When reliability cannot be compromised:

Cement Plant

Petrochemical Facility

Chockfast®

EPOXY GROUT

foundation systems

Power Generation

Gas Turbine Generators

Container Terminal

Steel Mill

ITW Philadelphia Resins

P.O. Box 309, Montgomeryville, PA 18936 USA
Telephone 215.855.8450 Fax 215.855.4688

ISO 9002
permanent alignment ... chemical resistant ... vibration damping ... worldwide service

CHOCKFAST RED general-purpose, high strength deep-pour grout for new installations; quick-turnaround retrofits; and fast, convenient quick-cure foundation reconstruction

CHOCKFAST GRAY thin-pour grout

CHOCKFAST BLUE oil-resistant foundation cap/grout for new installations; also strengthens and seals old foundations, while restoring original heights

CHOCKFAST ORANGE chocks for hot-running machinery; also used to assemble bearings; to maintain alignment of rails; and as a high-strength grout

CHOCKFAST BLACK deep-pour chocks allow a free flow of air under hot-running machinery while maintaining permanent frame alignment. Virtually 100% effective bearing area

From monolithic vibration damping of pump foundations to large reciprocating compressors, CHOCKFAST maintains precise, permanent machinery alignment.
Advantages of CHOCKFAST Red

CHOCKFAST RED is a user-friendly, chemically resistant, low dusting epoxy grout with high compressive, tensile and shear strengths. Excellent compatibility with concrete and steel minimizes or eliminates horizontal bond-line cracks, common to traditional epoxy grouts.

This 24-hr cure structural epoxy is formulated to provide excellent vibration damping for static and dynamic loads plus permanent monolithic support with intimate contact between equipment bedplates and underlying concrete foundations.

A gentle exothermic reaction during cure reduces cast-in stresses and allows single pours up to 48”. (For single pours deeper than 18”, contact a CHOCKFAST Representative.) Deep pours expedite installation of new equipment. They also reduce costly downtime for foundation repairs.

Low dusting formulation simplifies installation and cleanup procedures. Tools and mortar mixers can be cleaned with water.

CHOCKFAST BLUE Foundation Cap

This multi-purpose grout was developed for use under hot-running machinery. It provides a strong cap and excellent “oil-seal” for new foundations; strengthens and seals old foundations, while restoring their original height; and serves as a substitute for steel soleplates or rails.

What is a CHOCKFAST Chock?

It’s a conveniently pourable structural epoxy that replaces tediously fitted steel shims (steel chocks); and assures intimate contact with machined or unmachined equipment bedplates.

Like steel chocks, these structural epoxies allow a free flow of air under hot-running machinery to reduce “thermal humping” which can cause misalignment when equipment is mounted on full-bed grouts.

With low thermal conductivity, Chockfast chocks reduce heat build-up on foundations. They also provide a high coefficient of friction between equipment bedplates and foundations to maintain unsurpassed security of alignment, thus protecting costly equipment from damage and downtime.
Gas turbine generator foundation on deep-pour CHOCKFAST RED, ready for CHOCKFAST BLUE foundation seal

Turbine generator for cogen facility was installed on CHOCKFAST RED and BLUE

Pipe supports for natural gas transmission pipeline, aligned on CHOCKFAST RED

Skid-mounted compressor package, precisely aligned, prior to pouring CHOCKFAST RED

Crane rail installation with CHOCKFAST RED (or ORANGE) eliminates expensive, corrosion-prone leveling plates

permanent alignment ... chemical resistant ... vibration damping ... worldwide service
Baseplates for a pair of horizontal pumps, ready for grouting and vibration damping with CHOCKFAST RED

Temporary shelter for cold-weather grouting; and "conditioning" of all CHOCKFAST RED SG (with cold-weather additive) components

Vertical pump, mounted on CHOCKFAST RED

Single deep-pour minimizes downtime, while CHOCKFAST RED effectively damps vibrations

Turbocharger foundation, CHOCKFAST RED is poured over underlying concrete (center) ...

CHOCKFAST BLUE provides impervious "oil seal"
Power-plant equipment is precisely and permanently aligned on CHOCKFAST RED, BLUE and ORANGE.

Cogen engine is positioned on foundation, then chocked with CHOCKFAST ORANGE.

1400 tons of CHOCKFAST maintain precise alignment of rising sector gates in River Thames flood barrier.

Power plant turbine, supported on deep-pour CHOCKFAST RED.

Two new process vessels, ready for installation in refinery on CHOCKFAST ORANGE.

Turbine balancing machine, aligned on CHOCKFAST RED and BLUE.

permanent alignment ... chemical resistant ... vibration damping ... worldwide service
CHOCKFAST supports wind-power turbines, onshore and offshore.

Skid-mounted reciprocating compressors are supported on deep-pour CHOCKFAST BLACK chocks.

CHOCKFAST systems are widely used on offshore platforms.

Engine-room fire did not affect integrity of CHOCKFAST RED or BLACK.

Hot-running gas pipeline compressor is permanently aligned on CHOCKFAST RED, BLUE and BLACK.

Turbine cogeneration installations on CHOCKFAST BLUE.

permanent alignment ... chemical resistant ... vibration damping ... worldwide service
Factory-trained and certified CHOCKFAST REPRESENTATIVES are available for onsite technical support worldwide.

- Petrochemical plant: Chockfast Black, Orange, Blue and Red
- Gas turbine generators, skid-mounted on Chockfast Red
- Power plant generators on Chockfast Orange, Blue, Red
- Sewage system engines on Chockfast Orange, Blue and Red
- Cement kiln support rollers on deep-pour Chockfast Red
- Vertical pump: Chockfast Blue; horizontal pump: Chockfast Red
- Re-grout of poorly aligned pump, now on Chockfast Red
- Reciprocating compressor on Chockfast Black, Blue, Red
- Sand/gravel plant: Chockfast Gray, Red, Blue and Orange
- Chockfast Orange provides accurately cast races for large diameter bearings
- Jack-up platform on offshore rig, bearing plate on Chockfast Orange
- Railcar loading in petrochemical plant: Chockfast Red
- Crane rails in container terminal on Chockfast Red
- Ore conveyor piers supported on Chockfast Gray
- Sluice gate guides: Chockfast Gray
- Pipe supports on Chockfast Red
- Coke ovens in steel plant on Chockfast Red and Blue
- Turbine balancing machine, aligned on Chockfast Blue and Red
- Skid-mounted compressor package on Chockfast Blue and Red
- Emergency Power, EPCOT Center, DisneyWorld: Chockfast Blue

An Illinois Tool Works Company
P.O. Box 309
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Montgomeryville, PA 18936
Telephone 215.855.8450
FAX 215.855.4688
Printing this Manual

If you would like to print a copy of this Technical Manual, please review the following instructions:

This manual is already formatted for printing on the front and back sides of each page.

Color Printer

When printing from a color printer, enter the properties dialog box for your printer and select the appropriate settings for two-sided printing and follow be sure to follow your printer’s instructions for two-sided printing.

Professional Print Shops

You may also take this pdf file on CD or flash drive to a print shop to make copies. Be sure to instruct the attendant to provide the following:

- Designate the number of manual sets desired.
- Print color copies
- Two-sided printing
- If you plan to use your own three-ring binder, request the document be three-hole punched only
- If you would like the print shop to bind the document with a front and back cover, request clear plastic covers front and back and coil bound.
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Index & Quick Reference
This Specification Manual is furnished by
Chockfast® Engineered Grouting Systems
ITW Philadelphia Resins
And Your Local Chockfast Distributor

For the name of your local stocking distributor
please call Chockfast Grouting Systems Customer Service at
215-855-8450 or fax your inquiry to 215-855-4688

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The following is a quick reference to determine the product required for general application.

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<td>High flow grout 1/4”-1-1/4” depth</td>
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<td>Discuss application with</td>
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<td>determine expansion joint locations.</td>
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<td>Concrete Reconstruction</td>
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<td>Size and Depth of Pour</td>
<td>7’x7’x18” (&amp; Deeper)</td>
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</table>
Concrete Repair Compound
For repairing spalled concrete
smoothing and fairing
Any application 1/2" or greater
for vertical or overhead application
Phillybond® Blue 6A or
(Phillyclad 5020 for floors)

Concrete Bonding Agent
For bonding new concrete
to old concrete
Preferred
1775/620TS
(Chockfast Red resin & hardener will work equally well but will cure more slowly)

Pressure injection grout
For repairing cracks in existing concrete structures
or for pressure injecting loose pump bases or rails.
Preferred
1775/620TS
(Chockfast Red resin & hardener will work equally well but will cure more slowly)

Crane Rail Grouting
Chockfast Gray
Chockfast Red
Chockfast Blue
Product choice depends on design and depth of pour.

The above are suggested applications. Ambient temperature and other conditions could be a factor, so it is a good practice to discuss your particular application with your local ITW Philadelphia Resins distributor or representative.
Section 1
MATERIAL SPECIFICATIONS AND PROCEDURES
FOR EPOXY GROUTING OF PUMP BASEPLATES, RAILS, OR SOLEPLATES
8/1/91
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1.0 **GENERAL GUIDELINES (CHOCKFAST GROUTING SYSTEMS)**

1.1 THIS SPECIFICATION COVERS EPOXY GROUTING OF MECHANICAL EQUIPMENT ON CONCRETE FOUNDATIONS USING BASEPLATES, RAILS OR SOLEPLATES.

1.1.1 PRIOR TO ANY WORK BEING PERFORMED, THE GROUT MANUFACTURER OR HIS REPRESENTATIVE SHALL BE CONTACTED AND A PRE-JOB MEETING ARRANGED TO DISCUSS ALL ASPECTS OF EQUIPMENT GROUTING. AT THIS MEETING THE CONTRACTOR SHALL BE PRESENT. IF NO OUTSIDE CONTRACTOR IS BEING USED, THEN THE PLANT MAINTENANCE FOREMAN AND/OR CREW SUPERVISOR SHALL BE IN ATTENDANCE.

1.1.2 THE MACHINERY ENGINEER SHALL DEFINE THE RESPONSIBILITIES OF THE GROUT MANUFACTURER OR HIS REPRESENTATIVE, AND WILL DIRECT TO WHOM THE GROUT MANUFACTURER OR HIS REPRESENTATIVE WILL REPORT DURING THE COURSE OF THE PROJECT OR JOB.

1.1.3 A WRITTEN SUMMARY OF THIS MEETING WILL BE DISTRIBUTED TO ALL PARTIES CONCERNED PRIOR TO THE JOB START UP.

2.0 **MATERIALS**

2.1 EPOXY GROUT SHALL MEET THE FOLLOWING MINIMUM REQUIREMENTS:

2.1.1 FIRE RESISTANT AS PER ASTM D-635.

2.1.2 MINIMUM COMPRESSIVE STRENGTH - 12,000 PSI (ASTM C-579)

2.1.3 POT LIFE 2-3 HOURS @ 72°F

2.1.4 CLEAN UP SOLVENT - WATER

2.1.5 GROUT MUST HAVE LOW ENOUGH EXOTHERM TO PROVIDE DEEP POUR CAPABILITY UP TO 18" DEEP X 7' X 7' OR GREATER.

2.1.6 EVEN AGGREGATE DISTRIBUTION THROUGHOUT THE CURED GROUT WITH NO RESIN RICH SURFACE.

2.1.7 MAXIMUM COEFFICIENT OF THERMAL EXPANSION $11.2 \times 10^{-6}$ per $\degree F$, ASTM D-696

2.1.8 AGGREGATE MUST BE LOW DUST TYPE
3.0 **MATERIAL STORAGE**

3.1 ALL GROUT MATERIALS SHALL BE STORED IN A DRY AREA IN ORIGINAL UNOPENED CONTAINERS.

3.2 ALL EPOXY GROUT COMPONENTS SHALL BE PRECONDITIONED TO A MINIMUM OF 65°F AND A MAXIMUM OF 80°F FOR AT LEAST 48 HOURS PRIOR TO MIXING AND PLACEMENT.

4.0 **PREPARATION OF FOUNDATION**

4.1 NEW CONCRETE

4.1.1 PERFORM SHRINKAGE TEST AS PER ASTM C 157-80 ON NEW CONCRETE TO DETERMINE WHEN SHRINKAGE IS COMPLETE.

4.1.2 IF NO SHRINKAGE TEST IS PERFORMED, CURE TIME WILL BE APPROXIMATED AS FOLLOWS:

<table>
<thead>
<tr>
<th>Cement Type</th>
<th>Minimum Cure Time</th>
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<tr>
<td>STANDARD CEMENT</td>
<td>21-28 DAYS</td>
</tr>
<tr>
<td>HI-EARLY CEMENT (6-7 BAG MIX)</td>
<td>7 DAYS</td>
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4.1.3 CONCRETE COMPRESSIVE STRENGTH SHALL BE A MINIMUM OF 3500 PSI.

4.1.4 CONCRETE TENSILE STRENGTH SHALL BE A MINIMUM OF 350 PSI AS PER ASTM C 496-90.

4.2 CONCRETE SURFACE PREPARATION: OLD OR NEW CONCRETE

NOTE: HAND CHIPPING GUNS ONLY WILL BE USED. NO JACKHAMMERS WILL BE PERMITTED.

4.2.1 THE CONCRETE FOUNDATION SHALL BE DRY AND FREE OF OIL.

4.2.2 THE CONCRETE SHALL BE CHIPPED TO EXPOSE A MINIMUM OF 50% AGGREGATE SO AS TO REMOVE ALL LAITANCE AND PROVIDE A ROUGH SURFACE FOR BONDING. DOWELS TO PREVENT EDGE LIFTING OR PERIPHERAL REBAR MUST BE INSTALLED OR EXPOSED ON NEW CONCRETE AT THIS TIME. REFER TO DRAWING NOS. CF-007A AND CF-007B.
4.2.3 AFTER CHIPPING, THE EXPOSED SURFACES SHALL BE BLOWN FREE OF DUST AND CONCRETE CHIPS USING OIL AND WATER FREE COMPRESSED AIR FROM AN APPROVED SOURCE. CONCRETE SURFACE MAY ALSO BE VACUUMED.

4.2.4 AFTER THE FOUNDATION HAS BEEN CHIPPED AND CLEANED, IT SHALL BE COVERED TO PREVENT IT FROM BECOMING WET, OR CONTAMINATED.

4.2.5 FOUNDATION BOLTS SHALL BE EXAMINED FOR DAMAGED THREADS AND CORRECTIVE ACTION TAKEN. THE FOUNDATION BOLT THREADS SHALL BE PROTECTED DURING THE EQUIPMENT LEVELING AND GROUTING OPERATIONS. ALWAYS ALLOW A MINIMUM OF TWELVE (12) TIMES THE BOLT DIAMETER FOR FREE STRETCH. THIS SHALL BE ACCOMPLISHED BY WRAPPING WITH WEATHER STRIPPING OR OTHER APPROVED MATERIALS.

4.2.6 IF THE BOLTS ARE SLEEVED, THE SLEEVES SHALL BE FILLED WITH ELASTOMERIC MATERIAL (PHILLYBOND 7C) OR EXPANDING URETHANE FOAM TO PREVENT THE ANNULAR SPACE AROUND THE BOLT FROM BEING FILLED WITH EPOXY GROUT.

5.0 JACKSCREW LEVELING PADS

5.1 JACKSCREW LEVELING PADS SHALL BE SET AND PREPARED AS FOLLOWS:

5.1.1 PADS ARE TO BE MADE OF 3" DIAMETER, 1/2" THICK 4140 STEEL OR SIMILAR TYPE ROUND STOCK MATERIAL, IF AVAILABLE.

5.1.2 PADS WILL BE SANDBLASTED TO "WHITE METAL" AND PRIMED WITH AN EPOXY COATING (PHILLYCLAD 1000 SERIES).

5.1.3 PADS WILL BE RADIUSED ON THE EDGES TO REDUCE STRESS CONCENTRATIONS IN THE GROUT.

5.1.4 NO SQUARE LEVELING PADS WILL BE PERMITTED.

5.1.5 WHEN APPLICABLE, A HIGH COMRESSIVE STRENGTH EPOXY PUTTY (PHILLYBOND BLUE 6A) SHALL BE USED TO INSTALL THE PADS, BY PROVIDING A 100% BEARING AREA SURFACE. WHEN THIS PROCEDURE IS USED, THE PADS WILL BE LEVELED. CONSULT GROUT MANUFACTURER OR MACHINERY ENGINEER AS TO WHEN THIS PROCEDURE WILL BE USED.
5.1.6 JACKSCREWS, WHEN USED, SHALL BE GREASED OR WRAPPED WITH DUCT TAPE TO FACILITATE THEIR REMOVAL ONCE THE GROUT HAS CURED.

6.0 PREPARATION OF BASEPLATE, RAILS, OR SOLEPLATES

6.1 VERTICAL AND HORIZONTAL EDGES OF THE BASEPLATE, RAIL, OR SOLEPLATE THAT COME IN CONTACT WITH THE EPOXY GROUT WILL BE RADIUSED A MINIMUM OF 1/2" TO REDUCE STRESS CONCENTRATIONS IN THE GROUT.

6.2 SURFACES OF THE BASEPLATE, RAIL, OR SOLEPLATES WHICH WILL COME IN CONTACT WITH THE EPOXY GROUT SHALL BE SANDBLASTED TO A "WHITE METAL" FINISH.

6.3 IF THE GROUTING IS NOT TO BE DONE IMMEDIATELY, THE BASEPLATE, RAIL, OR SOLEPLATES SHALL BE PAINTED WITH ONE TO TWO COATS OF THIN FILM EPOXY COATING (PHILLYCLAD 1000 SERIES) TO GIVE A DRY FILM THICKNESS OF THREE (3) MILS. THIS COATING SHALL BE FULLY CURED PRIOR TO PLACEMENT OF THE GROUT.

6.4 IF THE EPOXY COATED BASEPLATE, RAILS, OR SOLEPLATES ARE NOT GROUTED WITHIN THIRTY (30) DAYS, THE COATED SURFACE SHALL BE ROUGHED UP WITH A WIRE BRUSH TO REMOVE THE BLOOM OR SHINE. ALL DUST PRODUCED BY BRUSHING SHALL BE REMOVED. THESE SURFACES SHALL BE CLEAN AND DRY PRIOR TO PLACEMENT OF GROUT.

6.5 BEFORE GROUTING API PUMP BASEPLATES, ALL MOUNTED EQUIPMENT SHALL BE REMOVED, AND THE PUMP BASEPLATE ONLY SHALL BE GROUTED.

6.6 1/2" DIAMETER VENT HOLES SHALL BE INSTALLED IN API PUMP BASEPLATES SO AS TO PREVENT AIR ENTRAPMENT IN COMPARTMENTS ISOLATED BY ANGLE IRON OR I-BEAM BRACING. CONSULT EQUIPMENT ENGINEER OR GROUT MANUFACTURER OR HIS REPRESENTATIVE FOR SPECIFIC LOCATIONS.
7.0 FORMING

7.1 ALL FORMING MATERIAL COMING IN CONTACT WITH THE GROUT SHALL BE COATED WITH THREE COATS OF A GOOD QUALITY PASTE FLOOR WAX. NO LIQUID WAX WILL BE PERMITTED.

7.2 CARE SHOULD BE TAKEN TO PREVENT ANY WAX FROM CONTACTING THE CONCRETE FOUNDATION OR THE BASEPLATE.

7.3 FORMS SHALL BE MADE LIQUID TIGHT TO PREVENT LEAKING OF GROUT MATERIAL. CRACKS AND OPENINGS SHALL BE SEALED WITH A GOOD QUALITY SILICONE SEALANT.

7.4 ALL INSIDE RIGHT ANGLES MUST BE ELIMINATED BY USING CHAMFER STRIPS, 1/2" TO 2". THE MACHINERY ENGINEER OR THE GROUT MANUFACTURER MUST BE CONSULTED WHEN IN DOUBT.

8.0 EXPANSION JOINTS

8.1 EXPANSION JOINTS, WHEN USED, SHALL BE INSTALLED AT LOCATIONS AS CALLED OUT ON THE INSTALLATION DRAWINGS, AS DIRECTED BY THE MACHINERY ENGINEER OR BY THE GROUT MANUFACTURER.

8.2 EXPANSION JOINTS, WHEN CONSTRUCTED, SHALL BE MADE FROM 1" THICK STYROFOAM OR REDWOOD. VARIATIONS SHOULD BE DISCUSSED WITH THE MACHINERY ENGINEER OR THE GROUT MANUFACTURER.

8.3 EXPANSION JOINTS SHOULD INCORPORATE THE "SECONDARY SEAL" DESIGN WHERE THE BOTTOM OF THE EXPANSION JOINT COMES IN CONTACT WITH THE FOUNDATION.

8.3.1 TO SEAL THE BOTTOM OF THE EXPANSION JOINT, MIX AN ELASTOMERIC EPOXY (PHILLYBOND 7C) WITH A MINIMUM ELONGATION FACTOR OF 200% @0°F WITH #3 GRIT DRY BLASTING SAND AT APPROXIMATELY 4 TO 7 PARTS SAND TO ONE PART ELASTOMERIC EPOXY TO FORM A NON-SLUMP MORTAR CONSISTENCY. LAYER THE MIX 1" TO 2" THICK BY 3" WIDE ON TOP OF THE CONCRETE WHERE THE EXPANSION JOINT IS TO BE INSTALLED. SET THE EXPANSION JOINT INTO THE MIX AND PRESS DOWN. WHEN CURED, THIS MIXTURE WILL FORM A SECONDARY SEAL TO PREVENT ANY CONTAMINANTS FROM REACHING THE CONCRETE. REFER TO DRAWING NO. CF-003 FOR DETAILS.
8.3.2 **PROVISIONS SHOULD BE MADE TO ALLOW FOR REMOVAL (AFTER THE GROUT HAS BEEN POURED AND CURED) OF 1/2" OF THE EXPOSED EXPANSION JOINT SURFACE. THIS AREA IS TO BE FILLED WITH THE ELASTOMERIC EPOXY (PHILLYBOND 7C) WITHOUT SAND.**

8.3.2.1 **SOME PUMP BASES DO NOT CONVENIENTLY ALLOW PLACEMENT OF EXPANSION JOINTS. IN SUCH CASES, THE JOINT CAN BE LOCATED UNDER THE CROSS BRACING BEAMS USING 1/4" PLYWOOD, 1" STYROFOAM, OR SIMILAR COMPRESSIBLE MATERIAL. THIS TYPE OF EXPANSION JOINT IS NOT USUALLY REMOVABLE AFTER THE PLACEMENT OF THE EPOXY GROUTING MATERIALS. THEREFORE, AN ALLOWANCE FOR THE VISIBLE PORTION OF THE EXPANSION JOINT TO BE REMOVED SHOULD BE MADE AND SEALED WITH AN ELASTOMERIC EPOXY (PHILLYBOND 7C). THE REMAINING PART OF THE EXPANSION JOINT WILL REMAIN UNDER THE CROSS BRACE BEAM, PERMANENTLY SEALED.**

8.3.3.1 **IN THE AREA WHERE THE ELASTOMERIC EPOXY (PHILLYBOND 7C) IS TO BE USED, ALL SURFACES MUST BE FREE OF ANY CONTAMINANTS THAT WOULD PREVENT THE MATERIAL FROM BONDING.**

9.0 **MIXING**

9.1 **PRIOR TO MIXING AND POURING OF THE EPOXY GROUT, THE MACHINERY ENGINEER, THE GROUT MANUFACTURER, OR THEIR REPRESENTATIVE SHALL INSPECT THE AREA TO BE GROUTED FOR:**

9.1.1 **BASEPLATE, RAIL, SOLEPLATE AND CONCRETE CLEANLINESS.**

9.1.2 **CHAMFER STRIPs INSTALLED AND THE FORMS WAXED.**

9.1.3 **FOUNDATION BOLTS PROPERLY WRAPPED AND SEALED.**

9.1.4 **EXPANSION JOINTS PROPERLY PREPARED AND SEALED, IF APPLICABLE.**

9.1.5 **MIXING EQUIPMENT CLEAN AND SUITABLE.**

9.1.6 **AMBIENT AND MATERIAL TEMPERATURES WITHIN LIMITS.**
9.1.6.1 Ambient temperatures at the beginning of mixing and at the completion of pour shall be recorded and given to the machinery engineer who will record the data in the permanent equipment records.

9.1.6.2 Foundation temperature shall be a minimum of 65°F.

9.1.6.3 Mixing equipment shall be free of all foreign material, moisture, oil, in good working order, and properly sized. Three-component epoxy grout materials shall be mixed in a mortar mixer at 15-20 RPM.

9.1.6.4 All personnel handling or working with the grouting materials shall follow safety instructions as directed by the equipment engineer.

9.1.6.5 Only full units of epoxy resin, hardener and aggregate shall be used in preparing the grout.

9.1.6.6 The epoxy resin and the hardener shall be blended for 3-4 minutes with a properly sized jiffy mixer and a 1/2" drill motor, at a speed of 200-250 RPM.

9.1.6.7 Immediately after the liquid blending has been completed, the aggregate shall be added and blended to fully wet the aggregate. This shall be accomplished under the direction of the grout manufacturer or his approved representative.

10.0 PLACEMENT

10.1 When required, a suitable head box shall be prepared to hydraulically force the grout into the pump baseplate cavities.

10.2 Grouting shall be continuous until the placement of epoxy grout is complete under all sections of the rail or compartments of the baseplate. Grout shall be poured from one side, corner, or end to prevent air entrapment.
10.3 NO MECHANICAL VIBRATORS SHALL BE USED TO PLACE THE GROUT UNDER THE BASEPLATE, RAIL OR SOLEPLATE. RAKES OR SIMILAR TOOLS MAY BE USED TO PLACE THE GROUT IF NECESSARY.

10.4 IF REQUIRED BY THE EQUIPMENT ENGINEER, ONE (1) 2" X 2" X 2" TEST CUBE SHALL BE MADE FROM EACH BATCH NUMBER OF GROUT PLACED. THE SAMPLE(S) SHALL BE TAGGED WITH THE EQUIPMENT NUMBER ON WHICH THE BATCH WAS USED AND WHERE IN THE FOUNDATION THE BATCH WAS PLACED.

10.5 CONSULT GROUT MANUFACTURER IF TESTING IS REQUIRED.

11.0 **FINISHING**

11.1 IF A COSMETIC APPEARANCE IS REQUIRED OR DESIRED, THE GROUT MANUFACTURER SHOULD BE CONTACTED FOR DIRECTIONS PERTAINING TO THE SPECIFIC GROUT SYSTEM BEING USED.

11.2 FORMS SHALL BE LEFT IN PLACE UNTIL THE GROUT HAS CURED. THE SURFACE OF THE GROUT SHOULD BE FIRM AND NOT TACKY TO THE TOUCH. CONTACT GROUT MANUFACTURER FOR APPROPRIATE CURE TIME BASED ON AMBIENT TEMPERATURE.

11.3 THE TOP OF THE PUMP BASEPLATE SHALL BE SOUNDED FOR VOIDS. IF ANY ARE LOCATED, TWO HOLES SHALL BE DRILLED IN EACH VOID AT OPPOSITE CORNERS OF THE CAVITY. BOTH OF THE HOLES SHALL BE TAPPED AND ONE FITTED WITH A PRESSURE GREASE FITTING. THE OTHER HOLE SHALL BE USED AS A VENT HOLE, AND PLUGGED WHEN INJECTION IS COMPLETED. THE VOID SHALL BE FILLED WITH UNFILLED EPOXY GROUT USING A GREASE GUN. CARE MUST BE TAKEN TO PREVENT LIFTING OR DEFORMING THE BASEPLATE.

11.4 ALL EDGES OF THE EPOXY GROUT WHERE REQUIRED SHALL BE DRESSED SMOOTH BY GRINDING.
12.0 **CLEAN-UP**

12.1 IMMEDIATELY AFTER GROUTING IS COMPLETED ALL TOOLS AND MIXING EQUIPMENT SHALL BE CLEANED USING WATER OR AN APPROVED SOLVENT (PRT 59).

12.2 ALL UNUSED MIXED EPOXY MATERIALS AND CLEAN-UP RESIDUE SHALL BE DISPOSED OF IN ACCORDANCE WITH INSTRUCTIONS FROM THE FACILITY ENVIRONMENTAL ENGINEER OR LOCAL AUTHORITY.

