Helifix Patch Pins per 32 sq. inches.
5. Clean area of all loose bits of concrete, etc.
6. Materials for patching are proportioned similar to the mix used for the concrete in the panel. The technician (based on his experience) will adjust or blend cements, sand and colorants to obtain a color that matches the adjacent finish. This is a trial and error procedure, until the color match is satisfactory.
7. When the technician has prepared the area to be repaired, he adds sufficient mixing water to the patching materials to bring them to the proper consistency. A latex bonding agent, is usually added to the mixing water to a ratio recommended by the bonding agent manufacturer.
8. The technician then applies the bonding agent in accordance with the bonding agent manufacturer's recommendations to coat the surface of the concrete being repaired.
9. He then applies the patching material to the area, flush with the surrounding surfaces. Depending upon the area to be repaired, temporary forms are clamped into position to provide straight edges and true surfaces.
10. After the patched area has hardened, it is surfaced (textured) to blend with the surrounding area. If the surface has a sandblasted finish the repaired area will be permitted to harden for two or three days before texturing of the surface is performed.

D. SURFACE DEFECTS WITH BROKEN PIECE SALVAGED (EPOXY BONDING): CHIPS, SPALLS, ETC. BETWEEN 2" WIDE OR DEEP & 4" WIDE OR DEEP.



1. The area to be repaired is cleaned of all loose bits of concrete, etc.
2. Ensure edges of broken piece and panel can be fitted together in a way to recreate a straight edge or corner.
3. Fabricate temporary shoring to hold broken piece in place during epoxy bonding steps.
4. Apply an anchoring epoxy, such as Hilti HY-150, to both edge surfaces. Care shall be taken not to apply too much that it leaks out the front face and down the panel.
5. Place temporary shoring in place to hold the piece without movement until the epoxy has set.
6. Scrape off any excess epoxy and remove epoxy from the seam to a depth of ¼".
7. Remove any temporary shoring once the epoxy has cured with sufficient strength.
8. Patch over seam.
   a. Materials for patching are proportioned similar to the mix used for the concrete in the panel. The technician (based on his experience) will adjust or blend cements, sand and colorants to obtain a color that matches the adjacent finish. This is a trial and error procedure, until the color match is satisfactory.
   b. When the technician has prepared the area to be repaired, he adds sufficient mixing water to the patching materials to bring them to the proper consistency. A latex bonding agent, is usually added to the mixing water to a ratio recommended by the bonding agent manufacturer.
   c. The technician then applies the bonding agent in accordance with the bonding agent manufacturer's recommendations to coat the surface of the concrete being repaired.
   d. He then applies the patching material to the area, flush with the surrounding surfaces. Depending upon the area to be repaired.
   e. After the patched area has hardened, it is surfaced (textured) to blend with the surrounding area. If the surface has a sandblasted finish the repaired area will be permitted to harden for two or three days before texturing of the surface is performed.

E. SURFACE DEFECTS WITH BROKEN PIECE SALVAGED (EPOXY BONDING): CHIPS, SPALLS, ETC. GREATER THAN 4" WIDE OR DEEP.



1. The area to be repaired is cleaned of all loose bits of concrete, etc.
2. Ensure edges of broken piece and panel can be fitted together in a way to recreate a straight edge or corner.
3. In order to provide enough space for the epoxy and keep piece alignment, it may be necessary to sandblast the epoxy bonding faces to remove some material.
4. Fabricate temporary shoring to hold broken piece in place during epoxy bonding steps.
5. Blow area clean with compressed air.
6. Remove temporary shoring and apply an anchoring epoxy, such as Hilti HY-150, to both edge surfaces. Care shall be taken not to apply too much that it leaks out the front face and down the panel.
7. Place broken piece in place and install temporary shoring to hold the piece without movement until the epoxy has set.
8. Once the epoxy has begun to cure (gelled), scrape off any excess epoxy and remove epoxy from the seam to a depth of ¼".
9. Remove any temporary shoring once the epoxy has cured with sufficient strength. Refer to manufacturer's recommendations.
10. Seam preparation for patch: Cement and stone will need to be cut out along the seam to give room for the patch mix and its aggregates. The depth and amount of material removed depends upon the architectural finish to be applied. Light sandblast and acid etch finishes require very little while exposed aggregates require the most.
11. Patch over seam.
    a. Materials for patching are proportioned similar to the mix used for the concrete in the panel. The technician (based on his experience) will adjust or blend cements, sand and colorants to obtain a color that matches the adjacent finish. This is a trial and error procedure, until the color match is satisfactory.
    b. When the technician has prepared the area to be repaired, he adds sufficient mixing water to the patching materials to bring them to the proper consistency. A

latex bonding agent, is usually added to the mixing water to a ratio recommended by the bonding agent manufacturer.

c. The technician then applies the bonding agent in accordance with the bonding agent manufacturer's recommendations to coat the surface of the concrete being repaired.
d. He then applies the patching material to the area, flush with the surrounding surfaces. Depending upon the area to be repaired.
e. After the patched area has hardened, it is surfaced (textured) to blend with the surrounding area. If the surface has a sandblasted finish the repaired area will be permitted to harden for two or three days before texturing of the surface is performed.

