ITW **Philadelphia Resins**

Chockfast® Foundation Systems

Electronic Machinery Grouting Manual

ISO 9002

Montgomeryville, PA. A 3790

Shannon, Ireland FM19523

"Proven Solutions"

Chockfast®

Index & Quick Reference

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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.

USE	**PRODUCT**
Equipment Grouting Engines Compressors Skid mounted units Pumps Sole Plates Rails	Chockfast® Red Chockfast Red S.G. Chockfast® Blue
Acid Resistant Grout and/or High temperature applications	Chockfast Blue
Epoxy Chocks sometimes referred to as pourable shims	Chockfast® Black Chockfast Orange®
Anchor bolt or Rebar installation Vertical (pourable) Horizontal (putty)	 Anchorfast™ Phillybond® Blue 6A
High flow grout 1/4"-1-1/4" depth	Chockfast Gray
Discuss application with ITW Philadelphia Resins to determine expansion joint locations.	
Concrete Reconstruction Size and Depth of Pour	Chockfast Red 7'x7'x18" (& Deeper)

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.

Chockfast®

Section 1

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MATERIAL SPECIFICATIONS AND PROCEDURES
FOR EPOXY GROUTING OF PUMP BASEPLATES, RAILS, OR SOLEPLATES
8/1/91

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 X 10^{-6} per 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:

STANDARD CEMENT 21-28 DAYS MINIMUM
HI-EARLY CEMENT (6-7 BAG MIX) 7 DAYS MINIMUM

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 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 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 EPOXY 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 CHOCKS.

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 X 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:

STANDARD CEMENT 21-28 DAYS MINIMUM
HI-EARLY CEMENT (6-7 BAG MIX) 7 DAYS MINIMUM

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 (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.

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 (PHILLYBOND 7C) WITHOUT SAND.

8.3.3 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.

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 CHOCKS WILL BE SIZED AS FOLLOWS:

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

12.4 ALL FOUNDATION BOLTS WILL BE WRAPPED WITH WEATHER 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 CHOCK AREA SHALL BE WRAPPED WITH DUCT TAPE TO FACILITATE REMOVAL AFTER THE CHOCK 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 CHOCK THICKNESS.

12.7 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.

12.8 INSTALL THE FRONT CHOCK DAMS. THESE SHALL BE MADE OF ANGLE IRON AND MUST PROVIDE A MINIMUM 1/2" HEAD ABOVE THE ENGINE OR COMPRESSOR BASE SURFACE. ALLOW 3/4" CLEARANCE BETWEEN THE ANGLE IRON AND THE ENGINE OR COMPRESSOR BASE. THE AREA OF THE ANGLE IRON EXPOSED TO THE EPOXY SHALL BE SPRAYED WITH A RELEASE AGENT (PRT-225).

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

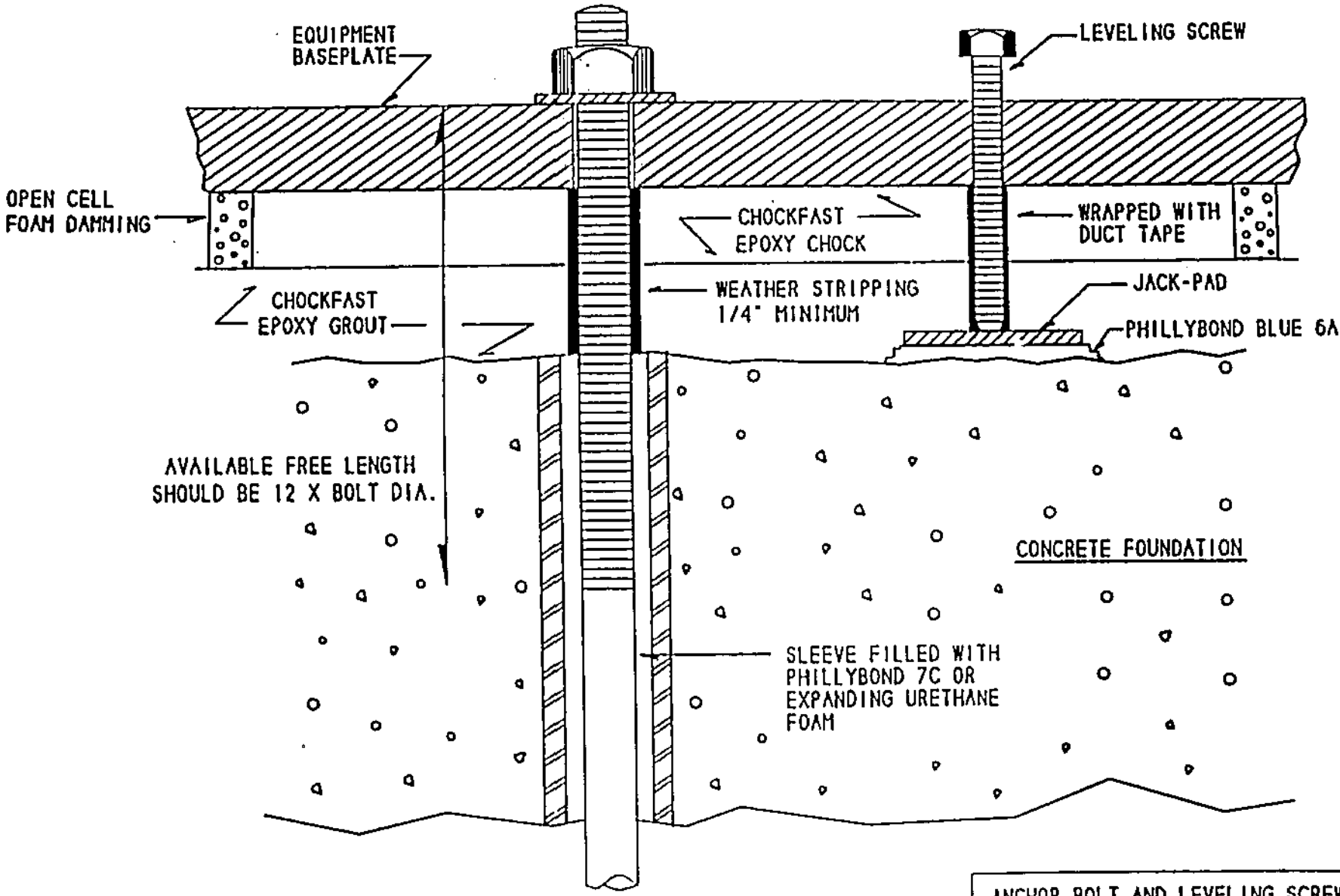
12.10 POURING OF THE EPOXY CHOCK WILL NOT BE PERFORMED UNTIL THE CHOCK MANUFACTURER OR HIS REPRESENTATIVE HAS APPROVED THE ABOVE INSTALLATION.

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.



ANCHOR BOLT AND LEVELING SCREW
ASSEMBLY FOR EPOXY CHOCKS
DRAWING NO. CF - 001

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

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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:

STANDARD CEMENT (3-5 BAG MIX)	28 DAYS MINIMUM
HI-EARLY CEMENT (6-7 BAG MIX)	7 DAYS MINIMUM

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 ANNULAR 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 EXPAQNSION 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 ¼ 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.

13.8.1 FRONT CHOCK DAMS SHALL BE MADE OF ANGLE IRON AND MUST PROVIDE A MINIMUM 1/2" HEAD ABOVE THE UNDERSIDE OF THE SKID RAIL, ENGINE OR COMPRESSOR BASE SURFACE. ALLOW 3/4" TO 1" CLEARANCE BETWEEN THE ANGLE IRON AND THE SKID RAIL, ENGINE OR COMPRESSOR BASE. THE AREA OF THE ANGLE IRON EXPOSED TO THE EPOXY CHOCKING COMPOUND SHALL BE LIGHTLY COATED WITH A NON MELT GREASE OR SPRAYED WITH A RELEASE AGENT (PRT-225).

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.