13.0 ANY QUESTIONS CONCERNING THESE SPECIFICATIONS SHOULD BE DIRECTED TO THE MACHINERY ENGINEER, THE GROUT MANUFACTURER, OR THEIR DIRECT REPRESENTATIVE.
MATERIAL SPECIFICATIONS AND PROCEDURES
FOR EPSOXY GROUTING AND/OR CHOCKING OF RECIPROCATING
ENGINES AND COMPRESSORS
1.0 GENERAL GUIDELINES: (CHOCKFAST GROUTING SYSTEMS)

1.1 THIS SPECIFICATION COVERS EPOXY GROUTING OF RECIPROCATING EQUIPMENT ON CONCRETE FOUNDATIONS USING RAILS, SOLEPLATES, FULL BED GROUTING, OR EPOXY CHOCS.

1.1.1 PRIOR TO ANY WORK BEING PERFORMED, THE GROUT MANUFACTURER OR HIS REPRESENTATIVE SHALL BE CONTACTED AND A PRE-JOB MEETING ARRANGED TO DISCUSS ALL ASPECTS OF EQUIPMENT GROUTING. AT THIS MEETING THE CONTRACTOR SHALL BE PRESENT. IF NO OUTSIDE CONTRACTOR IS BEING USED, THEN THE PLANT MAINTENANCE FOREMAN AND/OR CREW SUPERVISOR SHALL BE IN ATTENDANCE.

1.1.2 THE MACHINERY ENGINEER SHALL DEFINE THE RESPONSIBILITIES OF THE GROUT MANUFACTURER OR HIS REPRESENTATIVE, AND WILL DIRECT TO WHOM THE GROUT MANUFACTURER OR HIS REPRESENTATIVE WILL REPORT DURING THE COURSE OF THE PROJECT OR JOB.

1.1.3 A WRITTEN SUMMARY OF THIS MEETING WILL BE DISTRIBUTED TO ALL PARTIES CONCERNED PRIOR TO THE JOB START UP.

2.0 MATERIALS

2.1 EPOXY GROUT SHALL MEET THE FOLLOWING MINIMUM REQUIREMENTS:

2.1.1 MINIMUM COMPRESSIVE STRENGTH - 12,000 PSI (ASTM C-579)

2.1.2 POT LIFE - 2-3 HOURS @ 72 F

2.1.3 CLEAN UP SOLVENT - WATER

2.1.4 EVEN AGGREGATE DISTRIBUTION THROUGHOUT THE CURED GROUT WITH NO RESIN RICH SURFACE.

2.1.5 MAXIMUM COEFFICIENT OF THERMAL EXPANSION $11.2 \times 10^{-6}$ per F , (ASTM D-696)

2.1.6 AGGREGATE MUST BE LOW DUST TYPE
3.0 MATERIAL STORAGE

3.1 ALL GROUT MATERIALS SHALL BE STORED IN A DRY AREA IN ORIGINAL UNOPENED CONTAINERS.

3.2 ALL EPOXY GROUT COMPONENTS SHALL BE PRECONDITIONED TO A MINIMUM OF 65 F AND A MAXIMUM OF 80 F FOR AT LEAST 48 HOURS PRIOR TO MIXING AND PLACEMENT.

4.0 PREPARATION OF FOUNDATION: NEW CONCRETE

4.1 NEW CONCRETE

4.1.1 PERFORM SHRINKAGE TEST AS PER ASTM C 157-80 ON NEW CONCRETE DETERMINE WHEN SHRINKAGE IS COMPLETE.

4.1.2 IF NO SHRINKAGE TEST IS PERFORMED, CURE TIME WILL BE APPROXIMATED AS FOLLOWS:

<table>
<thead>
<tr>
<th>Cement Type</th>
<th>Minimum Cure Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>STANDARD CEMENT</td>
<td>21-28 DAYS</td>
</tr>
<tr>
<td>HI-EARLY CEMENT (6-7 BAG MIX)</td>
<td>7 DAYS</td>
</tr>
</tbody>
</table>

4.1.3 CONCRETE COMPRESSIVE STRENGTH SHALL BE A MINIMUM OF 3500 PSI AND HAVE A MINIMUM TENSILE STRENGTH OF 350 PSI AS PER ASTM C 496-90.

4.0 CONCRETE SURFACE PREPARATION FOR NEW OR OLD CONCRETE WILL BE AS FOLLOWS:

NOTE: HAND CHIPPING GUNS ONLY WILL BE USED. NO JACKHAMMERS WILL BE PERMITTED.

4.2.1 THE CONCRETE FOUNDATION SHALL BE DRY AND FREE OF OIL.

4.2.2 THE CONCRETE SHALL BE CHIPPED TO EXPOSE A MINIMUM OF 50% BROKEN AGGREGATE SO AS TO REMOVE ALL LAITANCE AND PROVIDE A ROUGH SURFACE FOR BONDING.

4.2.3 AFTER CHIPPING, THE EXPOSED SURFACES SHALL BE BLOWN FREE OF DUST AND CONCRETE CHIPS USING OIL- AND WATER-FREE COMPRESSED AIR FROM AN APPROVED SOURCE, OR BY VACUUMING.
4.2.4 AFTER THE FOUNDATION HAS BEEN CHIPPED AND CLEANED, IT SHALL BE COVERED TO PREVENT IT FROM BECOMING WET, OR CONTAMINATED.

4.2.5 FOUNDATION BOLTS SHALL BE EXAMINED FOR DAMAGED THREADS AND CORRECTIVE ACTION TAKEN. THE FOUNDATION BOLT THREADS SHALL BE PROTECTED DURING THE EQUIPMENT LEVELING AND GROUTING OPERATIONS. ALWAYS ALLOW A MINIMUM OF TWELVE (12) TIMES THE BOLT DIAMETER FOR FREE STRETCH. THIS SHALL BE ACCOMPLISHED BY WRAPPING WITH WEATHER STRIPPING OR OTHER APPROVED MATERIALS.

4.2.6 IF THE BOLTS ARE SLEEVED, THE SLEEVES SHALL BE FILLED WITH ELASTOMERIC OR EXPANDING URETHANE FOAM MATERIAL TO PREVENT THE ANNULAR SPACE AROUND THE BOLT FROM BEING FILLED WITH GROUT.

5.0 JACKSCREW LEVELING PADS

5.1 JACKSCREW LEVELING PADS SHALL BE SET AND PREPARED AS FOLLOWS:

5.1.1 PADS ARE TO BE MADE OF 3" DIAMETER, 1/2" THICK 4140 OR SIMILAR TYPE ROUND STOCK IF AVAILABLE.

5.1.2 PADS WILL BE SANDBLASTED TO "WHITE METAL" AND PRIMED WITH AN EPOXY COATING (PHILLYCLAD 1000).

5.1.3 PADS WILL BE RADIUSED ON THE EDGES TO REDUCE STRESS CONCENTRATIONS IN THE GROUT.

5.1.4 NO SQUARE LEVELING PADS WILL BE PERMITTED.

5.1.5 WHEN APPLICABLE A HIGH COMPRESSIVE STRENGTH EPOXY PUTTY (PHILLYBOND BLUE 6A) SHALL BE USED TO INSTALL THE PADS, BY PROVIDING A 100% BEARING AREA SURFACE. WHEN THIS PROCEDURE IS USED, THE PADS WILL BE LEVELED. CONSULT GROUT MANUFACTURER OR MACHINERY ENGINEER AS TO WHEN THIS PROCEDURE WILL BE USED.

5.1.6 JACKSCREWS, WHEN USED, SHALL BE GREASED OR WRAPPED WITH DUCT TAPE TO FACILITATE THEIR REMOVAL ONCE THE GROUT HAS CURED.
6.0 PREPARATION OF ENGINE OR COMPRESSOR BASE, RAILS, OR SOLEPLATES

6.1 SURFACES OF THE BASE, RAIL, OR SOLEPLATES WHICH WILL COME IN CONTACT WITH THE EPOXY GROUT SHALL BE SANDBLASTED TO A "WHITE METAL" FINISH.

6.2 IF THE GROUTING IS NOT TO BE DONE IMMEDIATELY, THE BASE, RAIL, OR SOLEPLATES SHALL BE PAINTED WITH ONE TO TWO COATS OF THIN FILM EPOXY COATING (PHILLYCLAD 1000 SERIES) TO GIVE A DRY FILM THICKNESS OF THREE (3) MILS. THIS COATING SHALL BE FULLY CURED PRIOR TO PLACEMENT OF THE GROUT.

6.3 VERTICAL AND HORIZONTAL EDGES OF THE BASEPLATE, RAIL, OR SOLEPLATE THAT COME IN CONTACT WITH THE EPOXY GROUT WILL BE RADIUSED A MINIMUM OF 1/2" TO REDUCE STRESS CONCENTRATIONS IN THE GROUT.

6.4 IF THE EPOXY COATED BASE, RAILS, OR SOLEPLATES ARE NOT GROUTED WITHIN THIRTY (30) DAYS, THE COATED SURFACE SHALL BE ROUGHED UP WITH A WIRE BRUSH TO REMOVE THE BLOOM OR SHINE. ALL DUST PRODUCED BY BRUSHING SHALL BE REMOVED. THESE SURFACES SHALL BE CLEAN AND DRY PRIOR TO PLACEMENT OF GROUT.

7.0 FORMING

7.1 ALL FORMING MATERIAL COMING IN CONTACT WITH THE GROUT SHALL BE COATED WITH THREE COATS OF A GOOD QUALITY PASTE FLOOR WAX. NO LIQUID WAX WILL BE PERMITTED.

7.2 CARE SHOULD BE TAKEN TO PREVENT ANY WAX FROM CONTACTING THE CONCRETE FOUNDATION OR THE BASE, RAIL, OR SOLEPLATE.

7.3 FORMS SHALL BE MADE LIQUID TIGHT TO PREVENT LEAKING OF GROUT MATERIAL. CRACKS AND OPENINGS SHALL BE SEALED WITH A GOOD QUALITY SILICONE SEALANT.

7.4 ALL INSIDE RIGHT ANGLES MUST BE ELIMINATED BY USING CHAMFER STRIPS, 1/2" TO 2". THE MACHINERY ENGINEER OR THE GROUT MANUFACTURER MUST BE CONSULTED WHEN IN DOUBT.
8.0 **EXPANSION JOINTS**

8.1 Expansion joints, when used, shall be installed at locations as called out on the installation drawings, as directed by the machinery engineer or by the grout manufacturer or his representative.

8.2 Expansion joints when constructed shall be made from 1" thick styrofoam or redwood. Variations should be discussed with the machinery engineer or the grout manufacturer.

8.3 Expansion joints should incorporate the "secondary seal" design where the bottom of the expansion joint comes in contact with the foundation.

8.3.1 To seal the bottom of the expansion joint, mix an elastomeric epoxy (Philbybond 7C) with a minimum elongation factor of 200% @ 0 F with #3 grit dry blasting sand at approximately 4 to 7 parts sand to one part elastomeric epoxy to form a non-slump mortar consistency. Layer the mix 1" to 2" thick by 3" wide on top of the concrete where the expansion joint is to be installed. Set the expansion joint into the mix and press down. When cured, this mixture will form a secondary seal to prevent any contaminants from reaching the concrete. Refer to drawing no. CF-003.

8.3.2 Provisions should be made to allow for removal (after the grout has been poured and cured) of 1/2" to 1" of the exposed expansion joint surface. This area is to be filled with the elastomeric epoxy (Philbybond 7C) without sand.

8.3.3 In the area where the elastomeric epoxy (Philbybond 7C) is to be used, all surfaces must be free of any contaminants that would prevent the material from bonding.

8.3.4 When deemed necessary by the equipment engineer, horizontal rebar incorporated into the grout design shall not penetrate an expansion joint. Refer to drawing no. CF-004E.
9.0 **MIXING**

9.1 PRIOR TO MIXING AND POURING OF THE EPOXY GROUT, THE MACHINERY ENGINEER, THE GROUT MANUFACTURER, OR THEIR REPRESENTATIVE SHALL INSPECT THE AREA TO BE GROUTED FOR:

9.1.1 BASE, RAIL, SOLEPLATE AND CONCRETE CLEANLINESS.

9.1.2 CHAMFER STRIPS INSTALLED AND THE FORMS WAXED.

9.1.3 FOUNDATION BOLTS PROPERLY WRAPPED AND SEALED.

9.1.4 EXPANSION JOINTS PROPERLY PREPARED AND SEALED.

9.1.5 MIXING EQUIPMENT CLEAN AND SUITABLE.

9.1.6 AMBIENT AND MATERIAL TEMPERATURES WITHIN LIMITS.

9.1.6.1 AMBIENT TEMPERATURES AT THE BEGINNING OF MIXING AND AT THE COMPLETION OF POUR SHALL BE RECORDED AND GIVEN TO THE MACHINERY ENGINEER WHO WILL RECORD THE DATA IN THE PERMANENT EQUIPMENT RECORDS.

9.1.6.2 FOUNDATION TEMPERATURE SHALL BE A MINIMUM OF 65 °F.

9.1.6.3 MIXING EQUIPMENT SHALL BE FREE OF ALL FOREIGN MATERIAL, MOISTURE, OIL, IN GOOD WORKING ORDER, AND PROPERLY SIZED. THREE-COMPONENT EPOXY GROUT MATERIALS (CHOCKFAST RED) SHALL BE MIXED IN A MORTAR MIXER AT 15-20 RPM.

9.1.6.4 ALL PERSONNEL HANDLING OR WORKING WITH THE GROUTING MATERIALS SHALL FOLLOW SAFETY INSTRUCTIONS AS DIRECTED BY THE EQUIPMENT ENGINEER.

9.1.6.5 ONLY FULL UNITS OF EPOXY RESIN, HARDENER AND AGGREGATE SHALL BE USED IN PREPARING THE GROUT.

9.1.6.6 THE EPOXY RESIN AND THE HARDENER SHALL BE BLENDED FOR 3 TO 4 MINUTES WITH A PROPERLY SIZED JIFFY MIXER AND A 1/2" DRILL MOTOR, AT A SPEED OF NO GREATER THAN 200-250 RPM.

9.1.6.7 IMMEDIATELY AFTER THE LIQUID BLENDING HAS BEEN COMPLETED, THE AGGREGATE SHALL BE ADDED AND BLENDED TO FULLY WET THE AGGREGATE. THIS SHALL BE ACCOMPLISHED UNDER THE DIRECTION OF THE GROUT MANUFACTURER OR HIS APPROVED REPRESENTATIVE.
10.0 **PLACEMENT**

10.1 WHEN REQUIRED, A SUITABLE HEAD BOX SHALL BE PREPARED TO HYDRAULICALLY FORCE THE GROUT UNDER THE ENGINE/COMPRESSOR BASE OR RAIL.

10.2 GROUTING SHALL BE A CONTINUOUS POUR UNTIL THE PLACEMENT OF EPOXY GROUT IS COMPLETE UNDER ALL SECTIONS OF THE ENGINE/COMPRESSOR BASE, RAIL, OR SOLEPLATE. GROUT SHALL BE POURED FROM ONE SIDE, CORNER, OR END TO PREVENT AIR ENTRAPMENT.

10.3 NO MECHANICAL VIBRATORS SHALL BE USED TO PLACE THE GROUT UNDER THE ENGINE/COMPRESSOR BASE, RAIL OR SOLEPLATE.

10.4 IF REQUIRED BY THE EQUIPMENT ENGINEER, ONE (1) 2" X 2" X 2" TEST CUBE SHALL BE MADE FROM EACH BATCH NUMBER OF GROUT PLACED. THE SAMPLE(S) SHALL BE TAGGED WITH THE EQUIPMENT NUMBER ON WHICH THE BATCH WAS USED AND WHERE IN THE FOUNDATION THE BATCH WAS PLACED.

10.5 CONSULT GROUT MANUFACTURER IF TESTING IS REQUIRED.

11.0 **FINISHING**

11.1 IF A COSMETIC APPEARANCE IS REQUIRED OR DESIRED, THE GROUT MANUFACTURER SHOULD BE CONTACTED FOR DIRECTIONS PERTAINING TO THE SPECIFIC GROUT SYSTEM BEING USED.

11.2 FORMS SHALL BE LEFT IN PLACE UNTIL THE GROUT HAS CURED. THE SURFACE OF THE GROUT SHOULD BE FIRM AND NOT TACKY TO THE TOUCH. CONTACT GROUT MANUFACTURER FOR APPROPRIATE CURE TIME BASED ON AMBIENT TEMPERATURE.

11.3 ALL EDGES OF THE EPOXY GROUT WHERE REQUIRED SHALL BE DRESSED SMOOTH BY GRINDING.
12.0 **EPOXY CHOCKING**

12.1 INSPECT THE GROUT CAP, RAIL, OR SOLEPLATE FOR A SMOOTH, CLEAN, OIL-FREE SURFACE.

12.2 THE ENGINE OR COMPRESSOR BASE SHALL BE CLEAN AND SMOOTH. ALL PITTED SURFACES SHALL BE FILLED WITH A HIGH BOND EPOXY FAIRING COMPOUND (PHILLYBOND BLUE 6A).

12.3 EPOXY CHOCS WILL BE SIZED AS FOLLOWS:

CHOCKS UNDER THE MAINFRAME WILL BE SIZED FOR A LOAD OF 500 PSI. CONSULT GROUT MANUFACTURER FOR PROPER CHOCH SIZING.

12.4 ALL FOUNDATION BOLTS WILL BE WRAPPED WITH WEATH STRIPPING TO PREVENT THE EPOXY FROM COMING IN CONTACT WITH THEM. IF REQUIRED, THE AREA WHERE THE FOUNDATION BOLT PENETRATES THE ENGINE OR COMPRESSOR BASE WILL BE FILLED WITH DUCT SEAL.

12.5 LEVELING OR JACKSCREWS THAT WILL BE IN THE CHOCH AREA SHALL BE WRAPPED WITH DUCT TAPE TO FACILITATE REMOVAL AFTER THE CHOCH HAS CURED.

12.6 OPEN CELL FOAM RUBBER DAMS WILL BE INSTALLED AS PER DRAWING NO. CF-001. THE HEIGHT OF THE FOAM DAM WILL BE 1/2" GREATER THAN THE CHOCH THICKNESS.

12.7 AFTER THE FOAM RUBBER DAMS ARE INSTALLED BUT PRIOR TO INSTALLING THE FRONT CHOCH DAMS, THE CHOCH AREA WILL BE SPRAYED WITH EPOXY RELEASE AGENT (PR-225). THIS SHALL BE ACCOMPLISHED UNDER THE GUIDANCE OF THE CHOCH MANUFACTURER OR HIS REPRESENTATIVE.


12.9 THE BOTTOM OF THE ANGLE IRON SHALL BE SEALED WITH A GOOD QUALITY SILICONE SEALANT.

12.10 POURING OF THE EPOXY CHOCH WILL NOT BE PERFORMED UNTIL THE CHOCH MANUFACTURER OR HIS REPRESENTATIVE HAS APPROVED THE ABOVE INSTALLATION.
13.0 **CLEAN-UP**

13.1 IMMEDIATELY AFTER GROUTING OR CHOCKING IS COMPLETED ALL TOOLS AND MIXING EQUIPMENT SHALL BE CLEANED USING WATER OR AN APPROVED SOLVENT (PRT-59).

13.2 ALL UNUSED MIXED EPOXY MATERIALS AND CLEAN-UP RESIDUE SHALL BE DISPOSED OF IN ACCORDANCE WITH INSTRUCTIONS FROM THE FACILITY ENVIRONMENTAL ENGINEER OR LOCAL AUTHORITY.

14.0 ANY QUESTIONS CONCERNING THESE SPECIFICATIONS SHOULD BE DIRECTED TO THE MACHINERY ENGINEER, THE GROUT MANUFACTURER, OR THEIR DIRECT REPRESENTATIVE.
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OPEN CELL FOAM DAMPING

EQUIPMENT BASEPLATE

LEVELING SCREW

WRAPPED WITH DUCT TAPE

CHOCKFAST EPOXY CHOCK

WEATHER STRIPPING 1/4" MINIMUM

JACK-PAD

PHILLYBOND BLUE 6A

CONCRETE FOUNDATION

SLEEVE FILLED WITH PHILLYBOND 7C OR EXPANDING URETHANE FOAM

AVAILABLE FREE LENGTH SHOULD BE 12 X BOLT DIA.

ANCHOR BOLT AND LEVELING SCREW

ASSEMBLY FOR EPOXY CHOCKS
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MATERIAL SPECIFICATIONS AND PROCEDURES FOR FULL BASE
EPOXY GROUTING FOR THE SKID SECTION OF SEPARABLE ENGINE,
COMPRESSOR AND PUMPING UNITS WHERE LONG TERM INSTALLATION
IS REQUIRED, INCLUDING THE CHOCKING OF VARIOUS COMPONENTS
INCLUDING CHOCKING OF THE SKID ASSEMBLY FOR SHORT TERM
INSTALLATION
6/2/92

This epoxy grouting specification is furnished by
Chockfast® Engineered Grouting Systems
ITW Philadelphia Resins
And Your Local Chockfast Distributor
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1.0 **GENERAL GUIDELINES (CHOCKFAST GROUTING SYSTEMS)**

1.1 THIS SPECIFICATION COVERS EPOXY GROUTING OF SKID MOUNTED MECHANICAL EQUIPMENT ON CONCRETE FOUNDATIONS FOR LONG TERM INSTALLATIONS.

1.1.1 PRIOR TO ANY WORK BEING PERFORMED, THE GROUT MANUFACTURER OR HIS REPRESENTATIVE SHALL BE CONTACTED AND A PRE-JOB MEETING ARRANGED TO DISCUSS ALL ASPECTS OF THE SKID GROUTING. AT THIS MEETING THE CONTRACTOR SHALL BE PRESENT. IF NO OUTSIDE CONTRACTOR IS BEING USED, THEN THE PLANT MAINTENANCE FOREMAN AND/OR CREW SUPERVISOR SHALL BE IN ATTENDANCE.

1.1.2 THE MACHINERY ENGINEER SHALL DEFINE THE RESPONSIBILITIES OF THE GROUT MANUFACTURER OR HIS REPRESENTATIVE, AND WILL DIRECT TO WHOM THE GROUT MANUFACTURER OR HIS REPRESENTATIVE WILL REPORT DURING THE COURSE OF THE PROJECT OR JOB.

1.1.3 A WRITTEN SUMMARY OF THIS MEETING WILL BE DISTRIBUTED TO ALL PARTIES CONCERNED PRIOR TO THE JOB START UP.

2.0 **MATERIALS**

THE EPOXY GROUT SHALL MEET THE FOLLOWING MINIMUM REQUIREMENTS:

2.1 FIRE RESISTANT AS PER ASTM D-635.

2.2 MINIMUM COMPRESSIVE STRENGTH 15,000 PSI (ASTM C-579 METHOD B).

2.3 POT LIFE 2-3 HOURS @ 72°F.

2.4 BE ABLE TO UTILIZE WATER FOR CLEAN UP.

2.5 HAVE A LOW ENOUGH EXOTHERM TO PROVIDE FOR A SINGLE LIFT DEEP POUR UP TO 18" DEEP X 7' X 7' OR GREATER.

2.6 HAVE EVEN AGGREGATE DISTRIBUTION THROUGHOUT THE CURED GROUT WITH NO RESIN RICH SURFACE.
2.7 HAVE A MAXIMUM COEFFICIENT OF THERMAL EXPANSION 11.2 X 10^{-6} PER F°, AS PER ASTM D-696.

2.8 UTILIZE A LOW DUST TYPE AGGREGATE.

3.0 MATERIAL STORAGE:

3.1 ALL GROUT MATERIALS SHALL BE STORED IN A DRY AREA IN ORIGINAL UNOPENED CONTAINERS.

3.2 ALL EPOXY GROUT COMPONENTS SHALL BE PRECONDITIONED TO A MINIMUM OF 65°F AND A MAXIMUM OF 80°F FOR AT LEAST 48 HOURS PRIOR TO MIXING AND PLACEMENT.

4.0 PREPARATION OF FOUNDATION:

4.1 NEW CONCRETE SHALL BE TESTED AS FOLLOWS:

4.1.1 PERFORM SHRINKAGE TEST AS PER ASTM C 157-80 ON NEW CONCRETE TO DETERMINE WHEN SHRINKAGE IS MINIMAL.

4.1.2 IF NO SHRINKAGE TEST IS PERFORMED, CURE TIME WILL BE APPROXIMATED AS FOLLOWS:

<table>
<thead>
<tr>
<th>Cement Type</th>
<th>Minimum Cure Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>STANDARD CEMENT (3-5 BAG MIX)</td>
<td>28 DAYS MINIMUM</td>
</tr>
<tr>
<td>HI-EARLY CEMENT (6-7 BAG MIX)</td>
<td>7 DAYS MINIMUM</td>
</tr>
</tbody>
</table>

4.1.3 CONCRETE COMPRESSIVE STRENGTH SHALL BE A MINIMUM OF 3500 PSI WHEN TESTED IN ACCORDANCE WITH ASTM C-39 & C-31.

4.1.4 CONCRETE TENSILE STRENGTH SHALL BE A MINIMUM OF 350 PSI AS PER ASTM C 496-90.

4.2 CONCRETE SURFACE PREPARATION: OLD OR NEW CONCRETE

**NOTE:** HAND CHIPPING GUNS ONLY WILL BE USED. **NO JACKHAMMERS WILL BE PERMITTED.**
4.2.1 THE CONCRETE FOUNDATION SHALL BE DRY AND FREE OF OIL.

NOTE: WHEN CHOCKING DIRECTLY TO A CONCRETE FOUNDATION THE CONCRETE WILL FIRST BE PAINTED WITH TWO COATS OF PHILLYCLAD 1000. THE FIRST COAT SHOULD BE REDUCED WITH PRT-61 33% BY VOLUME. THE SECOND COAT SHOULD BE APPLIED FULL STRENGTH.

4.2.2 THE CONCRETE SHALL BE CHIPPED TO EXPOSE A MINIMUM OF 50% AGGREGATE SO AS TO REMOVE ALL LAITANCE AND PROVIDE A ROUGH SURFACE FOR BONDING. DOWELS TO PREVENT EDGE LIFTING OR PERIPHERAL REBAR MUST BE INSTALLED OR EXPOSED ON NEW CONCRETE AT THIS TIME. REFER TO DRAWING NOS. CF-007A AND CF-007B.

4.2.3 AFTER CHIPPING, THE EXPOSED SURFACES SHALL BE BLOWN FREE OF DUST AND CONCRETE CHIPS USING OIL AND WATER FREE COMPRESSED AIR FROM AN APPROVED SOURCE. CONCRETE SURFACE MAY ALSO BE VACUUMED.

4.2.4 AFTER THE FOUNDATION HAS BEEN CHIPPED AND CLEANED, IT SHALL BE COVERED TO PREVENT IT FROM BECOMING WET, OR CONTAMINATED.

4.2.5 FOUNDATION BOLTS SHALL BE EXAMINED FOR DAMAGED THREADS AND CORRECTIVE ACTION TAKEN. THE FOUNDATION BOLT THREADS SHALL BE PROTECTED DURING THE EQUIPMENT SETTING, LEVELING AND GROUTING OPERATIONS. ALWAYS ALLOW A MINIMUM OF TWELVE (12) TIMES THE BOLT DIAMETER FOR FREE STRETCH. THIS SHALL BE ACCOMPLISHED BY WRAPPING WITH WEATHER STRIPPING OR OTHER APPROVED MATERIALS.

4.2.6 IF THE BOLTS ARE SLEEVED, THE SLEEVES SHALL BE FILLED WITH ELASTOMERIC MATERIAL (PHILLYBOND 7C) OR EXPANDING URETHANE FOAM TO PREVENT THE ANNUAL SPACE AROUND THE BOLT FROM BEING FILLED WITH EPOXY GROUT.

NOTE: "UNDER NO CIRCUMSTANCE SHALL THE EPOXY GROUT BE ALLOWED TO FLOW INTO THE ANCHOR BOLT SLEEVES."

