

SCOPE

- I 1.1 This practice covers grouting of machinery.
- I 1.2 **An asterisk (*)** indicates that a decision by the Owner's Engineer is required or that additional information is furnished by the Owner's Engineer.

SUMMARY OF ADDITIONAL REQUIREMENTS

- I 2.1 **Table 1** lists the standards and publications which shall be used with this practice as specified.

TABLE 1

STANDARDS AND PUBLICATIONS	
ACI Standards and Special Publication	
305	Hot Weather Concreting
306	Cold Weather Concreting
ACI 503R	Use of Epoxy Compounds with Concrete
ASTM Standards	
C33	Concrete Aggregates
C109	Compressive Strength of Hydraulic Cement Mortars (Using 2 in. or 50 mm Cube Specimens)
C150	Portland Cement
C157	Test Method for Length Change of Hardened Hydraulic Cement Mortar and Concrete

- I 2.2 **Contractor's grouting specification** shall include (but not be limited to) the following **information**:
 - a. Grouting mortar type for individual machinery applications.
 - b. Specific requirements of the machinery vendor and grouting manufacturer.
 - c. Procedures for removal or retention of shims, tightening of anchor bolts, and for packing or grouting of anchor bolt sleeves.
 - d. Provisions to be made for weather protection or artificial temperature conditioning (i.e., hot and cold weather practices, as applicable). Information from sources such as **ACI 305**, **ACI 306**, and **ACI 503R** shall be used.
 - e. Mixing and application procedures for field-mixed cement-sand grouting mortar, where applicable.
 - f. Safe handling practices for epoxy grout systems.
- * Foundation designs will be submitted to the machinery vendor for review per applicable API Standards or as otherwise specified by the Owner's Engineer. Specific requirements for vent holes, setting, leveling, and grouting shall be included in Contractor's grouting specification.
- R 2.3 **For factory-prepared grout**, the manufacturer's recommendations for storing, mixing, placement and curing of grout shall be followed in addition to the requirements of this practice. All conflicts with this practice shall be resolved with the Owner's Engineer.

GROUT SELECTION CRITERIA

- O,R 3.1 Unless otherwise specified, epoxy grout shall be used for grouting all machinery baseplates, soleplates or rails.
- R * 3.2 **When specified by the Owner's Engineer, cement-sand (cementitious) grout may be used for "light" machinery** having a gross plan area of 30sq ft or less (2.8 m² or less) and a total mass of 5000 lbs or less (2300 kg or less), providing:
 - a. Grout is non-corrosive and non-shrink.
 - b. Cement is portland cement **Type I per ASTM C150**.
 - c. Sand meets all the requirements for FINE AGGREGATE per **ASTM C33**.
 - d. Water-cement ratio is not more than 0.50 by weight.
 - e. Installed grout mix has a compressive strength not less than 4000 psi (27.6 MPa) at 7 days as determined by tests per **ASTM C109**.
- R 3.3 **Neat cement grout** (fluid mixture of cement and water, without aggregate) shall **not be used for grouting**.

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SURFACE PREPARATION

MACHINE BASE OR SUPPORT

- O 4.1 **Bonding surfaces shall be per the following:**
 - a. **For cement-sand grout**, metal surfaces shall be free of loose rust and mill scale, oil, grease, and any debris which may interfere with complete bonding.
 - b. **For epoxy grout**, metal surfaces shall be cleaned and precoated with epoxy resin per the requirements of applicable API Standards for rotating machinery, or as otherwise recommended by **ACI 503R** and the grout manufacturer.
- O 4.2 **Nonbonding surfaces**, such as leveling screws, wedges, and shims to be removed shall be **coated** per the grout manufacturer's recommendations, **to prevent adherence of the grout.**

CONCRETE FOUNDATION

- O,R * 4.3 **Foundations** shall have cured a minimum of 28 days before grouting. This interval may be reduced with the approval of the Owner's Engineer provided that the concrete on which the grout will bear shall have attained its design strength and shrinkage before grouting and that distortion due to drying shrinkage is determined to be less than alignment integrity requirements. However, this interval shall not be reduced to less than 7 days.
- O,R 4.4 **Bonding surfaces** shall be per the following:
 - a. **Laitance** (layer of weak, nondurable material) shall be **removed** by chipping. Use of jackhammers is not permitted.
 - b. **Surfaces** shall be **clean** and free of loose particles, oil and grease.
 - c. **Where cement-sand grout is to be used**, all **free water** shall be **removed** from the surface and from bolt holes immediately prior to grouting.
 - d. **Where epoxy grout is to be used**, **surfaces** shall be **clean and dry** immediately prior to grouting and prepared as per **ACI 503R**.
 - e. Foundations shall be covered to prevent them from becoming wet or contaminated after they have been chipped and cleaned.
- O,R 4.5 **Foundation Bolt Sleeves** shall be filled with an elastomeric or expanding urethane foam material to prevent the annular space around the bolt from being filled with grout. The bolts shall be wrapped with tape or weather stripping above the sleeve to prevent epoxy grout from bonding to the bolts.

INSTALLATION

SETTING AND LEVELING

- O,R 5.1 **Wedges, shims, or leveling screws** (preferred) shall be **used to position the machine** at its proper height, and to level the machine. Wedges shall not be retained.
- O,R 5.2 **Where shims are to be retained after grouting**, the shims shall have **full contact with the foundation and be covered with grout**. Shims shall have rounded corners.

PLACEMENT OF GROUT

- R 5.3 **Formwork** shall be placed **to avoid entrapment of air and resulting voids**. Joints shall be sealed to prevent leakage of grout. All right angle corners shall be chamfered. All form material that will come into contact with grout shall be coated with 3 coats of heavy paste wax to prevent bonding.
- O,R ♦ * 5.4 **Expansion joints in the epoxy grout**, when required to minimize cracking of concrete, shall be provided per epoxy grout manufacturer's recommendations. Expansion joints shall be made of redwood, styrofoam or polyurethane as directed by the Owner's Engineer. Exposed expansion joints shall be covered with an epoxy sealant to prevent infiltration of fluids to the foundation.
- R * 5.5 The Owner's Representative shall inspect and approve the area(s) to be grouted prior to the mixing and pouring of grout.