Chockfast®

Section 2

ISO 9002

Montgomeryville, PA.
A 3790

Shannon, Ireland
FMT1623

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

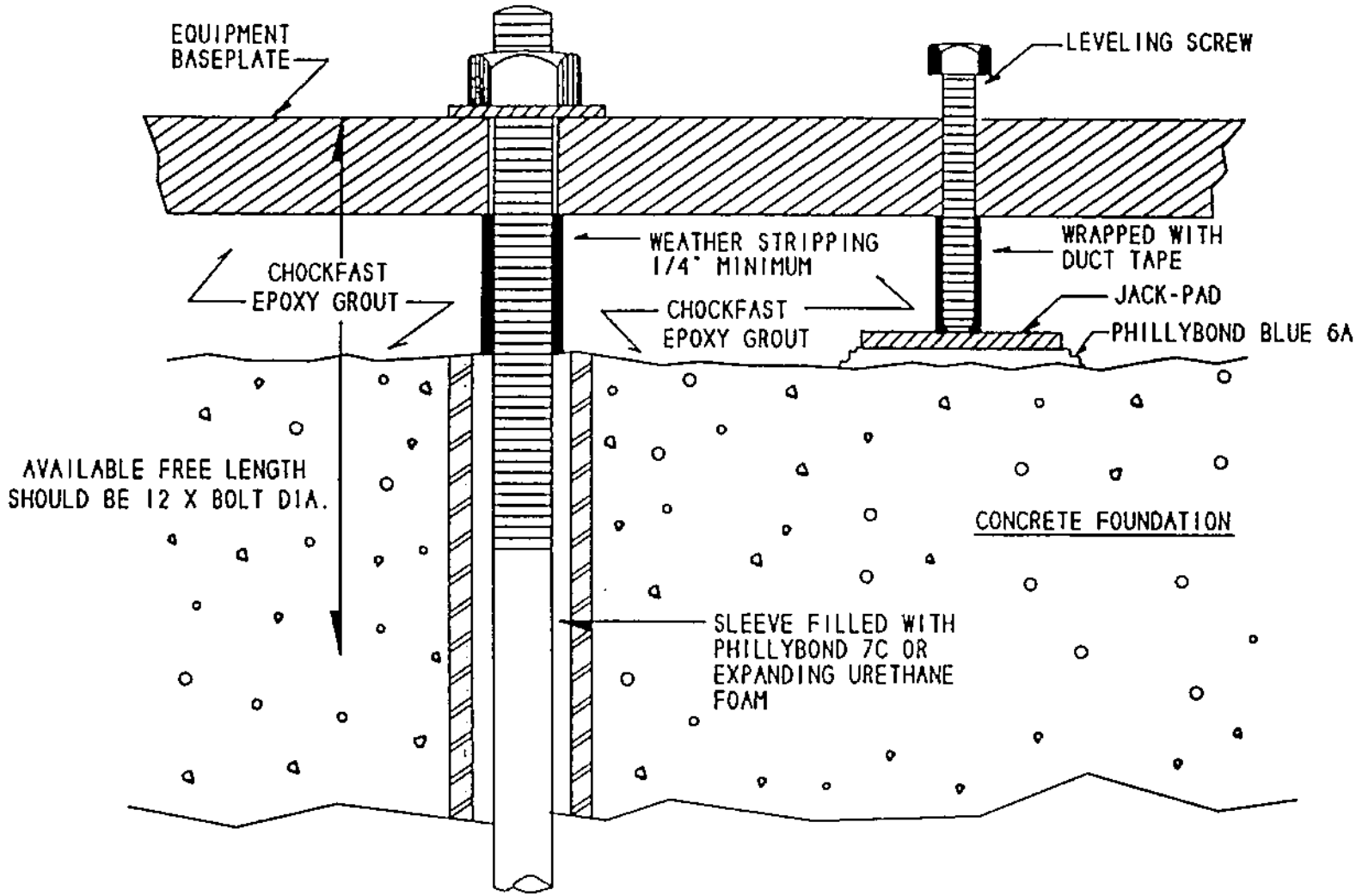
During the summer, the foundation and equipment to be grouted should be covered with some type of shelter to keep the uncured grout from being exposed to direct sunlight. This covering will also protect the foundation from dew, mist or rain. It should be erected 24 hours prior to grouting and remain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



ANCHOR BOLT AND LEVELING
SCREW ASSEMBLY
DRAWING NO. CF - 002

Chockfast®

Section 3

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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:

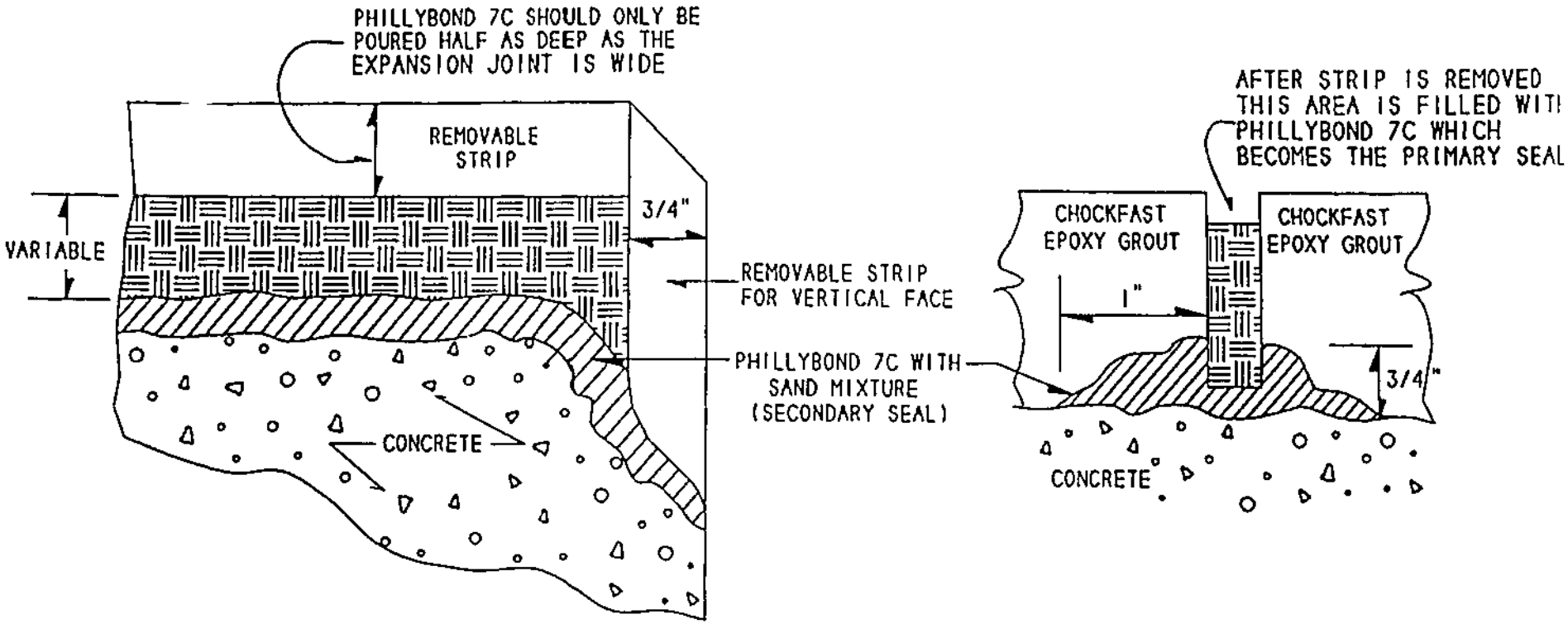
A. Using a medium size Jiffy mixer blade, mix the Phillybond 7C resin and hardener for three minutes at approximately 250 RPM.

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.



NOTE: AFTER THE GROUT HAS CURED REMOVE THE STRIPS AND FILL THE VOID WITH PHILLYBOND 7C

EXPANSION JOINT MATERIAL MAY BE STYROFOAM REDWOOD OR OTHER SUITABLE MATERIAL

EXPANSION JOINT DETAIL UTILIZING
THE SECONDARY SEAL DESIGN
DRAWING NO. CF - 003

Chockfast® Product Technical Bulletin

ITW PHILADELPHIA RESINS
EXPANSION JOINT COMPOUND

Bulletin #1018A

DESCRIPTION

ITW Philadelphia Resins EXPANSION JOINT COMPOUND is a two-component epoxy resin formulation intended as a flexible foundation seam sealant. It has good adhesive strength and flexibility over a wide temperature range.

USES

For sealing joints where expansion and contraction movement will take place. EXPANSION JOINT COMPOUND is particularly effective with concrete structures and forms part of ITW Philadelphia Resins' standard design recommendation for stationary diesel and gas engine installation. Expansion joints should be spaced in accordance with the recommendations of Bulletin No. 643. To obtain adequate extensibility the correct cross section must be maintained; please see the reverse side of this bulletin for suggestions.

ADVANTAGES

- 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.