5.0 JACKSCREW LEVELING PADS

5.1 JACKSCREW LEVELING PADS SHALL BE SET AND PREPARED AS FOLLOWS:
5.1.1 PADS ARE TO BE MADE OF MINIMUM 3" DIAMETER, 1/2" THICK 4140 STEEL OR SIMILAR TYPE ROUND STOCK MATERIAL, IF AVAILABLE.

5.1.2 PADS WILL BE RADIUSED ON THE EDGES TO REDUCE THE POSSIBILITY OF STRESS CONCENTRATIONS BEING DEVELOPED IN THE EPOXY GROUT.

5.1.3 NO SQUARE LEVELING PADS WILL BE PERMITTED.

5.1.4 WHEN APPLICABLE, A HIGH COMPRESSIVE STRENGTH EPOXY PUTTY (PHILLYBOND BLUE 6A OR PHILLYBOND #6) SHALL BE USED TO INSTALL THE PADS, BY PROVIDING A 100% BEARING AREA SURFACE. WHEN THIS PROCEDURE IS USED, THE PADS WILL BE LEVELED. CONSULT GROUT MANUFACTURER OR MACHINERY ENGINEER AS TO WHEN THIS PROCEDURE WILL BE USED.

5.1.5 JACKSCREWS, WHEN USED, SHALL BE WRAPPED WITH DUCT TAPE TO FACILITATE THEIR REMOVAL ONCE THE GROUT HAS CURED.

6.0 PREPARATION OF SKID FRAME FOR GROUTING

6.1 VERTICAL AND HORIZONTAL EDGES OF THE SKID FRAME BASE THAT COME IN CONTACT WITH, OR ARE EMBEDDED IN THE EPOXY GROUT, WILL BE RADIUSED A MINIMUM OF 3/8" TO REDUCE STRESS CONCENTRATIONS IN THE GROUT.

6.2 SURFACES OF THE SKID FRAME WHICH WILL COME IN CONTACT WITH OR ARE EMBEDDED IN THE EPOXY GROUT SHALL BE SANDBLASTED TO A "WHITE METAL" FINISH.

6.3 IF THE GROUTING IS NOT TO BE DONE IMMEDIATELY, THE SANDBLASTED AREAS TO BE GROUTED SHALL BE PAINTED WITH ONE TO TWO COATS OF THIN FILM EPOXY COATING (PHILLYCLAD 1000 SERIES). THIS COATING SHALL BE FULLY CURED PRIOR TO PLACEMENT OF THE GROUT.

6.4 IF THE EPOXY COATED AREAS ARE NOT GROUTED WITHIN THIRTY (30) DAYS, THE COATED SURFACE SHALL BE ROUGHED UP WITH A WIRE BRUSH OR SANDPAPER TO REMOVE THE BLOOM OR SHINE. ALL DUST PRODUCED BY BRUSHING OR SANDING SHALL BE REMOVED. THESE SURFACES SHALL BE CLEAN AND DRY PRIOR TO PLACEMENT OF GROUT.
6.5 Access holes shall be installed in the skid frame or the metal decking to provide access to compartments isolated by the I-beam framework of the skid. Consult equipment engineer or grout manufacturer or his representative for specific locations.

7.0 FORMING

7.1 Forming around the skid shall be sufficient to allow for adequate placement of the epoxy grout.

7.2 All forming material coming in contact with the grout shall be coated with three coats of a good quality paste floor wax. No liquid wax will be permitted.

7.3 Care should be taken to prevent any wax from contacting the concrete foundation or the skid frame.

7.4 Forms shall be made liquid tight to prevent leaking of epoxy grout material. Cracks and openings shall be sealed with a good quality silicone sealant.

7.5 All inside right angles must be eliminated by using chamfer strips, 1" to 2". The machinery engineer or the grout manufacturer must be consulted when in doubt.

8.0 EXPANSION JOINTS

8.1 Expansion joints, when used, shall be installed at locations as called out on the installation drawings, as directed by the machinery engineer or by the grout manufacturer.

8.2 Expansion joints, when constructed, shall be made from 1" thick styrofoam or redwood. Variations should be discussed with the machinery engineer or the grout manufacturer.

8.3 Expansion joints should incorporate the "secondary seal" design where the bottom of the expansion joint comes in contact with the foundation.

8.3.1 To seal the bottom of the expansion joint with a secondary
SEAL, MIX AN ELASTOMERIC EPOXY WITH A MINIMUM ELONGATION FACTOR OF 200% @ 0°F (PHILLYBOND 7C) WITH #3 GRIT DRY BLASTING SAND AT APPROXIMATELY 4 TO 7 PARTS SAND TO ONE PART ELASTOMERIC EPOXY TO FORM A NON-SLUMP MORTAR CONSISTENCY. LAYER THE MIX 1" TO 2" THICK BY 3" WIDE ON TOP OF THE CONCRETE WHERE THE EXPANSION JOINT IS TO BE INSTALLED. SET THE EXPANSION JOINT INTO THE MIX AND PRESS DOWN THEN PACK THE EXCESS AROUND THE BOTTOM OF THE JOINT MATERIAL APPROXIMATELY 1" HIGH. WHEN CURED, THIS MIXTURE WILL FORM A SECONDARY SEAL TO PREVENT ANY CONTAMINANTS FROM REACHING THE CONCRETE. REFER TO DRAWING NO. CF-003 FOR DETAILS.

8.3.2 PROVISIONS SHOULD BE MADE TO ALLOW FOR REMOVAL (AFTER THE GROUT HAS BEEN POURED AND CURED) OF 1/2" OF THE EXPOSED EXPANSION JOINT SURFACE. THIS AREA IS TO BE FILLED WITH THE ELASTOMERIC EPOXY (PHILLYBOND 7C) WITHOUT SAND.

8.3.2.1 SOME SKID ASSEMBLIES DO NOT CONVENIENTLY ALLOW PLACEMENT OF EXPANSION JOINTS. IN SUCH CASES, THE JOINT CAN BE LOCATED UNDER THE LATERAL CROSS BRACING BEAMS BY USING 1/4" PLYWOOD, 1" STYROFOAM, OR SIMILAR COMPRESSIBLE MATERIAL. THIS TYPE OF EXPANSION JOINT IS NOT USUALLY REMOVABLE AFTER THE PLACEMENT OF THE EPOXY GROUTING MATERIALS, THEREFORE, AN ALLOWANCE FOR THE VISIBLE PORTION OF THE EXPANSION JOINT TO BE REMOVED SHOULD BE MADE AND SEALED WITH AN ELASTOMERIC EPOXY (PHILLYBOND 7C). THE REMAINING PART OF THE EXPANSION JOINT WILL REMAIN UNDER THE CROSS BRACE BEAM, PERMANENTLY SEALED.

8.3.3.1 IN THE AREA WHERE THE ELASTOMERIC EPOXY (PHILLYBOND 7C) IS TO BE USED, ALL SURFACES MUST BE LIGHTLY ABRADED TO ENHANCE THE BOND AND BE FREE OF ANY CONTAMINANTS THAT WOULD PREVENT THE ELASTOMERIC EPOXY MATERIAL FROM BONDING.

9.0 MIXING

PRIOR TO MIXING AND POURING OF THE EPOXY GROUT, THE MACHINERY ENGINEER, THE GROUT MANUFACTURER, OR THEIR REPRESENTATIVE SHALL INSPECT THE AREA TO BE GROUTED FOR:
9.1 SKID FRAME AND CONCRETE FOR PROPER SURFACE PREPARATION AND CLEANLINESS.

9.2 GROUT FORM CHAMFER STRIPS INSTALLED AT PROPER ELEVATION AND FORMS ADEQUATELY WAXED.

9.3 FOUNDATION BOLTS PROPERLY WRAPPED AND SEALED.

9.4 EXPANSION JOINTS PROPERLY PREPARED AND SEALED, IF APPLICABLE.

9.5 MIXING EQUIPMENT CLEAN AND SUITABLE.

9.6 AMBIENT AND MATERIAL TEMPERATURES WITHIN LIMITS.

9.6.1 AMBIENT TEMPERATURES AT THE BEGINNING OF MIXING AND AT THE COMPLETION OF POUR SHALL BE RECORDED AND GIVEN TO THE MACHINERY ENGINEER WHO WILL RECORD THE DATA IN THE PERMANENT EQUIPMENT RECORDS.

9.6.2 FOUNDATION TEMPERATURE SHALL BE A MINIMUM OF 65°F.

9.7 MIXING EQUIPMENT SHALL BE FREE OF ALL FOREIGN MATERIAL, MOISTURE, OIL, IN GOOD WORKING ORDER, AND PROPERLY Sized (4 CU.FT. MAX) THREE-COMPONENT EPOXY GROUT MATERIALS SHALL BE MIXED IN A MORTAR MIXER AT 15-20 RPM MAXIMUM.

9.8 ALL PERSONNEL HANDLING OR WORKING WITH THE EPOXY GROUTING MATERIALS SHALL FOLLOW SAFETY INSTRUCTIONS AS DIRECTED BY THE EQUIPMENT ENGINEER.

9.8.1 ONLY FULL UNITS OF EPOXY RESIN, HARDENER AND AGGREGATE SHALL BE USED IN PREPARING THE GROUT.

9.8.2 THE EPOXY RESIN AND THE HARDENER SHALL BE BLENDED FOR 3-4 MINUTES WITH A PROPERLY SIZED JIFFY MIXER AND A 1/2" DRILL MOTOR, AT A SPEED OF 200-250 RPM.

9.8.3 IMMEDIATELY AFTER THE LIQUID BLENDING HAS BEEN COMPLETED, THE LOW DUST AGGREGATE SHALL BE ADDED AND BLENDED TO FULLY WET THE AGGREGATE. THIS SHALL BE ACCOMPLISHED UNDER THE DIRECTION OF THE GROUT MANUFACTURER OR HIS APPROVED REPRESENTATIVE.
10.0  **PLACEMENT**

10.1  **WHEN REQUIRED, A SUITABLE HEAD BOX SHALL BE PREPARED TO HYDRAULICALLY FORCE THE GROUT UNDER THE SKID FRAMEWORK.**

10.2  **GROUTING SHALL BE CONTINUOUS UNTIL THE PLACEMENT OF EPOXY GROUT IS COMPLETE UNDER ALL INDIVIDUAL SECTIONS OF THE SKID. WHEN APPROVED BY THE MACHINERY ENGINEER OR BY THE GROUT MANUFACTURER THE EPOXY GROUT MAY BE POURED FROM BOTH SIDES OF THE SKID AT ONCE. WHEN THIS IS DONE VISUAL ASSURANCE THAT THE EPOXY GROUT COMPLETELY FLOWS UNDER ALL SUPPORT BEAMS MUST BE OBTAINED.**

10.3  **NO MECHANICAL VIBRATORS SHALL BE USED TO PLACE THE GROUT UNDER THE SKID ASSEMBLY. RAKES, HOES OR SIMILAR TOOLS MAY BE USED TO ASSIST THE FLOW OF THE GROUT IF NECESSARY.**

10.4  **IF REQUIRED BY THE EQUIPMENT ENGINEER, ONE (1) 2"X 2"X 2" TEST CUBE SHALL BE MADE FROM EACH BATCH NUMBER OF GROUT PLACED. THE SAMPLE(S) SHALL BE TAGGED WITH THE EQUIPMENT NUMBER ON WHICH THE BATCH WAS USED AND WHERE IN THE FOUNDATION THE BATCH WAS PLACED.**

10.5  **CONSULT GROUT MANUFACTURER IF TESTING IS REQUIRED.**

11.0  **FINISHING**

11.1  **IF A COSMETIC APPEARANCE IS REQUIRED OR DESIRED, THE GROUT MANUFACTURER SHOULD BE CONTACTED FOR DIRECTIONS PERTAINING TO THE SPECIFIC GROUT SYSTEM BEING USED.**

11.2  **FORMS SHALL BE LEFT IN PLACE UNTIL THE GROUT HAS CURED. THE SURFACE OF THE GROUT SHOULD BE FIRM AND NOT TACKY TO THE TOUCH. CONTACT GROUT MANUFACTURER FOR APPROPRIATE CURE TIME BASED ON AMBIENT TEMPERATURE.**

11.2.1  **ALL EDGES OF THE EPOXY GROUT WHERE REQUIRED SHALL BE DRESSED SMOOTH BY GRINDING.**
12.0 **CLEAN-UP**

12.1 IMMEDIATELY AFTER GROUTING IS COMPLETED ALL TOOLS AND MIXING EQUIPMENT SHALL BE CLEANED USING WATER OR AN APPROVED SOLVENT (PRT 59).

12.2 ALL UNUSED MIXED EPOXY MATERIALS AND CLEAN-UP RESIDUE SHALL BE DISPOSED OF IN ACCORDANCE WITH INSTRUCTIONS FROM THE FACILITY ENVIRONMENTAL ENGINEER OR LOCAL AUTHORITY.

ANY QUESTIONS CONCERNING THE ABOVE GROUTING SPECIFICATIONS SHOULD BE DIRECTED TO THE MACHINERY ENGINEER, THE GROUT MANUFACTURER, OR THEIR DIRECT REPRESENTATIVE.

13.0 **EPOXY CHOCKING OF SKID ASSEMBLIES FOR SHORT TERM INSTALLATION:**

13.1 INSPECT THE CONCRETE FOUNDATION OR THE GROUT CAP FOR A SMOOTH, CLEAN, OIL-FREE SURFACE.

13.2 THE CONCRETE FOUNDATION, SKID RAIL, ENGINE OR COMPRESSOR BASE SHALL BE CLEAN AND SMOOTH. ALL PITTED SURFACES SHALL BE FILLED WITH A HIGH BOND EPOXY FAIRING COMPOUND (PHILLYBOND BLUE 6A).

**NOTE:** WHEN CHOCKING THE SKID TO THE GROUT CAP, THE EXPANSION JOINTS AND THE GROUT CAP SHALL BE INSTALLED PRIOR TO THE SKID BEING PLACED ON THE FOUNDATION.

13.3 EPOXY CHOCKS WILL BE SIZED AS FOLLOWS:

13.3.1 CHOCKS UNDER THE SKID SHALL BE SIZED AS PER THE CHOCKFAST COMPUTER DESIGN PROGRAM OR AS APPROVED BY THE EPOXY CHOCK MANUFACTURER, HIS REPRESENTITIVE OR THE MACHINERY ENGINEER.

13.3.2 CHOCKS UNDER THE ENGINE OR THE COMPRESSOR SHALL BE DESIGNED AS PER THE CHOCKFAST COMPUTER DESIGN PROGRAM OR AS APPROVED BY THE EPOXY CHOCK MANUFACTURER, HIS REPRESENTITIVE OR MACHINERY ENGINEER.

13.4 ALL FOUNDATION OR MOUNTING BOLTS TO BE CHOCKED WILL BE WRAPPED WITH \(\frac{1}{4}\) INCH BY 1 INCH WEATHER STRIPPING TO PREVENT THE EPOXY CHOCK FROM COMING IN CONTACT WITH THEM. IF
REQUIRED, THE AREA WHERE THE FOUNDATION OR MOUNTING BOLT PENETRATES THE SKID RAIL, ENGINE OR COMPRESSOR BASE WILL BE FILLED WITH DUCT SEAL TO PREVENT THE CHOCKING COMPOUND FROM LOCKING IN THE BOLT.

13.5 LEVELING OR JACKSCREWS THAT WILL BE IN THE CHOCK AREA SHALL BE WRAPPED WITH DUCT TAPE OR OTHER APPROVED METHODS TO FACILITATE THEIR REMOVAL AFTER THE CHOCK HAS CURED.

13.6 OPEN CELL FOAM RUBBER DAMS (AVAILABLE FROM CHOCKFAST) WILL BE INSTALLED AS PER DRAWING NO. CF-001. THE HEIGHT OF THE OPEN CELL FOAM DAM WILL BE 1/2" OR GREATER THAN THE ULTIMATE CHOCK THICKNESS.

13.7 AFTER THE FOAM RUBBER DAMS ARE INSTALLED BUT PRIOR TO INSTALLING THE FRONT CHOCK DAMS, THE CHOCK AREA WILL BE SPRAYED WITH EPOXY RELEASE AGENT (PR-225). THIS SHALL BE ACCOMPLISHED UNDER THE GUIDANCE OF THE CHOCK MANUFACTURER OR HIS REPRESENTATIVE.

13.8 INSTALLING THE FRONT CHOCK DAMS.


13.9 THE BOTTOM OF THE ANGLE IRON SHALL BE SEALED WITH A GOOD QUALITY SILICONE SEALANT.

13.10 POURING OF THE EPOXY CHOCK WILL NOT BE PERFORMED UNTIL THE CHOCK MANUFACTURER OR HIS REPRESENTATIVE HAS APPROVED THE ABOVE INSTALLATION.

14.0 CLEAN-UP
14.1 IMMEDIATELY AFTER THE CHOCKING IS COMPLETED ALL TOOLS AND MIXING EQUIPMENT SHALL BE CLEANED USING AN APPROVED SOLVENT (PRT-59).

14.2 ALL UNUSED MIXED EPOXY MATERIALS AND CLEAN-UP RESIDUE SHALL BE DISPOSED OF IN ACCORDANCE WITH INSTRUCTIONS FROM THE FACILITY ENVIRONMENTAL ENGINEER OR LOCAL AUTHORITY.

ANY QUESTIONS CONCERNING THE ABOVE GROUTING OR CHOCKING SPECIFICATIONS SHOULD BE DIRECTED TO THE MACHINERY ENGINEER, THE EPOXY CHOCK MANUFACTURER, OR THEIR DIRECT REPRESENTATIVE.
Section 2
GROUTING PREPARATION TIPS

Pouring epoxy grout under a piece of equipment is only a small part of a grout job. Days of preparation and many man hours are involved before the grout is actually poured. These pre-grout preparations can be the difference between a grout job lasting for the life of a piece of machinery, or only a few years or months. With this in mind, we want to design a grouting system that will be resistant to both static and dynamic loading, and accept, within limits, unbalanced forces that are imposed upon it by a piece of rotating or reciprocating equipment. The grouting system should utilize expansion joints to reduce the possibility of cracking due to thermal and mechanically induced stress.

I. PREPARATION OF NEW CONCRETE:

A. "Cure Time"

It is recommended that a shrinkage test as per ASTM-C157-80 be performed. Epoxy grout should never be poured on "green" or uncured concrete. If a hydration test is not performed, concrete cure times can be approximated by the following:

1. **Standard concrete**: 5 bag mix, 21-28 days, depending on climate and mix ratio;

2. **High early concrete**: 6-7 bag mix, 7 days, depending on climate and mix ratio.

3. The compressive strength of all new concrete should be a minimum of 3,500 psi with a minimum tensile strength of 350 psi before pouring epoxy grout.
B. **Concrete Surface Preparation**

1. All laitance must be removed and good aggregate exposed. This is usually achieved by light chipping to a depth that exposes 50% aggregate. This chipping is done after the concrete is sufficiently cured. Chipping should be accomplished using hand held chipping guns. *(Never use jackhammers on new concrete.)*

2. Horizontal foundation edges should be chamfered 4" to 6" at a 45° angle. This will help reduce the possibility of edge lifting during seasonal cyclic temperature changes (summer to winter). See Section 7 entitled "Edge Lifting Cause and Cure" for dowel installation and peripheral rebar exposure and refer to Drawing No. CF-007B for details.

3. The concrete surface should be free of any loose material, oil, water or any other contaminant that would prevent the grout from bonding. The use of oil free compressed air, or vacuum cleaners is highly recommended.

II. **Preparation of Old Concrete**

Same as for new concrete except the foundation should be inspected for any cracking and appropriate action taken. Consideration should be given to cracks in existing concrete foundation prior to pouring epoxy grout. Consult Chockfast Grouting Systems for corrective action.
III. **Preparation of Foundation Bolts**

Bolt embedment depth into the concrete varies depending on the foundation design. Free length should be 12 times the bolt diameter. The bolt should be wrapped with weather stripping, pipe insulation, or suitable material that will prevent the grout from bonding to the bolt shank. The minimum wrap thickness will be 1/4” to the side. When bolt sleeves are used, they should be filled with Phillybond 7C Elastomeric compound to prevent oil from migrating down around the bolt when the equipment is in operation. The sleeve should not protrude into the grout.

IV. **Leveling Pads**

A. Leveling pads used in conjunction with jackscrews should be round and a minimum of 1/2” thick. They should be level to the foundation and sandblasted to "white metal." The diameter of the leveling pad should not be less than 3 inches. Used pump shafts or used reciprocating compressor piston rods make excellent leveling pads. These should be installed as per Drawing Nos. CF-001 and CF-002.

B. When the equipment is in place and final base alignment is obtained, grease or wrap the jackscrew with duct tape prior to pouring the epoxy grout. Make certain that jackscrews are not flared or have damaged threads.

C. After the grout is poured and cured, remove the jackscrew and fill the hole with Phillybond 7C or install a 1/4” long bolt to plug the hole and prevent contaminants from reaching the grout interface.
V. **Grout Forms**

Grout forms should be constructed of 3/4" plywood (minimum) and braced both vertically and horizontally with 2" x 4" lumber. The face of the form to come in contact with the grout should be waxed to prevent bonding of the grout to the forms. A hardwood floor paste wax is normally used (2 to 3 coats). The grout forms should be liquid tight and sealed to the vertical concrete face with silicone caulk. All inside right angles (90°) should be chamfered to a minimum of 2" (where applicable) to prevent stress risers and possible cracking.

VI. **Expansion Joints**

Expansion joints are incorporated into large epoxy grout pours to reduce the possibility of cracking, especially when temperature differentials of 50°F are encountered. They should be approximately 1” thick and be designed to prevent any oil or water migration to the concrete foundation. Placement of the expansion joints should be between each anchor bolt, or break up a grout pour into sections. No two grout jobs are the same; therefore, Chockfast Grouting Systems, ITW Philadelphia Resins should be consulted for recommended expansion joint placement and design. See Section 3 entitled "Expansion Joint Suggestions" and Section 4E entitled "Rebar and Epoxy Grout", Drawing No. CF-004E, for additional information on expansion joint design.
VII. **Environmental Control**

During the summer, the foundation and equipment to be grouted should be covered with some type of shelter to keep the uncured grout from being exposed to direct sunlight. This covering will also protect the foundation from dew, mist or rain. It should be erected 24 hours prior to grouting and remain up for 48 hours after grouting is completed.

In the winter, a suitable covering to allow the foundation and equipment to be completely encapsulated should be constructed. A heating source should be applied so as to raise the entire foundation and equipment temperature to above 65°F for at least 48 hours prior to and after grouting.

VIII. **Base Plate Preparation**

All steel surfaces that will come in contact or be embedded into the epoxy grout will be prepared as follows.

1. Sandblasted to "white metal."
2. All sharp corners, both vertical and horizontal, that will be embedded in the grout, should be radiused (1/2" minimum) to reduce stress risers and the possibility of cracking the grout.
3. Sides and bottom of steel surfaces should be coated with Phillyclad 1000 Series in order to prevent a build up of rust, which would inhibit the bond of the epoxy grout to the steel.
Section 3
EXPANSION JOINTS

Why and When to Use Expansion Joints

In order to maintain alignment of grouted equipment, most epoxy machinery grouts are designed to be rigid and have high resistance to creep. As a result, stresses developed during cure and subsequent temperature changes may result in cracking. Cracks do not usually impair the grout's supporting capability, however, they are undesirable because of their cosmetic appearance. Cracks in the epoxy allow oil and water to migrate down to the concrete substrate and begin to deteriorate the concrete. Expansion joints should be used in all foundation designs over 4' length or width. The use of expansion joints will also help reduce the possibility of cracking on long grout pours.

I. Suggested Expansion Joint Locations

Expansion joints can be located every 3 to 7', depending on the length and width of the foundation. They should be positioned so as not to interfere with soleplate, chock or anchor bolt locations. For best results, always consult your Chockfast Grouting Systems representative or ITW Philadelphia Resins about expansion joint design and location.

II. Suggested Expansion Joint Design

The primary joint material should be a 1" to 2" thick. Redwood or styrofoam make excellent expansion joint materials. They are resistant to water and oil, and are easily compressible.
A. **Secondary Seal**

After the concrete surface has been chipped and the forms erected, the expansion joints may be installed. A mixture of one (1) part Phillybond 7C expansion joint compound and approximately four (4) to seven (7) parts dry blasting sand should be applied onto the concrete 3" wide and 1" thick along the area to receive the expansion joint. The expansion joint material is then pressed into this mixture to a depth of 1/2" to 3/4". The expansion joint compound and sand is allowed to cure. This now becomes the secondary seal. The secondary seal when cured provides support for the expansion joint when more grout is poured on one side than the other. See Drawing CF-003 for details.

An alternate method to use when installing the secondary seal is to chip a groove 1" deep into the concrete. This groove should be about 1" wider than the expansion joint material. Depending on personal preference, the joint can be set before or after the forms are erected. Whichever method is used, the Phillybond 7C is mixed with a slight amount of sand (coarse) so that it remains fluid, but is cost effective. Once the Phillybond 7C is in place, the expansion joint material is pressed into it, and the Phillybond 7C is allowed to cure.

There can be several variations to this, but good engineering practices should be observed. It is best to discuss expansion joint design and location with your local Chockfast distributor or ITW Philadelphia Resins.
B. **Primary Seal**

On most expansion joints, the primary seal can be poured in place. This is accomplished by installing a strip of wood or other material that is wrapped in polyethylene or duct tape (to prevent the grout from bonding). It is installed so that a portion of it extends above the grout when poured and down the vertical face. After the grout has hardened, these strips are removed from the horizontal surface and the vertical face. The void is then filled with Phillybond 7C expansion joint compound without sand. **The depth of the expansion joint compound used should be half the width of the expansion joint.**

III. **Mixing Phillybond 7C and Sand**

To form a non-slump workable paste proper mixing is essential:

A. Using a medium size Jiffy mixer blade, mix the Phillybond 7C resin and hardener for three minutes at approximately 250 RPM.

B. Pour the mixture into a five gallon bucket and slowly add clean dry sand while agitating with the medium Jiffy mixer blade. Add only enough sand to form a non-slump, non-run mixture (approximately a 7:1 ratio). This will vary depending on the grade of sand used. A Kol mixer can also be used to mix the Phillybond 7C and sand.
Other Methods for Expansion Joint Design

Alternate methods for expansion joint design include using foil backed styrofoam insulating board or rigid styrofoam material in lieu of a redwood expansion joint. Once the grout has cured, a small amount of the expansion joint material can be chipped away near the grout surface and the gap filled with Phillybond 7C. When utilizing this type of expansion joint material, a secondary seal along the bottom is absolutely necessary. Care should be exercised when pouring the grout to maintain an equal grout level on either side of the expansion joint to reduce the chances of joint deformation due to pressure differences.

CAUTION: Rebar, soleplates, or rails should not bridge or pass through expansion joints. To do so defeats the purpose of the expansion joint. Refer to Section 4E concerning rebar and epoxy grout.
Technical Bulletin # 1018C

Product Description

ITW POLYMER TECHNOLOGIES EXPANSION JOINT COMPOUND is a two component epoxy resin formulation intended as a flexible foundation seam sealant. It is self-leveling, flows smoothly and has good adhesive strength and flexibility over a wide temperature range.

Use & Benefits

ITW POLYMER TECHNOLOGIES EXPANSION JOINT COMPOUND is used to seal joints where expansion and contraction movement will take place. For best results, design the joint to be twice as wide as it is deep.

A few of the benefits include:

- Excellent adhesion to concrete, masonry, cured epoxy, glass, aluminum, steel, wood and many other construction materials.
- Remains flexible over a wide temperature range, 0°F to 150°F (-18°C to 65°C).
- Durable and weather resistant.
- Vibration and impact resistant.

Surface Preparations

Store the resin and hardener at between 70°F (21°C) and 80°F (27°C) for 24 hours before use. All surfaces must be sound, clean and dry. Remove all oils, grease, previous caulking, efflorescence and protective coating, etc. New concrete must be completely cured. Application should be made when the joint is as near mid-working temperature range as practicable, but above 55°F (13°C). Mix EXPANSION JOINT COMPOUND by adding the hardener to the resin can and using a small Jiffy mixer blade at 200 rpm in an electric drill. Mix for three minutes. Clean all tools with PRT-59 solvent. A trowelable mixture can be made by adding dry sand to mixed EXPANSION JOINT COMPOUND.

