## Miscellaneous Table of Contents

<table>
<thead>
<tr>
<th>Standard</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>MC 800</td>
<td>Substation Power Cable Trench</td>
</tr>
<tr>
<td></td>
<td>MC 800.1 Substation Power Cable Trench — Precast (Preferred) or Poured (Non-Traffic)</td>
</tr>
<tr>
<td>MC 805</td>
<td>Distribution Power Cable Trench</td>
</tr>
<tr>
<td></td>
<td>MC 805.1 Distribution Power Cable Trench — Poured (Non-Traffic)</td>
</tr>
<tr>
<td>MC 810</td>
<td>Cold Joints (Approved for Use at Contractor’s Request)</td>
</tr>
<tr>
<td></td>
<td>MC 810.1 Cold Joints (Approved for Use at Contractor’s Request)</td>
</tr>
<tr>
<td>MC 820</td>
<td>Joining Old and New Structures</td>
</tr>
<tr>
<td></td>
<td>MC 820.1 Joining Old and New Structures</td>
</tr>
<tr>
<td>MC 830</td>
<td>Protective Barrier for Underground Distribution Structures</td>
</tr>
<tr>
<td></td>
<td>MC 830.1 Protective Barrier for Underground Distribution Structures</td>
</tr>
<tr>
<td>MC 840</td>
<td>Wheelchair Ramps</td>
</tr>
<tr>
<td></td>
<td>MC 840.1 Wheelchair Ramps</td>
</tr>
<tr>
<td>MC 850</td>
<td>Structure Offsets for Joint Construction</td>
</tr>
<tr>
<td></td>
<td>MC 850.1 Structure Offsets for Joint Construction</td>
</tr>
<tr>
<td>MC 860</td>
<td>Inspection Criteria for Concrete Vaults, Manholes, and Covers</td>
</tr>
<tr>
<td></td>
<td>MC 860.1 Inspection Criteria for Concrete Vaults, Manholes, and Covers</td>
</tr>
<tr>
<td>MC 870</td>
<td>Removable Curb for 4’ x 5’ Vault Covers and Manhole Covers</td>
</tr>
<tr>
<td></td>
<td>MC 870.1 Removable Curb for 4’ x 5’ Vault Covers and Manhole Covers</td>
</tr>
<tr>
<td></td>
<td>MC 870.2 Removable Curbing (Steel Cover Plates)</td>
</tr>
<tr>
<td>MC 880</td>
<td>Repair Specifications for Concrete Pad Structures</td>
</tr>
<tr>
<td></td>
<td>MC 880.1 Repair Specifications for Concrete Pad Structures</td>
</tr>
<tr>
<td>MC 890</td>
<td>Foundation Detail for Fiberglass Nostalgic, Fiberglass, Steel, or Concrete Electroliers</td>
</tr>
<tr>
<td></td>
<td>MC 890.1 Electrolier Foundation Detail</td>
</tr>
<tr>
<td></td>
<td>MC 890.2 Marbelite Nostalgic Electrolier Foundation Detail</td>
</tr>
<tr>
<td></td>
<td>MC 890.3 Electrolier Foundation Requirements</td>
</tr>
</tbody>
</table>
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Substation Power Cable Trench

Scope MC 800.1 Substation Power Cable Trench — Precast (Preferred) or Poured (Non-Traffic)

Figure MC 800–1: Substation Power Cable Trench — Precast or Poured — Entrance Detail and Trench Plan

Note(s):
1. A 1" double coil insert on trench center-line is required in each end wall as shown. One is also required directly opposite the side entrance 1'-6" from the trench floor.
2. See AC 720.
3. See CD 172.

What's Changed? The acronym for the Miscellaneous Chapter of the UGS Manual has been changed from 'MS' to 'MC' for clarity.
Figure MC 800–1.4: Typical Trench Section

Materials:

Concrete:
3000 psi @ 28 days (See Note 1.)
0.259 cu. yd. per lin. foot of trench.

Reinforcing Steel:
Slicing overlap to be 15" MIN
12 required continuous #4 steel.

One per 8" of trench — #6 steel

Use 2 x 2 - 12/12 welded wire mesh for reinforcing deep recess. Extend fabric 6" MIN into walls and floor.

Figure MC 800–1.5: Mark 1 and Mark 2

Note(s):
1. See GI 020.
Figure MC 800–2: Substation Power Cable Trench — Precast or Poured — Conduit Bank Exits, Trench End Walls, and Section View of Trench

Figure MC 800–2.1: Conduit Bank Exits — Plan

Figure MC 800–2.2: Trench End Wall (2 Conduit Banks)

Figure MC 800–2.3: Trench End Wall (1 Conduit Bank)

All precast units have 12 terminators installed. Use only outside 6 for 1 conduit bank installations.

