PURPOSE AND USE OF PROCESS INDUSTRY PRACTICES

In an effort to minimize the cost of process industry facilities, this Practice has been prepared from the technical requirements in the existing standards of major industrial users, contractors, or standards organizations. By harmonizing these technical requirements into a single set of Practices, administrative, application, and engineering costs to both the purchaser and the manufacturer should be reduced. While this Practice is expected to incorporate the majority of requirements of most users, individual applications may involve requirements that will be appended to and take precedence over this Practice. Determinations concerning fitness for purpose and particular matters or application of the Practice to particular project or engineering situations should not be made solely on information contained in these materials. The use of trade names from time to time should not be viewed as an expression of preference but rather recognized as normal usage in the trade. Other brands having the same specifications are equally correct and may be substituted for those named. All Practices or guidelines are intended to be consistent with applicable laws and regulations including OSHA requirements. To the extent these Practices or guidelines should conflict with OSHA or other applicable laws or regulations, such laws or regulations must be followed. Consult an appropriate professional before applying or acting on any material contained in or suggested by the Practice.

This Practice is subject to revision at any time.

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PRINTING HISTORY

November 1996 Issued December 2010 Complete Revision
October 2001 Complete Revision

Not printed with State funds
# PIP STS03601
## Epoxy Grout Specification

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1. Introduction

1.1 Purpose
This Practice provides requirements for epoxy grout materials and installation.

1.2 Scope
This Practice describes the requirements for supplying, testing, and installing epoxy grout materials for machinery baseplates and soleplates.

Users of this Practice may also refer to PIP REIE686 for more detailed guidelines for machinery installation and grouting.

2. References

Applicable parts of the following Practices, industry codes and standards, and references shall be considered an integral part of this Practice. The edition in effect on the date of contract award shall be used, except as otherwise noted. Short titles will be used herein where appropriate.

2.1 Process Industry Practices (PIP)
- PIP STS03001 - Plain and Reinforced Concrete Specification
- PIP REIE686 - Recommended Practices for Machinery Installation and Installation Design

2.2 Industrial Codes and Standards
- ASTM International (ASTM)
  - ASTM C531 - Standard Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes
  - ASTM C579 - Standard Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes
  - ASTM C827/C827M - Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures
  - ASTM C882/C882M - Standard Test Method for Bond Strength of Epoxy-Resin Systems Used with Concrete by Slant Shear
  - ASTM C1181 - Standard Test Methods for Compressive Creep of Chemical-Resistant Polymer Machinery Grouts

2.3 Government Regulations
Federal standards and instructions of the U. S. Occupational Safety and Health Administration (OSHA), including any additional requirements by state or local agencies that have jurisdiction where the epoxy grout is to be installed, shall apply, including the following:
- Code of Federal Regulations, OSHA Part 1910
3. Definitions

constructor: The party responsible for supplying the materials, equipment, tools, supervision, and labor for the installation of the epoxy grout in accordance with the contract documents. The term constructor shall apply also to the constructor’s subcontractor(s) and vendor(s).

contract documents: Any and all documents, including codes, studies, design drawings, specifications, sketches, practices, and data sheets, that the purchaser has transmitted or otherwise communicated, either by incorporation or reference, and made part of the legal contract agreement or purchase order between the purchaser and the constructor.

epoxy grout manufacturer: The party who produces and warrants the performance of the epoxy grout materials provided in accordance with the contract documents. The epoxy grout materials are manufactured in a controlled process using standard codes, specifications, tests and possibly include shop drawings to assist in proper application, installation and/or use. The term epoxy grout manufacturer shall apply also to the epoxy grout manufacturer’s subcontractor(s) and/or vendor(s).

owner: The party who has authority through ownership, lease, or other legal agreement over the project wherein the epoxy grout will be installed.

purchaser: The party who awards the contract to the constructor. The purchaser may be the owner or the owner’s authorized agent.

inspector: The party responsible for verifying the quality of all materials, installations, and workmanship furnished by the constructor. The inspector shall be qualified by training and experience and hold certifications or documentation of their qualifications. Unless otherwise specified in the contract documents, the inspector will be retained by the purchaser.

4. Requirements

4.1 General

4.1.1 Constructor shall provide all equipment, materials, labor, supervision, and quality control of epoxy grout work. The constructor shall perform all work necessary for preparation, forming, supplying, handling, mixing, placing, locating joints including joint details, testing, inspection, curing and finishing of epoxy grout, and disposal of excess epoxy grout and other materials in accordance with the contract documents.

4.1.2 All work shall be in accordance with the epoxy grout manufacturer’s written recommendations, including temperature restrictions.