Physical Properties

- ELONGATION: 200%
- SERVICE TEMPERATURE: 0°F - 150°F (-18°C to 65°C)

Product Information

- COLORS: Red or Gray
- MIX RATIO: 12 parts resin to 1 part hardener
- COVERAGE: 152 cu. in. (2.5 liters)
- APPLICATION TEMPERATURE: Above 13°C (55°F)
- CURE TIME (approximate): 24 hours at 75°F (24°C), 48 hours at 55°F (13°C)
- POT LIFE: 45 minutes
- CLEAN UP: IMPAX IXT-59 Solvent
- UNIT WEIGHT:
  - Resin: 1 gallon can. Net weight 6 lbs. 8 oz. (2.95 kg)
  - Hardener: 1 pint can. Net weight 8.5 oz. (241 g)

Date

10/2005
General: Every reasonable effort is made to ensure the technical information and recommendations on these data pages are true and accurate to the best of our knowledge at the date of issuance. However, this information is subject to change without notice. Prior versions of this publication are invalid with the release of this version. Products and information are intended for use by qualified applicants that have the required background, technical knowledge, and equipment to perform said tasks in a satisfactory manner. Consult your local distributor for product availability, additional product information, and technical support.

Warranty: ITW Polymer Technologies, a division of Illinois Tool Works Inc., warrants that its products meet their printed specifications. This is the sole warranty. This warranty expires one year after product shipment.

Warranty Claims: If any product fails to meet the above, ITW Polymer Technologies will, at its option, either replace the product or refund the purchase price. ITW Polymer Technologies will have no other liability for breach of warranty, negligence, or otherwise. All warranty claims must be made in writing within one year of the date of shipment. No other claims will be considered.

Disclaimer: ITW Polymer Technologies makes no other warranty, expressed or implied, and specifically disclaims any warranty of merchantability or fitness for a particular purpose.

Mediation and Arbitration: If any dispute arises relating to products and/or their quality, the purchaser shall ITW Polymer Technologies be liable for any indirect, incidental or consequential damages. Maintenance of Warranty: No distributor or sales representative has the authority to change the above provisions. No change in the above provisions will be valid unless in writing and signed by an officer or the technical director of ITW Polymer Technologies. No term of any purchase order shall serve to modify any provision of this document.

Mediation and Arbitration: If any dispute arises relating to products and/or their quality, the purchaser may a) initiate mediation under the then current Center for Public Resources (CPR) Model Procedure for Mediation of Business Disputes, or b) initiate a non-binding arbitration under the rules of the American Arbitration Association for the resolution of commercial disputes.
**INSTALLATION PROCEDURES FOR CHOCKFAST RED, BLUE, BLACK, AND ORANGE**

**Chockfast Red Grout mixing shall be performed as follows:**

A. All grout materials to be stored in a controlled environment at 65°F to 80°F for 48 hours prior to mixing. If these conditions cannot be met, contact a Chockfast Grouting Systems representative or ITW Philadelphia Resins.

B. An approved Chockfast technician should inspect the foundation and witness the mixing and pouring procedure.

C. The grout should be mixed in a clean, slow speed (15-20 RPM) portable mortar mixer. Chockfast Red may also be mixed in a wheelbarrow.

D. Thoroughly mix the Chockfast Red Resin and Hardener (3 to 4 minutes) with a medium size Jiffy mixer blade at 200-250 RPM.

E. Pour the Chockfast Red resin and hardener mixture into a mortar mixer. Add one (1) bag of aggregate at a time. Use 3-1/2 bags on the first batch to completely wet out the mixer. All other batches to be four (4) bag mixes.

F. Mixing time of Chockfast Red is dependent on ambient and material temperatures. Contact Chockfast Grouting Systems representative for appropriate mixing times.

**Chockfast Red Grout pouring shall be as follows:**

A. Concrete temperature shall be a minimum of 65°F and a maximum of 90°F unless approved by Chockfast Grouting Systems representative or ITW Philadelphia Resins.

Should concrete temperature be below 65°F, then a temporary environmental control structure needs to be built around machine. If the temperature is above 90°F, consult Chockfast Grouting Systems representative or ITW Philadelphia Resins. Expansion joint locations should be at 7' intervals unless conditions dictate that they be less than 7'.
When pouring Chockfast Blue on top of Chockfast Red, the following procedure should be followed:

The Chockfast Blue may be poured on top of the Chockfast Red when the Chockfast Red will support firm thumb pressure yet remains tacky. This will enable the two grouts to bond physically as well as chemically. If the Chockfast Red has become hard, then its surface must be abraded by chipping or sandblasting.

**Expansion Joints**

The expansion joints in the Chockfast Blue must coincide with expansion joints in the Chockfast Red, maximum 42" spacing. When pouring Chockfast Blue directly onto concrete, install styrofoam or redwood expansion joints at least every 42". Tape the top 1/2" to 1" of the expansion joint material with duct tape prior to pouring the Chockfast Blue. After the Chockfast Blue has cured this 1/2" to 1" is removed and the void filled with Phillybond 7C expansion joint compound.

**Chockfast Blue preparation, mixing and pouring shall be as follows:**

A. Prior to using, the Chockfast Blue should be stored for at least twenty-four (24) hours in an environmentally controlled area at 70°F to 80°F.

B. Mix Chockfast Blue in a Kol mixer; if not available use large Jiffy mixer blade.

C. Mix at 200-250 RPM for 3 to 4 minutes.

D. Do not scrape sides of buckets when pouring.
**Epoxy Chocking**

A. Inspect the top of the foundation/soleplate for a smooth, clean, oil free surface.

B. The bedplate should be clean and free from rust or flaky paint. A primer coat is acceptable. Radius sharp frets, fill pock marks and rust pits with Phillybond Blue 6A.

C. Consult ITW Philadelphia Resins Corporation technician for chock sizes.

D. All foundation bolts to be sealed with duct seal where the anchor bolt enters the bedplate. Glue foam damming to the underside of the bedplate before lowering the engine/compressor onto the foundation if applicable. Use only ITW Philadelphia Resins Corporation supplied open cell foam damming.

E. If the equipment is in place, then install foam damming at each anchor bolt.

F. Foam rubber dams should be visually checked with a flashlight for tightness.

G. If overpours are to be left on the chocks, use weather stripping on the front edge of the bedplate which will be in direct contact with chock overpour. If overpours are to be removed, the weather stripping acts as a guide for a grinding wheel to remove the overpour.

H. Spray all chock areas adequately (approximately 40 average size chocks per one can) with PR-225 Release Agent prior to installing the steel front dams. This prevents the chock from bonding to the bedplate, soleplate or grout should chock removal be required at a later time.

I. Leveling screws should be wrapped with duct tape. Anchor bolt areas exposed to chocks should be wrapped with 1/4" thick weather stripping and duct tape.
J. Chock front dams should be made of angle iron. Angle iron dams should be positioned to allow a minimum of 3/4” static head above the bedplate surface and a 3/4” clearance between the angle iron dams and the bedplate. Spray the inside of the vertical face of the angle iron dams with PRT-225 Release Agent.

K. Seal the bottom of the angle iron with a good quality silicone sealant.

**Pouring Chockfast Black/Orange Chocks**

A. Precondition the Chockfast Black/Orange for a minimum of 24 hours at 70°F to 80°F before pouring.

B. Check and record bedplate temperature. When pouring Chockfast Orange, refer to hardener ratio guide (Bulletin No. 665) for proper amounts of hardener. See Technical Bulletin No. 666 for Chockfast Black pouring. Consult Chockfast Grouting Systems, ITW Philadelphia Resins, or approved technician if bedplate temperature is over 90°F.

C. Pour the proper amount of hardener into the resin container and mix with the appropriate size Jiffy mixer at 200-250 RPM for 3 to 4 minutes. Care must be taken to minimize air entrapment (no vortexing of liquid during mixing). When pouring Chockfast Black, make sure all aggregate is completely mixed from the bottom of the cans. Always use all the hardener when pouring Chockfast Black. Never scrape material from inside can.

D. Pour chocks from one corner to maximize the escape of air through the opposite corner and through the open cell foam damming, and to assure good contact with the engine bedplate.
E. Cure time before torquing anchor bolts:

1. Chockfast Black and Orange

   48 hours at 60°F
   36 hours at 65°F
   24 hours at 70°F
   21 hours at 75°F
   18 hours at 80°F
   15 hours at 85°F
   12 hours at 90°F

F. Once chocks have cured, remove jackscrews completely out of chock, very important.

G. Torque anchor bolts per manufacturer's approved torque values or consult Chockfast Grouting Systems or ITW Philadelphia Resins.
EPOXY GROUT FLOW VS. CLEARANCE

Over the years epoxy grouting technology has made tremendous advances. From its beginning in the early 1950s to today, we've seen epoxy grout's ability go from a 2" deep pour to pours exceeding 2' deep. The grouting products of today are more crack resistant and generate a lower exotherm than did their predecessors.

Unfortunately, with all these technological advances, most grouting specifications have not been modified or corrected to reflect these changes. The one item to be affected most is grout flow vs. clearance.

When using a conventional epoxy grout, most engineers call for a clearance between the foundation and the equipment to be grouted of usually 1" to 1-1/2". This is fine when using a fluid type epoxy grout, however, when using a flowable epoxy grout, problems can be encountered when flowing distance is greater than 2', or when cooler temperatures are encountered.

As epoxy grout flows across concrete, it gives up a percentage of its resin to the concrete. To compensate for this, the grout installer usually reduces the prepackaged, premeasured aggregate to obtain a more fluid mix.

The following changes occur when this reduction of aggregate is allowed.

1. The physical properties of the epoxy grout are reduced.
2. The exothermic reaction of the grout is increased.
3. The cost of the installation is increased.
Aggregate is the least costly of all the components of epoxy grout. Increasing the clearance space under a piece of equipment to be grouted is less expensive than reducing the aggregate filler to improve flow.

With this in mind, the following is presented for your consideration.

**FLOW UNDER LARGE SOLE PLATES, RAILS, OR SKID MOUNTED UNITS USING FLOWABLE EPOXY GROUT**

2" of clearance required for the first 2' of distance.

1/2" of additional clearance is required for each additional foot of distance up to 8'.

### 69°C to 78°F. (Material & Base)

<table>
<thead>
<tr>
<th>Distance (ft)</th>
<th>2'</th>
<th>3'</th>
<th>4'</th>
<th>5'</th>
<th>6'</th>
<th>7'</th>
<th>8'</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clearance (in.)</td>
<td>2&quot;</td>
<td>2-1/2&quot;</td>
<td>3&quot;</td>
<td>3-1/2&quot;</td>
<td>4&quot;</td>
<td>4-1/2&quot;</td>
<td>5&quot;</td>
</tr>
</tbody>
</table>

For cooler temperatures (55°C to 68°F.), increase clearance by 3/4".

### Distance (ft)

<table>
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<tr>
<th>2'</th>
<th>3'</th>
<th>4'</th>
<th>5'</th>
<th>6&quot;</th>
<th>7&quot;</th>
<th>8&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clearance (in.)</td>
<td>2-3/4&quot;</td>
<td>3-1/2&quot;</td>
<td>4-1/4&quot;</td>
<td></td>
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</table>

For warmer temperatures (79°C to 90°F.), a good rule of thumb is 1/4" clearance for every foot above 2'.

### Distance (ft)

<table>
<thead>
<tr>
<th>2'</th>
<th>3'</th>
<th>4'</th>
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<td>3&quot;</td>
<td>3-1/4&quot;</td>
</tr>
</tbody>
</table>

* Skid mounted equipment can be grouted with lower clearance (2 to 3") using special techniques.
NOTE: Where clearance cannot be increased, a headbox should be used to enhance flow.

CAUTION: These figures are approximations and should not be considered as cold, hard facts. Field situations and conditions should be considered in determining flow space. Also, proper grout selection (i.e., high flow/flowable) will greatly influence the placeability of the epoxy grout.
Bulletin Introduction

The following CHOCKFAST and ESCOWELD Installation Procedures have been written as an aid for contractors and end-users that are applying epoxy grout in the field. Proper pour sizes, the use of expansion joints, and temperatures are emphasized in this bulletin.

Application procedures are included for ESCOWELD 7505E/7530, CHOCKFAST Red, CHOCKFAST Red SG, CHOCKFAST Blue, CHOCKFAST Black and CHOCKFAST Orange. The procedures are described in a sequence that follows Bulletin No. 643 entitled "Standardized CHOCKFAST Design For Integral Gas Engine Compressors." If only one product is being used, the section describing the application of that particular product may be used independently.

These procedures may be followed, modified or rejected by the Owner, Engineer, Contractor or their Representative since they and not ITW Polymer Technologies are responsible for proper grout installation planning and executing. When the planned procedures differ from those discussed herein, the User is urged to contact the local ITW Polymer Technologies Distributor or ITW Polymer Technologies to discuss alternate methods.

Preparations For Grouting

The following applies to all types of grouts.

Grout should be stored in a shaded or air-conditioned area with ambient temperatures between 65°-95°F (16°-35°C).

New concrete foundations must be adequately cured before setting mechanical units. ITW Polymer Technologies will not assume the responsibility for the foundation design, concrete formulation, or structural integrity of the machinery foundation. Tensile strength and dimensional stability in particular develop slowly, so allow ample time for proper concrete curing. Consult a CHOCKFAST / ESCOWELD Representative in reference to concrete cure times.

Under no circumstances should oil, grease, water, etc soil the surface of the foundation.

To achieve good grout bond, chip concrete foundation to a rough finish, exposing 50% aggregate (fractured, course aggregate), using a small chipping hammer or equivalent. Avoid deep holes or grooves that could hinder the flow of grout.

Remove loose concrete pieces from the top of the foundation and from within the grout pockets. All surfaces to come in contact with the grout must be blown clean of dust and particles with oil-free air or swept with bristled brush.

Surfaces to be grouted should be kept dry. If foundation should be left overnight, tarp surface to prevent dew moisture and surface contamination from other operating machinery.

The bedplate should be clean, bright metal. Although CHOCKFAST Black and Orange are designed to eliminate the need for costly machining of bedplates, proper smoothing of sharp frets left by previous steel chocks or pock marks left by previously used cement grouts is important. Any sharp frets on the equipment baseplate must be ground off smooth to avoid potential cracks in the epoxy chock.

Bedplates should be inspected while the maximum amount of space is available between chipped concrete and the raised equipment. Badly corroded bedplates should be sandblasted to a white metal finish. ITW Repair Compound should be faired into pockmarks left by the corrosive influence of cement grouts.

12 times the anchor bolt diameter from the top should be wrapped with 1/4" thick neoprene foam rubber. This will prevent epoxy grout from sticking to the bolt and allow it to free stretch when tensioned and to allow for baseplate thermal growth. The 1/4" neoprene rubber should be used all the way to the bottom of machinery bedplates when isolating bolts. See Bulletin No. 660 entitled "Common Hold Down Bolt Arrangements" for more information on the grouting of hold down bolts. For grouting large anchor bolts (typically 2" or M52) see Bulletin No. 615.

ITW POLYMER TECHNOLOGIES
130 Commerce Drive ● Montgomeryville, PA 18936 ● 215-855-8450 ● Fax 215-855-4688
www.chockfastgrout.com ● www.escoweld.com
Wooden forms need to be carefully constructed to prevent leakage. Where removal of forms will be required, coat inside of wooden form with sealer (lacquer) and then 2 coats of a good paste wax to prevent adhesion of grout.

For installations of CHOCKFAST Red OR ESCOWELD 7505E/7530, expansion joints should be provided at least every 7' (2.15m) in both directions. On all installations where the cured grout temperature may drop to 55°F (13°C) or below, the expansion joint spacing should not exceed 36" (1.1m). For installations of CHOCKFAST Blue, expansion joints should be provided at least every 42" (1.1m) and pours should not normally exceed 42" x 42" x 1-1/2" thick (1.1m x 1.1m x 36mm thick).

Expansion joints must go completely through the epoxy grout to the underlying concrete foundation. Expansion joints can be made from rigid Styrofoam, redwood, neoprene rubber, etc., but in any case, must be oil tight. Expansion Joint Compound should be used to seal expansion joints, so please see Bulletins 645 and 662 for information on this product and on expansion joints in general.

Where CHOCKFAST Blue is used as an overlay on top of CHOCKFAST Red, the expansion joints in both products must coincide with each other. Under no condition should the CHOCKFAST Blue bridge an expansion joint in the CHOCKFAST Red. The expansion joint must be effectively sealed to protect the underlying concrete against penetration by oil or other contaminants. It is highly recommended that a secondary seal be incorporated into the expansion joint design with the use of Expansion Joint Compound material. Guidance on expansion joint design and complete information on EXPANSION JOINT COMPOUND may be found in Bulletins No. 645 and 662.

Warning: Expansion joints should not be placed near anchor bolts, be bridged by sole plates or rails, or be penetrated by rebar. To do so defeats the purpose of the expansion joint. Some equipment manufacturers require that their equipment be mounted on continuous rails. In this case it may be advantageous to provide for longitudinal growth of the rail with the implementation of abbreviated expansion joints located at each end of the rail.

Steel reinforcing bars, known as rebar, are a familiar feature of concrete structures. They are used to improve the tensile and shear strength of the structure. The coefficients of linear thermal expansion of steel and concrete are similar and compatible, but epoxy resin products have a coefficient two to five times as great and this can cause cracks to form.

The tensile strength of epoxy grout is at least six times that of concrete, the shear strength at least five times, so horizontal rebar is not as important as it is with concrete. In fact, the use of horizontal rebar is NOT recommended when using epoxy grouts.

Where significant unloaded areas of ESCOWELD 7505E/7530, CHOCKFAST Red or CHOCKFAST Blue will occur it is advisable to tie them to the concrete with short vertical pieces of rebar or "All-Thread" rod.

**This should always be done on new concrete**, at corners and edges in general and prevents tensile failure of the concrete. Where possible the dowels should be arranged as follows: 12" apart; 3" in from the edge of foundation and not closer than 1" from the top surface of the epoxy grout.

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**CHOCKFAST Red Pouring Procedures**

CHOCKFAST Red is a three-component, high-strength, 100% solids, epoxy grouting compound. See Technical Bulletin No. 617 for its Physical Properties.

To ensure proper mixing and pouring viscosity of the CHOCKFAST Red system, pre-condition the resin, hardener and aggregate at 65°-95°F (18°-35°C) for 48 hours prior to mixing. It is extremely important to pre-condition the CHOCKFAST Red aggregate as they will determine the temperature of the grout mixture.

Pour the CHOCKFAST Red hardener into the CHOCKFAST Red resin and mix 3-4 minutes with a "Jiffy" type mixing blade and a 1/2" (12 mm) slow speed drill motor. Prior to starting the drill, completely submerge the mixing blade into the liquids. This will prevent the formation of air bubbles that could be transferred into the final product.

Caution: Under no circumstances should the mixing of the CHOCKFAST Red resin and hardener be attempted in the mortar mixer.

CHOCKFAST Red should be mixed with a slow speed (15-20 rpm) portable mortar mixer of sufficient size to enable the mixing of two complete units 3.2 cu.ft. (90.6 liters) of CHOCKFAST Red epoxy grout. Mixing quantities greater than two units in a single mortar mixer is not recommended due to of the increased chance for proportioning error.
With the blades of the mortar mixer stopped, add the pre-mixed resin and hardener and one (1) bag of aggregate. The blades of the mortar mixer may be started at this time.

Progressively add the remaining aggregate assuring a homogeneous mix. **Note:** On the initial first unit mix, a 1/2 bag of aggregate, 23 lb. (10.4 kilograms) should be withheld to facilitate wetting out of the mortar mixer.

It is important to minimize air entrapment in the mixed unit of CHOCKFAST Red, therefore a mortar mixer speed of 15-20 rpm is recommended. When the CHOCKFAST Red resin, hardener and aggregate have been pre-conditioned to 70°F (21°C) or above, the grout material should be mixed only long enough to wet out the 4 bags of aggregate. When the CHOCKFAST Red components are below 70°F (21°C) a slightly longer mixing time may be necessary to obtain a suitable flowability. Unnecessarily long mixing time can entrap an excessive amount of air. Once the CHOCKFAST Red is thoroughly mixed the blades of the mortar mixer should be stopped. To facilitate unloading of the mortar mixer bucket, the blades may be rotated slightly after the bucket has been tilted to assist in rapid grout extraction from the mixer.

**Note:** Small quantities of CHOCKFAST Red (one unit at a time) may be hand mixed in a wheelbarrow with a hoe. Mix the resin and hardener separately as outlined in paragraph 2.

Pour the CHOCKFAST Red as soon as possible after mixing. The pot life of this product is approximately 2-3 hours at 70°F (21°C). Although CHOCKFAST Red is generally self-leveling, at temperatures below 65°F (18°C) rakes or paddles can easily be used to achieve complete filling of prepared areas. CHOCKFAST Red may be used at thicknesses between 2.0” (50mm) and 18” (450mm). Individual pours should generally not exceed 18” thick x 7’ long x 7’ wide (450mm thick x 21.5m long x 2.15m).

Cure time for CHOCKFAST Red is as follows:
- 54 hours @ 60°F (16°C)
- 36 hours @ 70°F (21°C)
- 24 hours @ 80°F (27°C)
- 18 hours @ 90°F (32°C)

Protect recently poured grout from any sudden temperature changes and direct sunlight.

Additional layers of CHOCKFAST Red may be poured providing the previous pour has returned to ambient temperature and its surface has been roughed up with a chipping hammer, sand blasting or other approved means.

If a cap of CHOCKFAST Blue is to be poured onto the CHOCKFAST Red it may be poured as soon as the CHOCKFAST Red will support firm thumb pressure yet allow a slight denting of the CHOCKFAST Red surface, and still has a tacky feel to it. This will enable the two grouts to both chemically and physically bond.

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**ESCOWELD Pouring Procedures**

The Pouring Procedures for ESCOWELD 7505E/7530 are exactly the same as CHOCKFAST Red.

**CHOCKFAST Red SG Pouring Procedures**

CHOCKFAST Red SG is a three component, high strength, 100% solids epoxy grouting compound which is used to grout large machinery and to support soleplates in all types of foundation designs with clearances as little as 25mm (1”). CHOCKFAST Red SG has extremely high physical properties and negligible shrinkage, making it ideal for final positioning of critically aligned equipment within close tolerances. Skid mounted compressors, extruders, turbines, pumps, motors and crane rails are just a few types of equipment supported on CHOCKFAST Red SG.

CHOCKFAST Red SG may be used in any thickness greater than 1” (25mm); however, individual pours should generally not exceed 4” (100mm) in thickness and (5’1.5m) in length. Expansion joints should be provided at least every 5ft. (1.5m). When using CHOCKFAST Red SG for crane rail applications expansion joints may be placed every 10’ (3m).

The same mixing and pouring procedures used for CHOCKFAST Red should be used with CHOCKFAST Red SG.
**CHOCKFAST Blue Pouring Procedures**

CHOCKFAST Blue is a two-component, 100% solids, pourable epoxy-based grouting compound containing aggregate that is most commonly used for severe applications.

When pouring CHOCKFAST Blue on top of CHOCKFAST Red one of the following procedures should be followed: 1) CHOCKFAST Blue may be poured directly on CHOCKFAST Red when the CHOCKFAST Red will support firm thumb pressure, yet allow a slight denting in its surface, and still have a tacky feel. This will allow the two grouts to chemically as well as physically bond. 2) If the CHOCKFAST Red has become hard then the surface must be abraded by chipping or sandblasting to establish a suitable surface profile, prior to pouring the CHOCKFAST Blue.

CHOCKFAST Blue contains aggregate pre-mixed into the resin. To ensure proper mixing and pouring viscosity, rotate the resin container upside-down during the pre-conditioning period to aid in mixing. This will compensate for the aggregate that may have settled during storage and transportation. Thoroughly mix hardener and resin until homogeneous color and texture is apparent (3-1/2 to 4 minutes) using a KOL mixer or large Jiffy mixer blade in 3/4" (18 mm) drilling machine. It is important that the KOL mixer blade contact the entire surface on the inside and bottom of the CHOCKFAST Blue can to insure a homogeneous mix. **Never scrape mixed material from the sides or bottom of the container.**

Use grout as soon as possible after mixing. CHOCKFAST Blue pot life is approximately 35 to 50 minutes at 70°F (21°C). Cure time for CHOCKFAST Blue is as follows:

- 36 hours @ 60°F (16°C)
- 24 hours @ 72°F (21°C)
- 16 hours @ 80°F (27°C)
- 12 hours @ 90°F (32°C)

**NOTE:** For additional design considerations, please see Technical Bulletin No. 643 entitled “CHOCKFAST Foundation Design for Gas Engine Compressors.”

**CHOCKFAST Black Pouring Procedures**

CHOCKFAST Black is a specially formulated 100% solids, two-component, inert-filled casting compound, developed for use as a chocking or shimming material.

Once the machinery is in position and aligned, install appropriately sized dams around each anchor bolt to create a mold for the chocks. Dams are typically made from strips of open-cell foam strip placed under the machinery on the sides and back of the mold. It may be convenient to glue these strips to the underside of the machinery if it is to be lowered into position. The desirable chock thickness is 50mm (2"). Foam rubber dams should be checked with a flashlight for tightness.

Jacking bolts which are inside the chock area must be wrapped with duct tape to isolate them from the epoxy chock.

An aerosol release agent, as supplied by ITW Polymer Technologies, should be sprayed into each prepared chock area. Only spray enough release agent to provide a fine misting of the chock area without puddling.

Front dams should now be positioned. Angle iron should be used and it should be large enough to allow for a 3/4" (20 mm) head above the machinery bedplate surface. Dams should be positioned between 3/4" (20 mm) and 1" (25 mm) away from the bedplate edges.

The overpour area on each chock can be cut off with an abrasive disc in order to provide easy inspection of chock/machinery interfaces and eliminate possible cracking from lateral expansion of equipment

**NOTE:** For appropriate sizing of chocks, please see Bulletin No. 643 entitled “Standardized CHOCKFAST Design for Integral Gas Engine Compressors” or contact ITW Polymer Technologies' Engineering Department or your Authorized CHOCKFAST Distributor.

**Equipment alignment and bolt integrity are the responsibility of the equipment owner.**

Add the complete container of hardener to resin. A small or medium Jiffy mixer blade, supplied by ITW Philadelphia Resins, inserted in a 1/2" (12 mm) variable speed drill is recommended for mixing.
Maximum drill speed should be kept below 250 rpm in order to minimize air entrapment and mixing time should be 3 to 4 minutes.

Pour mixed materials into chock mold, from one corner only, to maximize the escape of air through the opposite corner. The air will migrate through the open-cell foam damming and assure good surface contact with the equipment bedplate. **Never scrape mixed materials from the sides or bottom of the container when pouring.**

5. Before torquing bolts and executing final alignment check, allow chocks to cure at least:

- 48 hours @ 60°F (16°C)
- 36 hours @ 65°F (18°C)
- 24 hours @ 70°F (21°C)
- 21 hours @ 75°F (23°C)
- 18 hours @ 80°F (26°C)
- 15 hours @ 85°F (29°C)
- 12 hours @ 90°F (32°C)

**NOTE:** A good test for proper cure is to test with a Barcol hardness gauge if there is a question regarding cure. A **MINIMUM** Barcol reading of 24 on CHOCKFAST Black indicates that sufficient cure has been achieved to allow release of jacking screws and torque of hold down bolts.

**CHOCKFAST Orange Pouring Procedures**

The standard pour thickness for a CHOCKFAST Orange epoxy chock is 1-1/4” (31mm). Should the designed thickness be greater than 2-3/4” (70mm) please consult the CHOCKFAST Representative or ITW Polymer Technologies. The amount of hardener mixed with the CHOCKFAST resin must be measured according to chock thickness and equipment baseplate temperature.

Refer to Bulletin NO. 693 for hardener proportioning. All other procedures for the use of CHOCKFAST Orange are the same as for CHOCKFAST Black, ie, preconditioning, sizing chocks, forming, mixing, curing, etc.

**Reference**

For design considerations and application details please request Bulletin No. 643 entitled “Standard Chock Design for Integral Gas Engine Compressors.” or contact ITW Polymer Technologies’ Engineering Services Department.