PHYSICAL PROPERTIES

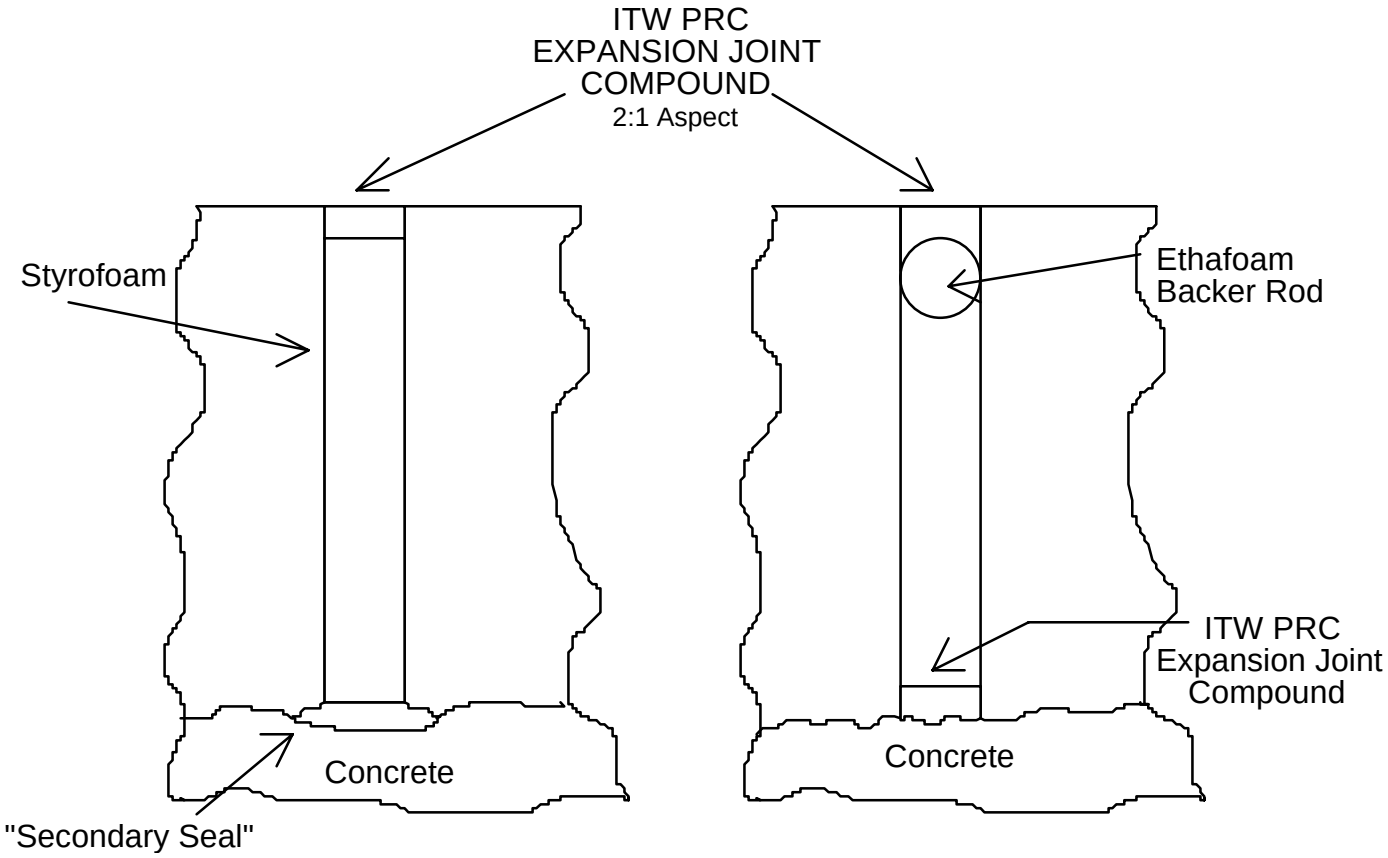
COLORS:	Dark Blue, Red, Gray
CONSISTENCY:	Self-leveling, flowable liquid
CURE TIME:	24 hours at 75°F (24°C) 48 hours at 55°F (13°C)
ELONGATION:	200%
MIXING RATIO BY WEIGHT:	12 parts resin to 1 part hardener
PACKAGING:	Resin: 1 gallon can. Net weight 6 lbs. 8 oz. (2.95 kg) Hardener: 1-pint can. Net weight 8.5 oz. (241 g) Mixed unit provides 152 cu. in. (2.5 liters)
POT LIFE:	45 minutes
USEFUL TEMPERATURE RANGE:	0°F - 150°F (-18°C to 65°C)

APPLICATION

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.

ITW PHILADELPHIA RESINS
130 Commerce Drive • Montgomeryville, PA 18936 • 215-855-8450 • Fax 215-855-4688

TYPICAL EXPANSION JOINT DETAILS:



Chockfast®

Section 4

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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° to 78°F. (Material & Base)

Distance (ft)	2'	3'	4'	5'	6'	7'	8'
Clearance (in.)	2"	2-1/2"	3"	3-1/2"	4"	4-1/2"	5"

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

Distance (ft)	2'	3'	4'	5'	6'*	7'*	8'*
Clearance (in.)	2-3/4"	3-1/2"	4-1/4"				

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

Distance (ft)	2'	3'	4'	5'	6'	7'	8'
Clearance (in.)	2"	2-1/4"	2-1/2"	2-3/4"	3"	3-1/4"	3-1/2"

* 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.

CHOCKFAST®
INSTALLATION PROCEDURE
INDUSTRIAL APPLICATIONS

Bulletin No. 642F

INTRODUCTION

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

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

Application procedures are included for CHOCKFAST RED, CHOCKFAST BLUE, CHOCKFAST BLACK and CHOCKFAST ORANGE® and are described in a sequence which 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.

PREPARATIONS FOR GROUTING

Grout Storage

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

New Concrete Foundations

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

2. Under no circumstances should the surface of the foundation be soiled by oil, grease, water, etc.

NOTE: Tensile strength of new concrete is extremely important when capping the concrete with epoxy grout. Follow these foundation preparation guidelines.

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

4. 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.

NOTE: See the paragraph entitled **Rebar Policy** on page 3 for design consideration of new concrete foundations.

5. 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

Miscellaneous

1. Bedplate Preparation: Bedplates 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 base plate 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 pock marks left by the corrosive influence of cement grouts. Although a vertical tensile crack in a resin chock will not cause loss of alignment, it is best to follow the above preparation techniques.

2. Anchor Bolts: It is preferable that 12 times the bolt diameter from the top should be wrapped with 1/4" thick neoprene foam rubber to provide free length for stretching when tensioned and to allow for base plate 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.

Forms

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.

CHOCKFAST RED POURING PROCEDURES

CHOCKFAST RED is a three-component, high-strength, 100% solids epoxy grouting compound. (See Technical Bulletin No. 617).

1. To ensure proper mixing and pouring viscosity of the CHOCKFAST RED system, pre-condition the resin, hardener and aggregate at 18°-35°C (65°-95°F) 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.

2. 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" (12mm) 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.

3. 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 90.6 liters (3.2 cu.ft.) 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, 10.4 kilograms (23 lb.) 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 portable mortar mixer speed of 15-20 rpm is recommended. When the CHOCKFAST RED resin, hardener and aggregate have been pre-conditioned to 21ºC (70ºF) 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 21ºC (70ºF) 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. Mixing of the resin and hardener must be accomplished separately as outlined in paragraph 2.

4. Although CHOCKFAST RED is generally self leveling, at temperatures below 18◦C (65◦F) rakes or paddles can easily be used to achieve complete filling of prepared areas.

5. Pour the CHOCKFAST RED as soon as possible after mixing. The pot life of this product is approximately 2-3 hours at 21◦C (70◦F).

6. CHOCKFAST RED may be used at thicknesses between 35mm (1-1/2") and 450mm (18"). Individual pours should generally not exceed 450mm thick x 21.5m long x 2.15m (18" thick x 7' long x 7' wide). See section below entitled **Expansion Joints: CHOCKFAST RED** for detailed information on expansion joint requirements and locations.

7. Cure time for CHOCKFAST RED is as follows:

54 hours @ 16◦C (60◦F)
36 hours @ 21◦C (70◦F)
24 hours @ 27◦C (80◦F)
18 hours @ 32◦C (90◦F)

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

9. 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.

10. 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 chemically as well as physically bond. For information concerning expansion joints in CHOCKFAST BLUE see the following section "Expansion Joints" in this Technical Bulletin.

Expansion Joints: CHOCKFAST RED

Expansion joints should be provided at least every 2.15m (7') in both directions on installations of CHOCKFAST RED. *On all installations where the cured grout temperature may drop to 13°C (55°F) or below, the expansion joint spacing should not exceed 1.1m (3'6"). Expansion joints must go completely through the CHOCKFAST RED to the underlying concrete foundation. (See Technical Bulletin No. 662).*

Warning: Expansion joints should not be placed near anchor bolts, be bridged by sole plates, 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 (where applicable).

Where CHOCKFAST BLUE is used as an overlay on 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 ITW EXPANSION JOINT COMPOUND material. Guidance on expansion joint design and complete information on ITW

EXPANSION JOINT COMPOUND may be found in Bulletins No. 645 and 662.

Rebar Policy

Steel reinforcing bars, known as rears, 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 CHOCKFAST products 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 CHOCKFAST grouts. Where significant unloaded areas of 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 CHOCKFAST top surface.

NOTE: For additional design considerations, please see Technical Bulletin No. 643 entitled "Standardized CHOCKFAST Design for Integral Gas Engine Compressors."