4.1.3 Any conflicts or inconsistencies between this Practice, the design drawings, the epoxy grout manufacturer’s specifications and recommendations, the machine or equipment manufacturer’s recommendations, or other contract documents shall be brought to the attention of the purchaser for resolution before the performance of work.
4.2 Field Quality Control

4.2.1 Constructor shall be solely responsible for the quality control of all constructor-provided materials, installations, and workmanship, including those items or installations provided by any of the constructor’s subcontractors or vendors.

4.2.2 The purchaser reserves the right to require the constructor to collect and test epoxy grout samples.

4.2.3 Notwithstanding the constructor’s responsibility for quality, the epoxy grout manufacturer shall provide a technical representative who shall be on-site to review the grouting set-up procedures and the epoxy grout manufacturer’s instructions with those who shall actually be doing the grouting. The technical representative shall remain at the grouting site as long and as often as required to ensure that the epoxy grout manufacturer’s installation instructions are being followed. This requirement may be waived by written notice from the purchaser or as otherwise specified in the contract documents.

4.2.4 The inspector shall have the right to perform inspections and tests at any time. The constructor shall cooperate with the inspector in the performance of these inspections and tests.

4.2.5 Checklists in the appendix to this Practice may be used to aid in quality control.

4.3 Testing

If required by the contract documents, epoxy grout shall be sampled and tested as follows:

a. For each epoxy grout shipment or manufacturing lot, a minimum of nine samples shall be tested for compressive strength in accordance with ASTM C579, Method B and linear shrinkage in accordance with ASTM C531.

b. Three cubes shall be tested at 24 hours, three cubes at three days, and three cubes at seven days.

c. All samples shall be labeled and their batch placement location noted.

4.4 Submittals

4.4.1 The epoxy grout manufacturer’s literature and certified test data shall be submitted to the purchaser for approval a minimum of 15 days before installation of the epoxy grout. The literature shall include the epoxy grout material properties in accordance with this Practice.

4.4.2 A written quality control program, describing in detail how compliance with this Practice will be ensured, shall be submitted to the purchaser for approval a minimum of 15 days before installation of epoxy grout. The program shall include procedures for preparation, forming, supplying, handling, mixing, placing, locating joints including joint details, testing, inspection, curing and finishing of epoxy grout, and disposal of excess epoxy grout and other materials in accordance with the contract documents.
4.4.3 If testing is required by the contract documents, copies of all epoxy grout placement and test reports shall be submitted to the purchaser within three days after tests are performed. The reports shall include the following information:

a. Identification of foundation for epoxy grout placement
b. Epoxy grout manufacturer and type
c. Epoxy grout design compressive strength
d. Date of epoxy grout placement
e. Air temperature at beginning of epoxy grout placement
f. Foundation temperature at beginning of epoxy grout placement
g. Epoxy grout compressive break strengths
h. Epoxy grout linear shrinkage.

4.5 Safety

The constructor shall be responsible for compliance with the safety requirements specified in the contract documents and as recommended by the epoxy grout manufacturer. The following minimum precautions shall be applied:

a. All epoxy grout Material Safety Data Sheets (MSDSs) shall be available and associated hazards reviewed with all grouting personnel.

b. Goggles or face shields and aprons shall be worn by personnel mixing and pouring the epoxy grout.

c. Protective gloves shall be worn by all personnel involved in the grouting operation.

d. Dust masks or respirators (in accordance with MSDS requirements) shall be worn by those personnel exposed to the aggregate prior to mixing.

e. Soap and water shall be available for periodic hand cleaning, should the need arise.

f. Because some epoxy grouts exhibit a very strong exothermic reaction and the possibility of thermal burns exists, caution shall be exercised for these epoxy grouts.

4.6 Materials

4.6.1 Epoxy grout shall be in accordance with the following physical properties:

a. Minimum compressive strength (ASTM C579, Method B modified): 12,000 psi (80 MPa) at 7 days

b. Maximum linear shrinkage: epoxy grout shall not shrink and shall expand not more than 4.0 percent when tested in accordance with ASTM C827/C827M (before set) and not more than 1.0 percent when tested in accordance with ASTM C531

c. Maximum coefficient of thermal expansion (ASTM C531): $30 \times 10^{-6}$ inch/inch/°F ($54 \times 10^{-6}$ mm/mm/°C)

d. Maximum creep (ASTM C1181): 0.005 inch/inch (0.005 mm/mm), tested at 70°F (20°C) and 140°F (60°C) with 400 psi (2.8 MPa) applied vertical load
e. Minimum bond strength of epoxy grout to concrete 
   \((\text{ASTM C882/C882M})\): 2000 psi (14 MPa)

f. The peak exotherm of a cylinder of epoxy grout 2 inches (50 mm) in 
diameter and 4 inches (100 mm) high, tested at a material and 
laboratory temperature of 75°F (24°C), shall not be greater than 95°F 
(35°C). Epoxy grout shall not emit highly volatile inhalation irritants.

4.6.2 All manufactured epoxy grout materials shall be delivered to the job site in 
original unopened packages and shall be stored in accordance with the epoxy 
grout manufacturer’s recommendations.