**Date**

06/2006
This bulletin promotes the use of CHOCKFAST® Red or ESCOWELD 7505E/7530 as a grout for setting large anchor bolts in large, deep anchor bolt pockets. Typical 2-part epoxy chocking compounds (like CHOCKFAST Gray), while good for use in smaller holes, should not be used in such cases because the exothermic heat created by their large mass may crack the epoxy.

Deep anchor bolt pockets - up to 2 meters (6 ft) long and 200mm (8") wide - may be filled conveniently with a single placement of CHOCKFAST® Red or ESCOWELD 7505E/7530.

The gentle exotherm of CHOCKFAST® Red and ESCOWELD 7505E/7530 allows grout placement around large bolts to be executed with a single pour in extremely hot and humid climates with negligible shrinkage.

**Design Considerations**

Most process machinery is critically aligned within hundredths of a millimeter tolerance. Therefore, final horizontal leveling pours in contact with critically aligned baseplates, rails, soleplates or coupled machinery should be limited to a depth of 100mm (4").

Two separate grout pours are required:

1. The first pour in the Anchor Bolt Pocket filled is made using CHOCKFAST® Red or ESCOWELD 7505E/7530

2. The Final Leveling Pour under the critically aligned machinery is then made using CHOCKFAST® RED or ESCOWELD 7505E/7530

Wrap bolt with tape to allow it to free-stretch during tensioning.
Date 06/2006

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Suggestions concerning the use of products are not warranties. The purchaser assumes the responsibility for determining suitability of products and appropriate use. ITW Polymer Technologies' sole liability, for breach of warranty, negligence or otherwise, shall be the replacement of product or refund of the purchase price, at ITW Polymer Technologies' election. Under no circumstances shall ITW Polymer Technologies be liable for any indirect, incidental or consequential damages.

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CHOCKFAST Red

A Deep-Pour Epoxy Grout

Technical Bulletin # 617R

Product Description

CHOCKFAST Red is a three-component, high strength, 100% solids, epoxy grouting compound used to grout large machinery and to support soleplates in all types of foundations. CHOCKFAST Red has an extremely high compressive strength. This along with negligible shrinkage makes it ideal for installing critically aligned machinery within very close tolerances.

Use & Benefits

CHOCKFAST Red has the following advantages when compared to conventional cement grouts:

- Impervious to oil
- Cures at least three times as quickly
- No mixing ratios to measure
- Grouts machinery in final aligned position
- High physical strength
- High impact strength
- Resistance to many more chemicals
- Strong bond to metal and concrete
- Unaffected by weathering and freeze / thaw cycling
- Stated physical properties assured
- Superior resistance to fatigue

Design Considerations

CHOCKFAST Red is quick curing, relative to cement grouts, but the cure is thermally gentle. This allows thick pours to be made without causing the stress cracks often associated with a hot-curing epoxy grout. CHOCKFAST Red may be used in thickness greater than 2 inches (50mm), however, individual pours should generally not exceed 18 inches (46cm) in thickness and 7 feet (2.2m) in length. When grouting critically aligned machinery coupled to another machine, it is advisable to limit the final leveling pour in accordance with the instructions in Bulletin No. 615 (latest revision).

CHOCKFAST Red contains no diluents that could interfere with the curing mechanism or that could cause material loss during or after cure. Therefore, machinery may be positioned at its final elevation before pouring because the shrinkage is negligible. Critical alignments are maintained during machinery operation due to its high dimensional stability and resistance to creep and vibration.

Application Instructions

CHOCKFAST Red may be mixed with contractor's hoe and wheelbarrow or in a small portable mortar mixer. Pre-condition resin, hardener and aggregate to 65°-80°F (18°-27°C) for 48 hrs. before mixing. Thoroughly mix hardener with resin first before mixing in aggregate. Where a very flowable mix is required the aggregate content may be reduced accordingly. However, in load-bearing areas a maximum reduction to 3-1/2 bags is recommended. Please contact the CHOCKFAST Distributor or ITW Polymer Technologies if less than 3-1/2 bags are being considered. See Bulletin No. 642 for mixing and installation procedures.
**Physical Properties**

- **Compressive Strength**: 15,250 psi (1,072 kg/cm²) ASTM C-579 MOD
- **Compressive Modulus of Elasticity**: 2,000,000 psi (140,600 kg/cm²) ASTM C-579 MOD
- **Linear Shrinkage**: Not Measurable ASTM D-2566
- **Coefficient of Linear Thermal Expansion**: \(11.2 \times 10^{-6} \text{ / } ^\circ\text{F} \text{ at } 32\text{ } ^\circ\text{F} \text{ to } 140\text{ } ^\circ\text{F}\) ASTM D-696
  
  \(20.1 \times 10^{-6} \text{ / } ^\circ\text{C} \text{ at } 0\text{ } ^\circ\text{C} \text{ to } 60\text{ } ^\circ\text{C}\) ASTM D-638
- **Flexural Strength**: 4,025 psi (283 kg/cm²) ASTM C-580
- **Flexural Modulus of Elasticity**: 2,000,000 psi (140,600 kg/cm²) ASTM C-580
- **Tensile Strength**: 1,890 psi (133 kg/cm²) ASTM D-638
- **Izod Impact Strength**: 4.6 in.lb/in. (0.02 N.m/mm) ASTM D-256
- **Service Temperature**: Up to 140°C (60°C)
- **Fire Resistance**: Self-Extinguishing ASTM D-635
- **Specific Gravity**: 2.06

**Product Information**

- **Unit Coverage**: 1.6 ft³ or 2,765 in³ (45.3 Liters)
- **Application Temperature**: 55°F (13°C) to 95°F (35°C)
- **Unit Packaging**
  - Resin (NH): 1.6 gal (6.1 L) in a 3 gal pail
  - Hardener (NH): 0.9 gal (3.5 L) in a plastic tray inserted into the top of the resin can
  - Aggregate: (4) 46 lb. (21 kg) bags
- **Unit Weight**
  - Resin: 15.4 lbs (7 kg)
  - Hardener: 7.6 lbs (3.4 kg)
  - Aggregate: 184 lbs (84 kg)
- **Shipping Weight**: 207 lbs (94 kg)
- **Cure Time (approximate)**
  - 54 hours @ 60°F (16°C); 36 hours @ 72°F (21°C)
  - 24 hours @ 77°F (25°C); 18 hours @ 32°C (90°F)
- **Pot Life**: Approximately 3 hours @ 21°C (70°F)
- **Shelf Life**: 2 years in dry storage
- **Clean Up**: Water or IMPAX IXT-59 or similar epoxy solvent

**Date**

- **06/2006**

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Bulletin Description

All major epoxy grouts on the market today have sufficient Compressive Strength to bear the weight of the equipment they support. It is more important to compare grouts based on how compatible they are with both the concrete and steel it is connected to. Therefore, the most important design criteria for an epoxy grout are those physical properties that directly affect the grout’s compatibility with concrete and steel; Coefficient of Linear Thermal Expansion and Peak Exotherm.

Coefficient of Expansion

Coefficient of Linear Thermal Expansion (CTE) is the amount something will expand or contract when it is subjected to a 1°F increase or decrease in temperature. It is expressed in units of inch per inch, degree of temperature change of the material. The following is a listing of the CTE’s for concrete, steel and various epoxy grouts as published by their respective manufacturers:

<table>
<thead>
<tr>
<th>Material</th>
<th>CTE (in./in. °F x 10^-6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete</td>
<td>5.9</td>
</tr>
<tr>
<td>Steel</td>
<td>6.1</td>
</tr>
<tr>
<td>CHOCKFAST RED</td>
<td>11.2</td>
</tr>
<tr>
<td>ESCOWELD 7505E/7530</td>
<td>14.6</td>
</tr>
<tr>
<td>OTHER EPOXY GROUTS</td>
<td>16.9</td>
</tr>
</tbody>
</table>

The closer the CTE of two materials are, the more compatible those materials are. They are compatible because they will tend to grow and shrink together as the outside temperature increases and decreases.

Peak Exotherm

Peak Exotherm (PE) is the maximum temperature that an epoxy reaches during its cure. This is also the point at which the epoxy changes from liquid to solid. The equipment operating temperature that produces no thermal stress is be equal to the peak exotherm temperature for that epoxy. For this reason CHOCKFAST RED and ESCOWELD 7505E/7530 were formulated to have the lowest peak exotherm possible (95°F to 130°F depending on depth).

EXOTHERM CURVES: CF Red & Escoweld vs. Other Epoxy Grouts
(Temperatures taken on 16' x 16' x 6” slab)

95°F Peak Exotherm of CHOCKFAST Red & ESCOWELD 7505E/7530
210°F Peak Exotherm of other “Non-shrink” Grouts
Application Instructions

Because CHOCKFAST Red and ESCOWELD 7505E/7530 are gently curing epoxy grouts, their peak exotherm temperatures are usually very close to the foundation temperature underneath operating equipment. This small difference between the peak exotherm temperature and the operating temperature results in minimum foundation stress.

When machinery is not operating, freezing conditions may occur. In this case, the epoxy grout will want to contract more than the concrete or steel because it has a higher CTE’s. As a result of the epoxy bond to the concrete, the epoxy will be put into compression and the concrete into tension.

When the temperature drops...

The Epoxy is in Compression

...Epoxy Grout shrinks faster than concrete

The Concrete is in Tension

...which forces the concrete to restrict the shrinking of the Epoxy

If the temperature drops far enough, the epoxy may build up sufficient tension to crack, or shear the bond line with the concrete. By using expansion joints installed in accordance with ITW Philadelphia Resins’ procedures, stress cracking can be avoided and longer life can be expected from properly designed foundations. Please seeBulletins No. 662 and 645 for more information on expansion joints.

Example Calculating Linear Contraction of Epoxy

The following example calculates the Linear Contraction of epoxy grout starting at the grout’s Peak Exotherm and returning to a foundation temperature of 70°F. The formula for Linear Contraction is:

\[
\text{Linear Contraction} = \text{Coefficient of Thermal Expansion (CTE)} \times \text{Change in Temperature (\(\Delta T\))}
\]

<table>
<thead>
<tr>
<th>Grout</th>
<th>CTE</th>
<th>(\Delta T) (PE - 70°F)</th>
<th>Linear Contraction</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHOCKFAST RED</td>
<td>(11.2 \times 10^{-6} \text{ in/in/°F})</td>
<td>(95 - 70°F) = 28.0 \times 10^{-5} \text{ in/in}</td>
<td></td>
</tr>
<tr>
<td>Other Grout</td>
<td>(27.0 \times 10^{-6} \text{ in/in/°F})</td>
<td>(210 - 70°F) = 378.0 \times 10^{-5} \text{ in/in}</td>
<td></td>
</tr>
</tbody>
</table>

This shows that the linear contraction of the competitive grout is 13 times as more than the linear contraction of the CHOCKFAST Red. Of course, if the foundation temperature were 95°F, there would be no linear contraction of CHOCKFAST Red.

Conclusion

A foundation that is healthy over the long-term is the result of a low peak exotherm coupled with a low Coefficient of Linear Thermal Expansion. CHOCKFAST Red and ESCOWELD 7505E/7530 were formulated to maintain these properties in single pours 18" deep if necessary. The compatibility of these grouts with concrete ensures a problem-free foundation for many years of operation.

Date 06/2006

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CHOCKFAST Blue

Epoxy Grout for Severe Applications

Technical Bulletin # 616K

Product Description

CHOCKFAST Blue is a two-component, aggregate-filled, pourable epoxy grouting compound for severe applications. This highly developed material is often used to replace steel soleplates or rails and is used as an epoxy foundation capping material that is resistant to high operating temperatures. Its unique properties permit usage directly under highly stressed machinery mounting surfaces.

Use & Benefits

Typical applications include the grouting of diesel engines, compressors, generators, gears, pumps and most other heavy equipment. CHOCKFAST Blue is unexcelled under heavy reciprocating and rotary machinery due to its excellent resistance to creep, fatigue and shock forces. It is also an excellent support surface for the CHOCKFAST Black epoxy chock.

Design Considerations

CHOCKFAST Blue is normally used in a thickness range of 1" to 1-1/2" (25-38mm). Thicker sections can be constructed with CHOCKFAST BLUE if proper layering techniques are used. Please contact ITW Polymer Technologies for additional application instructions.

Long pours should be divided into sections not exceeding 3'-6" (1.1m) in length. Longer, thicker or thinner pours are possible, but ITW Polymer Technologies should be consulted before deciding upon them. The pourable viscosity of the CHOCKFAST BLUE provides for essentially 100% surface contact. Because CHOCKFAST BLUE has negligible shrinkage, final alignment may be set before grouting.

Application Instructions

For CHOCKFAST BLUE temperatures that will be between 120°F-140°F (49°C-60°C) during engine operation the static loading shall not normally exceed 500 psi (35 kg/cm²) which is perfectly practical for most machinery. Below 120°F (49°C), loads up to 2,000 psi (140 kg/cm²) are permissible, but 1,200 psi 85 (kg/cm²) should not be exceeded without reference to ITW Polymer Technologies, who are always available for consultation on any application.

Precondition resin and hardener to 70°F-80°F (21°C-27°C) for 24 hours before mixing. The hardener should be added to the resin and power mixed until a homogeneous color and texture are apparent. Because the resin is aggregate–filled, heavy duty mixing equipment is required. Mixing for 3-5 minutes with a Kol mixer or a large Jiffy mixer blade in a 3/4" drilling machine is usually sufficient.

Physical Properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compressive Strength</td>
<td>9,000 psi (1336 kg/cm²)</td>
<td>ASTM C-579 MOD</td>
</tr>
<tr>
<td>Compressive Modulus of Elasticity</td>
<td>1,640,000 psi (115300 kg/cm²)</td>
<td>ASTM C-579 MOD</td>
</tr>
<tr>
<td>Linear Shrinkage</td>
<td>0.0001 in./in. (0.0001 mm/mm )</td>
<td>ASTM D-2566</td>
</tr>
<tr>
<td>Coefficient of Linear Thermal Expansion</td>
<td>15.4 X 10⁶°F @ 32°F to 140°F</td>
<td>ASTM D-698</td>
</tr>
<tr>
<td>Flexural Strength</td>
<td>4,920 psi (345 kg/cm²)</td>
<td>ASTM C-580</td>
</tr>
<tr>
<td>Flexural Modulus of Elasticity</td>
<td>1.7 X 10⁶ psi (120300 kg/cm²)</td>
<td>ASTM C-580</td>
</tr>
<tr>
<td>Tensile Strength</td>
<td>3,156 psi (225 kg/cm²)</td>
<td>ASTM D-640</td>
</tr>
<tr>
<td>Izod Impact Strength</td>
<td>3.4 in.lbs./in. (0.15 Newton m/cm )</td>
<td>ASTM D-258</td>
</tr>
<tr>
<td>Fire Resistance</td>
<td>Self-extinguishing</td>
<td></td>
</tr>
<tr>
<td>Specific Gravity</td>
<td>2.0</td>
<td></td>
</tr>
</tbody>
</table>

ITW POLYMER TECHNOLOGIES
130 Commerce Drive • Montgomeryville, PA 18936 • 215-855-8450 • Fax 215-855-4688
www.chockfastgrout.com
Product Information

COVERAGE 800 in. (\(13.1\) Liters)

APPLICATION TEMPERATURE 55°F (13°C) to 95°F (35°C)

UNIT PACKAGING Resin (NH): 5 gal (18.9 L) in a 5 gal pail
Hardener (NH): 0.34 gal (1.3 L) in ½ gal can
Aggregate is premixed in the resin

UNIT WEIGHT Resin: 55.5 lbs (25 kg)
Hardener: 2.9 lbs (1.3 kg)

SHIPPING WEIGHT 62 lbs (28 kg)

CURE TIME (approximate) 36 hrs. @ 60°F (16°C)
24 hrs. @ 72°F (21°C)
16 hrs. @ 80°F (27°C)
11 hrs. @ 90°F (32°C)

POT LIFE 35-50 minutes @ 70°F (21°C)

CLEAN UP IMPAX IXT-59 or other epoxy solvent

SHELF LIFE Excess of 2 years in dry storage

Reference

For design considerations and application details please request Bulletin # 640 and #642 or contact ITW Polymer Technologies’ Engineering Services Department.

Date 06/2006
CHOCKFAST® Orange

The Premier Industrial Chocking Compound

Technical Bulletin #1032

Product Description

CHOCKFAST ORANGE is a specially formulated 100% solids, two component inert filled casting compound developed for use as a chocking or grouting material. CHOCKFAST is designed to withstand severe marine and industrial environments involving a high degree of both physical and thermal shock. The compound is non-shrinking and has very high impact and compressive strength.

Years of successful in-service experience have shown the use of CHOCKFAST ORANGE to be a far superior yet less expensive method of establishing and permanently retaining precise equipment alignment under extreme conditions.

Use & Benefits

CHOCKFAST ORANGE was developed as a chocking or grouting compound for use under industrial engines and other types of machinery in depths of ½" to 4" (12mm to 100mm). The compound is used under diesel and gas engines, reduction gears, generators, compressors, pumps, bearing blocks, crane rails and numerous other applications.

CHOCKFAST ORANGE requires no special tools or special skills as does chocking with steel. When cast, CHOCKFAST ORANGE flows readily into the chock area filling voids and conforming to all irregularities. This eliminates the machining of base plates or foundations for a perfectly fitted chock.

Design Considerations

For design considerations and application details please request 642 for Industrial applications or contact ITW Polymer Technologies’ Engineering Services Department.

Application Instructions

Using open-cell foam damming material, build a dam around 3 sides of the area to be chocked. Wrap the anchor bolt with tape so the Chockfast will not stick to it. Install a metal dam along the front of the chock approximately ½" to ¾" (12mm to 18mm) from the mounting flange. Seal the flange with strip caulking, or Silicone to prevent leaks. Install foam in the overpour area to the top of the mounting flange to prevent the Chockfast from leaking.

Mix the Chockfast as directed on the can. See technical Bulletin #665 to determine the proper amount of hardener to use. Slowly pour the Chockfast into one end of the overpour area and allow it to flow across and under the mounting flange.
## Physical Properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
<th>Test Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compressive Strength</td>
<td>19,000 psi</td>
<td>ASTM D-695MOD</td>
</tr>
<tr>
<td>Compressive Modulus of Elasticity</td>
<td>533,000 psi</td>
<td>ASTM D-695</td>
</tr>
<tr>
<td>Linear Shrinkage</td>
<td>0.0002 in/in</td>
<td>ASTM D-2566</td>
</tr>
<tr>
<td>Coefficient of Linear Thermal Expansion</td>
<td>17.1 x 10^-6/F°F @ 32°F to 140°F (30.8 x 10^-6°C @ 0°C to 60°C)</td>
<td>ASTM D-696</td>
</tr>
<tr>
<td>Flexural Strength</td>
<td>7,615 psi</td>
<td>ASTM C-580</td>
</tr>
<tr>
<td>Flexural Modulus of Elasticity</td>
<td>8.6 x 10^3 psi</td>
<td>ASTM C-580</td>
</tr>
<tr>
<td>Tensile Strength</td>
<td>4,970 psi</td>
<td>ASTM D-638</td>
</tr>
<tr>
<td>Shear Strength</td>
<td>5,400 psi</td>
<td>FED-STD-406 (Method 1041)</td>
</tr>
<tr>
<td>Izod Impact Strength</td>
<td>6 in./ls./in.</td>
<td>ASTM D-256</td>
</tr>
<tr>
<td>Shock Resistance</td>
<td>Pass MIL-S-901C (Navy) High Impact Shock Test, Grade A, Type A, Class 1</td>
<td></td>
</tr>
<tr>
<td>Thermal Shock</td>
<td>Pass -0°F to 212°F</td>
<td>ASTM D-746</td>
</tr>
<tr>
<td>Vibration</td>
<td>Meets MIL-STD-167</td>
<td></td>
</tr>
<tr>
<td>Fire Resistance</td>
<td>Self extinguishing</td>
<td>ASTM D-635</td>
</tr>
<tr>
<td>Specific Gravity</td>
<td>1.58</td>
<td></td>
</tr>
<tr>
<td>Barcol Hardness</td>
<td>40+ fully cured - 35 minimum</td>
<td>ASTM D-2583</td>
</tr>
</tbody>
</table>

## Product Information

### UNIT COVERAGE
- Small Unit: 120 cu.in (1,966 cc)
- Large Unit: 260 cu.in (4,261 cc)

### APPLICATION TEMPERATURE
- 55°F (13°C) to 95°F (35°C)

### PACKAGING per Unit
- Small Unit: Resin (NH) - 7.2 lbs. (3.3 kg), 0.53 gal (2 L) in a 1 gal can, Hardener (H) - 0.5 lbs. (0.23 kg), 7.7 oz (0.23 L) in an 8 oz plastic bottle
- Large Unit: Resin (NH) - 14.4 lbs. (6.5 kg), 0.53 gal (2 L) in a 1 gal can, Hardener (H) - 0.99 lbs. (0.45 kg), 15.4 oz (0.23 L) in an 16 oz plastic bottle

### UNIT SHIPPING WEIGHT
- Small Unit: 9 lbs (4 kg)
- Large Unit: 17 lbs (7.7 kg)

### CURE TIME (approximate)
- 48 hours @ 60°F (15°C)
- 24 hours @ 70°F (21°C)
- 36 hours @ 65°F (18°C)
- 18 hours @ 80°F (26°C)

### POT LIFE
- 30 min. @ 70°F (21°C)

### SHELF LIFE
- 2 years

### CLEAN UP
- IMPAX IXT-59 or similar epoxy solvent

## Reference

For design considerations and application details please request Bulletin No. 1032, Page 3. For technical support, visit the website [here](http://www.itwpt.com). For product availability, additional product information, and technical support, contact your local distributor or ITW Polymer Technologies' Engineering Services Department.

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**Date:** 02/2007
**Product Description**

CHOCKFAST® Black is a specifically formulated 100% solids, inert filled casting compound developed for use as a chocking material. It is a cost-effective method of maintaining permanent precise alignment of critical equipment. It will withstand severe environments involving high physical and thermal shock.

**Use & Benefits**

This unique product is used under gas and diesel engines, compressors, generators, turbines, motors, pumps and various other types of equipment. CHOCKFAST® Black is ideal for use under these hot running reciprocating and rotating machines because of its excellent resistance to creep and fatigue at high operating temperatures. It is non-shrinking and has a very high impact and compressive strength. Resin chocks made with CHOCKFAST® Black reduce possible bearing or crankshaft damage because they (1) minimize heat build-up on foundations, (2) assure precise and unsurpassed contact with bedplates, and (3) provide a high coefficient of friction to help hold engines down tight. The excellent flowability of CHOCKFAST® Black allows it to fill voids in the chock area and conform to all surface irregularities.

**Design Considerations**

CHOCKFAST® Black was designed to be a thick pour liquid chocking material. A chock depth of 2" (50mm) is standard; however, thinner or thicker pours can be made satisfactorily. The 2" (50mm) chock elevates equipment above the underlying foundation, which allows a free flow of air thereby reducing possible foundation humping problems.

Contact ITW Polymer Technologies for information regarding pours less than 1-1/4" (32mm) in thickness or greater than 2-1/2" (62mm) in thickness.

**Installation Instructions**

Construct a chock mold around one or more anchor bolts using open cell foam damming material on three sides. Wrap the shank of the anchor bolt with tape, cover with foam pipe insulation or coat with non-melt grease to prevent the CHOCKFAST from sticking to it and to seal the bolt hole. Place a metal dam 1/2" to ¾" (12mm to 18mm) from the mounting pad and seal with caulk. Spray the inside of the mold and front metal dam with Release Agent. Mix and pour the epoxy as directed.

---

**Diagram:**

- Side and back dams should be made from open-cell foam.
- Wrap all bolt threads with tape or Armalflex tubing insulation.
- ½ inch (12 mm) Minimum
- 2 inches (50 mm) Maximum
- ½ inch to ¾ inch (12 mm to 18 mm) Maximum

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www.chockfastgrout.com
Physical Properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compressive Strength</td>
<td>17,300 psi (1,216 kg/cm²)</td>
<td>ASTM C-695</td>
</tr>
<tr>
<td>Compressive Modulus of Elasticity</td>
<td>800,000 psi (56,000 kg/cm²)</td>
<td>ASTM C-695</td>
</tr>
<tr>
<td>Linear Shrinkage</td>
<td>0.00018 in/in (0.00018 mm/mm)</td>
<td>ASTM D-2566</td>
</tr>
<tr>
<td>Coefficient of Linear Thermal Expansion</td>
<td>32°F to 140°F @ 15.0 X 10⁻⁶/F°</td>
<td>ASTM D-696</td>
</tr>
<tr>
<td>Flexural Strength</td>
<td>6,200 psi (435 kg/cm²)</td>
<td>ASTM C-580</td>
</tr>
<tr>
<td>Flexural Modulus of Elasticity</td>
<td>1,400,000 psi (101,300 kg/cm²)</td>
<td>ASTM C-580</td>
</tr>
<tr>
<td>Tensile Strength</td>
<td>2,900 psi (204 kg/cm²)</td>
<td>ASTM D-638</td>
</tr>
<tr>
<td>Shear Strength</td>
<td>5,000 psi (350 kg/cm²)</td>
<td>FED-STD-406</td>
</tr>
<tr>
<td>IZOD Impact Strength</td>
<td>5.1 in.lbs./in (0.23 N.m/cm)</td>
<td>ASTM D-256</td>
</tr>
<tr>
<td>Fire Resistance</td>
<td>Self Extinguishing</td>
<td>ASTM D-635</td>
</tr>
<tr>
<td>Specific Gravity</td>
<td>1.94</td>
<td></td>
</tr>
<tr>
<td>Barcol Hardness</td>
<td>55 Full Cure</td>
<td>ASTM D-2583</td>
</tr>
<tr>
<td>Maximum Operating Temperature</td>
<td>200°F (94°C)</td>
<td></td>
</tr>
</tbody>
</table>

Product Information

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit Coverage</td>
<td>265 in³ (4,343 cm³)</td>
</tr>
<tr>
<td>Application Temperature</td>
<td>55°F (13°C) to 95°F (35°C)</td>
</tr>
<tr>
<td>Unit Packaging</td>
<td>Resin (NH) – 18.2 lbs. (8.3 kg), 1.2 gal (4.5 L) in a 2gal pail Hardener (H) – 0.74 lbs. (0.34 kg), 11.5 oz (3.4 L) in an 16 oz plastic bottle</td>
</tr>
<tr>
<td>Shipping Weight</td>
<td>21 lbs. (9.5 kg)</td>
</tr>
<tr>
<td>Cure Time (approximate)</td>
<td>48 hours @ 60°F (15°C)</td>
</tr>
<tr>
<td></td>
<td>36 hours @ 65°F (18°C)</td>
</tr>
<tr>
<td></td>
<td>24 hours @ 70°F (21°C)</td>
</tr>
<tr>
<td></td>
<td>18 hours @ 80°F (26°C)</td>
</tr>
<tr>
<td>Pot Life</td>
<td>45 min. @ 70°F (21°C)</td>
</tr>
<tr>
<td>Shelf Life</td>
<td>Exceed 18 months</td>
</tr>
<tr>
<td>Clean Up</td>
<td>IMPAX IXT-59 or similar epoxy cleaner</td>
</tr>
</tbody>
</table>

Reference

For design considerations and application details please request Bulletin No. 642 or contact ITW Polymer Technologies' Engineering Services Department.

Date

06/2006
Maintenance of alignment in reciprocating machinery such as large diesel engines and compressors is of critical importance to operators. Without it, the possibility of broken crankshafts, worn bearings and associated machinery downtime greatly increases.

Benefits of CHOCKFAST

With CHOCKFAST Resin Chocks, the maintenance of equipment alignment is improved dramatically when compared to installations that use steel chocks. There are many cases of improved alignment provided by CHOCKFAST when used as a direct retrofit for steel chocks under troublesome engines.