What's Changed? The acronym for the Miscellaneous Chapter of the UGS Manual has been changed from 'MS' to 'MC' for clarity.
Figure MC 800–2.4: Section View of Trench Adjacent to Pad for Metal Clad Unit (Poured in Place)

Note(s):
1. Pouring of trench and pad to be monolithic. Trench to be finished smooth with drainage as indicated in MC 800. If precast trench is used, pour pad level with top of trench wall. Pad should butt against precast wall.

6"  6"
6"  6"
4'-0"
5'-3"  6"

Pad reinforcing to enter trench wall a MIN of 15". (Poured Trench)
MC 805 Distribution Power Cable Trench

Scope MC 805.1 Distribution Power Cable Trench — Poured (Non-Traffic)

Figure MC 805–1: Distribution Power Cable Trench — Slab Box Entrance Location(s)

Note(s):
1. Contractor shall coordinate with precast concrete vendor to specify location(s) and quantity of cable opening(s) per Edison drawing(s). Refer to DDS-6, Section 4.0, Table 6-8, Table Footnote f.
2. The slab box shall have only one cable opening on the front and/or back.
3. Additional cable openings may be located on the side of the structure if needed as shown (see plan view).
4. No saw cutting allowed on any part of the slab box. Any modifications to slab box (new or existing) shall be approved by Underground Structural Engineering.
5. Precast trench allowed with Underground Structures Engineering approval.

What's Changed? Updated Note 5 to show precast trenches allowed with Underground Structures Engineering approval.
Figure MC 805–2: Distribution Power Cable Trench — Trench Plan and Section Details

Note(s):
1. Contractor shall obtain approval from building owner prior to construction or any modifications to existing structure(s).
2. Dowel and epoxy #4 rebar at depth, 3-inch minimum to 4-inch maximum. Minimum of three locations equally spaced in trench wall.
3. Cable trench shall be inclined if a grade separation exists between the pad mount structure and cable trench termination.
4. Top of cable trench (under pad only) shall be flush to bottom of pad. Non-shrink grout (min. 3000 psi @ 28 days) may be used. Contractor shall ensure that there are no gaps or voids.
5. Dry wells shall be constructed as shown and at every 10 foot intervals for horizontal runs. Bottom of trench shall be sloped towards dry well where they occur.
6. All rebar lap splices shall be 24 inch minimum, staggered.
7. Cable trenches shall not be constructed in vehicle traffic areas.
8. All rebar shall be 60 ksi.
9. Use minimum 3000 psi concrete.
10. Joint sealer shall be one part polyurethane and shall conform to ASTM D1751.
11. Where new concrete poured against existing concrete, apply epoxy bonding agent (ex. Sikadur 32 Hi-Mod Adhesive) or equiv.
12. Contractor shall be responsible for grading and drainage. SCE not responsible for any water intrusion, flooding or similar.
13. All structures are customer owned.
14. Trenches deeper than 4 feet by SCE engineering approval only.
<figure>
<figcaption>Figure MC 805-3: Distribution Power Cable Trench — Poured — Trench Plan and Section Details</figcaption>
</figure>

**Note(s):**
1. Contractor shall obtain approval from building owner prior to construction or any modifications to existing structure(s).
2. Dowel and epoxy #4 rebar at depth, 3 inch minimum to 4 inch maximum. Minimum of three locations equally spaced in trench wall.
3. Cable trench shall be inclined if a grade separation exist between the pad mount structure and cable trench termination.
4. Top of cable trench (under pad only) shall be flush to bottom of pad. Non-shrink grout (min. 3000 psi @ 28 days) may be used. Contractor shall ensure that there are no gaps or voids.
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9. Use minimum 3000 psi concrete.
10. Joint sealer shall be one part polyurethane and shall conform to ASTM D1751.
11. Where new concrete poured against existing concrete, apply epoxy bonding agent (ex. Sikadur 32 Hi-Mod Adhesive) or equivalent.
12. Contractor shall be responsible for grading and drainage. SCE not responsible for any water intrusion, flooding or similar.
13. All structures are customer owned.
14. Cable trench sections 4 feet deep shall be constructed per section detail "C-C" in Figure MC 805-4 (Sheet 4).
15. Trenches deeper than 4 feet by SCE engineering approval only.