12. Clean area of all loose bits of concrete, epoxy, etc.
13. Materials for patching are proportioned similar to the mix used for the concrete in the panel. The technician (based on his experience) will adjust or blend cements, sand and colorants to obtain a color that matches the adjacent finish. This is a trial and error procedure, until the color match is satisfactory.
14. When the technician has prepared the area to be repaired, he adds sufficient mixing water to the patching materials to bring them to the proper consistency. A latex bonding agent, is usually added to the mixing water to a ratio recommended by the bonding agent manufacturer.
15. The technician then applies the bonding agent in accordance with the bonding agent manufacturer's recommendations to coat the surface of the concrete being repaired.
16. He then applies the patching material to the area, flush with the surrounding surfaces. Depending upon the area to be repaired, temporary forms are clamped into position to provide straight edges and true surfaces.
17. After the patched area has hardened, it is surfaced (textured) to blend with the surrounding area. If the surface has a sandblasted finish the repaired area will be permitted to harden for two or three days before texturing of the surface is performed.

F. FILLING HIGH CONCENTRATIONS OF BUG HOLES.

1. Clean area to be patched. Remove all dirt, dust, and loose material.
2. Materials for patching are proportioned similar to the mix used for the concrete in the panel. The technician (based on his experience) will adjust or blend cements, sand and colorants to obtain a color that matches the adjacent finish. This is a trial and error procedure, until the color match is satisfactory.
3. When the technician has prepared the area to be repaired, he adds sufficient mixing water to the patching materials to bring them to the proper consistency. A latex bonding agent is added to the mixing water to a ratio recommended by the bonding agent manufacturer.
4. Technician will hand rub area with bug holes to be filled in a circular motion. Allow to set for a few minutes.
5. Excess material will be removed with a damp sponge or a dry rag in a circular motion.
6. Some shrinkage of the material may occur and repeating this procedure may be necessary to flush off bug holes with cement mix.

G. COLOR ISSUES: (Standard Fix) CEMENT MATRIX TONING

1. Clean area to be repaired. Remove all dirt, dust, and loose material.
2. Toning is a sponging technique designed to impregnate pigments into the concrete.
3. Technician will develop a solution of water, bonding agent, cement and colorants.

4. Water to bonding agent ratios are proportioned similar to bonding agent manufacturer's recommended ratio for use with a cement slurry.
5. Solution is sponged on face of concrete.
6. After solution dries, repeat procedure to achieve desired color.

H. COLOR ISSUES: (Optional Fix) RUB ON CEMENT MATRIX

1. Clean area to be repaired. Remove all dirt, dust, and loose material.
2. Materials for "rub" are proportioned similar to the mix used for the concrete in the panel. The technician (based on his experience) will adjust or blend cements, sand and colorants to obtain a color that matches the adjacent finish. This is a trial and error procedure, until the color match is satisfactory.
3. When the technician has prepared the area to be repaired, he adds sufficient mixing water to the patching materials to bring them to slurry consistency. A latex bonding agent is added to the mixing water to a ratio recommended by the bonding agent manufacturer.
4. Technician will hand rub area in a circular motion. Rub will be allowed to become dry. Duration depends upon air temperature and humidity.
5. Excess material will be removed with a damp sponge or a dry rag in a circular motion. A final "buffing" will be done to remove cement from surface.

I. COLOR ISSUES: RESURFACING (Smooth, Light blast and acid etch finishes)

1. Heavily sandblast area to be resurfaced deep enough to fully expose course aggregate. (Protect surrounding areas from sandblasting.) Ensure that none of the existing cement matrix is covering the exposed course aggregate.
2. Clean area by using compressed air to remove any dust, and loose material.
3. Apply the proper color cement rub across the area:
    a. Materials for "rub" are proportioned similar to the mix used for the concrete in the panel. The technician will adjust or blend cements, sand and colorants to obtain the proper color that match. Note that this can be a trial and error procedure, until the color match is satisfactory.
    b. A latex bonding agent is added to the mixing water to a ratio recommended by the bonding agent manufacturer.
    c. Technician will hand rub and apply the finish as it dries.
4. Rubbed area will need to cure for a few days before the final finish is applied. (Light sandblasting or acid etching.) Exact duration depends upon air temperature and humidity.