Reasons For Success

The key reason for the success of CHOCKFAST Resin Chocks is that they produce a higher lateral resistive force when compared to steel chocks under cast iron bedplates. The coefficient of friction between CHOCKFAST Resin Chocks and cast iron is 0.7 as compared to 0.15 for steel to cast iron. An independent engine manufacturer during an extensive test program (Sulzer Brothers - Winterthur, Switzerland), established these coefficients. The following examples illustrate the superior total lateral resistive forces derived from the use of resin chocks:

engine Deadweight plus Bolt Tension work to hold the engine in place.
Friction also helps hold the engine in place.
Friction plus Engine Deadweight plus Bolt Tension = Total Lateral Resistive Force
The higher the Total Lateral Resistive Force, the higher the forces available to maintain alignment.

Because CHOCKFAST fills every little crease and crevice in the mounting foot, the friction between CHOCKFAST and cast iron is much larger than between steel and cast iron.
Examples

Let's compare the total resistive force available from CHOCKFAST Resin Chocks to steel chocks for three Diesel Engines:

**Example 1: DRESSER CLARK HBA8**

<table>
<thead>
<tr>
<th>Description</th>
<th>Calculation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engine Deadweight</td>
<td>170,000 lbs.</td>
</tr>
<tr>
<td>Hold Down Bolts &amp; Tension Per Bolt</td>
<td>(19) 1-1/2” Main Frame Bolts @ 25,560 lbs/bolt</td>
</tr>
<tr>
<td>Assume all load is on (19) - 10” x 10” Main Frame Chocks</td>
<td></td>
</tr>
<tr>
<td>Total Normal Load</td>
<td>Engine Deadweight + All Bolt Tensions = 170,000 lbs + 19 x 25,560 lbs = 655,640 lbs</td>
</tr>
<tr>
<td>Total Resistive Force Of CHOCKFAST Resin Chocks To Cast Iron Engine Bedplate</td>
<td>Coefficient of Friction of CHOCKFAST Resin Chocks to Cast Iron x Total Normal Force = 0.7 x 655,640 lbs = 458,948 lbs</td>
</tr>
</tbody>
</table>

Forces available to help hold alignment:
1) with CHOCKFAST Resin Chocks = *458,948 lbs.*
2) with steel chocks = *98,346 lbs.*

**Example 2: COOPER ENERGY 16V-250**

<table>
<thead>
<tr>
<th>Description</th>
<th>Calculation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engine Deadweight</td>
<td>270,000 lbs.</td>
</tr>
<tr>
<td>Hold Down Bolts &amp; Tension Per Bolt</td>
<td>(20) 2” Main Frame @ 45,500 lbs./bolt</td>
</tr>
<tr>
<td>Assume all load is on 20 Main Frame Chocks</td>
<td></td>
</tr>
<tr>
<td>Total Normal Load</td>
<td>Engine Deadweight + All Bolt Tensions = 270,000 lbs + 20 x 45,500 lbs = 1,180,000 lbs</td>
</tr>
<tr>
<td>Total Resistive Force Of CHOCKFAST Resin Chocks To Cast Iron Engine Bedplate</td>
<td>Coefficient of Friction of CHOCKFAST Resin chocks to Cast Iron x Total Normal Force = 0.7 x 1,180,000 lbs = 826,000 lbs</td>
</tr>
</tbody>
</table>

Forces available to help hold alignment:
1) with CHOCKFAST Resin Chocks = *826,000 lbs.*
2) with steel chocks = *177,000 lbs.*

**Example 3: INGERSOLL RAND KVG-412**

<table>
<thead>
<tr>
<th>Description</th>
<th>Calculation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engine Deadweight</td>
<td>140,000 lbs.</td>
</tr>
<tr>
<td>Hold Down Bolts &amp; Tension Per Bolt</td>
<td>(18) 1-1/2” Main Frame Bolts @ 25,560 lbs/bolt</td>
</tr>
<tr>
<td>Assume all load is on 18 Main Frame Chocks</td>
<td></td>
</tr>
<tr>
<td>Total Normal Load</td>
<td>Engine Deadweight + All Bolt Tensions = 140,000 lbs + 18 x 25,560 lbs = 600,080 lbs</td>
</tr>
<tr>
<td>Total Resistive Force Of CHOCKFAST Resin Chocks To Cast Iron Engine Bedplate</td>
<td>Coefficient of Friction of CHOCKFAST Resin chocks to Cast Iron x Total Normal Force = 0.7 x 600,080 lbs = 420,056 lbs</td>
</tr>
</tbody>
</table>

Forces available to help hold alignment:
1) with CHOCKFAST Resin Chocks = *420,056 lbs.*
2) with steel chocks = *90,012 lbs.*

CONCLUSION: CHOCKFAST resin chocks provide 4 to 5 times the resistive force of steel chocks.
Technical Bulletin # 693B

Bulletin Description

The purpose of the hardener in every epoxy compound or coating is to cause a reaction that will result in the hardening of the epoxy resin. This reaction usually creates heat within the epoxy that forces the molecules to cross-link and bond tightly together. Depending on the type and quantity of resin, additives and hardener used, the final epoxy product will have certain physical properties such as compressive strength, flexibility, hardness, shear strength, shock resistance, etc.

The overwhelming majority of epoxy compounds have a fixed ratio of resin to hardener that results in a product with predictable physical properties. However, rather than specify an exact amount of hardener to use with CHOCKFAST Orange, ITW Polymer Technologies asks the end user to determine the correct amount for a particular installation that will cause the compound to achieve maximum physical properties strength. The amount of hardener is determined based on the temperature of the steel of the surrounding chock and the thickness of the chock.

By varying the amount of hardener used, the reaction that takes place between the resin and the hardener can be managed. The goal is to achieve a relatively high exothermic heat within the CHOCKFAST without causing it to either boil or crack. It is this high heat that gives CHOCKFAST Orange its exceptional strength characteristics.

Using CHOCKFAST Orange between two pieces of steel is different than using it between steel and concrete or steel and epoxy. Steel has a much greater ability to absorb heat from the CHOCKFAST during the curing process. For this reason, slightly more hardener is used when pouring CHOCKFAST between two pieces of steel.

Application Instructions

Note that before mixing the resin and hardener that the resin temperature should be in the range 20º to 25ºC (68º-77ºF).

The maximum amount of hardener possible should normally be used. The graph on the following page is for guidance and the optimum amount will usually be slightly more than it shows.

After puncturing the metal foil seal, the hardener bottle is inverted and squeezed to discharge the hardener into the resin container. The hardener reduction lines are to be read with the bottle inverted as shown.

Dispose of excess hardener in an approved manner and do not collect the remainder of several bottles in one bottle as it may be mistaken for a complete hardener unit. It is usually best to mix left over hardener in the empty cans of CHOCKFAST. The hardener will combine with the left over resin and become inert.
General: Every reasonable effort is made to insure the technical information and recommendations on these data pages are true and accurate to the best of our knowledge at the date of issuance. However, this information is subject to change without notice. Prior versions of this publication are invalid with the release of this version. Products and information are intended for use by qualified applicators that have the required background, technical knowledge, and equipment to perform said tasks in a satisfactory manner. Consult your local distributor for product availability, additional product information, and technical support.

Warranty: ITW Polymer Technologies, a division of Illinois Tool Works Inc., warrants that its products meet their printed specifications. This is the sole warranty. This warranty expires one year after product shipment.

Warranty Claims: If any product fails to meet the above, ITW Polymer Technologies will, at its option, either replace the product or refund the purchase price. ITW Polymer Technologies will have no other liability for breach of warranty, negligence or otherwise. All warranty claims must be made in writing within one year of the date of shipment. No other claims will be considered.

Disclaimer: ITW Polymer Technologies makes no other warranty, expressed or implied, and specifically disclaims any warranty of merchantability or fitness for a particular purpose.

Suggestions concerning the use of products are not warranties. The purchaser assumes the responsibility for determining suitability of products and appropriate use. ITW Polymer Technologies' sole liability, for breach of warranty, negligence or otherwise, shall be the replacement of product or refund of the purchase price, at ITW Polymer Technologies' election. Under no circumstances shall ITW Polymer Technologies be liable for any indirect, incidental or consequential damages.

Modification of Warranty: No distributor or sales representative has the authority to change the above provisions. No change in the above provisions will be valid unless in writing and signed by an officer or the Technical Director of ITW Polymer Technologies. No term of any purchase order shall serve to modify any provision of this document.

Mediation and Arbitration: If any dispute arises relating to products or product warranties, either the purchaser or ITW Polymer Technologies may a) initiate mediation under the then current Center for Public Resources (CPR) Model Procedure for Mediation of Business Disputes, or b) initiate a non-binding arbitration under the rules of the American Arbitration Association for the resolution of commercial disputes.

Example:
40 mm (1-9/16”) chocks & a steel temperature of 27°C (80°F) requires a 1/4 Hardener Reduction
INSTRUCTIONS FOR GROUTING IN HOT WEATHER

I. Handling and Storage
   A. All components shall be stored in a dry and weatherproof area prior to grouting. Under no circumstances should grouting components be stored outside in direct sunlight or under a tarpaulin.
   B. For optimum handling characteristics, resin and hardener components shall be preconditioned to a temperature of 65°F to 80°F prior to grouting.

II. Preparation
   A. The work area, including foundation, machinery and mixing equipment, should be protected from direct sunlight prior to grouting. This can best be accomplished by a temporary cover around the work area, if required.
   B. The temperature of the concrete foundation and machinery shall be tested using a surface thermometer prior to grouting. Surface temperatures shall not exceed 90°F.

III. Placement
   A. If ambient temperatures above 90°F are expected, grouting shall take place during early morning or evening hours when the temperature is lower.

IV. Curing
   A. If ambient temperatures above 90°F are expected, the work area, including foundation and machinery, shall be protected from direct sunlight after placement of the grout, until the grout has cured and returned to ambient temperature.
INSTRUCTIONS FOR GROUTING IN COLD WEATHER

I. Handling and Storage

A. All components shall be stored in a dry and weatherproof area prior to grouting. Under no circumstances should grouting components be stored outside or in an area that cannot be heated to 65°F or above.

B. For optimum handling characteristics, all components (particularly aggregate portion) shall be adjusted to a temperature of 65° to 80°F 48 hours prior to grouting. Aggregate bags shall be unstacked to allow for equal heating.

II. Preparation

A. The work area, including foundation and machinery, shall be preconditioned to a temperature above 65°F 24 hours prior to grouting. This can best be accomplished by constructing a temporary structure around the work area with a suitable covering, if required.

B. The temperature of the concrete foundation and steel machinery shall be a minimum of 65°F prior to grouting.

III. Placement

A. Grouting shall be coordinated to allow for minimum placement time.

IV. Curing

A. The work area, including foundation and machinery, shall be held at a minimum of 65°F for 48 hours after placement of the grout.

B. Heating sources (lamps, steam or gas heaters, etc.) shall not be positioned so as to create hot spots (localized heating) on the grout.
C. Once the grout is fully cured, the temperature inside the temporary structure should be equalized with the external temperature gradually.
REBUILDING CONCRETE FOUNDATIONS AND REGROUTING
EQUIPMENT WITH EPOXY GROUT

Rebuilding of concrete foundations using epoxy grout may be desirable in some cases because of the advantage of the rapid cure strength (5,000 to 6,000 psi in the initial 8 to 10 hours of cure). Epoxy grouts have been used for years in making deep foundation capping repairs and regrouting heavy equipment due to the cost savings achieved through the reduction in out-of-service time on critical equipment.

Recent technology and improved grouting materials have resulted in a number of grouting or regrouting methods that have proved successful in a wide range of applications. Several methods or combination of methods, depending on the degree of existing grout and foundation deterioration, can be used successfully in repairing the foundation and regrouting equipment. The more common methods that have been used successfully are described in the following outline:

I. **Grout and Concrete Removal**

   A. The foundation being rebuilt should be chipped to remove all oil-soaked concrete using specialized pneumatic equipment. The foundation should be chipped down to clean, sound concrete, and all horizontal reinforcing bar removed.

   B. Any vertical reinforcing bar damaged during chipping should be replaced and additional vertical reinforcing bar installed on 12” centers, if required. This is done to reinforce corners and edges of foundations to reduce or transfer corner stress and to reduce the possibility of edge lifting. Drill holes 1” larger than the rebar diameter (and a minimum of 4” deep) and grout in dowels using epoxy grout. See Drawing CF-007B and refer to Section 7 entitled "Edgelifting Cause and Cure" for more details.
II. **Grout Placement**

A. For making the deep foundation leveling or capping pour (18" x 7' x 7' maximum) use of preconditioned grout aggregate to 70°F is recommended. Epoxy grout is poured to within 6" of the equipment base. If the equipment is to be chocked and set later, then the grout is poured to the final elevation.

B. After the deep foundation leveling pour is made, the final grout pour can be made after the first pour has cured and returned to ambient temperature. Depending on the size of the equipment, ambient temperature, and the amount of grout placed, it may be necessary to allow the grout to cure longer than 24 hours and then sandblast or chip surface before making the final grout pour. A standard unit (four bag mix) of epoxy grout should be prepared for grouting in the sole plates, chocks, equipment base, or for making the final pour to the machine base.

C. Expansion joints may be installed in the foundation capping or regrouth pour to reduce the potential for stress cracking due to thermal changes. The basic function or purpose of the expansion or control joints is to reduce the possibility of stress cracks developing in the epoxy grout. The phenomenon or mechanism of stress cracking of aggregate-epoxy resin grout is non-uniform and unpredictable. On large pours, even with the addition of expansion joints between each anchor bolt or every seven feet, hairline cracks can develop due to non-uniform stresses caused by temperature extremes or other variables.
In general, experience shows that cracks on large foundation capping pours can best be controlled by preconditioning the epoxy grout to control the exotherm and employing expansion joints. Temperature extremes must be avoided. Steps to control temperature extremes should be followed when grouting in hot or cold weather.
REBAR AND EPOXY GROUT

Many questions are asked concerning the use of steel reinforcing rods, or rebar, in epoxy grout foundations. Since rebar has historically been used in concrete, it seems logical that it should also be beneficial in epoxy grouts. This is not necessarily true.

Concrete, as a rule of thumb, has a tensile strength of only about 10 percent of its compressive strength. In other words, a 3,000 psi concrete in compression will have a tensile strength of approximately 300 psi. Steel rebar is used to add tensile strength to concrete members. Epoxy grouts, however, have considerably higher tensile strengths, usually in the range of 1,500 to 2,000 psi, and should not require additional reinforcement in most applications.

The principal concern with using rebar in epoxies lies in their different coefficients of linear thermal expansion, or how much they will "grow" or "shrink" with changes in temperature. Concrete and steel have similar coefficients and are therefore compatible when used together. Epoxy grouts, however, have higher coefficients and some formulations can have rates of expansion almost five times that of steel. The following graph shows the coefficients of linear thermal expansion in inches per inch of length or depth, per degree Fahrenheit.

<table>
<thead>
<tr>
<th>Material</th>
<th>Coefficient of Linear Thermal Expansion (in./in./deg. F)x 10^6</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONCRETE</td>
<td>5.9</td>
</tr>
<tr>
<td>STEEL</td>
<td>6.1</td>
</tr>
<tr>
<td>CHOCKFAST RED</td>
<td>11.2</td>
</tr>
<tr>
<td>OTHER EPOXY GROUTS</td>
<td>16.9</td>
</tr>
<tr>
<td></td>
<td>28.0</td>
</tr>
</tbody>
</table>
Epoxies are exothermic, or create heat, in their curing process. Different epoxy grout formulations have different curing reactions that can vary from having a peak exotherm of a few degrees to well over 100° above their ambient pour temperatures. Because maximum exotherm is related to the size of the mass, the "hotter" epoxy grouts are limited to relatively shallow pours. An indication of the amount of exotherm to be expected can be obtained by referring to the manufacturers maximum recommended pour depth; the greater the depth the more gentle the cure.

Epoxies go from a liquid to a solid state at about their peak exotherm. When grout is poured on a concrete base with exposed rebar, the curing reaction heats both materials. As the grout solidifies, it is anywhere from warm to hot and encapsulates the steel rods. It is easy to visualize what happens as the grout and steel cool back to ambient temperatures and contract at different rates. Epoxy grout is put in tension when it contracts more than steel which creates stress in the epoxy. The greater the temperature and thermal expansion differences are between the epoxy and steel, the greater the amount of stress in the grout. This can cause cracks in the grout that may appear shortly after it has cured, or further drops in temperature years later can increase the stresses and cause cracks. Some grout manufacturers recommend the massive use of rebar in deep pours to act as a heat sink and reduce the peak exotherm. However, this may actually be the cause of cracks if the foundation ever sees significant fluctuation in temperatures. This same phenomenon can also be the cause of loose soleplates or rails if they are set in an epoxy grout with a high coefficient of expansion.

Because the total thermal expansion and contraction of a material is directly proportional to its length, the mismatch between rebar and epoxy grouts applies primarily to the long horizontal rods commonly found in machinery foundations. Short vertical pins placed around the foundation
perimeter provide a mechanical lock between the grout and concrete. These pins will not usually precipitate a stress crack in a good quality epoxy grout, providing they are at least three inches in from any surface. Having a coefficient of expansion as close as possible to concrete and steel is also very important in situations where considerable increases in temperature are possible. As the temperature rises, the grout will expand more than the steel if rebar is present. This puts the grout in compression and the rebar in tension, which is allowable because the strengths of these materials are very high under these conditions. The area for concern, however, is at the interface between the concrete and epoxy grout. As the grout expands at a faster rate it puts the concrete in tension, which, as discussed earlier, is not one of concrete's strengths. If the stresses are great enough, the grout will shear the concrete just below the bond line. This condition is harder to detect than a crack in the grout, but if it is subjected to dynamic forces, as under an engine, this horizontal crack will make itself evident in time.

This tendency for the grout to shear its bond with the concrete can, however, be minimized. Since the amount of thermal expansion is proportional to the length, properly spaced expansion joints in the grout reduce the effective length by segmenting, and thereby minimizing stresses on the bond area. The greater the discrepancy between thermal coefficients of materials, the closer expansion joints must be to insure a lasting structure.

Various physical properties are published by grout manufacturers for their materials. Compressive strength, compressive modulus of elasticity, and tensile strength, while important, are overemphasized because they are far greater than concrete and usually loaded to a fraction of their limits. The most important design criteria, if an epoxy grout is to be used with other materials such
as concrete and steel, is the compatibility with these materials. Since very few environments are absolutely stable, the effects of temperature changes must be calculated and undue stresses eliminated by proper choices of materials.

If, for whatever reason, horizontal rebar is installed and epoxy grout poured around it, then care should be taken to prevent the rebar from penetrating an expansion joint as shown in Drawing No. 004E.
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CHOCKFAST GROUTING SYSTEMS

EPOXY GROUTING OF PUMP BASEPLATES

In today's modern industrial complexes, the need for equipment reliability is of prime concern to everyone.

For years cement grouts were used to install pump bases. Because of their poor bond and shrinkage, it was necessary to pressure inject these bases to eliminate voids. Pressure injecting of baseplates is a time consuming and expensive repair that may or may not solve the problem.

Over the last decade more and more users are specifying epoxy grout for pump baseplate installation.

Because of unacceptable baseplate preparation and poor epoxy grout installation techniques, the high cost and the need to pressure inject pump bases is still with us.

The whole concept of grouting is to make the pump base and the foundation monolithic. By doing this, we reduce the natural frequency of the pump base, thus increasing seal and bearing life.

Improper grouting techniques can result in repair cost and downtime that could greatly exceed the time and money spent on the initial pump base installation.

The procedures that follow are specifically designed for Chockfast Red. Because of its low exotherm, Chockfast Red may be poured up to 18" deep in a single pour, thereby allowing for single lift grout pours. The ability to make deep single lift grout pours, coupled with proper foundation and baseplate preparation will reduce the man hours involved in making several lifts, and the need to pressure inject to eliminate voids caused by poor grouting practices.
To begin with, the concrete foundation should be properly cured. It is chipped to provide a good surface profile for the epoxy grout. The foundation must be clean and dry before pouring the epoxy grout. The best way to protect the foundation is to erect a temporary structure over it. This structure will protect the foundation from direct sunlight, which could result in excessive heating and uneven curing of the epoxy grout; also it will allow for environmental control. If the ambient temperature is below 65°F, then it is necessary to heat the surrounding area to above 65°F.

Preparation of the baseplate begins with the removal of the pump, driver, and other accessories mounted to the baseplate. The baseplate should be bare when it is grouted.

After the equipment is removed, the underside of the baseplate should be inspected. Any additional grout holes, vent holes, or jackscrews should be installed at this time.

After any repairs or modifications are completed, the underside of the pump base should be sandblasted to "white metal." After this step great care should be taken to prevent any contact with oil, water, or other contaminants that would affect the bond of the grout.

The elapsed time between sandblasting the base and the actual grouting should not allow the surface to "bloom" with surface rust. To prevent this, prime the baseplate underside with Phillyclad 1000 Series, or other approved primer that will create a bond to steel of no less than 1500 psi and have a dry film thickness of 3 mils.

When setting the baseplate onto the foundation, there are several common methods used to support the baseplate while the grout is being poured and during the curing process. These methods usually result in improperly installed baseplates and will result in grout cracking. It is recommended that methods 1 through 4 not be employed when setting pump baseplates.
1. Flat plates cut into squares and stacked one on top of the other until the required elevation of the baseplate is obtained. This technique results in trial and error for proper elevation, and designed in stress risers.

2. Using single or parallel wedges to obtain proper elevation.

3. Incorporating a steel shim pack (or chocking system) that is pregrouted in place. (This method is extremely labor intensive and time consuming.)

4. Using a nut on the underside of the baseplate to achieve proper elevation.

5. Utilizing a jackscrew alongside each anchor bolt is the only sure way to properly set and level pump bases. (This is by far the easiest, most accurate, and least time consuming method.)

The primary advantage to using a jack bolt is that it can be removed after the grout is cured, therefore allowing the entire pump baseplate to be supported by the grout, not by the leveling devices.

Methods 1 through 4 do not allow for the grout to accept the load of the baseplate. Furthermore, methods 1, 3, and 4 allow for stress concentration points to be designed into the grout. These concentrations points could result in cracking of the epoxy grout at a later time.

Method 2 does not allow for proper tightening of the anchor bolts. Anchor bolts require a minimum of twelve bolt diameters available free length for proper tensioning. This method could result in loose baseplates later, with no way to tighten them short of a regrouting.

When using jack bolts, it is recommended that round plate often called a jack pad be used under the jack bolt. This pad can be constructed from 1/2” thick steel plate, old pump shafts
or 2" diameter rebar. Whichever material is used, it should be a minimum of 1/2" thick and have a minimum diameter of 2", or three times the diameter of the jack bolt.

The purpose of this jack pad is to provide a bearing area for the jack bolt and prevent the jack bolt from digging into the concrete during the leveling phase of the pump installation.

There are two ways to mount the jack pad. Some people prefer to secure and level the pad with Phillybond Blue 6A epoxy putty, while others prefer to simply place the jack pad under the jack bolt and begin the leveling procedure. After the pump base is leveled, the grout forms can be installed. Refer to Drawing CF-001 for details.

There are two ways to construct grout forms. Method Number One is to place the forms directly against the foundation. Doing this requires that a seal be placed 1" to 2" below the chipped surface to act as a seal for the epoxy grout. After the grout has cured and the forms removed, then the caulk must be removed, and the interface smoothed by using Phillybond Blue 6A.

Method Number Two allows the forms to be moved 1" to 2" away from the foundation. Using this technique requires that all foundation surfaces be chipped, and all vertical and horizontal edges be chamfered 2" to 6" inches to reduce any stress concentration points that may cause cracking in the epoxy grout.

Pouring epoxy grout completely around the pump foundation allows complete encapsulation of the concrete and reduces the possibility of concrete contamination due to oil or product. Also, this method eliminates the need for someone to come back and dress up the foundation.
NOTE: Do not use this method if you would be covering an expansion joint between the foundation and the adjoining pad.

Whichever method is used, the forms should be constructed of 3/4” plywood and braced both vertically and horizontally with 2” x 4” lumber. The face of the forms to come in contact with the epoxy grout should be waxed to prevent bonding of the grout to the forms. Waxing is performed prior to erecting the forms around the foundation. Doing this eliminates the possibility of contaminating the concrete surface. A good hardwood floor paste wax is required. Under no circumstances should liquid wax be used. Apply two to three coats, allowing the wax to dry before the next coat.

The grout forms should be liquid tight and sealed to the vertical face with a good caulking material. All inside right angles (90°) should be chamfered to a minimum of 1” to 2” to prevent stress concentration areas and possible cracking of the epoxy grout at a later time.

During the summer, the foundation and equipment to be grouted should be covered with some type of shelter to keep the uncured grout from being exposed to direct sunlight. This covering will also protect the foundation from dew, mist or rain. It should be erected 24 hours prior to grouting and remain up until after the grout has completely cured.

In the winter, a suitable covering to allow the foundation and equipment to be completely encapsulated should be constructed. A heating source should be applied so as to raise the foundation and equipment temperature to above 65 °F for at least 48 hours prior to and after grouting.

The epoxy grout resin and hardener should be mixed in accordance with the instructions for the type of grout being used. Generally this means mixing the epoxy resin and hardener to
a homogeneous state by using a Jiffy mixer in a slow speed electric or air drill motor, at a speed of 200-250 RPM. Care should be taken at this point not to whip in air. The mixed Chockfast Red resin and hardener should have a clear amber appearance (in cool weather, this could be a milky white color). All parts of the grout (resin, hardener and aggregate) should have been brought to a temperature of between 65°F and 80°F. This is called preconditioning, and should be accomplished 48 hours prior to grouting.

The final mixing and ultimate pouring of the Chockfast Red epoxy grout mixture (resin and hardener with aggregate) is accomplished by using a mortar mixer. The liquid is poured into the mixer and the 4 bags of aggregate are then added. Mixing time will vary from 2 to 5 minutes, depending on ambient temperature, material and foundation temperature. Once the grout is thoroughly mixed, it is then poured or transported via wheelbarrow or buckets to the forms. During the mixing and installation of the epoxy grout, proper safety practice should be employed. Goggles or face shields should be worn by those mixing and pouring the epoxy grout. Protective gloves should be worn by all, and dust masks should be worn by those exposed to the aggregate prior to mixing. Soap and water should be available for periodic hand cleaning should the need arise.

The installation of Chockfast Red for pump base grouting may be accomplished two ways. The traditional method is sometimes called "the two pour method." This involves pouring epoxy grout only to the bottom flange of the pump base. This pour is allowed to harden, then the remainder of the pump base cavity is poured. The problems that are associated with the two pour method are:
(1) It takes twice, sometimes three times the man hours to pour a pump base. This is due to equipment cleanup and re-setup to complete the pour.

(2) The first pour should be allowed to completely cool to ambient temperature before the second pour is made. Failure to do this could result in thermal stress at the interface of the grout which could result in cracking at a later date.

With the single pour method, a set of waxed upper form covers is installed, with vent holes drilled about every twelve inches. The grout is then poured starting at the pump end and working toward the opposite end. Because most API-610 baseplates are built with a sloped deck, we need to insure that plugs are available for the vent holes, and that covers are available for the grout holes. These plugs and covers should also be waxed to prevent the grout from bonding to them. In some cases, metal plugs are used in the pump base. It may be desirable to allow these plugs to bond to the grout.

Whichever method is employed (the one or two pour method), the installer should use some type of head box or grout pump to ensure complete filling of the pump base. A good head box that can be cut to fit is a typical traffic cone. A more sophisticated appliance is a grout pump constructed of PVC pipe and polyethylene foam with a plunger. In any case, when grout emerges from the vent hole, the plug should be installed. Grout must flow from each vent hole. After the base is completely filled, the grouting is completed. It is a good practice to have someone stand by with a bucket of grout to add a slight amount to each grout hole as required during the curing process to maintain a head on the grout.
Clean up of Chockfast Red is accomplished with soap and water. For cleaning of the baseplate, it is recommended that PRT—59 solvent be used.

Once the grout is completely cured, the forms may be removed. Depending on the method used to place the forms (directly against the foundation or 1" away), it may be necessary to smooth the vertical face of the foundation with Phillybond Blue 6A. After this, the foundation may be painted with Phillyclad 1000 Series epoxy coating.