---

**Approved by:**

**Effective Date:** 10-25-2019

**What's Changed?** Updated Figure MC 805-3.
What's Changed?
MC 810  Cold Joints (Approved for Use at Contractor's Request)

Scope MC 810.1  Cold Joints (Approved for Use at Contractor’s Request)

Figure MC 810–1: Cold Joints

Note(s):
1. Dimensions are approximate. Sloped surfaces approximately 45° from vertical. Joint surface must be free of debris when second pour is made. Use 2 coats of “Sika-Seal” or equal for sealing.

What's Changed? The acronym for the Miscellaneous Chapter of the UGS Manual has been changed from ‘MS’ to ‘MC’ for clarity.
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Note(s):
1. Dimensions indicated by letters will be tabulated on working drawings with same letters for identification.
2. Subscript "1" when used will indicate a dimension referenced to the existing wall; subscript "2" when used will indicate a dimension referenced to the new wall.
3. Cut existing steel near center line of opening and turn into new structure as shown. Move new steel, otherwise passing through opening, to nearest edge with 1-inch clearance and 1-inch spacing between pieces.
4. Turn ends of new steel coming around corners up or down when necessary to clear opening. Paint 4-inch-wide band on outer surface around opening broken in old structure, with 2 coats of Sika Seal (1 gallon) black liquid or equivalent bonding agent before pouring.

What's Changed? The acronym for the Miscellaneous Chapter of the UGS Manual has been changed from 'MS' to 'MC' for clarity.
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MC 830 Protective Barrier for Underground Distribution Structures

Scope MC 830.1 Protective Barrier for Underground Distribution Structures

Figure MC 830–1: Protective Barrier for Underground Distribution Structures

Figure MC 830–1.1: Plan Equipment Foundation

Figure MC 830–1.2: Plan Pole or Vent

What's Changed?
1. Structures will normally be installed only in nontraffic areas. Protective barriers are to be used where construction exposes equipment to traffic.

2. Tops of protective barriers are to be smooth cut and top edges are to be rounded.

3. At least one barrier is to be removable, with a means of lifting to support the weight of the barrier, when overhead obstacles prevent equipment removal or installation by crane. See Figure MC 830–1.3 (Sheet 2). The location of the removable barrier(s) shall be approved by the Underground Inspector.

4. Adequate clearance must be provided for doors, cooling radiators, and so forth.

5. Protective barriers, as shown above, indicate typical requirements. Field conditions will necessitate changes for adequate equipment protection. Application of protective barriers is site-specific.
6. The Underground Inspector in the field must approve all protective barrier installations prior to construction. The Underground Inspector will determine (a) status of overhead obstructions, (b) the front and back of equipment foundations, and (c) the clearances required on doors, cooling radiators, and so forth.

7. When a 72" x 94" pad is being installed, (a) increase the distance to 36 inches minimum between the protective barriers and the front edge of the pad; and (b) increase the distance between the protective barriers and the back edge of the pad for capacitor bank (door side only) to 36 inches minimum. The Underground Inspector will determine the front and back of this equipment foundation.

8. With prior SCE approval, the following alternatives may be used in lieu of protective barriers for padmounted structures:
   a. When specified on working drawing, a 6-inch (minimum vertical face) concrete curb may be installed in place of protective barriers. This curb must be at least 6 inches thick and its front face at least 60 inches (minimum spacing) from the equipment foundation.
   b. When specified on working drawing for residential tract developments, protected barriers will not be required when there are rolled curbs or 6-inch vertical face curbs that have at least 60 inches (minimum spacing) from the curb to the edge of the equipment foundation.
   c. Where equipment is located adjacent to a residential driveway, protective barriers may not be required when there is 30-inch (minimum) clearance from the equipment foundation to the edge of the driveway. In addition, a 60-inch clearance shall be maintained from a fire hydrant to a pole. Field conditions will necessitate changes for adequate equipment protection. If the minimum clearances cannot be obtained, protective barriers are required.

9. With prior SCE approval, the following alternatives may be used in lieu of protective barriers for primary surface or semi-buried structures including BURD structures:
   a. When specified on working drawing, a 6-inch (minimum vertical face) concrete curb, 8-feet in length may be installed in place of protective barriers. This curb must be at least 6 inches thick.
   b. Where there are rolled curbs or curbs that have less than 6-inches of vertical face, protective barriers may not be required when there is at least 60 inches (minimum spacing) from the curb to the edge of the primary surface or semi-buried structures. (See Figure MC 830-1.5)
   c. Where equipment is located adjacent to a residential driveway, protective barriers may not be required when there is 30-inch (minimum) clearance from the equipment foundation to the edge of the driveway. (See Figure MC 830-1.5)
   d. Field conditions will necessitate changes for adequate equipment protection. If the minimum clearances cannot be obtained or there is no curb, protective barriers shall be required.
   e. In addition, a 60-inch clearance shall be maintained from a fire hydrant to a pole, transformers, PME switches, or any primary surface or semi-buried structure.

