1. INTRODUCTION

1.1 Scope
This specification covers non-shrink and epoxy grouting of structural column base plates and equipment bases, Portland cement grout for minor elements and bonding agents for bonding of new concrete to existing concrete.

1.2 Application
Grout and grouting shall provide 100% (full) contact between the base of the item being grouted and foundation and shall completely fill the grout space. The materials, mix and method of installation shall be selected to ensure the fulfillment of this requirement. Grout shall be provided where called for on the design drawings and in accordance with this specification.

1.2.1 Non-Shrink Grout shall be used for all installations unless otherwise specified by this specification or the design drawings.

1.2.2 Epoxy Grouts shall be used for the following as noted on the design drawings:
   a. All major machinery.
   b. All equipment supports and structural units subject to substantial dynamic force, vibration or impact resulting from equipment operation, fluid flow, or thermal considerations.

1.2.3 Portland cement grout may be used, when approved by the Engineer, for small, minor structural elements such as pipe supports, platform columns, stairs and similar applications

1.2.4 Epoxy Bonding Agents shall be used to bond fresh, plastic concrete to hardened concrete. Application shall be in accordance with manufacturer’s instructions.

2. REFERENCE SPECIFICATIONS
The applicable portions of the following documents, including all documents referred to herein, are hereby made part of this specification. They shall be the latest of current edition including all amendments and revisions.

2.1 American Concrete Institute (ACI) 301 - Specifications for Structural Concrete for Buildings.

2.2 American Society of Testing and Materials (ASTM).

2.4 ASTM C144 Specifications for Aggregates for Masonry Mortar.

2.5 ASTM C1107 Specification for Packaged Dry, Hydraulic-Cement Grout (NonShrink).


3. MATERIALS

3.1 Non-Shrink Grout

3.1.1 The dry material for non-shrink grout shall be pre-mixed and bagged.

3.1.2 Non-Metallic non-shrink grout shall be Five Star Grout as manufactured by U. S. Grout Corporation, Fairfield, CT or approved equal.

3.1.3 Request for alternate non-shrink grouts must be submitted in writing and approved by the Engineer.

3.2 Epoxy Grout

3.2.1 Epoxy Grout shall be Five Star Epoxy Grout as manufactured by U. S. Grout Corporation, Fairfield, CT or approved equal.

3.2.2 Requests for alternate epoxy grouts must be submitted in writing and approved by the Engineer.

3.3 Portland Cement Grout

3.3.1 Portland Cement shall be Type II conforming to ASTM C150.

3.3.2 Aggregate shall be a clean, well-graded, natural or manufactured sand in general conformance with ASTM C144, except the recommended grading shall be as follows:
- Passing a No. 8 Sieve - 95 to 100%
- Passing a No. 16 Sieve - 65 to 90%
- Passing a No. 50 Sieve - 10 to 30%
- Passing a No. 100 Sieve - 3 to 10%

3.3.3 For fluid grouts, the percentages of fine materials passing the 50 and 100 mesh sieves should be near the upper limits of the grading given in Par. 3.3.2 above. Aggregate, for stiff grouts, shall meet the usual grading specifications of ASTM C144.

3.3.4 Water used for any grout shall be clean and free from injurious amounts of oils, acids, alkalis, organic materials or other
deleterious substances. In general, potable water will be satisfactory. Other water shall be qualified in accordance with ACI 301.

3.4 Bonding Agents

3.4.1 Epoxy Bonding Agents shall be "Sikadur 32 Hi-Mod" epoxy adhesive as manufactured by Sika Chemical Corporation or approved equal with identical properties.

3.4.2 Requests for alternate bonding agents must be submitted in writing and approved by the Engineer.

4. EXECUTION

4.1 Material Preparation and Handling

4.1.1 Non-Shrink Grout

a. Non-Shrink grouts shall be mixed, handled, applied and installed in strict accordance with the manufacturer's instructions and recommendations.

b. The non-shrink grouts specified herein are handled and mixed in a manner similar to Portland Cement grouts. The consistency for flowable or dry-pack grouts is controlled by the water content.