4.6.3 All materials and tools shall be stored in a clean and organized manner.

4.6.4 Unless specified in the contract documents, admixtures shall not be added to 
the epoxy grout without approval of the purchaser and the epoxy grout 
manufacturer.

4.7 Pre-Grouting Requirements

4.7.1 The Pre-Grouting Checklist \(\text{STS03601-F1}\) appended to this Practice may be 
used by the constructor and/or the inspector to aid in complying with the 
requirements in this specification.

4.7.2 Foundation Preparation

4.7.2.1 Unless otherwise approved by purchaser, new concrete foundations 
shall be cured (by others) for seven days minimum before surface 
preparation.

4.7.2.2 Chipping

1. Verify that anchor bolt threads are covered with duct tape or other 
suitable means (by others) to keep them clean and to prevent any 
damage that might occur during the chipping operation.

2. In the areas to be covered by epoxy grout, the foundation shall 
be prepared by chipping away all laitance (poor quality 
concrete) and oil-soaked or damaged concrete down to exposed 
fractured coarse aggregate.

3. Unless a greater minimum clearance is shown in the contract 
documents, a minimum of 1 inch (25 mm) of concrete shall be 
removed in the chipping process down to a depth to permit 
1 inch (25 mm) minimum clearance between the concrete and 
the bottom of the base or sole plate.

4. Unless otherwise approved by purchaser, a chipping hammer 
shall be used for chipping and removal.

   a. Chipping the surface with a needle gun or bushing tool or 
sandblasting to remove laitance from the foundation is not 
   permitted.

   b. Concrete chipping shall not be performed with heavy tools 
   (e.g., jackhammers), because heavy tools can damage the 
   structural integrity of the foundation.
4.7.2.3 When the surface chipping is complete, all chippings and dust shall be removed from the surface by thoroughly sweeping and vacuuming or blowing with clean, dry, oil-free air.

4.7.2.4 The foundation shall be kept free of contamination by oil, dirt, water, etc., after the foundation has been prepared for epoxy grouting. When work is not in progress, protective sheeting (e.g., sheets of clean polyethylene) shall be used to cover the prepared surfaces.

4.7.3 Suitable shelter or enclosures shall be provided to protect the foundation and baseplate from direct sunlight, dew, rain, or other inclement weather.

4.7.4 During cold weather, adequate enclosures and heating shall be provided to maintain the foundation, forms, and baseplate temperature within the temperature range and for the time duration recommended by the epoxy grout manufacturer.

4.7.5 Proper access to grout holes and leveling surfaces shall be provided prior to epoxy grout installation. Machinery may have to be removed from baseplates (by others) to facilitate this access.

4.7.6 Verify that anchor bolt sleeves are filled (by others) with a nonbonding moldable material.

4.7.7 Epoxy grout forms shall be constructed to be liquid-tight with adequate strength, rigidity, and dimension to support epoxy grout placement. Forms shall be installed in accordance with the following requirements:

a. Epoxy grout forms shall be attached to concrete with drilled anchors or other method approved by the purchaser. Power nailing is not permitted.

b. Three coats of paste wax shall be applied to the inside surface of forms to prevent epoxy grout adherence to the forms. Other approved form release agents or bond breakers may be used as recommended by the epoxy grout manufacturer. Oil or liquid wax is not permitted.

c. Epoxy grout form elevation shall be checked to ensure that the top surface of the epoxy grout will match the elevation shown on the construction drawings.

d. Chamfer strips [3/4 inch (20 mm), 45°] shall be installed at each vertical corner and at the horizontal surface of the epoxy grout forms.

e. All form joints and interfaces between forms and concrete foundation, including expansion joints, shall be sealed using epoxy grout manufacturer’s recommended sealant. If epoxy grout manufacturer has no recommendations for sealant, use room-temperature vulcanizing (RTV) silicone sealant.

4.7.8 Unless otherwise specified in the contract documents, expansion joints in epoxy grout shall be constructed in accordance with epoxy grout manufacturer’s recommendations.

4.7.9 Epoxy grout reinforcement (if required) shall be installed as specified in the contract documents and in accordance with PIP STS03001.
4.7.10 Baseplate Preparation

4.7.10.1 Verify that baseplate surfaces that will be in contact with epoxy grout are cleaned (by others) to remove oil, grease and dirt, and coated (by others) with an epoxy grout compatible coating in preparation for epoxy grout placement.

4.7.10.2 Baseplate leveling screws shall be liberally coated with paste wax or grease to prevent epoxy grout adherence. Oil or liquid wax is not permitted. Paste wax or grease shall be prevented from contacting concrete foundation or metal surfaces that are intended to be in contact with the epoxy grout.