Figure MC 830–1.6: Placement of Primary or Semi-Buried Structure from Driveway
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MC 840  Wheelchair Ramps

Scope MC 840.1  Wheelchair Ramps

Wheelchair ramps are required only when specified on the working drawings. They shall be constructed as shown below in the location specified on the working drawings.

Figure MC 840–1: Wheelchair Ramps

Note(s):
1. Score lines are required at points “W” on all ramps.
2. Ramps shall have a rough broom finish transverse to the axis of the ramp. The finish must be rougher than the adjacent sidewalk.
3. Design may vary due to local regulations.
MC 850  Structure Offsets for Joint Construction

Scope MC 850.1  Structure Offsets for Joint Construction

Figure MC 850–1: Structure Offsets for Joint Construction

18" — For pull boxes
33" — When Edison manholes and vaults are involved.

What's Changed? The acronym for the Miscellaneous Chapter of the UGS Manual has been changed from 'MS' to 'MC' for clarity.
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MC 860  Inspection Criteria for Concrete Vaults, Manholes, and Covers

Scope

MC 860.1  Inspection Criteria for Concrete Vaults, Manholes, and Covers

1.0  General

This procedure defines criteria for UDI inspectors for concrete vaults, manholes, and covers.

2.0  Background

Vaults and Manhole Structures

Concrete structures have a limited life span of approximately 20-80 years. This variation is due to many factors including environmental, concrete mix design and loading conditions it has been subjected to. These factors cause structural deterioration including cracks, spalls, delamination, exposed reinforcing bars, and bulging. The extent of deterioration will affect structural integrity. Evaluating the extent of deterioration requires expertise. Therefore, a minimum criteria will be defined in this standard to determine when a Field Investigation (FI) is needed. This FI will be performed by a certified inspector and review by a licensed professional engineer.

Vault and Manhole Covers

Precast concrete covers in vaults typically have a life span less than the structure due to continuous traffic loads. Round iron covers typically have long life spans and rarely require replacement.

3.0  Definitions

1. Areas inside the structure – includes access, ceiling, side walls, end walls, and floor
2. Delamination – occurs when reinforcing steel beneath the surface is rusted and separated from the concrete layer
3. Spalling – delamination that has fallen off

4.0  UDI Inspection Criteria for Concrete Vaults and Manholes

Any of the following criteria found in the structure shall result in an FI.

1. A single crack is greater than 1/8 inch in width and 8 feet in continuous length. This includes continuous cracking from one area to another.
2. Total length of cracks (greater than 1/8 in width) is greater than 15 feet.
3. A total length of exposed steel reinforcing bars is greater than 5 feet.
4. Spalling or loose concrete is observed on 20% or more in one area (e.g. side wall and/or ceiling) of the structure.
5. Buckling, bulging, or displacing of concrete exceeds ½ inch from plumb. Do not include original deformities from concrete forming or similar.

If an FI is conducted, send notification to Deteriorated Vault and Manhole Program (DVMP).

What's Changed? Various verbiage additions and deletions for all major sections to clearly define inspection criteria for vaults, manholes, and covers.
5.0 UDI Inspection Criteria for Structure Covers

The following criteria shall result in a replacement of a cover:

1. Cracks greater than 1/16 inch width found in the concrete portion of the vault cover.
2. Any cracks found in the round iron cover or frame

NOTE

Covers that meet the criteria above shall be replaced with the latest standard cover (See FC 623, FC 627, FC 660, FC 661, and FC 670)

What's Changed? Various verbiage additions and deletions for all major sections to clearly define inspection criteria for vaults, manholes, and covers.