CHOCKFAST BLUE
POURING PROCEDURES

CHOCKFAST BLUE is a two-component, 100% solids, pourable epoxy based grouting compound for severe applications.

1. Inspect top of foundation and/or underlying grout base for cleanliness, paying special attention to the removal of oil and water. Underlying surfaces should be roughed up with chipping hammer to ensure good bond. When pouring CHOCKFAST BLUE on top of CHOCKFAST RED one of the following procedures should be followed: 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. 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.

2. Expansion Joints: Expansion joints should be provided at least every 1.1m (42") and pours should not normally exceed 1.1m x 1.1m x 36mm thick (42" x 42" x 1-1/2" thick). Where CHOCKFAST RED is the underlying material, the expansion joints in it must coincide with expansion joints in the CHOCKFAST BLUE. Expansion joints can be made from rigid styrofoam, redwood, neoprene rubber, etc., but in any case, must be oil tight. ITW EXPANSION JOINT COMPOUND should be used to seal expansion joints, so please see Bulletin 645 for information on this product and on expansion joints in general.

3. Mixing Grout: To ensure proper mixing and pouring viscosity, pre-condition resin and hardener to 70°-80°F (21°-26°C) for 24 hours prior to mixing. It is also beneficial to 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.

4. 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 18mm (3/4") 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.

5. Use grout as soon as possible after mixing. CHOCKFAST BLUE pot life is approximately 35

to 50 minutes at 21◦C (70◦F)

6. Cure time for CHOCKFAST BLUE is as follows:

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

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.

Preparation and Forming:

1. Inspect top foundation (i.e., CHOCKFAST BLUE or soleplates) for smooth, non-gouged, clean, oil-free surface.

2. Bedplate Preparation: Please refer to #1 under Miscellaneous on Page Two of this Bulletin for information pertaining to bedplate preparation.

3. Appropriately sized dams for the chocks are installed once the machinery is in position. These will normally be local to the hold down bolts and open celled foam strip is used for the three sides under the machinery. 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").

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

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

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

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

8. Over pours 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 frames.

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

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

POURING:

1. Be sure to precondition CHOCKFAST BLACK for a minimum of 24 hours at 21◦-27◦C (70◦-80◦F) before pouring.

2. Check machinery bedplate temperature and the size of chocks.

3. Add the complete container of hardener to resin. A small or medium Jiffy mixer blade, supplied by ITW Philadelphia Resins, inserted in a 12mm (1/2") 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.

4. Pour mixed materials into chock cavity, 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. Allow chocks to cure at least:

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

before torquing bolts and executing final alignment check.

6. **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

1. The standard pour thickness for a CHOCKFAST ORANGE epoxy chock is 31mm (1-1/4"). Should the designed thickness be greater than 70mm (2-3/4") please consult the CHOCKFAST Representative or ITW Philadelphia Resins. The amount of hardener mixed with the CHOCKFAST resin must be measured according to chock thickness and equipment base plate 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.

Grouting
Large Anchor Bolts

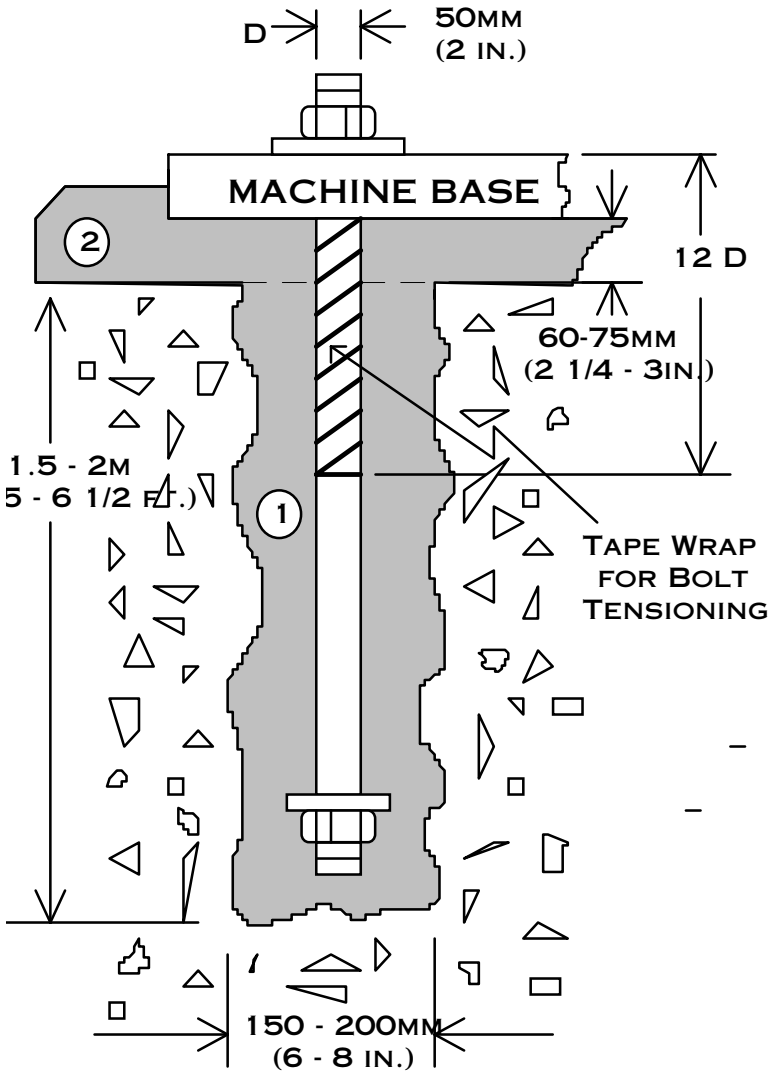
Bulletin # 615A

Grouting Large Anchor Bolts

Deep anchor pockets up to 2 meters (6 ft) long and 200mm (8”) wide may be filled conveniently with a single placement of CHOCKFAST® RED.

The gentle exotherm of CHOCK-FAST®RED allows grout placement of large bolts to be executed with single pours in extremely hot and humid climates with negligible shrinkage.

Most process machinery is critically aligned within hundredths of 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”).



① CHOCKFAST® RED “Final Leveling Pour” under critically aligned machinery components

② CHOCKFAST® RED “Bolt Pocket” filled with first pour

Chockfast® Product Technical Bulletin

CHOCKFAST®RED

BULLETIN # 617P

CHOCKFAST RED 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. CHOCKFAST RED has extremely high compressive strength and negligible shrinkage, making it ideal for the final positioning of critically aligned machinery within close tolerances.

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
- Higher 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

CHOCKFAST RED contains no non-reactive diluents which could interfere with the curing mechanism or which could cause material loss during or after cure. 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.

CHOCKFAST RED may be mixed with contractor's hoe and wheelbarrow or in a small portable mortar mixer. Precondition resin, hardener and aggregate to 18°-27°C (65°-80°F) 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 Representative or ITW Philadelphia Resins if less than 3-1/2 bags are being considered. See Bulletin No. 642 for mixing procedures.

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 30mm (1.25"), however, individual pours should generally not exceed 46cm (18") in thickness and 2.2m (7') in length. When grouting highly critically aligned machinery, which is coupled to another machine, it is advisable to limit the final leveling pour in accordance with the instructions in Bulletin No. 615 (latest revision).

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

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PHYSICAL PROPERTIES

COEFFICIENT OF LINEAR THERMAL EXPANSION: Temperature Range	20.1×10^{-6}/C° 0°to 60°C	ASTM D-696 (11.2×10^{-6}/F°) (32° to 140°F)
COMPRESSIVE MODULUS OF ELASTICITY:	140600 kg/cm^2 (2,000,000 psi)	ASTM C-579 (Modified)
COMPRESSIVE STRENGTH:	1072 kg/cm^2 (15,250 psi)	ASTM C-579 (Modified)
FIRE RESISTANCE:	Self-extinguishing	ASTM D-635
FLEXURAL STRENGTH:	2825 kg/cm^2 (4025 psi)	ASTM C-580
FLEXURAL MODULUS OF ELASTICITY	140600 kg/cm^2 (2,000,000 psi)	ASTM C-580
IZOD IMPACT STRENGTH:	0.02 N.m/mm (4.6 in.lb/in)	ASTM D-256
LINEAR SHRINKAGE:	Not measurable	ASTM D-2566
POT LIFE:	Approximately 3 hours @ 21°C (70°F)	
SPECIFIC GRAVITY:	2.06	
TENSILE STRENGTH:	133 kg/cm^2 (1,890 psi)	ASTM D-638
COVERAGE:	94 kg (207 lbs.) 45.3 liters (1.6 ft^3)	
CURE TIME (approximate):	54 hrs. @ 16°C (60°F) 36 hrs. @ 21°C (72°F) 24 hrs. @ 27°C (80°F) 18 hrs. @ 32°C (90°F)	
PACKAGING:	Resin: 6.1 liters (1.6 gal) Hardener: 3.4 liters (0.9 gal) Aggregate: 4.21 kg bags (4 – 46 lb. bags)	
SHELF LIFE:	2 years in dry storage	