J. COLOR ISSUES: RESURFACING (Medium or Heavy blast finishes)

1. Scarify and chip down surface area to be repaired to a depth of roughly 1". Ensure that there are no high spots and that the surface is very rough. Do not cut the perimeter of the repair with diamond cutting tools. The perimeter of the repair is to remain jagged but to the proper 1" depth. This will help ensure the repaired edge is not detected later.
2. Remove any loose material with a brick hammer. Afterwards, clean the area with compressed air to remove any dust.
3. Apply the proper color concrete mix (includes fine and course aggregates) across the area:
    a. Concrete mix is to be proportioned similar to the mix used for the concrete in the panel. The technician will adjust or blend cements, sand, stone and colorants to

obtain the proper color that match. Note that this can be a trial and error procedure, until the color match is satisfactory.

b. A latex bonding agent is added to the mixing water to a ratio recommended by the bonding agent manufacturer.
c. Technician will hand rub and apply the preliminary finish as it dries.

4. Rubbed area will need to cure for a week before the final finish is applied. (Medium/heavy blast.) Exact duration depends upon air temperature and humidity.

K. WATERPROOF NON-STRUCTURAL PATCH: (Protection of non-galvanized reinforcing)

1. Clean area to be repaired. Remove all dirt, dust, and loose material.
2. Cut and/or grind any reinforcing a minimum of ½" below the surface. If a torch is used to cut the reinforcing back, use a wire brush to fully remove any carbon.
3. With a wire brush, remove any rust, carbon deposits or coatings from the reinforcing. As an alternate, this can be done with a small sandblaster.
4. Remove any loose concrete material.
5. Apply a coat of epoxy bonding agent to concrete and reinforcing (Duralprep A.C. by Euclid Chemical Co. or equal) in accordance with manufacturer's recommendations.
6. Materials for patch shall be proportioned similar to the mix used for the concrete in the panel. The technician (based on his experience) will adjust or blend cements, sand and colorants to obtain a color that matches the adjacent finish. This is a trial and error procedure, until the color match is satisfactory.
7. A waterproofing admixture shall be added to the cement mix. (Anti-Hydro or equal) the admixture will be mixed with water per the manufacturer's recommendations. This mixture will be used in place of straight water. Optionally, a penetrating sealer can be used in place of the admixture.
8. When the technician has prepared the area to be repaired, he adds a sufficient quantity of water to the patching materials to bring them to stiff consistency.
9. Technician will hand apply the cement mix in a circular motion. Patch will be allowed to become dry. Duration depends upon air temperature and humidity.
10. Excess material will be removed with a trowel (urethane or steel), damp sponge or a dry rag in a circular motion. The technical will finish the surface to mimic the surrounding areas.

L. WATERPROOF STRUCTURAL PATCH: (Protection of non-galvanized reinforcing)

1. Clean area to be repaired. Remove all dirt, dust, and loose material.
2. Cut and/or grind any reinforcing a minimum of ½" below the surface. If a torch is used to cut the reinforcing back, use a wire brush to fully remove any carbon.
3. With a wire brush, remove any rust, carbon deposits or coatings from the reinforcing. As an alternate, this can be done with a small sandblaster.
4. Where reinforcing is exposed and continues into the repair, remove any concrete to expose ½" around all sides of the reinforcing. This will ensure that the cement fully encases the reinforcing.
5. Remove any loose concrete material.
6. Apply a coat of epoxy bonding agent to concrete and reinforcing (Duralprep A.C. by Euclid Chemical Co. or equal) in accordance with manufacturer's recommendations.
7. Patch the entire area with a non-shrink grout in accordance with the manufacturer's recommendations. Use Euclid NS Grout or equal.

8. Non-shrink grout repair shall be kept ¼" below the top surface to permit an architectural finish to be applied. The non-shrink patch shall be left rough to ensure a good bond by the architectural top coat.
9. Materials for the architectural finish shall be proportioned similar to the mix used for the concrete in the panel. The technician (based on his experience) will adjust or blend cements, sand and colorants to obtain a color that matches the adjacent finish. This is a trial and error procedure, until the color match is satisfactory.
10. A waterproofing admixture shall be added to the cement mix. (Anti-Hydro or equal) the admixture will be mixed with water per the manufacturer's recommendations. This mixture will be used in place of straight water. Optionally, a penetrating sealer can be used in place of the admixture.
11. When the technician has prepared the area to be repaired, he adds a sufficient quantity of water to the patching materials to bring them to stiff consistency.
12. Technician will hand apply the cement mix in a circular motion. Patch will be allowed to become dry. Duration depends upon air temperature and humidity.
13. Excess material will be removed with a trowel (urethane or steel), damp sponge or a dry rag in a circular motion. The technical will finish the surface to mimic the surrounding areas.