4.7.10.3 All miscellaneous baseplate holes (e.g., coupling guard holes) shall be plugged to prevent the entrance of epoxy grout. All plugs shall be coated with paste wax to prevent epoxy grout adherence.

4.7.10.4 Verify that the baseplate has been located, rigidly installed, and leveled (by others) in the position shown in the contract documents. Verify that the baseplate is supported on shims or leveling screws secured with anchor bolts, and that the anchor bolt nuts are snug before epoxy grout placement to ensure that the baseplate cannot float out of position.

4.7.11 If the anchor bolt sleeves do not extend to the bottom of the baseplate, the area between the top of the sleeves and the bottom of the baseplate shall be packed with a soft moldable material (e.g., foam pipe insulation) such that epoxy grout will be excluded from the sleeves when the epoxy grout is placed.

4.7.12 Material and Equipment Availability

4.7.12.1 An adequate quantity of epoxy grout (i.e., 15-25 percent extra) shall be on hand before starting to mix and place epoxy grout.

4.7.12.2 Clean tools, mixing equipment, and safety supplies shall be readily available at the jobsite.

4.7.13 Pre-Grouting Meetings

4.7.13.1 Pre-grouting meetings shall be held at least one day before the first epoxy grout placement and before the grouting of special purpose equipment to facilitate understanding and agreement on procedures and responsibilities, and to ensure all necessary materials and equipment are on hand.

4.7.13.2 The parties present at the pre-grouting meeting shall include, as a minimum, the epoxy grout manufacturer’s technical representative, the designated machinery representative, the foreman in charge of the grouting activities, the foremen in charge of supporting the grouting activities (e.g., scaffolding installers and laborers), the grouting materials coordinator, the inspector, and a site safety representative.

4.7.13.3 During the pre-grouting meeting, contingency plans shall be developed (e.g., method for performing or postponing the work in the event of inclement weather) to ensure that once the epoxy grout placement begins, it continues without interruption until completion.
4.7.14 The constructor shall obtain the inspector’s approval before starting epoxy grout installation.

4.8 Epoxy Grout Installation

4.8.1 The Epoxy Grout Installation Checklist STS03601-F2 appended to this Practice may be used by the constructor and/or the inspector to aid in complying with the requirements in this specification.

4.8.2 Epoxy Grout Mixing

4.8.2.1 Partial units of epoxy, resins, hardener, or aggregate shall not be used.

4.8.2.2 Before introducing the aggregate, the resin and hardener shall be mixed at 200-250 rpm with a “jiffy mixer” (a.k.a., dual ribbon mixer) with an attached drill motor, in accordance with the epoxy grout manufacturer’s specified time period. A paint mixer shall not be used because it can create a vortex that can introduce air into the mixture. Entrained air in the resin/hardener mixture is not permitted.

4.8.2.3 Epoxy grout shall be mixed in a clean, slow-speed (i.e., 15-20 rpm) portable mortar mixer. Epoxy grout mixing in a concrete mixer is not permitted.

4.8.2.4 The blended resin and hardener shall be poured into the mortar mixer and full bags of aggregate shall be slowly added.

4.8.2.5 Mixing shall be performed only long enough to completely wet the aggregate.

Comment: Overmixing will introduce excessive air into the mixture and reduce the epoxy grout strength and can also result in voids. A mortar mixer is required to properly coat the aggregate with the resin and hardener without over-mixing.

4.8.2.6 For small pours, epoxy grout may be mixed in a clean wheelbarrow with a mortar hoe.

4.8.2.7 The ratio of components shall not be varied, and solvent shall not be added to change the epoxy grout consistency.

4.8.3 Epoxy Grout Placement

4.8.3.1 Epoxy grout shall be placed within the pot life specified by the epoxy grout manufacturer.

4.8.3.2 If epoxy grout is placed through grout holes, the epoxy grout shall be placed into one hole continuously until the epoxy grout has passed a second hole. A liquid head pressure shall be maintained at the first access hole until a head pressure has been established at the next hole. Epoxy grout placement shall continue from the next hole in a similar fashion.

4.8.3.3 If epoxy grout is not placed through grout holes:

a. Epoxy grout shall be placed starting at one end of the forms and filling the cavity completely while advancing toward the other end.
b. Epoxy grout shall be placed along only one side of the baseplate allowing it to slowly flow under the baseplate to the opposite side.

4.8.3.4 Epoxy grout shall not be placed around the perimeter of a baseplate because this can cause air entrapment.

4.8.3.5 Epoxy grout shall not be vibrated as a means of helping it flow because this tends to separate the aggregate from the resin binder.

4.8.3.6 Limited use of push tools may be employed to help distribute the epoxy grout, using long strokes rather than short jabs. Violent ramming of the epoxy grout is not permitted.

4.8.3.7 If required by the contract documents, samples for testing shall be obtained in accordance with Section 4.3 of this Practice.