Effective Date: 01-26-2018
Removable Curb for 4’ x 5’ Vault Covers and Manhole Covers

Scope MC 870.1 Removable Curb for 4’ x 5’ Vault Covers and Manhole Covers

Figure MC 870–1: Removable Curb for 4’ x 5’ Vault Covers and Manhole Covers

Note(s):
1. The three-sided offset curbing around the vault necking, or manhole necking, shall be constructed to the dimensions of the existing or proposed curbing.
2. A 2-1/8” wide by 1/4” deep recess shall be placed on top of the offset curb, and curb face, as shown on the drawing.
3. Three plate covers are required for 4’ x 5’ vault covers. Manhole covers require two plate covers (plate #1 and 3).
4. Threaded 3/8” inserts shall be placed in the 2-1/8” wide curb recesses, to the dimensions shown on the “Top View” drawing. A minimum of five inserts are required for the 4’ x 5’ vault cover, four for a manhole cover.
5. Whenever the plate depth exceeds 36”, an additional insert, equally spaced, shall be placed into the recess of the offset curbing sides.
6. For steel cover plate details, see Scope MC 870.2 (Sheet 2).
Scope MC 870.2  Removable Curbing (Steel Cover Plates)

Figure MC 870–2: Removable Curbing (Steel Cover Plates)

Note(s):
1. Nonskid 1/4" thick steel floor plates shall be constructed to the dimensions shown. See MC 860 for plate location sequence on curb offset.
2. The 2" x 2" x 1/4" steel L shall be welded to the top and angled floor plate face.
3. Angled floor plate face may be bent or welded in place to the top plate.
4. Angle and depth of floor plate face shall match standard curb.
5. A minimum of seven 3/8" stainless steel flathead screws are required for the 4' x 5' vault cover plates, and a minimum of five screws for the manhole plates.
6. Covers to be hot dip galvanized per ASTM A123 after fabrication.
1.0 General

This procedure defines methods and materials for the repair of concrete pads in order to extend service life.

2.0 Repair Criteria

Structures shall be considered for repair if the following criteria are met:

Table MC 880–1: Exposed Rebar Remediation Guideline

<table>
<thead>
<tr>
<th>Repair</th>
<th>Length of Exposed Rebar refs</th>
<th>Length of Exposed Rebar refs</th>
<th>Recommended Time Frame</th>
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<tbody>
<tr>
<td>A - No Action</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>B - No Action</td>
<td>under 3&quot;</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>C - Repair</td>
<td>under 12&quot;</td>
<td>under 6&quot;</td>
<td>up to 2 years</td>
</tr>
<tr>
<td>D - Repair</td>
<td>12&quot; to 24&quot;</td>
<td>6&quot; to 12&quot;</td>
<td>up to 1 year</td>
</tr>
<tr>
<td>E - Replace</td>
<td>24&quot; to 36&quot;</td>
<td>12&quot; to 18&quot;</td>
<td>up to 1 year</td>
</tr>
<tr>
<td>F - Replace</td>
<td>over 36&quot;</td>
<td>Over 18&quot;</td>
<td>up to 6 months</td>
</tr>
</tbody>
</table>

refs:

\( a/ \) Refer to Figure MC 880-1.1

\( b/ \) Refer to Figure MC 880-1.2

3.0 Repair Procedures

This procedure is intended for use on the exterior surface of a semi-surface buried structure. This procedure shall not be used for the interior portion of a semi-surface buried structure, vault or manhole. This procedure shall not be used on a frame or cover. FlexKRETE shall not be used if an outage is required to repair the concrete.
3.1 FlexKRETE (Preferred)

The repair of concrete shall be done using FlexKRETE and shall be in accordance with the latest version of the manufacturer's recommended application procedure.

Table MC 880–2: FlexKRETE Materials

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
<th>SAP Number</th>
</tr>
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<tbody>
<tr>
<td>FlexKRETE Kit</td>
<td>1 Pint</td>
<td>10210023</td>
</tr>
<tr>
<td></td>
<td>1 Quart</td>
<td>10210024</td>
</tr>
<tr>
<td></td>
<td>1/2 Gallon</td>
<td>10210025</td>
</tr>
<tr>
<td>FlexPrime (Part A &amp; B) Kit</td>
<td>2 Gallon</td>
<td>10210026</td>
</tr>
<tr>
<td></td>
<td>2 Quart</td>
<td>10210027</td>
</tr>
<tr>
<td></td>
<td>12 Ounces</td>
<td>10210028</td>
</tr>
<tr>
<td>FlexTemp Additive</td>
<td>5 Ounces</td>
<td>10210029</td>
</tr>
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</table>

Table MC 880–3: List of Approved Tools for Preparation and Mixing

<table>
<thead>
<tr>
<th>Tool Description</th>
<th>SAP Number</th>
</tr>
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<tbody>
<tr>
<td>4-1/2&quot; Grinder(a/)</td>
<td>10148461</td>
</tr>
<tr>
<td>Cold Chisel (7/8&quot; Blade)</td>
<td>10143228</td>
</tr>
<tr>
<td>Small Sledge Hammer</td>
<td>10170841</td>
</tr>
<tr>
<td>1/2&quot; Heavy Duty Drill Motor(b/)</td>
<td>10148363</td>
</tr>
</tbody>
</table>

\(a/\) 1 steel grinder wheel and 1 stone grinder wheel needed for prep work and finish work, respectively.