The equipment may now be set and aligned knowing that it will rest on a solid foundation.
DETAILED CHECKLIST FOR ROTATING EQUIPMENT:
HORIZONTAL PUMP BASEPLATE CHECKLIST
PRIOR TO GROUTING

1. CONCRETE FOUNDATION ROUGHED UP TO PROVIDE BOND FOR GROUT. _____
2. CONCRETE FOUNDATION CLEAN AND FREE OF OIL, DUST AND MOISTURE. BLOWN WITH OIL FREE COMPRESSED AIR. _____
3. FOUNDATION BOLT THREADS UNDAMAGED. _____
4. FOUNDATION BOLT THREADS WRAPPED WITH WEATHER-STRIPPING OR DUCT TAPE. _____
5. ALL EQUIPMENT REMOVED AND BASEPLATE UNDERSIDE SAND-BLASTED TO WHITE METAL, CLEAN AND FREE OF OIL OR DIRT. _____
6. EIGHT POSITIONING SCREWS, TWO PER DRIVER PAD. _____
7. BASEPLATE WELDS CONTINUOUS AND FREE OF CRACKS. _____
8. MOUNTING PADS EXTEND 1" BEYOND EQUIPMENT FEET EACH DIRECTION. _____
9. MOUNTING PADS MACHINED PARALLEL WITHIN 0.002". _____
10. JACKSCREWS AT EACH FOUNDATION BOLT. _____
11. BASEPLATE RAISED TO PROPER HEIGHT PER DRAWING. _____
12. PAD HEIGHTS PERMIT 1/8" MINIMUM SHIM UNDER DRIVER FEET. _____
13. ALL LEVELING DEVICES MAKE SOLID CONTACT WITH CONCRETE AND BASEPLATE. _____
14. ALL MACHINED SURFACES ON BASE LEVEL TO WITHIN 0.0005 IN./FOOT IN TWO DIRECTIONS (90° OPPOSED) USING A MACHINIST LEVEL (0.0005 IN./DIVISION) WITH ANCHOR BOLT NUTS SNUGGED DOWN. _____
15. SUFFICIENT VENT HOLES PROVIDED IN CORRECT LOCATION. _____
16. FOUNDATION AND BASEPLATE PROTECTED FROM DIRT AND MOISTURE CONTAMINATION.

LEVELING ACCEPTED BY_______________________________

WHEN ALL OF THE ABOVE ARE COMPLETED AND BASEPLATE LEVELING IS ACCEPTED, THE BASEPLATE CAN THEN BE GROUTED.
DETAILED CHECKLIST FOR ROTATING EQUIPMENT:
BASEPLATE GROUTING

DATE_________  TIME_________AM-PM

ALL THE FOLLOWING APPLY TO EPOXY GROUTING ONLY

INITIAL

1. AMBIENT TEMPERATURE ABOVE 60 °F DURING MIXING, POUR AND CURE. _____
2. NO PARTIAL UNITS OF EPOXY, RESINS, HARDENER OR AGGREGATE USED, UNLESS APPROVED BY GROUT MANUFACTURER. _____
3. RESIN AND HARDENER BLENDED THREE MINUTES MINIMUM. _____
4. FULL BAGS OF AGGREGATE SLOWLY ADDED TO BLENDED LIQUID AND MIXED TO COMPLETELY WET OUT THE AGGREGATE. _____
5. EPOXY/AGGREGATE MIXTURE MIXED AS PER MANUFACTURER’S INSTRUCTIONS. _____
6. BATCH PLACED WITHIN ITS POT LIFE. _____
   AMBIENT TEMP. AT START OF POUR _____ F.
   AMBIENT TEMP. END OF POUR _____ F.
7. NO VIBRATOR USED TO PLACE GROUT. _____
8. POUR RATE SLOW ENOUGH TO PERMIT AIR TO ESCAPE. _____
9. GROUT HOLES AND VENT HOLES FILLED WITH EPOXY GROUT. _____

AFTER GROUT HAS CURED  DATE/INITIAL

10. FORMS REMOVED. _____
11. JACKSCREWS REMOVED AND VOIDS FILLED. _____
12. ANCHOR BOLTS TIGHTENED. _____

WHEN ALL OF THE ABOVE ARE COMPLETED AND GROUTING IS ACCEPTED, THEN THE EQUIPMENT CAN BE PLACED ON THE BASEPLATE.
PUMP BASE PLAN VIEW

○ EXISTING GROUT HOLES
○ INDICATES ADDITIONAL GROUT HOLES THAT MAY REQUIRE FIELD INSTALLATION
+ INDICATES 1/2 VENT HOLES THAT MAY REQUIRE FIELD INSTALLATION. ADDITIONAL VENT HOLES MAY BE REQUIRED. CONTACT GROUT MANUFACTURER.
● INDICATES POSSIBLE VENT HOLES INSTALLED BY OEM
--- INDICATES CROSS BRACING THAT MAY EXIST BUT NOT BE VISIBLE

TYPICAL INSTALLATION
IMAGINARY LINES EXTENDED DOWNWARD 30° TO EITHER SIDE OF VERTICAL & SHOULD PASS THROUGH BOTTOM OF FOUNDATION.

FOUNDATION MASS SHOULD BE APPROXIMATELY 3-5 TIMES THAT OF THE EQUIPMENT

TYPICAL API PUMP

DRAWING NO.
CF - 005
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PRE-GROUTING OF API PUMP BASEPLATES

Industry has learned that by proper baseplate grouting, pump vibrations can be significantly reduced and mean runtime between seal, bearing, and coupling failures can be dramatically extended. There have been several excellent articles written about proper pump grouting, however, the problems of pump grouting are still with us.

Many end users specify that a thin film epoxy coating of some type be applied to the underside of the pump baseplate at the manufacturer's facility. However, the problem stemming from this can result in loose or improperly grouted baseplates. We are continuously asked, "is your epoxy grout compatible with our primer" or paint? The answer to this is very simple, all epoxy grouts will bond to whatever surface they touch. The question one should be asking is, what is the bond strength of the pre-applied primer or paint?

OEM's manufacturing pump baseplates should do everything in their power to assure a good surface profile for the epoxy primer or coating to bond to. Once the baseplate leaves the manufacturing facility, it can be anywhere from six months to two years before it is actually installed. It arrives at the end user's facility and is either stored in a warehouse or in a laydown yard. From the time it arrives at the job site and goes into storage until the time it is set on its foundation, the surface under the baseplate that the grout will ultimately be required to bond to is usually dirty, oily, or rusted due to rough handling. Very seldom does the installing contractor take the time to inspect the underside of the pump base let alone clean it prior to setting it on the foundation.

Once the baseplate is set and leveled on the foundation, the contractor normally will not begin to install the epoxy grout until there are several pieces of equipment to be grouted. During this waiting period dust and oil can collect as well as rust develop on the underside of the baseplate. When grouting is finally done it is without cleaning the underside of the pump base or removing the pump and its driver for better grouting access. This inattention to detail will definitely result in a poorly bonded pump baseplate and the need to come back and pressure inject to eliminate a soft foot condition. Problems resulting from pressure injecting to eliminate voids under the pump base by personnel not familiar with this technique can result in hydraulic deformation, or delamination of a securely bonded section of the base if pressure is applied too rapidly or to an unvented area. Care should be taken to see that pressure under the machinery base never exceeds 6 to 10 psi to prevent these problems.

A new technology is developing wherein the pump base is inverted and grout poured directly into it at the time of initial fabrication. The grout is allowed to cure prior to the pump base being sent to the machine shop for machining or grinding of the support pedestals.
PRE-GROUTING OF API 610 PUMP BASEPLATES AT THE FACTORY PRIOR TO THE PADS BEING MACHINED WILL ACHIEVE THE FOLLOWING FOR THE OEM:

1. Increased rigidity of the pump baseplate will help the OEM meet API 610 nozzle load requirements and reduce test stand vibration so that the assembly will easily meet the .1 To .2 IPS (inches per second) required by API and some end users. ANSI pump specs call for a limit of .3 IPS.

2. Reduced fabrication costs - no need for grout holes, vent holes, or additional bracing installed in the baseplate.

3. No need for high VOC (volatile organic compounds) epoxy primers (normally solvent based and spray applied).

4. Guaranteed 100% grout bond and void free contact to underside of pump baseplate.

5. Maintain sufficient rigidity during transport and lifting to prevent any twisting or bending of the pump base. This could ultimately result in reduced OEM warranty service calls on newly installed pumps incorrectly grouted due to a twisted or deformed base plate.

6. Reduce installation problems at the end user facility by eliminating the need for the general contractor to go through elaborate procedures in the field to achieve a void-free grout job.

WHEN INSTALLING A PRE-GROUTED PUMP BASE THE CONTRACTOR IS REQUIRED TO DO THE FOLLOWING:

1. Wipe the underside of the pre-grouted baseplate with a non residue leaving solvent. This is accomplished when the assembly is suspended prior to setting on the foundation.

2. Flow approximately 2 inches of grout under the pre-grouted base. Current procedures in the field require what is commonly known as a two lift grout pour unless elaborate forming is constructed to allow the pour to be completed in one lift.

This will eliminate any problems that a contractor who is unfamiliar with epoxy grout technology and specialized grouting techniques might have.
FROM THE END USER POINT OF VIEW:

1. The up front cost associated with the new technology will increase shipping weight from the OEM's facility but not necessarily the freight charges.

2. The increased cost of pre-grouting should not be any more than what would normally be experienced at the plant level. Actually the overall cost of grouting from a labor standpoint should be significantly reduced.

3. Most OEM’s call for the pump and driver to be removed from the base prior to grouting. This allows for the base to be leveled without deformation or distortion from single point support from the jack screws. Pre-grouted pump baseplates will eliminate the need to remove any mechanical components.

4. This pre-grouting will eliminate the need to pressure inject improperly grouted pump bases. Pressure injection can and will result in serious problems when accomplished by inexperienced personnel. Over pressuring when injecting an epoxy resin system under the baseplate can actually lift or bow the base, and in some cases result in damage to the coupling end section of the pump.

THE BENEFITS OF PRE-GROUTING PUMP BASES WITH EPOXY GROUT ARE:

1. A bond to the steel base plate greater than 2000 psi is achieved.

2. A compressive strength greater than 10,000 psi is achieved within 24 to 48 hours after placement.

3. 100% bearing area against the base plate underside.

4. The pump base will be easier to grout to the foundation.

5. Vibration dampening will be enhanced.

   (Chockfast Red has a vibration damping capability thirty times greater than cement grout)

6. Baseplate deformation or distortion in the field when using high exothermic epoxy is eliminated.

   (Chockfast Red has the lowest exothermic reaction of all the epoxy grouts)
WARNING:

USING AN EPOXY GROUT THAT IS DESIGNED TO BE POURED ON TOP OF CONCRETE OR IS POURED IN MAXIMUM THICKNESSES OF 6 INCHES AND UNDER SHOULD BE AVOIDED WHEN USING THE PRE-GROUTED OR INVERTED TECHNIQUE BECAUSE OF THE HIGH EXOTHERMIC TEMPERATURES THAT WILL BE GENERATED AND THE POSSIBLE BASE PLATE DEFORMATION THAT COULD RESULT BECAUSE OF INSUFFICIENT HEAT SINK AVAILABLE TO THE EPOXY GROUT. THE USE OF ANY EPOXY GROUTING PRODUCT OTHER THAN CHOCKFAST RED MAY PROVE UNSTABLE WHEN POURED WITHOUT SUFFICIENT HEAT SINK.
Product Description

ITWPRC 100 NON-SHRINK CEMENT GROUT is a high performance, non-shrink, precision grout that meets or exceeds all requirements of the Corps of Engineers CRD C-621 and ASTM C-1107. It is designed for a wide range of consistencies from damp pack to high fluidity, meeting the most demanding job conditions.

Use & Benefits

ITWPRC 100 NON-SHRINK CEMENT GROUT is recommended for grouting of anchor bolts, baseplates, structural steel and pre-cast columns, dowels, etc. which require non-shrink, high tolerance, high strength performance. It is flowable for easy placement, adheres well to concrete or steel, and exhibits good impact and vibration characteristics.

Design Considerations

Pre-washed graded 3/8” pea gravel may be used in applications thicker than 2”. In depths from 2” to 5”, add 25% of the 3/8” pea gravel by weight. For depths 5” and deeper, add 50% 3/8” pea gravel by wt. When grouting in hot weather, provide shade around the area to be grouted. Use cool mixing water and protect the grout from the sun for up to 48 hours.

When grouting in cold weather, raise the temperature of the area to be grouted. Preheat the mixing water and cover the grout to retain warmth. DO NOT place at temperatures below 40°F or if the temperature is expected to fall below 40°F within the next 24 hour period.

ITWPRC 100 NON-SHRINK CEMENT GROUT should be kept in a shaded, dry area. At no time should the packaged material be exposed to moisture.

Application Instructions

Remove all dirt, oil or loose foreign material from any steel surface to come in contact with CHOCKCRETE. Concrete surfaces must be sound and roughened to insure proper bonding. Concrete surfaces should be saturated for a minimum of 4 hours but preferably for 24 hours prior to placing the grout. Remove all excess water from the foundation prior to placing ITWPRC 100 NON-SHRINK CEMENT GROUT.

Build the forms at least 1” higher than the bottom of the item being grouted.

A portable mortar mixer should be used when mixing the grout. Start with the minimum water requirements. ADD WATER TO MIXER FIRST, then slowly add powder. Add additional water as required for desired consistency. Water requirements per 50 lb. bag are:

<table>
<thead>
<tr>
<th>Consistency</th>
<th>Plastic</th>
<th>Flowable</th>
<th>Fluid</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>6.80 to 7.00 pints water</td>
<td>7 to 8 pints water</td>
<td>8.00 to 9.25 pints water</td>
</tr>
<tr>
<td></td>
<td>0.85 to 0.88 gal.</td>
<td>0.88 to 0.94 gal.</td>
<td>1.00 to 1.19 gal.</td>
</tr>
<tr>
<td></td>
<td>7.05 to 7.30 lbs.</td>
<td>7.30 to 7.80 lbs.</td>
<td>8.33 to 9.50 lbs.</td>
</tr>
<tr>
<td></td>
<td>3.18 to 3.29 liters</td>
<td>3.29 to 3.79 liters</td>
<td>3.79 to 4.40 liters</td>
</tr>
</tbody>
</table>

**CAUTION: DO NOT OVER WATER.** Adding more water than recommended can cause bleeding, separation and a reduction of ultimate strength. DO NOT re-temper or add additional cement, sand or admixtures without first contacting ITW Polymer Technologies.

The grout should be placed continuously by pouring from one side to the other to avoid air entrapment. Cover with clean wet rags and keep moist until final set.
Physical Properties

### COMPRESSIVE STRENGTH:

<table>
<thead>
<tr>
<th>Time</th>
<th>Plastic Flowable Fluid</th>
<th>3 days</th>
<th>5,900</th>
<th>5,400</th>
<th>4,800</th>
<th>7 days</th>
<th>8,900</th>
<th>7,700</th>
<th>6,200</th>
<th>28 days</th>
<th>11,500</th>
<th>8,400</th>
<th>7,800</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
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<td></td>
</tr>
</tbody>
</table>

ASTM C-109

### STATIC MODULUS OF ELASTICITY:

<table>
<thead>
<tr>
<th>Time</th>
<th>Plastic Flowable Fluid</th>
<th>3 days</th>
<th>2.64 x 106 psi</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>7 days</td>
<td>2.79 x 106 psi</td>
</tr>
<tr>
<td></td>
<td></td>
<td>28 days</td>
<td>3.00 x 106 psi</td>
</tr>
</tbody>
</table>

ASTM C-469

### EXPANSION PERCENTAGE:

<table>
<thead>
<tr>
<th>Time</th>
<th>Plastic Flowable Fluid</th>
<th>3 days</th>
<th>0.07%</th>
<th>0.03%</th>
<th>0.02%</th>
<th>14 days</th>
<th>0.07%</th>
<th>0.03%</th>
<th>0.02%</th>
<th>28 days</th>
<th>0.07%</th>
<th>0.03%</th>
<th>0.02%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

CRD D-621

### COEFFICIENT OF THERMAL EXPANSION:

<table>
<thead>
<tr>
<th>Time</th>
<th>Plastic Flowable Fluid</th>
<th>3 days</th>
<th>1,055 psi</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>7 days</td>
<td>1,230 psi</td>
</tr>
<tr>
<td></td>
<td></td>
<td>28 days</td>
<td>1,430 psi</td>
</tr>
</tbody>
</table>

ASTM C-531

### FLEXURAL STRENGTH:

<table>
<thead>
<tr>
<th>Time</th>
<th>Plastic Flowable Fluid</th>
<th>3 days</th>
<th>550 psi</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>7 days</td>
<td>680 psi</td>
</tr>
<tr>
<td></td>
<td></td>
<td>28 days</td>
<td>750 psi</td>
</tr>
</tbody>
</table>

ASTM C-78

### SPLITTING TENSILE STRENGTH:

<table>
<thead>
<tr>
<th>Time</th>
<th>Plastic Flowable Fluid</th>
<th>3 days</th>
<th>3.5 hrs</th>
<th>4 hrs</th>
<th>3.6 hrs</th>
<th>4.75 hrs</th>
<th>4.8 hrs</th>
<th>4.75 hrs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>7 days</td>
<td>4 hrs</td>
<td>3.6 hrs</td>
<td>4.75 hrs</td>
<td>4.8 hrs</td>
<td>4.75 hrs</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>28 days</td>
<td>4 hrs</td>
<td>4.8 hrs</td>
<td>4.75 hrs</td>
<td>4.8 hrs</td>
<td>4.75 hrs</td>
<td></td>
</tr>
</tbody>
</table>

ASTM D-496

### STRENGTH OF ANCHORS:

<table>
<thead>
<tr>
<th>Type</th>
<th>Plastic Flowable Fluid</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-1/4&quot; dia. bolt in a 2-1/2&quot; dia. hole with 9&quot; embedment</td>
<td>Tensile Strength</td>
</tr>
<tr>
<td></td>
<td>53,200 lbs.</td>
</tr>
<tr>
<td></td>
<td>Shear Strength</td>
</tr>
<tr>
<td></td>
<td>24,300 lbs.</td>
</tr>
<tr>
<td>1/2&quot; dia. bolt in a 1-1/8&quot; dia. hole with 4&quot; embedment</td>
<td>Tensile Strength</td>
</tr>
<tr>
<td></td>
<td>7,100 lbs.</td>
</tr>
<tr>
<td></td>
<td>2,000 lbs.</td>
</tr>
</tbody>
</table>

ASTM E-488

Product Information

### UNIT PACKAGING:

- Individual Bags - Super Sack

### UNIT WEIGHT:

- 22.7 kg (50 lbs.) Bags
- 1,361 kg (3,000 lb) Super Sack

### UNIT YIELD:

Plastic Flowable Fluid

- Approx. 0.43 ft.³
- 0.44 ft.³
- 0.45 ft.³

### APPLICATION TEMPERATURE:

45°F Minimum - 90°F Maximum

### SET TIME (approximate):

- Initial: 3.5 hrs
- Final: 4.75 hrs

### SHELF LIFE:

1 year in dry, shaded storage

### CLEAN UP:

Water

Date

<table>
<thead>
<tr>
<th>General</th>
<th>06/2006</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Suggestions concerning the use of products are not warranties. The purchaser assumes the responsibility for determining suitability of products and appropriate use. ITW Polymer Technologies' sole liability, for breach of warranty, negligence, or otherwise, shall be the replacement of product or refund of the purchase price, at ITW Polymer Technologies' election. Under no circumstances shall ITW Polymer Technologies be liable for any indirect, incidental or consequential damages. Modification of Warranty: No distributor or sales representative has the authority to change the above provisions. No change in the above provisions will be valid unless in writing and signed by an officer or the Technical Director of ITW Polymer Technologies. No term of any purchase order shall serve to modify any provision of this document. Mediation and Arbitration: If any dispute arises relating to products or product warranties, either the purchaser or ITW Polymer Technologies may a) initiate mediation under the then current Center for Public Resources (CPR) Model Procedure for Mediation of Business Disputes, or b) initiate a non-binding arbitration under the rules of the American Arbitration Association for the resolution of commercial disputes.
PRESSURE GROUTING MACHINERY BASE PLATES
TO ELIMINATE VOIDS AND IMPROVE ALIGNMENT

The injecting of epoxy resin under machine bases to fill voids is a concept that has been used for the last 25 years. By using injection points and vent holes that will allow the trapped air to be vented, a filler of epoxy is pumped (or, in some cases, gravity fed) into the void. This liquid epoxy fills the void, becomes hard, and is as strong or stronger than the grout below it, thereby providing the necessary support for the machine base and reducing resonant vibration.

The need to pressure inject machinery bases stems from two causes:

1. Improperly prepared machinery bases to be grouted, i.e., not sandblasted, dust, grease, etc.
2. Cementitious grout used as a cost saving measure that will not bond to steel, and when mixed and installed has a tendency to bleed under the base and cause voids.

These two causes could allow a soft foot condition to exist, and a resonant frequency vibration to develop. The resulting vibration can result in excessive seal, bearing, and coupling problems. These problems can easily be avoided by employing proper grouting procedures and techniques when installing baseplate mounted equipment. In this paper we will discuss the techniques necessary to properly pressure inject a machinery base plate or pump base, when such voids do occur because of improper grouting techniques, actual shrinkage of the grout, or in some cases, when there is movement of the machinery base. Filling such voids to restore or achieve good base plate contact can turn a poor grout job into a successful one.

LOCATING THE VOIDS

Locating voids under a loose base plate is a rather simple matter. It requires a small hammer and some type of marker. By sounding out the base plate with a hammer, we can easily locate areas that are not bonded or have voids.

Once the extent of a void is determined, holes are drilled into the cavity. A small void may only require one injection point and one vent point, but usually a multi-hole layout is required, with injection ports at the outer periphery of the void and a vent port in the center. Different layouts may be required for a large void since the rule of thumb for distance between holes should not exceed 12"-14". Holes should be drilled vertically if access from above is available. When access is restricted, holes may be drilled at an angle or even horizontally depending on the base plate or machinery configuration.
After drilling the initial hole into the void, the depth of the void can be determined by measuring the penetration of a stiff wire. Additional holes can also be drilled to confirm the extent of the void. If the depth checks indicate consistent voids over 1/4" in depth, then an epoxy with a filler will be needed instead of the normal two-part epoxy injection liquid. A three-component high flow formulation may even be required if the depth can be measured in inches which, in turn, will require a larger access hole.

WARNING: Two-part liquid epoxy injection grouts are designed to fill thin voids of approximately .001" to .250". Filling a deep void with a large area, approximately 2"-3" deep, where the volume would require over a gallon of liquid epoxy would be very dangerous as the exothermic heat developed during cure could cause excessive stress and possible distortion of the equipment base.

INJECTION EQUIPMENT

For two-part liquid epoxy injection, the holes are usually drilled and tapped for 1/8" or 1/4" pipe fittings. Both injection and vent holes are tapped so that a vent hole can be used also as an injection point during the final stages of injection. Common grease fittings with pipe threads are used as a means of attaching the pumping mechanism, typically a hand held grease gun. When a hand held grease gun is used, its life expectancy will be very short. Because of the nature of the epoxy injection material, any delay can result in the material in the gun becoming hard. If this occurs, no amount of cleaning will restore the gun to normal operation. It is a good practice to use an inexpensive, hand held grease gun because it will normally be thrown away during the course of the job.

Large repair projects, with numerous injection points can best be handled by a high volume pumping system rather than hand held grease guns. Regardless of the type of pumping equipment, care should be taken to see that pressure under the machinery base is limited to 6-30 psi to prevent hydraulic deformation, or delamination of a securely bonded section of the base if pressure is applied too rapidly or to an unvented area. In some cases, the ball checks in some grease fittings may be removed, or the fittings temporarily not installed, or very loose in the vent holes. In any case, the type of injection equipment needs to be compatible with the epoxy cleaning solvents used, and the equipment cleaned up frequently.

In the case of a massive injection project, it may be necessary to obtain an air operated drum pump similar to those found at service station grease racks. If this type of pump is used, a pressure regulator should be installed on the air side of this pump so that the pump's stall speed will be sufficient to prevent over pressurizing of the machinery base. Reciprocating drum pumps of this type should have no greater than a 20:1 ratio, and be sufficiently sized to fit in a five-gallon bucket.
Liquid epoxy injection material will ruin any type of pumping equipment if allowed to set up inside it. In the case of pressure pots or reciprocating pumps, it will be necessary to periodically flush these items with a solvent designed for the epoxy being used.

**MIXING**

Mixing of the two-part injection material should be done in small batches commensurate with the void size. It is not a good idea to try to split, or otherwise use only a portion of a large unit of epoxy injection material. If necessary, though, be sure to accurately measure out the epoxy resin and hardener to ensure the mixture will cure properly. One quart units are usually preferred not only because of the short working time of the two component epoxies (usually 30 minutes maximum), but also because of the small capacity of the injection (grease) gun. Adequate crew size and proper job planning are essential since the injection process on any piece of equipment should be continuous. In the case of multiple interconnected voids, simultaneous injection with more than one gun may be required.

**APPLICATION**

When a hand operated grease type gun is used, the end cap and spring plunger must be removed, and the grease gun is held vertically. The helper will maintain a constant level within the grease gun through the open top as the liquid is being pumped. It is important that the gun always have some liquid level above the plunger, so air will not be injected under the base.

Injection should start at one of the outer points and continue until material comes out of all the open vent holes. In the case of some API 610 pump bases, the pump base is sloped down from the driven end to the pump. When injecting epoxy resin into these bases, one should start at the low end and work upward. There are occasions when, as the pumping is started, resistance will be felt by the operator. This is usually when a space of only a few thousandths of an inch, but with a large area, is being filled. If this occurs, pumping should be stopped periodically to allow the pressure to subside as the epoxy mixture flows into restricted voids. Under no circumstances should the epoxy be forced into the void. To do this could seriously deform, or misalign the base plate. This is the reason for monitoring the injection pressure, or having the stall speed of a reciprocating pump set at 25-30 psi. Alternately start and stop pumping until the void is full, and liquid starts to flow from the vent holes. Sometimes it is necessary to move onto an adjacent injection point if the void area is large. Remember the goal is to fill the void sufficiently that injection at the peripheral points will cause flow to be seen at the vents. Once the void is completely filled, the grease fittings should not be disturbed and all open holes should be plugged. In the event of slow leakage into an adjacent void or into a foundation crack, additional pumping can be resumed. If leakage continues, the grout should be allowed to set, and a second injection attempted either through the original holes or new ones.
Experience and common sense are needed under these circumstances.

The above procedures may sound complicated, however, many loose pump bases and other types of grouted machinery have been satisfactorily repaired by injection of liquid epoxy.

Pressure injection is not a substitute for proper grouting procedures, but is used only to correct a problem that resulted from improper grouting procedures or unsuitable grouting materials such as cement-based grouts.

NOTE: PRESSURE INJECTING OF MACHINERY BASES AND FOUNDATIONS SHOULD NOT BE CONSIDERED AS A PERMANENT AND LONG-LASTING REPAIR.
Section 6
SKID CHOCKING

Over the years, installation of skid-mounted equipment was accomplished without much thought of long-term effect. If epoxy grout was used, the drawings called for 1" to 1-1/2" maximum grout thickness. No provisions were made for access under the skid, and the installer was usually required to flow the epoxy grout 8' to 10' under a 1" to 1-1/2" space. To do this, the installer would remove 1 to 2 bags of aggregate from the grout to improve its flow, thereby changing the aggregate fill ratio. This was usually done without the benefit of expansion joints. Because of these practices, the following occurred:

A. **Increased cost**

   This is an important part of any job, but who pays for this? The project engineer has more important things on his mind. The construction superintendent is looking at the overall schedule so the installer or end-user has to pay, either in dollars or equipment and foundation problems down the road.

B. **Reduced Physical Properties of the Grout**

   Leaving out aggregate to improve flow is a common practice; however, it is not a recommended one. The most common reason to remove aggregate to enhance flow is insufficient space (or clearance) between the skid base and the foundation. This lack of clearance comes from:

   1. Improper clearance specified on the installation drawing for the epoxy grout being used.
2. Correct elevation of the concrete foundation or skid not attained.