M. WATERPROOF RESURFACING: RUB ON CEMENT MATRIX

1. Clean area to be repaired. Remove all dirt, dust, and loose material.
2. Prepare area with an epoxy bonding agent. Apply a coat of epoxy bonding agent (Duralprep A.C. by Euclid Chemical Co. or equal) in accordance with manufacturer's recommendations.
3. Materials for "rub" are proportioned similar to the mix used for the concrete in the panel. The technician (based on his experience) will adjust or blend cements, sand and colorants to obtain a color that matches the adjacent finish. This is a trial and error procedure, until the color match is satisfactory.
4. A waterproofing admixture shall be added to the cement mix. (Anti-Hydro or equal) the admixture will be mixed with water per the manufacturer's recommendations. This mixture will be used in place of straight water.
5. When the technician has prepared the area to be repaired, he adds a sufficient quantity of the Anti-Hydro/Water mixture to the patching materials to bring them to slurry consistency.
6. Technician will hand rub area in a circular motion to apply the cement matrix. Rub will be allowed to become dry. Duration depends upon air temperature and humidity.
7. Excess material will be removed with a trowel (urethane or steel), damp sponge or a dry rag in a circular motion. The technical will finish the surface to mimic the surrounding areas.
8. NOTE: If color change (not toning) is needed, the area shall be sandblasted initially to ensure a minimum of a 1/8" layer of cement.

N. LIFTING LUG AND PICKING EYE PATCHING: (Exterior architectural applications)

1. Clean any loose debris from recess.
2. Primary filling with the base coat:
    a. The technician applies a bonding agent to interior surface of the recess as per the manufacturer's directions.
    b. A non-shrink grout is used to fill the void up to ¼" of the surface. The surface will be left rough in preparation for a final finish coat.
3. Final finish:

a. The Materials for patching are proportioned similar to the mix used for the concrete in the panel. The technician (based on his experience) will adjust or blend cements, sand and colorants to obtain a color that matches the adjacent finish. This is a trial and error procedure, until the color match is satisfactory.
b. When the technician has prepared the area to be repaired, he adds sufficient mixing water to the patching materials to bring them to the proper consistency. A latex or acrylic bonding agent, is added to the mixing water to a ratio recommended by the bonding agent manufacturer.
c. The technician then applies the bonding agent in accordance with the bonding agent manufacturer's recommendations to coat the surface of the concrete being repaired.
d. He then applies the patching material to the area, flush with the surrounding surfaces.

4. After the patched area has begun to set, the surface will be textured to blend with the surrounding area.

O. <u>LIFTING LUG AND PICKING EYE PATCHING:</u> (Interior and "dead space" areas within door/window frames) (Typically required due to non-galvanized lugs are used or when lifter is aligned with inner bead of caulking)

1. Clean any loose debris from recess.
2. Filling lifter will be done in one lift.
3. The technician applies a bonding agent to interior surface of the recess as per the manufacturer's directions.

P. <u>WATERTIGHT PATCHING (Typically needed at exterior caulk bead junctures):</u> (Exterior architectural applications, EG: Lifting lugs, over extended reveals)

1. Clean any loose debris from recess.
2. Primary filling with the base coat:
    a. The technician applies a bonding agent to interior surface of the recess as per the manufacturer's directions.
    b. A non-shrink grout is used to fill the void up to ¼" of the surface. The surface will be left rough in preparation for a final finish coat.
3. Final finish:
    a. Apply a coat of epoxy bonding agent (Duralprep A.C. by Euclid Chemical Co. or equal) in accordance with manufacturer's recommendations.
    b. The Materials for patching are proportioned similar to the mix used for the concrete in the panel. The technician (based on his experience) will adjust or blend cements, sand and colorants to obtain a color that matches the adjacent finish. This is a trial and error procedure, until the color match is satisfactory.
    c. He then applies the patching material to the area, flush with the surrounding surfaces.
4. After the patched area has begun to set, the surface will be textured to blend with the surrounding area.
5. A clear non-film forming sealer may optionally be applied to enhance the water resistance properties of the patch. (Protectosil BHN or equal)

Q. <u>REPAIR PATCHES TO MEET WATERTIGHT APPLICATIONS:</u> (Exterior architectural applications, EG: Lifting lugs, over extended reveals)