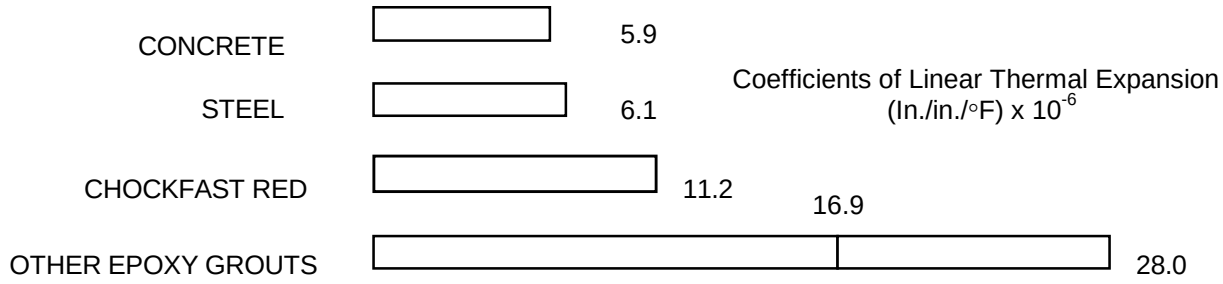
June 98

CHOCKFAST® RED
Compatibility With Concrete and Steel

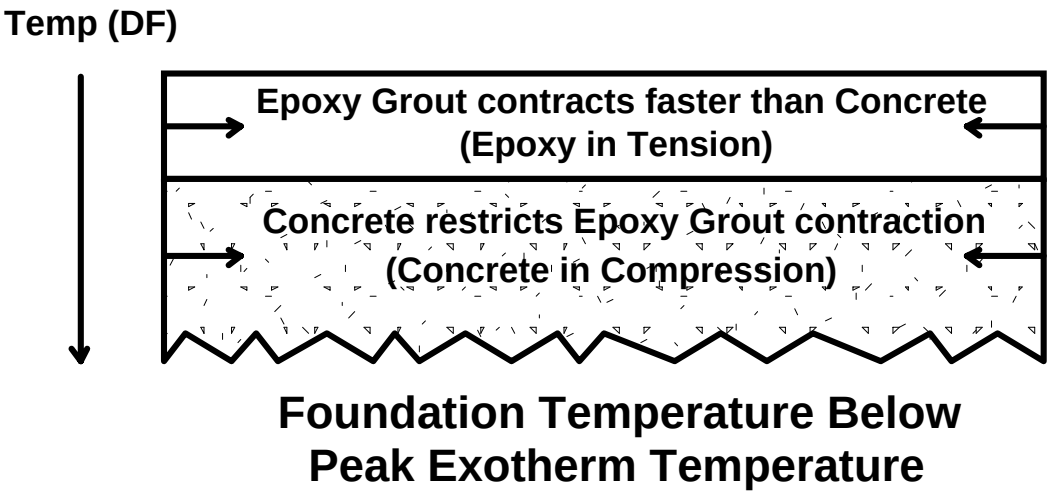
Bulletin # 638A

The most important design criteria for an epoxy grout are those physical properties that directly affect the grout's compatibility with concrete and steel; these criteria are Coefficient of Linear Thermal Expansion and peak Exothermic Temperature. All major epoxy grouts on the market today have sufficient Compressive Strength.

1. Coefficient of Linear Thermal Expansion (CTE) provides the expansion or contraction in units of inch per inch of a material subjected to a 1◦F increase or decrease in temperature. The following is a listing of the CoTE's for concrete, steel and various epoxy grouts as published by their respective manufacturers:



Because CHOCKFAST RED is a gently curing epoxy grout, its peak exothermic temperature (95◦F to 130◦F depending on depth) is often very near the foundation temperature under operating machinery. This small difference between the peak exothermic temperature and the operating temperature results in minimum foundation stress. When machinery is not operating, freezing conditions may occur, and the epoxy grout will want to contract more than the concrete or steel because of the different CoTE's. As a result of the epoxy bond to the concrete, the epoxy will be in tension and the concrete in compression.



Foundation Temperature Below Peak Exotherm Temperature

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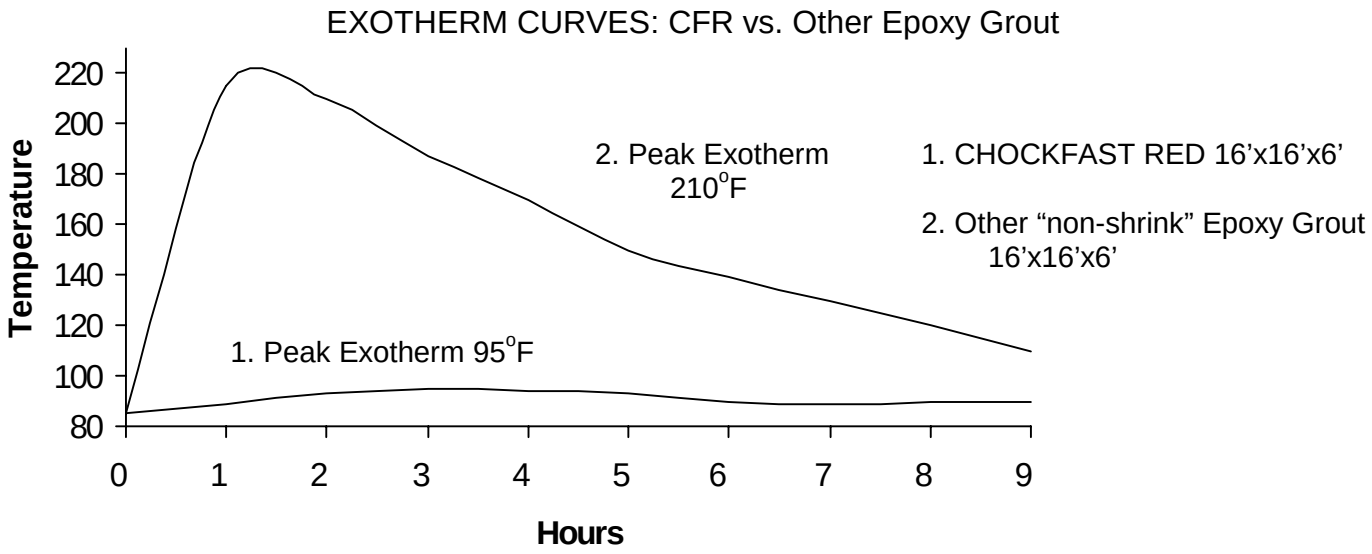
If the temperature drops far enough below equilibrium, the epoxy may be in sufficient tension to crack the epoxy itself, or shear the bond line with the concrete.

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 see Bulletins No. 662 and 645 for more information on expansion joints.

2. Peak Exothermic Temperature 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. Therefore, the operating temperature that would produce no thermal stress would be equal to the peak exothermic temperature for that epoxy. For this reason CHOCKFAST RED has been formulated to have the lowest peak exothermic temperature possible.



Assuming a 70◦F foundation temperature and the CoTE's and PE values for the respective grouts, the linear contraction of the epoxy grout would be:

Linear Contraction (in/in) = CTE X ΔT

Grout	CTE	ΔT (PE-70◦)	Linear Contraction
CHOCKFAST RED	11.2 x 10^{-6} (in/in/◦F) x	(95-70)◦F =	28.0 x 10^{-5} (in/in)
Other Grout	27.0 x 10^{-6} (in/in/◦F) x	(210-70)◦F =	378.0 x 10^{-5} (in/in)

The linear contraction of the competitive grout is 13 times as great as the linear contraction of the CHOCKFAST RED. Of course, if the foundation temperature was 95◦F there would be no linear contraction of CHOCKFAST RED.

A long term healthy foundation is the end result of a low peak exothermic temperature coupled with a low Coefficient of Linear Thermal Expansion. CHOCKFAST RED has been formulated to maintain these properties in single pours 18" deep if necessary. The compatibility of CHOCKFAST RED with concrete ensures a problem-free foundation for many years of operation

October, 99

CHOCKFAST ® BLUE

Bulletin # 616J

CHOCKFAST BLUE is a two component, 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, which is resistant to high operating temperatures. Its unique properties permit usage directly under highly stressed machinery mounting surfaces. 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.

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

Long pours should be divided into sections not exceeding 1.1m (3'6") in length. Longer, thicker or thinner pours are possible, but ITW Philadelphia Resins 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.