3. Installer fails to remove laitance from the top of the foundation and chip surface properly.

C. **Cracking of the Grout Due to Thermal Stress**

The increased exotherm of the epoxy grout from a reduced amount of aggregate is dependent on the ambient temperature at which the grout is poured. If the ambient temperature is 90°F, then the exotherm will be higher than if the grout was poured at 65°F. Again, the removal of aggregate is not a recommended practice.

I. **Grouting Methods:**

Most skid-mounted units are constructed so that the base is compartmentalized. Pouring grout under the skid causes the compartments to become holding reservoirs for oil, water or fuel. One corrective procedure is to pour grout under the skid, and then (after the grout has cured) fill the skid compartments with concrete or cement grout which fills the reservoirs. This result is monolithic chunks of concrete or cement grout that will shrink away from the framework of the skid and leave tiny passageways to collect and weep oil, water or fuel, etc.

Full bed grouting of a skid can be a problem as far as cost and labor are concerned, but there are easier ways to do it:
A. **Base Grout Cap With Epoxy Chocks**

Prior to setting the skid on the foundation, the expansion joints are installed and secured. All anchor bolt sleeves (where required) are filled with Phillybond 7C or other suitable material. Anchor bolts are wrapped, then the Chockfast Red grout is poured a minimum of 2” thick. If using Chockfast Blue for a skid mounting application, then pour thickness should not exceed 1-1/2” maximum. This would put the top of the grout cap 2” to 2-1/2” below the base of the skid's final elevation. After the grout is allowed to cure, the skid may be placed in position and brought to final elevation. Once the skid is level and at elevation, it is then chocked at each anchor bolt with Chockfast Black epoxy chocking compound.

B. **Pouring Chockfast Black Directly on Concrete**

Very similar to A., this technique allows the Chockfast Black chocks to bear directly on the concrete. When using this type of installation, the following guidelines should be followed.

1. Paint the entire foundation with two coats of Phillyclad 1000 as per the manufacturer's recommendation.
2. Set the skid. (Jackscrew pads should be round and have no sharp corners.)
3. Level the skid and install wrapping around anchor bolts and jackscrews.
4. Install chock forms.
5. Blow out the chock area with clean air. The chock area must be clean and dry prior to pouring the chock.
6. Pour the chock.
These suggestions will not cover every installation, but they will give some suggestions for specialized grouting problems. Consult your Chockfast representative to determine if this technique is applicable to your installation. Also consult the skid manufacturer to determine if the skid is rigid enough to be properly supported by chocks. See Drawing No. CF-006 for details.
FOUNDATION GROUTED PRIOR TO SETTING THE SKID. THIS TECHNIQUE IS USED IN CONJUNCTION WITH EPOXY CHOCKS.
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## CHOCK DESIGN WORKSHEET

Common Torque and Loading Values for Anchor Bolts

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<td>67,000</td>
<td>3,780</td>
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</table>

(1) \[
\text{lb.} = \frac{\text{unit dead weight}}{\text{no. anchor bolts}}
\]

(2) \[
\text{lb.} = \frac{\text{dead wt. per bolt}}{\text{bolt load from table}}
\]

(3) \[
\text{lb.} = \frac{\text{total load per bolt}}{\text{chock load}}
\]

(4) \[
\text{sq.in.} = \frac{\text{chock area under frame}}{\text{chock width under frame}}
\]

(5) \[
\text{cu.in.} = \frac{\text{chock width under frame from Line 4}}{\text{chock depth (thickness) from Line 4}}
\]

(6) \[
\text{cu.in.} = \frac{\text{Total Volume per chock from Line 4}}{\text{chocking compound required}}
\]

(7) \[
\text{cu.in.} = \frac{\text{chocking compound required}}{\text{loss/waste volume/unit}}
\]

Chock length is right to left as you look at it.
Chock width is front to back as you look at it.
Chock depth is top to bottom as you look at it.
Section 7
EDGE LIFTING, CAUSE AND CURE

Edge lifting, or curling, as it is sometimes referred to, is the phenomenon caused by the difference in the rate of thermal contraction between epoxy grout and concrete with low tensile strength. In Fig. 1 we see how the different coefficients of thermal expansion/contraction react one to the other during a temperature decrease.

The result of this differential contraction results in the tensile failure of the concrete just below the grout interface as shown in Fig. 2 & 3. Concrete tensile strength is about 10% of its compressive strength.

When a sufficient amount of heat is applied to the epoxy grout, the reverse occurs. As Fig. 4 show us, the epoxy expands at a rate greater than the concrete and the crack closes.

This is why these cracks are more noticeable during the winter than they are in the summer.

There are several ways to eliminate edge lifting, one of which is to expose peripheral rebar or install doweling around the outside edge of the foundation as shown in Fig. 5. This is normally done when the epoxy grout cap is poured 8" to 12" (or greater) away from the machinery base and is done for cosmetic or sealing reasons rather than for equipment support. By changing the dimensions of the grout cap to "depth greater than width" as show in Figure 6, we reduce the affected area that would be subject to thermal contraction. The edge lifting phenomenon does not occur under the machinery grouted because the equipment deadweight and the anchor bolt tension allows the grout to remain in compression.

Prevention of edge lifting is much easier than repairing it. Another way to prevent edge lifting is to radius, or chip away the outside edge of the concrete foundation. There are several schools of thought on how much to chip away, however, all agree that a 45° angle is the best method and that
2" to 6" is a sufficient area. As shown in Fig. 6, this radiusing of the concrete will usually expose rebar that was originally installed in the concrete. This exposed rebar will further aid in the prevention of edge lifting.

Fig. 7 shows that by reducing dimension X to the same as or less than dimension Y, we can reduce the possibility of edge lifting. Edge lifting will not occur where the epoxy grout is in compression. When utilizing this type of application one must be sure that dimension X allows sufficient room for proper grout placement. A head box will be required to enhance flow under large machinery or plates when using a minimum grout shoulder.

Figures listed in this section apply to Drawing Nos. CF-007, CF-007A, and CF-007B.
FIGURE: 1

EPOXY GROUT CONTRACTS MORE THAN CONCRETE

CONCRETE Restricts EPOXY CONTRACTION

CONCRETE IN COMPRESSION

FIGURE: 2

EPOXY GROUT

THE SYSTEM AT THERMAL STABILITY

FIGURE: 3

EPOXY GROUT

CRACK OPENS

CONCRETE

THE SYSTEM DURING THE COOLING CYCLE.
GROUT CONTRACTS MORE THAN CONCRETE.

FIGURE: 4

EPOXY GROUT

CONCRETE

THE SYSTEM DURING THE WARMING CYCLE.
GROUT EXPANDS MORE THAN CONCRETE AND CRACK CLOSES.

FIGURE: 5

EDGE LIFTING CAUSE AND CURE
45° CHAMFER TO EXPOSE PERIPHERAL REBAR

FIGURE: 6

SHOULDER WIDTH (W) SHOULD BE LESS THAN GROUT DEPTH (D)

FIGURE: 7

DOWELING TO PREVENT EDGE LIFTING

FIGURE: 5

EPOXY GROUT
CONCRETE

EPOXY GROUT
CONCRETE

EPOXY GROUT
CONCRETE

EQUIPMENT BASE
A - 1" LARGER THAN THE REBAR DIAMETER
B - 1/2" DIAMETER MINIMUM
Section 8
PROPER ANCHOR BOLT TENSIONING 
AND ITS RELATIONSHIP TO CHOCK LIFE 
BY 
DONALD M. HARRISON

The entire concept of tightening an anchor bolt is to provide an additional load to be combined with the equipment deadweight that will hold a piece of equipment in a pre-determined position regardless of the designed operating forces that act upon it. When tightening an anchor bolt, most people attempting this procedure give little or no thought to what results their actions will accomplish.

If a wrench with a “cheater” extension or an improperly calibrated torque wrench is used to tighten an anchor bolt, then the force applied may result in the epoxy chocks being loaded far above or below their design. The condition of the anchor bolt threads and the type of lubricant used can have a dramatic effect on the bolt tightening and resultant chock loads. Some older published bolt torques were based on DRY assembly. Variables such as lubrication, plating, thread form, etc., may increase or decrease applied torque values by as much as 20%, and must be considered.

The following table gives the coefficients of friction of various lubricants used as thread lubricants:

<table>
<thead>
<tr>
<th>lubricant</th>
<th>coeff. of friction</th>
<th>% of effort to friction</th>
<th>% of effort to tension</th>
<th>relative torque in ft. lbs. for a 1-3/8&quot; bolt at 50% minimum yield</th>
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</thead>
<tbody>
<tr>
<td>moly/oil</td>
<td>0.060</td>
<td>83.1</td>
<td>16.9</td>
<td>642</td>
</tr>
<tr>
<td>lead oil</td>
<td>0.094</td>
<td>88.6</td>
<td>11.4</td>
<td>945</td>
</tr>
<tr>
<td>copper &amp; graphite with oil</td>
<td>0.100</td>
<td>88.6</td>
<td>10.8</td>
<td>998</td>
</tr>
<tr>
<td>* steel on steel</td>
<td>0.400</td>
<td>97.05</td>
<td>2.95</td>
<td>3669</td>
</tr>
</tbody>
</table>

* DRY included for reference only

A bolt elongates as it is tightened. This elongation can be as much as .001" per inch of total bolt length for each 30,000 P.S.I. of induced tension.
Most epoxy chocks are designed to carry a minimum load of 500 psi. Improper anchor bolt maintenance can result in a loose chock. When an anchor bolt is initially tightened, it is done when a piece of equipment is shut down and it is cool enough for someone to safely work on it. In the case of an overhaul, then the entire unit is "cold iron". Once the equipment is started up and placed on line the anchor bolt can expand as much as .018" as it goes from its initial temperature, which in some cases could be as low as 30°F, up to operating temperature which normally is around 155°F-165°F. This adds up to a thermal range of around 125°F-135°F. This amount of growth will depend on the coefficient of thermal expansion of bolt material.

It is possible for the anchor bolt to actually come loose simply by thermal growth. Normally when this happens, the chock gets the blame for not being able to hold the engine. Epoxy chocks are designed to be in compression; they are not and never will be designed to act as a super glue to hold down a piece of equipment. Holding the piece of equipment in place is the job of the anchor bolt. Supporting the equipment at a desired elevation is the function of the epoxy chock. Very seldom, if ever, is the equipment shut down and the alignment or anchor bolt tension re-checked.

THE FOLLOWING ARE RULES OF THUMB FOR ANCHOR BOLT TENSIONING:

1. Use the proper type and grade nut for the anchor bolt being used.
2. Thoroughly clean the threads, nut face and flange where the nut face bears. If a rough surface is found dress it out to as smooth a surface as possible.

WARNING: SURFACE FINISH WILL AFFECT THE COEFFICIENT OF FRICTION. FRICTION LOSSES ARE HIGHER WITH VERY SMOOTH FINISHES BECAUSE THEY TRAP VERY LITTLE LUBRICANT AT NORMAL BEARING PRESSURES. HOWEVER, MACHINED FINISHES RANGING FROM 23 TO 250 RMS SHOW NO MEASURABLE EFFECT ON FRICTION LOSSES.

3. Equipment bolt holes and anchor bolts should line up. The distance between the anchor bolt and the vertical face of the bolt hole should be equal on all sides.
4. The nut face and washer should bear evenly for 360°. Misalignment of the anchor bolt by as little as 1° off its vertical axis can result in loss of resistance to fatigue.
5. Flat washers used between the nut face and the equipment will reduce galling if the washer hardness is less than the nut.
6. The lubricant used on the anchor bolt and nut threads must be suitable for the service it will be placed in. The pressure developed between the metal faces of the threads and washer will
range from 25,000 - 50,000 psi. It is important that the lubricant be able to withstand this pressure and not squeeze away or break down. Lubricants containing high percentages of molybdenum disulfide have a bearing pressure limit that allows anchor bolt tightening to a stress equivalent of 100% of yield.

THE FOLLOWING SUGGESTIONS ARE GIVEN AS TO SCHEDULED ANCHOR BOLT TENSIONING.

1. Initial tensioning - the bolt is tensioned and released three times with final tensioning accomplished on the third try. The amount of time between tensioning will be dependent on the anchor bolt material and its elastic property. This could range from a few minutes to many hours for the bolt to relax from the stretch imposed on it.

2. Seven (7) days after the equipment has been placed in service and is at operating temperature the anchor bolt is checked for proper tension. The bolt is NOT loosened for this or other tension checks.

3. Thirty (30) days after the initial tensioning and with the equipment at operating temperature, the anchor bolt is checked for proper tension.

4. Six (6) months after initial tensioning, the anchor bolts are checked for proper tension.

5. The anchor bolts are checked for proper tension every six (6) months thereafter.

Pull down at each anchor bolt should be monitored each time the bolts are checked for proper tension. These readings should be recorded and plotted. If excessive pull-down is recorded then the machine alignment should be rechecked.

The best method of obtaining proper anchor bolt tensioning is to monitor its stretch. There are several ways to monitor the stretch and ultimate load or clamping force exerted by the bolt. One way utilizes an indicator pin mounted in the top of the anchor bolt. Others include mechanical bolt tensioning devices used in lieu of a conventional nut, or load monitoring washers.

MEASURING PULL-DOWN AT ANCHOR BOLTS FOR EQUIPMENT INSTALLED ON EPOXY CHOCKS

When attempting to measure the amount of equipment pull-down, it is a common practice to use a dial indicator to observe the clamping effect on a piece of machinery when the anchor bolts are being tightened. The value and significance of the readings depend on how and where the dial indicators are positioned.
It is apparent why large indicator readings can occur. If the indicator head is positioned to contact the grout at the edge of the chock then only the chock volume change after cure will be measured, typically .0005" to .0015". This volume change after cure is not a problem if all chocks have the same amount of pull-down due to volumetric change during cure, and the amount of pull-down is less than .010" between anchor bolts. In the case of a gas engine compressor the alignment (web deflection) can be affected by a change in elevation at the anchor bolt of .010".

**NOTE: FOR EVERY .010" ELEVATION CHANGE AT THE ANCHOR BOLT THE WEB DEFLECTION OF A CRANKSHAFT INCREASES BY APPROXIMATELY .001".**

If the chock is poured on a steel soleplate or rail, then the indicator should be set to read off the steel surface. A soleplate or rail is not significantly deflected by the anchor bolt stress, so only the chock compression, if any, will be measured.

**AS LONG AS ALL THE ANCHOR BOLTS ARE OF SIMILAR LENGTH AND MATERIAL, AND THEY ARE ALL TENSIONED (OR TIGHTENED) EQUALLY, THEN CRITICALLY ALIGNED EQUIPMENT SUCH AS A GAS ENGINE OR COMPRESSOR WILL NOT HAVE ITS ALIGNMENT ADVERSELY AFFECTED.**

**WARNING: FAILURE TO MAINTAIN PROPER ANCHOR BOLT TENSION COULD RESULT IN THE FOLLOWING:**

Chocks will become loose, and over time oil and dirt (grit) will cause the chock and the equipment base to be abraded (wear) due to movement of the equipment.

The epoxy chock loses its ability to resist lateral forces. The coefficient of friction between the CHOCKFAST epoxy chock and cast iron is 0.7 as compared to 0.15 for steel to cast iron.

The anchor bolt may be placed in a shear condition.

Depending on the length of the equipment and rigidity of the frame, flexing on a horizontal plane could occur.
Technical Bulletin # 691B

Bulletin Description

Anchor bolt Pull Out Strength is the force required to pull a single bolt out of its foundation. The separation can occur between the epoxy grout and the concrete foundation or it can occur between the anchor bolt and the epoxy grout itself. This bulletin provides the formulas needed to calculate the force required to pull an anchor bolt out in either manner.

To calculate the Total Pull Out Strength of the entire machine, multiply the force required to pull one bolt out times the total number of bolts.

When calculating Pull Out Strength it is assumed that:
1. A clean, threaded rod or bolt with a coarse surface profile is used.
2. A nut and washer are installed at the bottom of the rod to act as a mechanical interference.
3. The anchor bolt hole is clean and dry, with no contaminants.

Bond Strength Epoxy to Concrete

The bond of the epoxy grout to the concrete foundation is stronger than the bond of the concrete to itself. Typically, concrete will separate next to the bond line of the epoxy and concrete. Therefore, the weakest link in the bond of epoxy to concrete is the concrete itself. The force required to pull concrete apart is called its Shear Strength. A conservative value for concrete shear strength is 800 psi. To determine the force required to pullout the bolt separating it at the epoxy to concrete bond, use the following calculation:

\[ \text{Force} = D \times \pi \times L \times 800 \text{ psi} \]

Where:
\( F \) = Bolt Pullout Force in lbs.
\( D \) = Grout Hole Diameter in inches
\( L \) = Length in inches of the grout hole
\( \pi \approx 3.1415 \)

Below are examples of the force required to pull out various size bolts out of various size holes.

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<tr>
<th>PULL OUT STRENGTH IN POUNDS</th>
<th>3&quot;</th>
<th>4&quot;</th>
<th>5&quot;</th>
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<td>HOLE DIAMETER</td>
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<td>7,530</td>
<td>9,420</td>
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<td>20,100</td>
<td>25,130</td>
<td>50,260</td>
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</tbody>
</table>
Calculating Pull-Out Strength
Bulletin No. 691B, Page 2

Bond Strength Epoxy to Steel

The bond of grout to the steel anchor bolt can be calculated using 1600 psi as the Bond Strength of epoxy to steel. This too is also a conservative number. To determine the force at the grout-to-bolt interface, use the following calculation:

\[ F = BD \times \pi \times L \times 1600 \text{ psi} \]

Where:
- \( F \) = Bolt Pullout Force in lbs.
- \( D \) = Bolt Diameter in inches
- \( L \) = Length in inches of the bolt embedded in grout (does not include the portion of the bolt that is wrapped with tape or inside a bolt sleeve.

\( \pi = 3.1415 \)

Examples of the force required to separate a bolt from the surrounding epoxy assuming there is no nut.

<table>
<thead>
<tr>
<th>Pull Out Strength in Pounds</th>
<th>GROUTED BOLT LENGTH</th>
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<tr>
<td>BOLT DIAMETER</td>
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<td>1/2&quot;</td>
<td>7,540</td>
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<td>3/4&quot;</td>
<td>11,300</td>
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<td>1&quot;</td>
<td>15,070</td>
</tr>
<tr>
<td>1.5&quot;</td>
<td>22,610</td>
</tr>
</tbody>
</table>

Pull-Out Strength – Anchor Bolt in Concrete

As a comparison, an anchor bolt set in a concrete foundation will typically crack up and out from the bottom of the bolt at a 45° angle in a cone shaped section. The force required to pull up this cone shaped section of concrete is the force required to separate concrete over the total surface area of the cone. The Surface Area of a Cone (SACone) = Lateral Surface Area of a Right Circular Cone with 45° Sides:

\[ SACone = \pi \times 1.4142 \times H^2 \]

The force required to pull the concrete apart is the Shear Strength of concrete (800 psi) times the Surface Area of the Cone.

\[ \text{Force lbs} = 800 \text{ psi} \times SACone \text{ in}^2 \]

\[ \text{Force lbs} = 800 \times \pi \times 1.4142 \times H^2 \]

Date 08/2005
Section 9
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# CHOCKFAST GROUTING SYSTEMS

## GROUT MATERIAL AND EQUIPMENT CHECKLIST

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<thead>
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</table>

Chockfast
Spec. Doc.
Sect. 10
Rev. 1/15/92
CONTRACTOR SUPPLIED PRODUCTS

18. _______ SMALL JIFFY MIXER, 2-1/2” DIAMETER
19. _______ MEDIUM JIFFY MIXER, 3” DIAMETER
20. _______ LARGE JIFFY MIXER, 5” DIAMETER
21. _______ ROLLS WEATHER STRIPPING (FOR WRAPPING ANCHOR BOLTS, JACKSCREWS AND FOR CHOCS)
22. _______ ROLLS DUCT TAPE (2”)
23. _______ TUBES SILICONE SEALANT
24. _______ CAULKING GUN
25. _______ CANS URETHANE FOAM SEALANT (EXPANDING)
26. _______ 1 LB DUCT SEAL
27. _______ TUBES NON-MELT GREASE
28. _______ VINYL GLOVES
29. _______ DUST MASK
30. _______ SURFACE THERMOMETER
31. _______ HARDWOOD FLOOR PASTE WAX (1 LB.)
32. _______ PNEUMATIC OR ELECTRIC DRILL (1/2”, 300 RPM OR LESS) FOR JIFFY MIXER
33. _______ MORTAR MIXER IN GOOD CONDITION (15-20 RPM)
34. ______ ANGLE IRON FOR FRONT DAMMING OF CHOCK (MIN. 3/4" LARGER THAN CHOCK THICKNESS)

35. ______ WHEELBARROW (FOR MOVING GROUT FROM MIXING AREA TO THE FORMS)

36. ______ SHOVELS, RAKES AND HOES (FOR MOVING GROUT AROUND FORMS)

37. ______ BOX OF RAGS

38. ______ SOAP AND WATER AT JOB SITE FOR CLEANUP

39. ______ TROWELS (FOR LEVELING OR SMOOTHING GROUT)

40. ______ ENVIRONMENTAL CONTROL AT JOB SITE.
    ______ SCAFFOLDING
    ______ LUMBER
    ______ TARP
    ______ POLYETHYLENE
    ______ HEATER

41. ______ EXPANSION JOINT MATERIAL
    ______ 1" STYROFOAM
    ______ 1" REDWOOD
    ______ SAND FOR SECONDARY SEAL
GROUT PROJECT DATA SHEET

GENERAL INFORMATION:
NAME_____________________________ TITLE__________________________
COMPANY__________________________ PROJECT START DATE_____________
PHONE NO.________________________ FAX NO.________________________
ADDRESS__________________________________________________________
_________________________________________________________________
CONTRACTOR_______________________________________________________
CONTACT__________________________ PHONE NO.______________________

EQUIPMENT:
MANUFACTURER_____________________ JOB LOCATION___________________
FUNCTION__________________________
NEW INSTALLATION__________________ REGROUT________________________

TYPE OF EQUIPMENT:
ENGINE_____ COMPRESSOR_____ INTEGRAL UNIT_____ DIRECT CONNECTED_____ 
CENTRIFUGAL_____ PUMP_____ TURBINE_____ STEAM_____ GAS_____
GENERATOR_____ ELECTRIC MOTOR_____ OTHER__________________________
EQUIPMENT DEAD WEIGHT____________ OPERATING WEIGHT______________

TEMPERATURE (°F) SUMMER HIGH________ WINTER LOW____________
EQUIPMENT OPERATING TEMPERATURE____________________

EXISTING MOUNTING SYSTEM:
NEW MOUNTING SYSTEM: (check all methods under consideration)
FULL BED_____ RAIL_____ SOLE PLATES_____ EPOXY CHOCKS_______
GROUT PROJECT DIMENSIONS:

<table>
<thead>
<tr>
<th>DIMENSIONS</th>
<th>NUMBER OF EACH</th>
</tr>
</thead>
<tbody>
<tr>
<td>BASE</td>
<td></td>
</tr>
<tr>
<td>RAILS</td>
<td></td>
</tr>
<tr>
<td>SOLEPLATES</td>
<td></td>
</tr>
</tbody>
</table>

ANCHOR BOLTS:

<table>
<thead>
<tr>
<th>STANDARD</th>
<th>HIGH STRENGTH (4140)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FREESIDE</td>
<td>COMP.SIDE</td>
</tr>
<tr>
<td>DIAMETER</td>
<td>X-HEAD</td>
</tr>
<tr>
<td>NUMBERS</td>
<td>PEDESTAL</td>
</tr>
<tr>
<td>TORQUE</td>
<td>OTHER</td>
</tr>
</tbody>
</table>

CONCRETE:

OVERALL DIMENSIONS OF FOUNDATION__________________________________________________________

(DRAWING IF POSSIBLE)

AGE OF FOUNDATION__________________________________________________________

CONDITION OF OLD CONCRETE:

CLEAN______ OIL SOAKED______ CHEMICAL ATTACKED______ CRACKED______

OTHER________________________________________________________

COMPRESSIVE STRENGTH IF KNOWN__________________________________________

IF OIL SOAKED, CHEMICALLY ATTACKED, OR CRACKED, DESCRIBE CHEMICAL TYPE, DEPTH AND LOCATION ON SEPARATE SHEET OR DRAWING

IF NEW CONCRETE WILL BE POURED: DESIGN COMPRESSIVE STR._________
TYPE OF CONCRETE_____________________________________________________

GROUT:
DEPTH OF GROUT___________ EXISTING___________ NEW________________________

SPECIAL CONDITIONS OR COMMENTS_________________________________________
_______________________________________________________________________
_______________________________________________________________________
_______________________________________________________________________
_______________________________________________________________________
_______________________________________________________________________
_______________________________________________________________________
_______________________________________________________________________

Chockfast
Spec. Doc.
Sect. 10A
8/1/91
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CHOCKFAST
TECHNICAL SERVICE CHECKLIST

GENERAL INFORMATION

Customer: _______________________________     Contact/Title: ___________________
Location: _______________________________     Tel: _____________________________
Contractor: _____________________________     Contact: _________________________
Tel:____________________________

EQUIPMENT

Mfgr: ____________________________________    Model: ____________________________
Location: ___________________________________    Inside ____   Outside ____
Shaded/heated-How Long _____________          Equipment Base Temperature____°F
Grout System:  Full Bed___   Rail___   Sole Plate___   Epoxy Chock___

ANCHOR BOLTS

Type: ___________________________    Diameter _____    Torque_______________________
Wrapped_________    Greased___________

JACKSCREWS
Wrapped ____  Other(specify)___________________________

**METAL SURFACE CONDITIONS**

Blasted ____  Rusted ____  Clean ____  Oily ____

Primed (type)_________________________  Other (specify)_________________________

**CONCRETE**

Condition: Good ____  Fair ____  Poor ____  Cracked ____

(If cracked, show locations on sketch.)

Age of concrete:  Old ____  New ____  (If new, date of pour) ___________

Compressive Strength:  Currently ____________  Designed ____________

Preparation: Chipped ____  Other (specify)_________________________

Chamfered ____ in. to reduce edge lifting.  YES  NO

Surface:  Dry ____  Wet ____  Oily ____  Other (specify)_________________________

Shaded/heated  How Long ____________  Temperature ____________

Anchor Bolt Holes:  Dry ____  Wet ____  Sleeved ____  Sealed ________

<table>
<thead>
<tr>
<th>TEMPERATURE °F</th>
<th>BATCH NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRODUCT: Units Resin Hrdnr Agg  Resin Hrdnr Agg</td>
<td></td>
</tr>
<tr>
<td>RED ____ ____ ____ ____  ________  ________  ________</td>
<td></td>
</tr>
</tbody>
</table>

| ____ ____ ____ ____  ________  ________  ________ |

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EXPANSION JOINTS

Yes: Type (describe) ____________________________________________

Distance between joints: Width ___________ Length _________

No: Reason for no joints._____________________________________

_________________________________________________________________

REBAR

Diameter: Vertical _____  Spacing: Vertical ______

Rebar on perimeter to reduce edge lifting? YES NO  Diameter______

Spacing: Vertical ___________  Surface Condition: Sandblasted____

Rusted _____  Oily ___________  Clean _______

If horizontal rebar was incorporated in the design, explain why:

_________________________________________________________________

GROUT: CHOCKFAST RED

Average Depth of Pour _____________  Time of Pour _____________

Ambient Temperature ________________

Aggregate removed? YES NO  How much? __________________________

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Why _____________________________________________________________

**GROUT: CHOCKFAST BLUE**

How was Chockfast Red surface abraded for Chockfast Blue pour?

________________________________________________________________________

Depth of Chockfast Blue________

Temperature of Chockfast Red prior to pouring Chockfast Blue____

Expansion joints located in Chockfast Blue every 42"__________

**CHOCKING COMPOUND:** Chockfast Black __________

Chockfast Orange __________

Ambient Temperature _____________

Bedplate Temperature _____________

Chock Load _____________ PSI

Chock Size  L___________  W___________  D_____________

**COMMENTS**

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

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Sect. 10B
8/1/91
SKETCH

Name/Date
Factory-trained and certified CHOCKFAST REPRESENTATIVES are available for onsite technical support worldwide.