1. Where water is wicking around patch (minor traces of water infiltration)
    a. Removal of lifter patch is not required.

   b. Apply a clear non film forming sealer that will not affect the color of the precast. (Protectosil BHN or equal)
2. Where water is leaking around patch.
   a. Remove architectural finish coating previously applied.
   b. Apply a coat of epoxy bonding agent (Duralprep A.C. by Euclid Chemical Co. or equal) in accordance with manufacturer's recommendations.
   c. The Materials for patching are proportioned similar to the mix used for the concrete in the panel. The technician (based on his experience) will adjust or blend cements, sand and colorants to obtain a color that matches the adjacent finish. This is a trial and error procedure, until the color match is satisfactory.
   d. He then applies the patching material to the area, flush with the surrounding surfaces.
   e. After the patched area has begun to set, the surface will be textured to blend with the surrounding area.
   f. A clear non-film forming sealer may optionally be applied to enhance the water resistance properties of the patch. (Protectosil BHN or equal)

R. CLEANING

Various techniques and materials to clean architectural concrete surfaces include:

1. Washing with plain or hot water and may contain detergents or other commercial cleaners. Hot water is recommended for atmospheric temperatures below 45˚f in order to help prevent the development efflorescence.
   a. Precast shall be cleaned with no more than 3000 psi of water pressure and with a fan tip of not less than 15˚.
   b. Protect lower portion of wall with excess water.
   c. Pre-wet wall and apply detergents from top to bottom of area to work and in accordance with manufacturer's dilution rates.
   d. Let detergent soak on wall. Do not let product dry on wall. If necessary, spray a mist of water on wall to keep moist.
   e. Hose down wall starting from the top down.
   f. Fully wash down wall until there isn't any evidence of the detergent.
2. Steam cleaning (Limited to spot cleaning of grease)
   a. Saturate wall below area to be clean with clean water.
   b. Steam clean from top down.
   c. Continue to saturate wall below area to be cleaned.
3. Light abrasive blasting (brush blasting)
   a. Wear full blasting protective gear including respirator.
   b. Load blasting pot with 00 or 000 media.
   c. Start blasting from the top to bottom of area.
   d. Keep nozzle at +/- 24" to 35" from the wall. Technician will determine what works best without modifying the current architectural finish.
   e. Periodically stop and look at progress from a distance of about 20'. If a higher production rate is required, use a 2nd worker to load the blast pot and inspect from 20'.
   f. Do not induce any blast patterns.
4. Application of diluted acidic solution.
   a. Wear personal protective equipment for work with acidic solutions. Depending upon acid used, a respirator may be required.
   b. Pre-wet (soak) the surface to reduce acid penetration with clean potable water.
   c. Apply a solution of 5% to 10% concentration of acid onto the pre-wetted surface with a pump sprayer. In areas of high wind or if there is a risk of exposure below by people or property, apply acid with a brush.

d. Continuously wet down the surface being cleaned. All traces of acid should be flushed from the panel with plenty of clean water before the panel dries.
e. The acid and brushes must be kept clean.

S. REMOVING STAINS FROM PRECAST CONCRETE SURFACES

Note: Appropriate public protection should be followed at all times.

1. Removing Tar Stains
    a. Wait for colder weather, if possible, and then chip off the stain (tar) with a scotch hammer, or stiff wire brush.
    b. Remove oil stain left by tar with acetone, and then wash with muriatic acid, making a "clean test" first.
    c. Rinse the unit thoroughly with clean water.
2. Removing Paint Stains
    a. Remove by sandblasting or by chipping with a scotch hammer, (Peel-a-way may also be used).
3. Removing Welding & Diesel Smoke Stains
    a. When the stain is fresh, clean with a wire brush.
    b. Older stains can be cleaned with sandpaper if the finish permits.
    c. If dry method not feasible, use muriatic acid, diluted as per specifications or a commercial tile cleaner, and rinse thoroughly with clean water.
    d. If the first two methods are not effective, the stained area can be chipped out and patched.
4. Removing Rust Stains from:
    a. Acid-Etched Finishes:
        i. Use a wet rubbing stone on a test piece to ascertain how deep the stain is and the effectiveness of the procedure.
        ii. If acid cleaning is required, dilute 50:50, and apply to stain and brush lightly while still wet with a bristle brush.
        iii. Rinse thoroughly with clean water when finished.
    a. Smooth Finishes:
        i. Remove stains using sandpaper on a dry surface. If this is not effective, wet the damaged area and rub using coarse silica and a rubbing stone.
    b. Sandblasted Finishes:
        i. Use a rubbing stone on a test piece (dry) to ascertain how deep the stain is and the effectiveness of the procedure.
        ii. If a muriatic acid cleaning is required, dilute 30:1. Use the acid in different strengths and clean area with a wire brush, making sure not to over brush.
        iii. Rinse thoroughly with clean water.
5. Rust Stains on White Precast:
    a. Use a stronger muriatic acid solution, if required, to remove the stain.
    b. Use a rubbing stone to match the original finish.
    c. Rinse thoroughly with clean water after using acid.
6. Oil Stains:

a. Mix a poultice to apply to the stain. Make a thick paste consisting of 1 lb. 6 oz. of Trisodium Phosphate (TSP), 1 gallon of water and Calcium Carbonate (also called architectural lime). Adjust calcium to create a thick paste.
b. Scrape or wire brush (no steel bristles) any oil residue from surface. Be careful not to damage surface.
c. Apply a thick layer of poultice to surface. Allow to dry overnight.
d. The next day, scrape and wire brush the poultice off. Wash the rest of the poultice off with a low pressure washer.
e. Allow to dry and repeat steps above until the stain is removed.
f. Once the stain is removed, it may be necessary to lightly clean the surface with sandblasting for sandblast finishes and acid for acid wash finishes.

7. Removing Epoxy Spills/Stains:
   a. If epoxy is still in a liquid state, absorb as much liquid with rags, saw dust or kitty litter. Be careful not to spread the liquid epoxy any further.
   b. Once epoxy begins to gel, scrape as much epoxy from the surface.
   c. If epoxy is already cured, use a heat gun to soften the epoxy and scrape off as much epoxy is from the surface.
   d. If a thin film of epoxy remains on the surface, apply a solvent based epoxy (& paint) remover to dissolve it. Do this in a small test area to make sure the concrete pigments are not affected. Follow manufacturer's directions. Be careful not to spread the stain beyond the original location.
   e. After step "d" above, there should only be a light stain. Remove the stain by lightly abrasive blasting the surface. Be sure not to over blast the surface and increase the course aggregate (stone) exposure in the concrete. Refer to the Light Abrasive Blasting Cleaning section above. (Section R)
   f. Final restoration of the surface shall be as follows:
      i. Acid-Etched Finishes: After light blast above, acid cleaning is required. Dilute muriatic acid 1:1 with water and apply to area. Rinse thoroughly with clean water when finished.
      ii. Sandblasted Finishes: No additional abrasive blasting should be needed.

T. CRACK REPAIRS (Less than 0.005": Water Repellent)

a. Clean concrete surface and remove all oils, grease and other surface contaminates.
b. Apply sealer, Protectosil BSM 400 by Evonik (or equal) in accordance with manufacturer's recommendations.

U. CRACK REPAIRS OPTIONAL (Between 0.005" and 0.010": Water Repellent)

a. Clean concrete surface and remove all oils, grease and other surface contaminates.
b. Dampen area with water. Remove all loose debris if evident.
c. Pack crack with cement mix. Materials for patching are proportioned similar to the mix used for the concrete in the panel. The technician (based on his experience) will adjust or blend cements, sand and colorants to obtain a color that matches the adjacent finish. This is a trial and error procedure, until the color match is satisfactory.
d. When the technician has prepared the area to be repaired, he adds sufficient mixing water to the patching materials to bring them to the proper consistency. A latex bonding agent, is usually added to the mixing water to a ratio recommended

by the bonding agent manufacturer. Bonding agent is NOT applied to the crack. The cement mix uses sifted sand and is packed into crack with the butt of the trowel or any other non-marring tool.

c. After crack repair has cured for a day or two, weather dependent, a Silane sealer shall be applied over crack, Protectosil BSM 400 by Evonik (or equal) in accordance with manufacturer's recommendations. Sealer shall extend beyond the crack by at least 12" in all directions.
d. Verify that sealing applications will not affect the panel color.
e. Note: This may be a good time to seal the whole building if there is extensive cracking.

V. CRACK REPAIRS (0.005" to 0.010": Epoxy Sealing)

1. Crack preparation:
    a. Route out crack with a narrow diamond blade to a depth of 3/8".
    b. After crack has been routed out, blow or brush out all dust and debris from crack.

2. Sealing Crack: Non-Architectural Concrete (See item 3 below for Architectural repairs)
    a. Fill routed crack just above surface.
    b. After epoxy has cured, grind flush with surface.

3. Sealing Crack: **Architectural Concrete**
    a. Fill routed crack to not less than 1/8" below the surface with epoxy. Sika Anchorfix, Hilti HY150 or equal.
    a. After epoxy has cured, scrub with wire brush (plastic, bronze or brass bristles) to remove excess sealer.
    b. Patch routed crack with cement/bonding agent mix to match surrounding panels color and texture.