\(b/\) Mixing paddle needed for drill motor

A. Mixing and Application Procedures for FlexKRETE Pint, Quart and Half Gallon Kits

Tools Needed for successful mixing:

- Drill motor – 1/2" preferred
- Mixing paddle – Hamster Cage type
- One additional, clean 5-gallon bucket
Open Kit and verify contents:
- Plastic container containing FlexKRETE (Pint kit, pint container, Quart kit, quart container and so on).
- Sand
- 4 oz. bottle with appropriate amount of clear catalyst.
- Plastic container containing Fumed Silica (Pint kit, pint container, Quart kit, quart container and so on).
- Plastic Quart. mixing cup
- One pair gloves
- 2" and 6" plastic putty knives
- 2" wide chip brush
- Wood or plastic stir stick

Mixing:
1. Open container marked FlexKRETE and pour entire contents into the clean 5-gallon bucket.
2. Open 4 oz. bottle of catalyst and pour entire contents into the same 5-gallon bucket.
3. Mix both liquids together until thoroughly blended. (approx. 30 seconds). At this point the catalyzed FlexKRETE will be used as the primer.
4. Add sand from the 5-gallon pail that held the kit, into the blended mixture and blend until all sand is saturated with the catalyzed FlexKRETE. (Save 5-gallon bucket for the mixing of the next kit)
5. Open container of fumed silica and pour into bucket. Be careful not to breathe in the fumed silica. Mix until all signs of the fumed silica are gone. The fumed silica adds strength while reducing weight keeping the product from sagging or fall away when applying on vertical repairs.

Application Tips
The warmer and drier the air the quicker the mixture will cure. This product can cure in as little as 15 minutes in high temperatures. Do not apply this product unless the area to be repaired is free of any and all moisture, as the moisture will stop the curing process. This product cures by a chemical reaction causing a buildup of heat. This heat will draw moisture out of the concrete or air and stop the curing process.

Surface Preparation
The area to be repaired needs to be free of all oils, dirt, dust, organics, moisture and other contaminants. It may be necessary to clean the repair area with a grinder and or wire brush.
Primming of Repair Area

The area to be repaired needs to be primed. Prime with the catalyzed product. After performing mixing procedure number 3, in the above mixing instructions, use the provided paint brush to apply the catalyzed FlexKRETE to the repair area paying close attention to the nooks and crannies. This allows the liquid to penetrate into the "bores" of the concrete assuring a complete and solid bond. Paint all concrete and rebar. Once the area is primed, proceed to step 4 of the mixing instructions.

Placing

Once the FlexKRETE, catalyst, sand and fumed silica have been thoroughly mixed it can be applied. Use the provided putty knives to pack, apply and finish the mixture to the damaged area. It is important to force the material into all the nooks and crannies to assure a strong bond. Do not worry if the primer has cured FlexKRETE will adhere to itself extremely well. If needed, a light grinding on the cured FlexKRETE will/can remove over pours, high spots, and other such imperfections.

Estimated Cure Rates

- 100°F and up 15 minutes or less
- 90°F – 100°F 15 minutes to 1/2 hour
- 70°F – 90°F 1/2 hour to 45 minutes
- 40°F – 70°F 45 minutes to 1-1/2 hours

These are only estimates. Other factors that will affect the cure rates are:

- Humidity
- Temperature of the concrete
- Temperature of the sand
- Temperature of the FlexKrete
- Size of the repair being made. A large repair will generate more heat quicker.
3.2 QuiKRETE (SAP 10205739) (Alternative)

When FlexKRETE is not available and if repair need to be done with urgency, QuiKRETE Quick-Setting Cement shall be used as an alternative to repair cracks and spalls on concrete pad structures.

3.3 Bullseye Quick Patch (Alternative)

This product is an ultraviolet light activated repair patch material that can be used for the repair of BURD rings, vent pipes, risers (secondary and primary), pads (fiberglass, corroded unistruts and hand holes).

Table MC 880–4: Bullseye Quick Patch Details

<table>
<thead>
<tr>
<th>Patch Size (a/)</th>
<th>SAP Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>6&quot; x 9&quot;</td>
<td>10185030</td>
</tr>
<tr>
<td>9&quot; x 12&quot;</td>
<td>10185031</td>
</tr>
</tbody>
</table>

\(a/\) Each SAP code comes with 12 packages capable of repairing their respective patch size.