For CHOCKFAST BLUE temperatures that will be between 49°-60°C (120°-140°F) during engine operation the static loading shall not normally exceed 35 kg/cm^2 (500 psi) which is perfectly practical for most machinery. Below 49°C (120°F) loadings up to 140 kg/cm^2 (2,000 psi) are permissible, but 85 kg/cm^2 (1,200 psi) should not be exceeded without reference to ITW Philadelphia Resins, who are always available for consultation on any application. Request Bulletins # 640 and #642 for additional design and application detail.

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

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PHYSICAL PROPERTIES

COEFFICIENT OF LINEAR THERMAL EXPANSION:		
Temperature range	0°C to 60°C 27.7 x 10^{-6}/C° ASTM D-6 (32°F to 140°F) 15.4 X 10^{-6}/F°	
COMPRESSIVE MODULUS OF ELASTICITY:	115300 kg/cm^2 (1,640,000 psi)	ASTM C-579
COMPRESSIVE STRENGTH:	1336 kg/cm^2 (19,000 psi)	ASTM C-579
FIRE RESISTANCE:	Self-extinguishing	ASTM D-635
FLEXURAL STRENGTH	345 kg/cm^2 (4920 psi)	ASTM C-580
FLEXURAL MODULUS OF ELASTICITY	120300 kg/cm^2 (1.7 X 10^6 psi)	ASTM C-580
IZOD IMPACT STRENGTH:	.15 Newton m/cm (3.4 in.lbs./in.)	ASTM D-256
LINEAR SHRINKAGE:	0.0001 mm/mm (0.0001 in./in.)	ASTM D-2566
POT LIFE:	35-50 minutes @ 21°C (70°F)	
SPECIFIC GRAVITY:	2.0	
TENSILE STRENGTH:	225 kg/cm^2 (3156 psi)	ASTM D-638
COVERAGE:	500 cc/kg .435 m^2 @ 30 mm (13.8 cu.in./lb.) (640 in^2 @ 1-1/4")	
CURE TIME:	36 hrs. @ 16°C (60°F) 24 hrs. @ 21°C (72°F) 16 hrs. @ 27°C (80°F) 11 hrs. @ 32°C (90°F)	
PACKAGING:	26 kg (58 lbs.) in 5-gal. can 13.1 liters (800 cu.in.)	
SHELF LIFE:	Excess of 2 years in dry storage	

October, 99

Chockfast® Product Technical Bulletin

CHOCKFAST ORANGE©

Bulletin # 659D

DESCRIPTION:

CHOCKFAST ORANGE (PR-610TCF) 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 PR-610TCF to be a far superior yet less expensive method of establishing and permanently retaining precise equipment alignment under extreme conditions. PR-610TCF is approved or accepted for its intended marine use by American Bureau of Shipping, Lloyd's Register, Bureau Veritas, Det Norske Veritas, Germanischer Lloyd and most other major regulatory agencies worldwide.

APPLICATION:

CHOCKFAST ORANGE was developed as a chocking or grouting compound for use under marine main propulsion machinery. The compound is used under diesel and gas engines, reduction gears, generators, compressors, pumps, bearing blocks, crane rails and numerous other applications. PR-610TCF 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.

PHYSICAL PROPERTIES:

COEFFICIENT OF LINEAR THERMAL EXPANSION: Temperature Range: 0°C to 60°C (32°F to 140°F)	30.8×10^{-6}/C° 17.1×10^{-6}/F°	ASTM D-696
COMPRESSIVE MODULUS OF ELASTICITY:	37482 kg/cm^2 (533,000 psi)	ASTM D-695
COMPRESSIVE STRENGTH:	1336 kg/cm^2 (19,000 psi)	ASTM D-695 (Mod)
FIRE RESISTANCE:	Self extinguishing	ASTM D-635
FLEXURAL STRENGTH:	575 kg/cm^2 (7615 psi)	ASTM C-580
FLEXURAL MODULUS OF ELASTICITY	72880 kg/cm^2 (8.6×10^5 psi)	ASTM C-580
HARDNESS - BARCOL:	40-44 fully cured 35 minimum	ASTM D-2583

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PHYSICAL PROPERTIES (con't)

LINEAR SHRINKAGE:	0.0002 mm/mm (0.0002 in/in), 0.02%	ASTM D-2566
POT LIFE:	30 min. @ 21°C (70°F)	
SPECIFIC GRAVITY:	1.58	
TENSILE STRENGTH:	349 kg/cm^2 (4,970 psi)	ASTM D-638
COVERAGE:	1966 cc per 3.4 kg (120 cu.in/7.5 lbs.) 4261 cc per 6.8 kg (260 cu.in/15 lbs.)	
CURE TIME:	48 hours @ 15°C (60°F) 36 hours @ 18°C (65°F) 24 hours @ 21°C (70°F) 18 hours @ 26°C (80°F)	
SHELF LIFE:	More than 18 months	
SHOCK RESISTANCE:	Pass MIL-S-901C (Navy) High Impact Shock Test, Grade A, Type A, Class 1	
SHEAR STRENGTH:	380 kg/cm^2 (5,400 psi)	FED-STD-406 (Method 1041)
THERMAL SHOCK:	Pass -18°C to 100°C (0°F to 212°F)	ASTM D-746
VIBRATION:	MIL-STD-167	

For additional information see Bulletin No. 692, "Guidelines for Marine Designers". "Application Instructions".

CHOCKFAST® BLACK
Machinery Chocking Compound

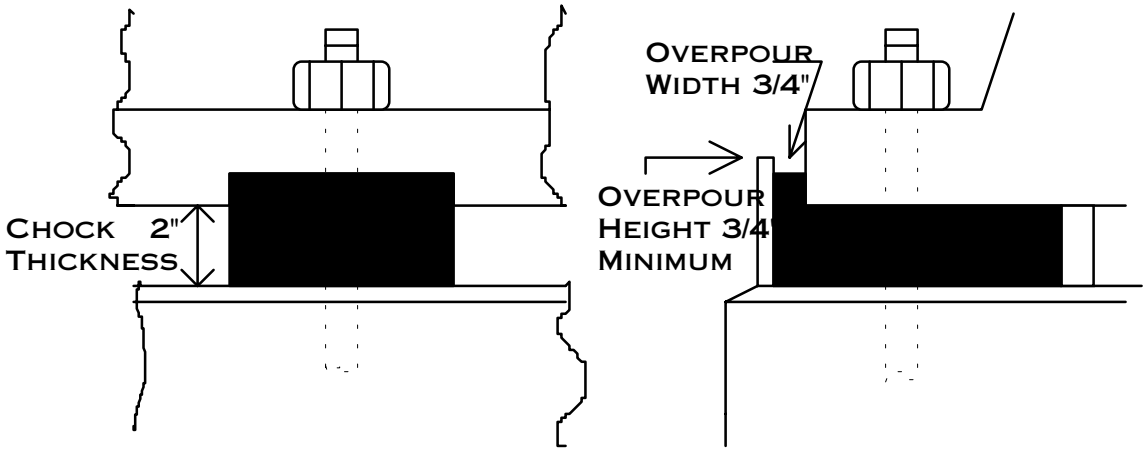
Bulletin # 666F

CHOCKFAST BLACK is a specifically formulated 100% solids, inert filled casting compound developed for use as a chocking or grouting material. This unique product is used under gas and diesel engines, compressors, generators, turbines, motors, pumps and various other types of equipment. CHOCKFAST BLACK is a cost effective method of maintaining permanent precise alignment of critical equipment. It will withstand severe environments involving high physical and thermal shock. CHOCKFAST BLACK is ideal for use under hot running reciprocating and rotating machinery due to its excellent resistance to creep and fatigue at high operating temperatures. It is non-shrinking and has a very high impact and compressive strength. Since these resin chocks (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...they reduce possible bearing or crankshaft damage.

CHOCKFAST BLACK was designed to be a thick pour liquid chocking material. A chock depth of 50mm (2") is standard; however, thinner or thicker pours can be made satisfactorily. The 50mm (2") chock elevates equipment above the underlying foundation, which allows a free flow of air thereby reducing possible foundation humping problems. Contact ITW Philadelphia Resins for information regarding pours less than 32mm (1-1/4") in thickness or greater than 62mm (2-1/2") in thickness.

The excellent flowability of CHOCKFAST BLACK allows it to fill voids in the chock area and conform to all surface irregularities. This eliminates the need to machine equipment bedplates, which is both costly and time consuming. The excellent surface contact and the high coefficient of friction between CHOCKFAST BLACK and the machinery bedplate assure a permanent precise alignment.