W. CRACK REPAIRS (Greater than 0.010": Epoxy Injection)

1. Crack preparation:
    a. Clean the crack and the surface surrounding it to allow the epoxy to bond to sound concrete. At a minimum, the surface to receive Epoxy Sealer should be brushed with a wire brush. Oil, grease or other surface contaminates must be removed in order to allow the Epoxy Sealer to bond properly. Take care not to impact any debris into the crack during cleaning. Using clean, oil free compressed air, blow out the crack to remove any dust, debris or standing water. Best results will be obtained if the crack is dry at the time of injection. If water is continually seeping from the crack, the flow must be stopped in order for epoxy injection to yield a suitable repair. Other materials such as polyurethane resins may be required to repair an actively leaking crack.
    b. If a coating, sealant or paint has been applied to the concrete it must be removed before placing the Epoxy Sealer. Under the pressure of injection these materials may lift and cause a leak. If the surface coating is covering the crack, it may be necessary to route out the opening of the crack with a narrow diamond blade using a grinder in order to get past the surface contamination.

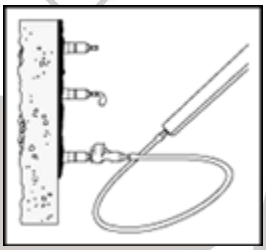
2. Injection Preparation: **Non-Architectural Concrete** (See item 3 below for Architectural repairs)
    a. Adhere injection ports to the concrete by applying a small amount of Epoxy Sealer around the bottom of the port base. Place the port at one end of the crack

and repeat until the entire crack is ported. Injection ports should be placed 8" to 12” apart along the length of the crack.

b. Using a putty knife, generously work epoxy along the entire length of the crack. Take care to mound the epoxy around the base of the port to approximately 1/4" thick extending 1" out from the base of the port and to work out any holes in the material. It is recommended that the sealing epoxy should be a minimum of 3/16" thick and 1" wide along the crack. Insufficient sealing epoxy will result in leaks under the pressure of injection. If the crack passes completely through the concrete element, seal the back of the crack, if possible.

c. Allow the sealing epoxy to harden before beginning injection plumbing.
d. For gang injection, connect tubing between ports with Tee connectors and poly tubing. Connect tubing to low pressure injection system and proceed to injection phase.
e. For port by port injection, proceed to injection phase.

3. Injection Preparation: **Architectural Concrete**
   a. Follow same procedures as for Non-Architectural Concrete except route out crack with a narrow diamond blade to a depth of 3/8”. Sealing epoxy must be kept not less than 1/8” below the surface. At ports, a removable sealer may be used.
4. Epoxy injection: Port by port injection
   a. Follow manufacturer’s mixing instructions on the product label.
   b. Attach the fittings to the end of the nozzle by pushing the tubing over the barbs at the end of the nozzle. Make sure that all ports are pushed in to the open position.



   c. Inject epoxy into the first (bottom) port until it begins to flow out the next port above. Remove cartridge from 1st port, close that port and move to the next port. Repeat this procedure until all the ports have been injected and closed.
5. Epoxy injection: Gang injection

a. Follow manufacturer's mixing instructions on the product label.
b. After epoxy has been mixed, pour into injection system bowl and close lid.
c. Start compressor and set pressure regulator between 7psi and 15psi for Architectural Concrete and between 10psi and 25psi for Structural Concrete.
d. Epoxy will flow through all ports.
e. Maintain pressure during manufacturer's set time.

6. Cleanup: Non-Architectural Concrete
    a. Remove tubing and break off ports.
    b. Grind sealing epoxy off and leave a flush finish.

7. Cleanup & Finish: Architectural Concrete
    a. Remove tubing and break off ports.
    b. Peel off sealer. Scrub with wire brush (plastic, bronze or brass bristles) to remove remaining sealer.
    c. Patch routed crack with cement/bonding agent mix to match surrounding panels color and texture.

X. MISCELLANEOUS: Cutting reveals, rustifications, etc.

1. Use the appropriate personal protective gear for concrete cutting.
2. Layout the reveal.
3. Using a grinder with a diamond blade, cut the layout lines to a depth and angle to mimic the existing reveals by the Precaster.
4. Chip out reveal about 1/8" greater than the reveal depth.
5. Coat the base and sides of the reveal with a latex bonding agent.
6. Follow procedures noted in section A for repairing surface defects.