Note(s):

1. Bullseye Quick patch shall not be used for concrete repairs.
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What's Changed? Figure MC 890-1, Note 1 was updated for clarity.
Note(s):
1. The footing depth will vary depending on the type of soil and wind loading requirements. See Table MC 890–1 (Sheet 3) through Table MC 890–4 (Sheet 4).
2. Foundation shall be installed after conduit or CIC (for Underground Service), curbs, and sidewalks are in place and grades are established.
3. 1-1/2" Plastic CIC Sleeve for UG Concrete Electrolier (tape both ends to prevent debris from entering the sleeve).
4. Concrete to reach a minimum compression strength of 2800 psi in 28 days. See UGS 20.3.
5. Place a minimum size concrete apron of 30" x 30" x 4" thick around the pole at the ground level to provide a constrained surface condition when required. Grout to be placed after pole is set and plumbed.
## Scope MC 890.3  
Electrolier Foundation Requirements

### Table MC 890–1: 70 MPH Wind Zone, Constrained Surface Condition

<table>
<thead>
<tr>
<th>Soil Type</th>
<th>Fiberglass, Concrete, or Steel</th>
<th>Nostalgic</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Per UBCa/</td>
<td></td>
</tr>
<tr>
<td></td>
<td>23' Shaft</td>
<td>28' Shaft</td>
</tr>
<tr>
<td>I. Massive Crystalline Bedrock</td>
<td>H 2'-6&quot; x D 20&quot; dia.</td>
<td>H 2'-6&quot;</td>
</tr>
<tr>
<td>II. Sedimentary and Foliated Rock</td>
<td>H 2'-6&quot;  x D 20&quot; dia.</td>
<td>H 2'-6&quot;</td>
</tr>
<tr>
<td>III. Sandy Gravel, Gravel</td>
<td>H 3'-0&quot;  x D 20&quot; dia.</td>
<td>H 3'-0&quot;</td>
</tr>
<tr>
<td>IV. Sand, Silty Sand, Clayey Sand, Silty Gravel, Clayey Gravel</td>
<td>H 3'-0&quot;  x D 20&quot; dia.</td>
<td>H 3'-0&quot;</td>
</tr>
<tr>
<td>V. Clay, Sands, Sandy Clay, Silty Clay, Clayey Silt</td>
<td>H 3'-0&quot;  x D 20&quot; dia.</td>
<td>H 3'-0&quot;</td>
</tr>
</tbody>
</table>

Note(s):  
1. H = Depth of footing  
2. D = Diameter of round footing or the side dimension of square footing.

### Table MC 890–2: 70 MPH Wind Zone, Non-Constrained Surface Condition

<table>
<thead>
<tr>
<th>Soil Type</th>
<th>Fiberglass, Concrete, or Steel</th>
<th>Nostalgic</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Per UBCa/</td>
<td></td>
</tr>
<tr>
<td></td>
<td>23' Shaft</td>
<td>28' Shaft</td>
</tr>
<tr>
<td>I. Massive Crystalline Bedrock</td>
<td>H 2'-6&quot; x D 20&quot; dia.</td>
<td>H 2'-6&quot;</td>
</tr>
<tr>
<td>II. Sedimentary and Foliated Rock</td>
<td>H 3'-0&quot;  x D 20&quot; dia.</td>
<td>H 3'-0&quot;</td>
</tr>
<tr>
<td>III. Sandy Gravel, Gravel</td>
<td>H 3'-0&quot;  x D 20&quot; dia.</td>
<td>H 3'-0&quot;</td>
</tr>
<tr>
<td>IV. Sand, Silty Sand, Clayey Sand, Silty Gravel, Clayey Gravel</td>
<td>H 3'-0&quot;  x D 20&quot; dia.</td>
<td>H 3'-0&quot;</td>
</tr>
<tr>
<td>V. Clay, Sands, Sandy Clay, Silty Clay, Clayey Silt</td>
<td>H 3'-0&quot;  x D 20&quot; dia.</td>
<td>H 3'-0&quot;</td>
</tr>
</tbody>
</table>

Note(s):  
1. H = Depth of footing  
2. D = Diameter of round footing or the side dimension of square footing.
### Table MC 890–3: 90 MPH Wind Zone, Constrained Surface Condition