NOMINAL THICKNESS STANDARDS - CHOCKFAST I



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130 Commerce Drive • Montgomeryville, PA 18936 • 215-855-8450 • Fax 215-855-4688

PHYSICAL PROPERTIES

COEFFICIENT OF LINEAR THERMAL EXPANSION: Temperature Range 0°C to 60°C (32°F to 140°F)	27.0 x 10^{-6}/C° 15.0 X 10^{-6}/F°	ASTM D-696
COMPRESSIVE MODULUS OF ELASTICITY:	5.6x10^4 kg/cm^2 (800,000 psi)	ASTM D-695
COMPRESSIVE STRENGTH:	1216 kg/cm^2 (17,300 psi)	ASTM D-695
MAXIMUM OPERATING TEMPERATURE	94°C (200°F)	
FIRE RESISTANCE:	Self-Extinguishing	ASTM D-635
FLEXURAL STRENGTH:	435 kg/cm^2 (6200 psi)	ASTM D-580
FLEXURAL MODULUS OF ELASTICITY	101300 kg/cm^2 (1.4 x 10^6 psi)	ASTM D-580
HARDNESS-BARCOL:	55 Full Cure	ASTM D-2583
IZOD IMPACT STRENGTH:	0.23 N.m/cm (5.1 in.lbs./in)	ASTM D-256
LINEAR SHRINKAGE:	0.00018mm/mm (0.00018 in/in)	ASTM D-2566
POT LIFE:	45 min. @ 21°C (70°F)	
SPECIFIC GRAVITY:	1.94	
TENSILE STRENGTH:	204 kg/cm^2 (2,900 psi)	ASTM D-638
COVERAGE:	4343 cc per 8.6 kg 86860mm^2 @ 50mm thick (265 cu.in. per 19 lbs.) (132 in^2 @ 2" thick)	
CURE TIME:	48 hours @ 15°C (60°F) 36 hours @ 18°C (65°F) 24 hours @ 21°C (70°F) 18 hours @ 26°C (80°F)	
SHEAR STRENGTH:	350 kg/cm^2 (5,000 psi)	FED-STD-406 (Method 1041)
SHELF LIFE:	Exceed 18 months	

Chockfast® Product Technical Bulletin

MAINTENANCE OF ALIGNMENT FROM CHOCKFAST® RESIN CHOCKS

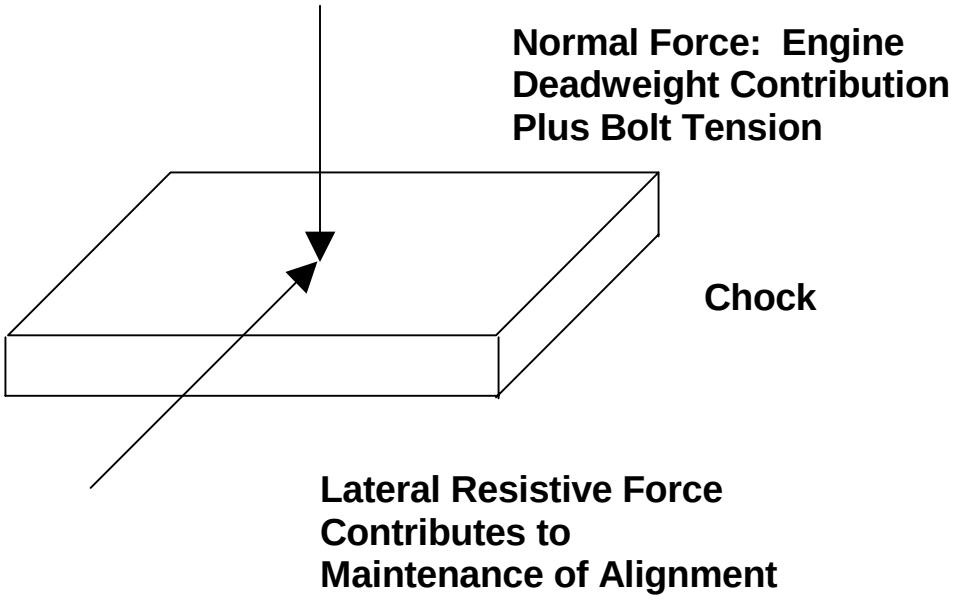
Bulletin # 639A

Maintenance of crankshaft alignment in reciprocating machinery is of critical importance to engine operators. Without it the possibility of broken crankshafts, worn bearings and associated machinery downtime increases.

With CHOCKFAST Resin Chocks, maintenance of engine 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.

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. These coefficients were established by an independent engine manufacturer during an extensive test program (Sulzer Brothers - Winterthur, Switzerland). The following calculation illustrates the superior total lateral resistive forces derived from the use of resin chocks:



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Example 1: DRESSER CLARK HBA8

If we compare the total resistive force available from CHOCKFAST Resin Chocks for an HBA8 Clark, we get the following:

Engine Deadweight = 170,000 lbs.
Hold Down Bolt Tension Per Bolt - 25,560
1-1/2" O Bolts - 19 Main Frame Bolts
*Assume all load is on 19 - 10" x 10" Main Frame Chocks

TOTAL NORMAL LOAD = Engine Deadweight + All Bolt Tensions = 170,000 lbs + 19 x 25,560 lbs.

TOTAL RESISTIVE FORCE OF CHOCKFAST RESIN CHOCKS TO CAST IRON ENGINE BEDPLATE = Coefficient of Friction of CHOCKFAST Resin Chocks to Cast Iron x Total Normal Force = 0.7 x 655,640 lbs. = 458,948

TOTAL RESISTIVE FORCE OF STEEL CHOCKS TO CAST IRON = Coefficient of Friction of Steel Chocks to Cast Iron x Total Normal Force = 0.15 x 655,640 = 98,346 lbs.

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

Engine Deadweight = 270,000 lbs.
Hold Down Bolt Tension Per Bolt - 45,500 lbs.
2" O Bolts - 20 Main Frame Chocks
*Assume all load is on 20 Main Frame Chocks

TOTAL NORMAL LOAD = Engine Deadweight + Total Bolt Tensions = 270,000 lbs. + 20 x 45,500 = 1,180,000 lbs.

TOTAL RESISTIVE FORCE OF CHOCKFAST RESIN CHOCKS TO CAST IRON ENGINE BEDPLATE = Coefficient of Friction of CHOCKFAST Resin Chocks to Cast Iron x Total Normal Force = 0.7 x 1,180,000 lbs. - 826,000 lbs.

TOTAL RESISTIVE FORCE IF STEEL CHOCKS USED = 0.15 x 1,180,000 lbs. = 177,000 lbs.

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

Engine Deadweight = 140,000 lbs.
Hold Down Bolt Tension Per Bolt = 25,560 lbs.
18 1-1/2" O Bolts
*Assume all load is on 18 Main Frame Chocks

TOTAL NORMAL LOAD = Engine Deadweight and Total Bolt Tensions = 140,000 + 18 x 25,560 = 600,080 lbs.

TOTAL RESISTIVE FORCE OF CHOCKFAST RESIN CHOCKS TO CAST IRON ENGINE BEDPLATE = Coefficient of Friction of CHOCKFAST Resin Chocks to Cast Iron x Total Normal Force = 0.7 x 600,080 lbs. = 420,056 lbs.

TOTAL RESISTIVE FORCE IF STEEL CHOCKS USED = 0.15 x 600,080 lbs. = 90,012 lbs.

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 - 5 TIMES THE RESISTIVE FORCE OF STEEL CHOCKS.

October, 99

Chockfast® Product Technical Bulletin

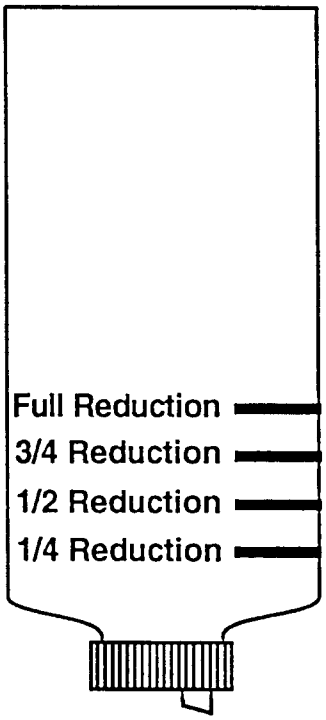
Chockfast Orange Hardener Ratio Guide (I.V. Version)