4.8.3.8 The final level of the epoxy grout shall be flush with the top of horizontal chamfer edges built into the forms.

4.8.3.9 The forms shall be checked for leaks frequently. All leaks shall be sealed to prevent voids from forming.

Comment: Leaks do not self-seal and can cause voids if not stopped.

4.8.3.10 The epoxy grout volume used shall be checked against the estimated cavity volume to confirm that the cavity was filled sufficiently and that no air pockets were created within the cavity.

4.8.3.11 If grouting around sliding surfaces (e.g., reactor skirts, exchanger supports, etc.), epoxy grout shall be placed such that it will not inhibit movement between the sliding surfaces.

4.8.3.12 A final check of baseplate elevations and level shall be made and corrected (by others), if required, immediately after epoxy grout placement and before the epoxy grout sets.

4.8.3.13 Air bubbles rising to the surface of epoxy grout shall be removed by lightly spraying the bubble surface with the epoxy grout manufacturer’s recommended cleaning solvent.

4.8.3.14 Grout head boxes shall be removed after the epoxy grout has set.

4.8.3.15 Baseplate fill and vent holes shall not be plugged until the epoxy grout has set because plugging can cause baseplate distortion because of epoxy grout expansion.

4.9 Post-Grouting Requirements

4.9.1 The Post-Grouting Checklist STS03601-F3 appended to this Practice may be used by the constructor and/or the inspector to aid in complying with the requirements in this specification.

4.9.2 The foundation, epoxy grout, and baseplate temperatures shall be maintained in the temperature range and for the time duration recommended by the epoxy grout manufacturer.

4.9.3 Leveling screws, if required to be removed, and epoxy grout forms shall be removed only after the epoxy grout has obtained sufficient strength and
hardness in accordance with epoxy grout manufacturer’s recommendations. In the absence of such recommendations, the epoxy grout is considered to be of sufficient strength and hardness when a sixpenny finishing nail cannot be driven with a hammer into the grout surface.

4.9.4 Filling Voids

4.9.4.1 The epoxy grout shall be checked for voids after it has cured.

4.9.4.2 If voids are present in the epoxy grout, epoxy grout shall be used to fill them.

4.9.4.3 Unless otherwise specified by the epoxy grout manufacturer, epoxy grout shall be pumped through high-pressure threaded fittings installed in the baseplate where voids have been found. Extreme care shall be taken to ensure that excessive pressures do not buckle the baseplate. At least one vent hole shall be drilled into each void to help prevent excessive pressures.

4.9.5 If leveling screws are required to be removed, baseplate leveling screw holes shall be filled with RTV silicone sealant or with short cap screws that do not extend below the threaded holes in the baseplate. Leveling screw holes shall not be filled with epoxy grout.

4.9.6 Expansion joints shall be sealed with RTV silicone sealant.

4.9.7 After epoxy grout has hardened, baseplate periphery shall be sealed with RTV silicone sealant.

4.9.8 The entire top of exposed machinery foundations shall be painted with a compatible non-skid protective coating to protect the foundation cap from oil and weathering. The coating shall extend down from the top of the foundation 18 inches (450 mm) minimum.

4.10 Disposal

4.10.1 All materials shall be converted to solid waste for proper disposal.

4.10.2 The following procedure shall be used for making solid waste in any type of hardener container:

a. The hardener shall be mixed with the resin.

Comment: The hardener/resin mixture is considered inert.

b. Excess hardener/resin mixture shall be poured into the hardener container.

c. The container shall be closed and shaken until excess hardener mixes with excess hardener/resin mixture.

Comment: This final mixture in the hardener container is considered inert for proper solid waste disposal.
This checklist may be used for quality control and assurance of pre-grouting work prior to epoxy grout installation.