4.1.2 Epoxy Grouts

a. Epoxy Grouts shall be handled, mixed, applied and installed in strict accordance with the manufacturer's instructions and recommendations.

b. Epoxy grouts have a relatively short pot life and must be used immediately after mixing. Pot life, mixing times and installation period vary with temperature conditions, refer to manufacturer's instructions and recommendations.

4.1.3 Portland Cement Grout

a. Dry materials shall be thoroughly mixed before the addition of any water.

b. Grout shall not be retempered by the addition of water.

c. A primary requisite is that the mix readily and completely fill the spaces to be grouted. The consistency of the mix required to accomplish this is controlled by the amount of water used. The mixture shall be consistent with minimum water content and shrinkage necessary to accomplish the intended purposes. The following are recommended grout proportions:
4.1.4 Epoxy Bonding Agents
Epoxy bonding agents shall be handled, mixed, and applied in strict accordance with the manufacturer’s recommendations.

4.2 Installation

4.2.1 Cleaning
Surfaces to be grouted shall be thoroughly roughened and cleaned of all foreign matter and laitance. Anchor bolts, anchor bolt holes and the bottom of equipment and column base plates shall be cleaned of all oil, grease, dirt and loose material.

4.2.2 Wetting
Immediately prior to grouting with either Portland Cement or non-shrink grout, the concrete surface to be grouted shall be thoroughly wetted with water.

4.2.3 Drying
For epoxy grout installations, all surfaces which will come into contact with the grout must be absolutely dry and clean.

4.2.4 Anchor Bolt Sleeves
Water and debris in all anchor bolt sleeves shall be removed before grouting is started. All anchor bolt sleeves shall be completely filled with grout unless otherwise indicated on the drawings.

4.2.5 Positioning
Units to be grouted shall be set in their exact position and at their exact elevation prior to grouting.

4.2.6 Installation Procedures
Grouting, once started, shall proceed continuously and be accomplished quickly. The installation procedures shall be such as to insure full contact with all surfaces, complete filling of the grout space, release of all entrapped air, no segregation of

<table>
<thead>
<tr>
<th>Use</th>
<th>Grout Thickness</th>
<th>Mix Proportions</th>
<th>Max. Water Gals/Sack of Cement</th>
</tr>
</thead>
<tbody>
<tr>
<td>General</td>
<td>One inch and over,</td>
<td>One sack Portland cement to 2 cubic feet of sand</td>
<td>6</td>
</tr>
<tr>
<td>Fluid</td>
<td>Under one inch</td>
<td>One sack Portland cement to 1 cubic foot of sand</td>
<td>5</td>
</tr>
</tbody>
</table>
Bonding and Grouting

materials, no bleeding and completion of grouting before any initial set.

4.2.7 Large Areas
When large areas are to be grouted, grout holes shall be provided in the base unit. Grout shall be installed through such holes by pressure grouting.

4.2.8 Thickness
Grout thickness shall generally be a minimum of one inch. For large or heavy units, the thickness may be greater.

4.2.9 Surface Preparation for Bonding
The surface of existing concrete shall be cleaned of grease, oil, paint, ice, laitance, and other coatings, and shall be either mechanically roughened to expose the aggregate or etched with a solution of not more than 10% hydrochloric acid and water, followed by a thorough flushing with clean water to leave the surface clean. Thoroughly soak the surface until absorptions stop, and then remove free water before applying bonding mixtures.

NOTE: If bonding agent manufacturer recommends dry surface, thoroughly dry in accordance with manufacturer's recommendations before applying.

4.3 Finishing

4.3.1 Trimming
After sufficient set has been attained, excess grout shall be trimmed away on a line flush with the bottom of the equipment base. The finish surface shall be troweled smooth and shall slope away from the base a minimum of 1/4" in 12". Form and seal epoxy grout per manufacturer's instructions.

4.3.2 Curing
Grout shall be suitably cured. During cold weather, provisions shall be made to prevent freezing.