Y. MISCELLANEOUS: Replacing thin bricks:

1. Use the appropriate personal protective gear for concrete cutting.
2. Using a 4" grinder with a diamond blade, cut around perimeter of brick to be replaced. Cut the brick the full depth diagonally from corner to corner in both directions.
3. Using a chipping gun or hammer and chisel, remove the old brick.
4. Scarify surface below original brick.
5. Clean area from dust and concrete debris.
6. Install new brick in a bed of epoxy, Hilti HY150 or equal.
    a. Patch around the perimeter of new brick using procedures noted in section A for repairing surface defects.
    b. Clean bricks after 1 to 3 days depending upon ambient temperatures. Use procedures noted for E.4, Cleaning with diluted acid.

Z. MISCELLANEOUS: Cutting open joints

1. Use the appropriate personal protective gear for concrete cutting.
2. Layout and mark the location of the appropriate joint size and location.
3. Cut joint with 14" concrete demolition saw or twin blade saw (by Husqvarna)
4. Using a 4" grinder with a diamond blade, round over joint edges to match surrounding precast.

AA. MISCELLANEOUS: Panel texturization: Abrasive blasting

1. Wear full blasting protective gear including respirator.
2. Load blasting pot with 000, 00, 0, 1, 2 or 3 size media. (Depth of cut dependent)
3. Protect surrounding areas from blast media
4. Start blasting from the top to bottom of area.
5. Keep nozzle at +/- 24" from the wall.
6. Periodically stop and look at progress from a distance of about 20'. If a higher production rate is required, use a 2nd worker to load the blast pot and inspect from 20'.
7. Do not induce any blast patterns.

BB. MISCELLANEOUS: Panel texturization: Acid etching

1. Wear personal protective equipment for work with acidic solutions. Depending upon acid used, a respirator may be required.
2. Keep bags of sodium bicarbonate onsite and accessible for emergency spill neutralization.
3. Pre-wet (soak) the surface to reduce acidic penetration with clean potable water.
4. Apply a solution of 25% to 50% concentration of acid onto the pre-wetted surface with a pump sprayer. In areas of high wind or if there is a risk of exposure below by people or property, apply acid with a brush.
5. Continuously wet down the surface being cleaned. All traces of acid should be flushed from the panel with plenty of clean water before the panel dries.
6. The sprayer, sponges and brushes must be kept clean.

CC. MISCELLANEOUS: Panel toning: Abrasive blasting

1. Wear full blasting protective gear including respirator.
2. Load blasting pot with 000, 00, 0, 1, 2 or 3 size media. (Depth of cut dependent)
3. Protect surrounding areas from blast media
4. Start blasting from the top to bottom of area.
5. Keep nozzle at +/- 24" from the wall.
6. Periodically stop and look at progress from a distance of about 20'. If a higher production rate is required, use a 2nd worker to load the blast pot and inspect from 20'.
7. Do not induce any blast patterns.

DD. MISCELLANEOUS: Panel toning: Acid etching

1. Wear personal protective equipment for work with acidic solutions. Depending upon acid used, a respirator may be required.
2. Keep bags of sodium bicarbonate onsite and accessible for emergency spill neutralization.
3. Pre-wet (soak) the surface to reduce acid penetration with clean potable water.
4. Apply a solution of 25% to 50% concentration of acidic solution onto the pre-wetted surface with a sponge or pump sprayer. A sponge shall be used in small areas or where overspray can affect adjacent materials or workers. In conditions of high wind or if there is a risk of exposure below by people or property, apply acidic solution with a sponge.
5. Continuously wet down the surface being treated (as needed). All traces of acid should be flushed from the panel with plenty of clean water before the panel dries.
6. The sponges and sprayer must be kept clean.

EE. MISCELLANOUS: Installing plastic lifter and pocket covers

1. Covers are adhered to the precast wall panels with a one part polyurethane sealant/adhesive. Sikaflex 1a is recommended. Select proper color to best match precast panels.
2. Follow manufacturer's application recommendations. Priming is not necessary. Temperatures should be between 40 degrees and 100 degrees F.
3. Remove any standing water and dirt from within the lifter or recessed pocket. Use compressed air to remove any remaining water. Use a stiff brush to remove dirt from face (if necessary).
4. Grind any high spots around the lifter or pocket that will interfere with the plastic cover installation.
5. Apply a continuous bead (+/- ¼") of sealant around mounting surface of the plastic cover.
6. Center cover over lifter or pocket and firmly press against the precast.
7. Some of the adhesive will project out where the cover meets the wall. Using a finger or a rubber spatula, smooth this sealant back against the cover to form a uniform appearance around the perimeter.
8. Wipe off any excess sealant from the cover or precast. Xylene may be necessary to wipe clean.
9. Depending upon temperature, it may be necessary to use painters' masking tape to hold the cover in place until the sealant cures. (24 hours)