Foundation Description: _______________________________________

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<th>INITIALS</th>
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<th>COMMENTS</th>
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<td>4.4.1</td>
<td>The epoxy grout manufacturer’s literature and certified test data were submitted to the purchaser for approval a minimum of 15 days before installation of the epoxy grout. The literature includes the epoxy grout material properties in accordance with this Practice.</td>
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<tr>
<td>4.4.2</td>
<td>A written quality control program, describing in detail how compliance with this Practice will be ensured, was submitted to the purchaser for approval a minimum of 15 days before installation of the epoxy grout. The program includes procedures for preparation, forming, supplying, handling, mixing, placing, locating joints including joint details, testing, inspection, curing and finishing of epoxy grout, and disposal of excess epoxy grout and other materials in accordance with the contract documents.</td>
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<tr>
<td>Foundation Preparation</td>
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<td>4.7.2.1</td>
<td>The foundation was cured (by others) for seven days minimum before surface preparation, unless otherwise approved by purchaser.</td>
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<td>4.7.2.2.1</td>
<td>Anchor bolt threads are undamaged and are protected with duct tape or other suitable means (by others).</td>
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<td>4.7.2.2.2</td>
<td>In the areas to be covered by epoxy grout, the foundation was prepared by chipping away all laitance (poor quality concrete) and oil-soaked or damaged concrete down to exposed fractured coarse aggregate.</td>
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<td>4.7.2.2.3</td>
<td>A minimum of 1 inch (25 mm) of concrete was removed in chipping process.</td>
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<td>4.7.2.2.3</td>
<td>There is 1 inch (25 mm) minimum clearance between the concrete and the bottom of the base or sole plate, or a greater minimum clearance if shown in the contract documents.</td>
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<td>4.7.2.2.4</td>
<td>The proper tools were used for chipping.</td>
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<td>4.7.2.3</td>
<td>After the surface chipping was complete, all chippings and dust were removed from the surface by thoroughly sweeping and vacuuming or blowing with clean, dry, oil-free air.</td>
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<td>Foundation Protection &amp; Heating</td>
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<td>4.7.2.4</td>
<td>The foundation was kept free of contamination by oil, dirt, water, etc., after the foundation had been prepared for epoxy grouting, by the use of protective sheeting (e.g., sheets of clean polyethylene).</td>
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<td>4.7.3</td>
<td>A suitable shelter or enclosure is provided to protect the foundation and baseplate from direct sunlight, dew, rain, or other inclement weather</td>
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<tr>
<td>4.7.4</td>
<td>If cold weather is expected, adequate enclosures and heating are provided to maintain the foundation, forms and baseplate temperature within the temperature range and for the time duration recommended by the epoxy grout manufacturer.</td>
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<tr>
<td>Access for Grouting</td>
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<tr>
<td>4.7.5</td>
<td>Proper access to grout holes and leveling surfaces is provided. Machinery was removed from baseplates (by others) to facilitate this access, if required.</td>
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<tr>
<td>SECTION</td>
<td>REQUIREMENTS</td>
<td>N/A</td>
<td>INITIALS</td>
<td>DATE</td>
<td>COMMENTS</td>
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<tr>
<td>4.7.6</td>
<td>Anchor bolt sleeves are filled (by others) with a nonbonding moldable material.</td>
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<tr>
<td><strong>Epoxy Grout Forms</strong></td>
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<tr>
<td>4.7.7</td>
<td>Epoxy grout forms were constructed to be liquid-tight with adequate strength, rigidity, and dimension to support epoxy grout placement.</td>
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<tr>
<td>4.7.7.a</td>
<td>Epoxy grout forms were attached to concrete with drilled anchors or other method approved by the purchaser. Power nailing was not used.</td>
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<tr>
<td>4.7.7.b</td>
<td>Three coats of paste wax were applied to the inside surface of the forms or other approved form release agents or bond breakers were used as recommended by the epoxy grout manufacturer to prevent epoxy grout adherence to the forms. Oil or liquid wax was not used.</td>
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<tr>
<td>4.7.7.c</td>
<td>The epoxy grout form elevation was checked to ensure that the top surface of the epoxy grout will match the elevation shown on the construction drawings.</td>
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<tr>
<td>4.7.7.d</td>
<td>Epoxy grout forms have 3/4-inch (20 mm), 45° chamfer strips installed at each vertical corner and at the horizontal surface of the epoxy grout forms.</td>
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<tr>
<td>4.7.7.e</td>
<td>All form joints and interfaces between forms and the concrete foundation, including expansion joints, are sealed using the epoxy grout manufacturer's recommended sealant. If epoxy grout manufacturer had no recommendation for sealant, room-temperature vulcanizing (RTV) silicone sealant was used.</td>
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<tr>
<td><strong>Expansion Joints</strong></td>
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<tr>
<td>4.7.8</td>
<td>Expansion joints in epoxy grout are constructed in accordance with the epoxy grout manufacturer’s recommendations, or as otherwise specified in the contract documents.</td>
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<tr>
<td><strong>Grout Reinforcement</strong></td>
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<tr>
<td>4.7.9</td>
<td>Epoxy grout reinforcement (if required) was installed as specified in the contract documents and in accordance with PIP STS03001.</td>
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<tr>
<td><strong>Baseplate Preparation</strong></td>
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<tr>
<td>4.7.10.1</td>
<td>Baseplate surfaces that will be in contact with epoxy grout were cleaned (by others) to remove oil, grease, and dirt and are coated (by others) with an epoxy grout compatible coating in preparation for epoxy grout placement.</td>
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<tr>
<td>4.7.10.2</td>
<td>Baseplate leveling screws are liberally coated with paste wax or grease to prevent epoxy grout adherence. Oil or liquid wax were not used.</td>
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<tr>
<td>4.7.10.2</td>
<td>No paste wax or grease is in contact with any concrete foundation or metal surfaces that are intended to be in contact with the epoxy grout.</td>
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<tr>
<td>4.7.10.3</td>
<td>All miscellaneous baseplate holes (e.g., coupling guard holes) are plugged to prevent the entrance of epoxy grout and plugs are coated with paste wax to prevent epoxy grout adherence.</td>
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<tr>
<td>4.7.10.4</td>
<td>The baseplate is located, rigidly installed, and leveled (by others) in the position shown in the contract documents. The baseplate is supported on shims or leveling screws and secured with anchor bolts. The anchor bolt nuts are snug before epoxy grout placement to ensure that the baseplate cannot float out of position.</td>
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</table>
## Anchor Bolt Sleeves Preparation