<table>
<thead>
<tr>
<th>Soil Type</th>
<th>Fiberglass, Concrete, or Steel</th>
<th>Nostalgic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Per UBC[a]</td>
<td>23' Shaft</td>
<td>28' Shaft</td>
</tr>
<tr>
<td>I. Massive Crystalline Bedrock</td>
<td>2'6&quot; 20&quot; dia.</td>
<td>2'6&quot; 20&quot; dia.</td>
</tr>
<tr>
<td></td>
<td>2'6&quot; 30&quot; x 30&quot;</td>
<td>2'6&quot; 30&quot; x 30&quot;</td>
</tr>
<tr>
<td>II. Sedimentary and Foliated Rock</td>
<td>3'0&quot; 20&quot; dia.</td>
<td>3'0&quot; 20&quot; dia.</td>
</tr>
<tr>
<td></td>
<td>2'6&quot; 30&quot; x 30&quot;</td>
<td>2'6&quot; 30&quot; x 30&quot;</td>
</tr>
<tr>
<td>III. Sandy Gravel, Gravel</td>
<td>3'0&quot; 20&quot; dia.</td>
<td>4'0&quot; 20&quot; dia.</td>
</tr>
<tr>
<td></td>
<td>3'0&quot; 30&quot; x 30&quot;</td>
<td>3'0&quot; 30&quot; x 30&quot;</td>
</tr>
<tr>
<td>IV. Sand, Silty Sand, Clayey Sand,</td>
<td>4'0&quot; 20&quot; dia.</td>
<td>4'0&quot; 20&quot; dia.</td>
</tr>
<tr>
<td>Clay Gravel, Clayey Gravel</td>
<td>4'0&quot; 30&quot; x 30&quot;</td>
<td>3'0&quot; 30&quot; x 30&quot;</td>
</tr>
<tr>
<td>V. Clay, Sands, Sandy Clay, Silty</td>
<td>4'6&quot; 30&quot; x 30&quot;</td>
<td>4'0&quot; 30&quot; x 30&quot;</td>
</tr>
<tr>
<td>Clay, Clayey Silt</td>
<td>4'6&quot; 30&quot; x 30&quot;</td>
<td>6'0&quot; 30&quot; x 30&quot;</td>
</tr>
</tbody>
</table>


**Note(s):**
1. H = Depth of footing
2. D = Diameter of round footing or the side dimension of square footing.

### Table MC 890–4: 90 MPH Wind Zone, Non-Constrained Surface Condition

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<th>Fiberglass, Concrete, or Steel</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Per UBC[a]</td>
<td>23' Shaft</td>
<td>28' Shaft</td>
</tr>
<tr>
<td>I. Massive Crystalline Bedrock</td>
<td>2'6&quot; 20&quot; dia.</td>
<td>3'0&quot; 20&quot; dia.</td>
</tr>
<tr>
<td></td>
<td>2'6&quot; 30&quot; x 30&quot;</td>
<td>3'0&quot; 30&quot; x 30&quot;</td>
</tr>
<tr>
<td>II. Sedimentary and Foliated Rock</td>
<td>4'0&quot; 20&quot; dia.</td>
<td>4'0&quot; 20&quot; dia.</td>
</tr>
<tr>
<td></td>
<td>3'0&quot; 30&quot; x 30&quot;</td>
<td>3'0&quot; 30&quot; x 30&quot;</td>
</tr>
<tr>
<td>III. Sandy Gravel, Gravel</td>
<td>5'0&quot; 20&quot; dia.</td>
<td>5'6&quot; 20&quot; dia.</td>
</tr>
<tr>
<td></td>
<td>3'6&quot; 30&quot; x 30&quot;</td>
<td>4'0&quot; 30&quot; x 30&quot;</td>
</tr>
<tr>
<td>IV. Sand, Silty Sand, Clayey Sand,</td>
<td>5'6&quot; 20&quot; dia.</td>
<td>6'0&quot; 20&quot; dia.</td>
</tr>
<tr>
<td>Clay Gravel, Clayey Gravel</td>
<td>4'0&quot; 30&quot; x 30&quot;</td>
<td>4'6&quot; 30&quot; x 30&quot;</td>
</tr>
<tr>
<td>V. Clay, Sands, Sandy Clay, Silty</td>
<td>6'0&quot; 20&quot; dia.</td>
<td>6'6&quot; 20&quot; dia.</td>
</tr>
<tr>
<td>Clay, Clayey Silt</td>
<td>4'6&quot; 30&quot; x 30&quot;</td>
<td>5'0&quot; 30&quot; x 30&quot;</td>
</tr>
</tbody>
</table>


**Note(s):**
1. H = Depth of footing
2. D = Diameter of round footing or the side dimension of square footing.