4.7.11  Anchor bolt sleeves extend to the bottom of the baseplate, or the area between the top of the anchor bolt sleeves and the bottom of the baseplate is packed with a soft moldable material (e.g., foam pipe insulation) to exclude epoxy grout from the sleeves.

## Material and Equipment Availability

4.7.12.1  An adequate quantity of epoxy grout (i.e., 15-25 percent extra) is on hand before starting to mix and place epoxy grout.

4.7.12.2  Clean tools, mixing equipment, and safety supplies are readily available at the jobsite.

## Pre-Grouting Meetings

4.7.13.1 & 4.7.13.2  Pre-grouting meetings were held before the first day of epoxy grout placement and before grouting of special purpose equipment. The epoxy grout manufacturer’s technical representative, the designated machinery representative, the foreman in charge of the grouting activities, the foremen in charge of supporting the grouting activities (e.g., scaffolding installers and laborers), the grouting materials coordinator, the inspector, and a site safety representative were present.

4.7.13.1  Procedures and responsibilities were agreed to and understood.

4.7.13.3  Contingency plans were developed (e.g., method for performing or postponing the work in the event of inclement weather) to ensure that once the epoxy grout placement begins, it will continue without interruption until completion.

4.7.14  The constructor obtained the inspector’s approval before starting epoxy grout installation.
This checklist may be used for quality control and assurance of work during epoxy grout installation.

Foundation Description ____________________________________________________________

<table>
<thead>
<tr>
<th>SECTION</th>
<th>REQUIREMENTS</th>
<th>N/A</th>
<th>INITIALS</th>
<th>DATE</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.5</td>
<td>Personnel wore appropriate safety items and followed safety precautions specified in this Practice.</td>
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<tr>
<td><strong>Epoxy Grout Mixing</strong></td>
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<tr>
<td>4.8.2.1</td>
<td>Partial units of epoxy, resins, hardener, or aggregate were not used.</td>
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<tr>
<td>4.8.2.2</td>
<td>Before introducing the aggregate, the resin and hardener were mixed at 200-250 rpm with a &quot;jiffy mixer&quot; (a.k.a., dual ribbon mixer) with an attached drill motor, in accordance with the epoxy grout manufacturer's specified time period. A paint mixer was not used. There was no entrained air in the resin/hardener mixture.</td>
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<tr>
<td>4.8.2.3 &amp; 4.8.2.6</td>
<td>Epoxy grout was mixed in a clean, slow-speed (i.e., 15-20 rpm) portable mortar mixer (not a concrete mixer). (For small pours, epoxy grout may be mixed in a clean wheelbarrow with a mortar hoe.)</td>
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<tr>
<td>4.8.2.4 &amp; 4.8.2.5</td>
<td>The blended resin and hardener were poured into the mortar mixer and full bags of aggregate were slowly added. Mixing was performed only long enough to completely wet the aggregate.</td>
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<td>4.8.2.7</td>
<td>The ratio of components was not varied, and solvent was not added to change the epoxy grout consistency.</td>
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<tr>
<td><strong>Epoxy Grout Placement</strong></td>
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<tr>
<td>4.4.3</td>
<td>Epoxy grout manufacturer and type:</td>
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<td></td>
<td>Epoxy grout design compressive strength:</td>
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<td>Date of epoxy grout placement:</td>
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<td></td>
<td>Air temperature at beginning of epoxy grout placement:</td>
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<td></td>
<td>Foundation temperature at beginning of epoxy grout placement:</td>
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<tr>
<td>4.8.3.1</td>
<td>Epoxy grout was placed within the pot life specified by the epoxy grout manufacturer. Time at beginning of epoxy grout placement:</td>
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<td>Time at end of epoxy grout placement:</td>
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<tr>
<td>4.8.3.2</td>
<td>If epoxy grout was placed through grout holes, the epoxy grout was placed into one hole continuously until the epoxy grout passed a second hole. A liquid head pressure was maintained at the first access hole until a head pressure was established at the next hole. Epoxy grout placement continued from the next hole in a similar fashion.</td>
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<tr>
<td>4.8.3.3 &amp; 4.8.3.4</td>
<td>If epoxy grout was not placed through grout holes, the epoxy grout was placed starting at one end of the form and filled the cavity completely while advancing toward the other end. The epoxy grout was placed along only one side of the baseplate allowing it to slowly flow under the baseplate to the opposite side. The epoxy grout was not placed around the perimeter of the baseplate.</td>
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<tr>
<td>4.8.3.5 &amp; 4.8.3.6</td>
<td>Epoxy grout was not vibrated as a means of helping it flow. If push tools were employed to help distribute the epoxy grout, they were used in a limited manner and with long strokes rather than short jabs. There was no violent ramming of the epoxy grout.</td>
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<tr>
<td>4.3 &amp; 4.8.3.7</td>
<td>If required by the contract documents, samples for testing were obtained in accordance with Section 4.3 of this Practice.</td>
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<tr>
<td>4.8.3.8</td>
<td>The final level of the epoxy grout is flush with the top of horizontal chamfer edges built into the forms.</td>
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<tr>
<td>4.8.3.9</td>
<td>The forms were checked for leaks frequently. All leaks were sealed to prevent voids from forming.</td>
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<tr>
<td>4.8.3.10</td>
<td>The epoxy grout volume used was checked against the estimated cavity volume to confirm that the cavity was filled sufficiently and that no air pockets were created within the cavity.</td>
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<tr>
<td>4.8.3.11</td>
<td>When grouting around sliding surfaces (e.g., reactor skirts, exchanger supports, etc.) epoxy grout was placed such that it will not inhibit movement between the sliding surfaces.</td>
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<tr>
<td>4.8.3.12</td>
<td>A final check of baseplate elevation and level was made and corrected (by others), if required, immediately after epoxy grout placement and before the epoxy grout set.</td>
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<tr>
<td>4.8.3.13</td>
<td>Air bubbles that rose to the surface of the epoxy grout were removed by lightly spraying the bubble surface with the epoxy grout manufacturer's recommended cleaning solvent.</td>
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<tr>
<td>4.8.3.14 &amp; 4.8.3.15</td>
<td>Grout head boxes were removed after the epoxy grout had set. Baseplate fill and vent holes were plugged after the epoxy grout had set.</td>
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</table>
This checklist may be used for quality control and assurance of post-grouting work after epoxy grout installation.

Foundation Description ____________________________________________________________

<table>
<thead>
<tr>
<th>SECTION</th>
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<tbody>
<tr>
<td></td>
<td><strong>Submittals</strong></td>
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</table>
| 4.4.3   | If testing is required by the contract documents, copies of all epoxy grout placement and test reports were submitted to the purchaser within three days after tests were performed. The reports include the following information:  
  a. Identification of foundation for epoxy grout placement  
  b. Epoxy grout manufacturer and type  
  c. Epoxy grout design compressive strength  
  d. Date of epoxy grout placement  
  e. Air temperature at beginning of epoxy grout placement  
  f. Foundation temperature at beginning of epoxy grout placement  
  g. Epoxy grout compressive break strengths  
  h. Epoxy grout linear shrinkage. |     |          |      |          |
|         | **Temperature**                                                                                                                                                                                               |     |          |      |          |
| 4.9.2   | The foundation, epoxy grout, and baseplate temperatures were maintained in the temperature range and for the time duration recommended by the epoxy grout manufacturer. |     |          |      |          |
|         | **Leveling Screws & Grout Forms Removal**                                                                                                                                                                   |     |          |      |          |
| 4.9.3   | Epoxy grout was of sufficient strength and hardness in accordance with this Practice, before leveling screws and epoxy grout forms were removed.                                                              |     |          |      |          |
|         | **Filling of Voids**                                                                                                                                                                                          |     |          |      |          |
| 4.9.4   | The epoxy grout was checked for voids after it had cured. If voids were present, they were filled with epoxy grout in accordance with this Practice.                                                            |     |          |      |          |
|         | **Sealant Application**                                                                                                                                                                                        |     |          |      |          |
| 4.9.5   | Baseplate leveling screw holes were filled with RTV silicone sealant (not epoxy grout) or with short cap screws that do not extend below the threaded holes in the baseplate.                                          |     |          |      |          |
| 4.9.6   | Expansion joints were sealed with RTV silicone sealant.                                                                                                                                                       |     |          |      |          |
| 4.9.7   | After epoxy grout had hardend, baseplate periphery was sealed with RTV silicone sealant.                                                                                                                     |     |          |      |          |
|         | **Protective Coating Application**                                                                                                                                                                           |     |          |      |          |
| 4.9.8   | The entire top of exposed machinery foundation was painted with a compatible non-skid protective coating to protect the foundation cap from oil and weathering. This coating extends down from the top of the foundation 18 inches (450 mm) minimum. |     |          |      |          |
|         | **Disposal**                                                                                                                                                                                                  |     |          |      |          |
| 4.10    | All materials were converted to solid waste for proper disposal in accordance with this Practice.                                                                                                           |     |          |      |          |