Bulletin # 693A

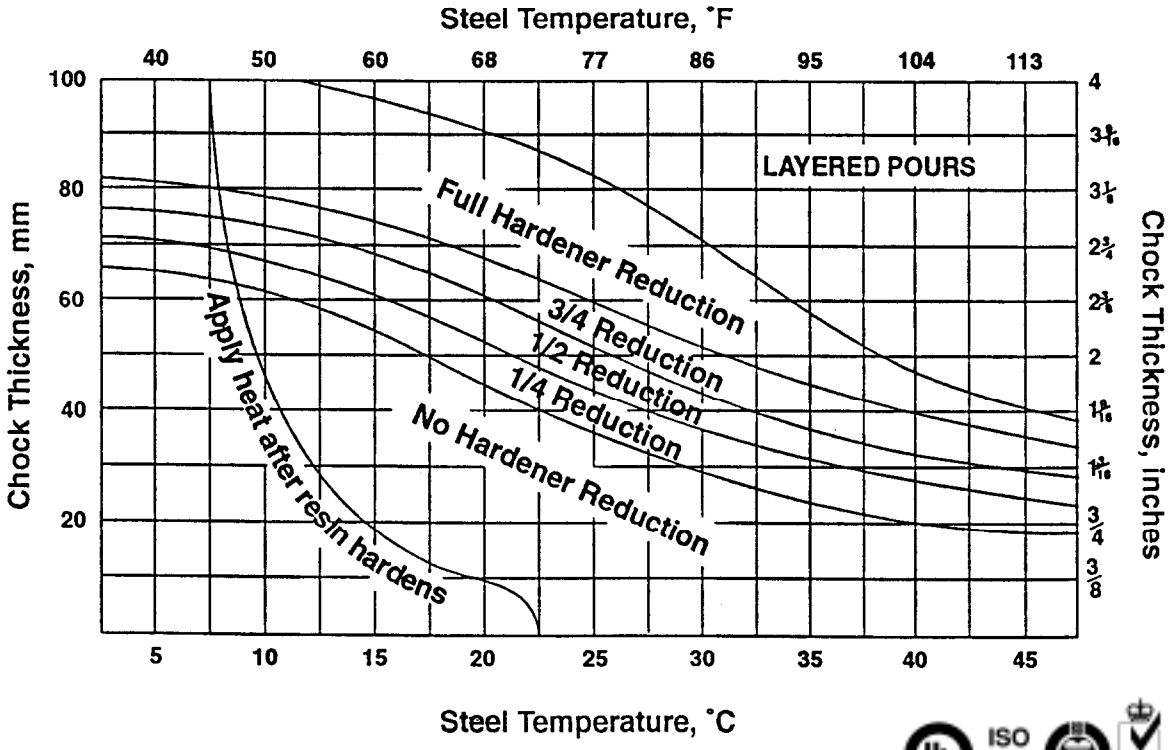
The hardener ratio may be varied to optimize the reaction and cure. Note that the resin temperature should be in the range 20°-25°C (68°-77°F).

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.

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



See Reverse Side for Examples of Graph's Use.



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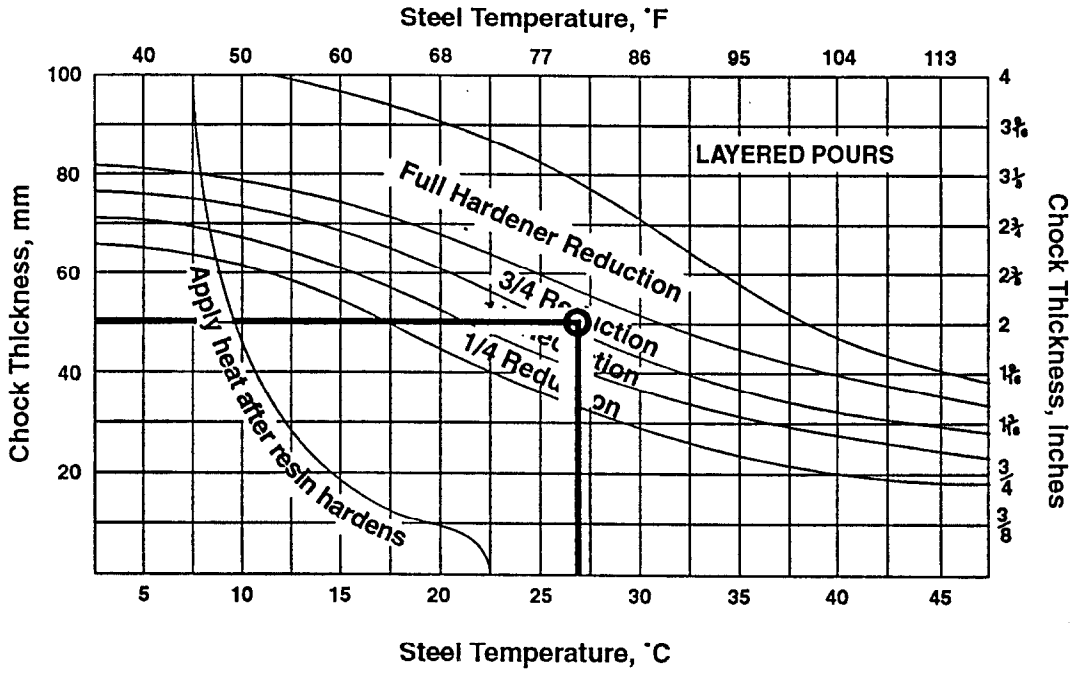
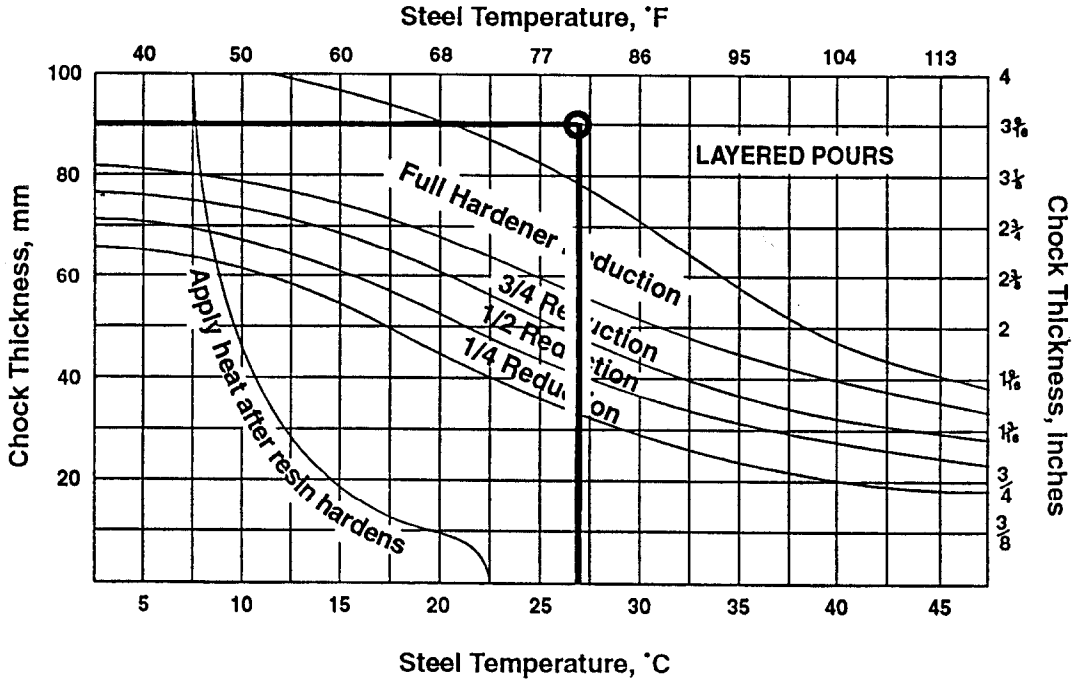
Example: 50mm (2") chocks, steel temperature 27˚C (80˚F) 3/4 reduction of hardener



Example: 90mm (3 9/16") chocks, steel temperature 27˚C (80˚F)

Consult distributor about pouring in layers.



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° 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 regrout 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.

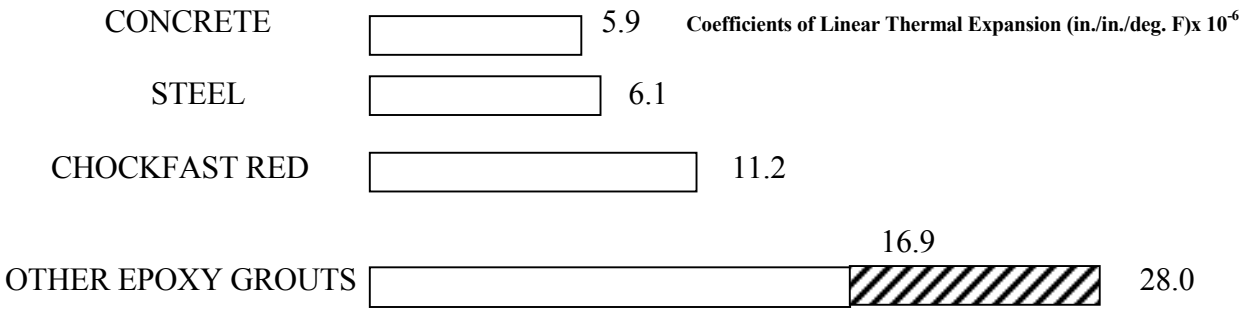
In general, experience shows that cracks on large foundation capping pours can best be controlled by preconditioning the epoxy grout to control the exotherm and employing expansion joints. Temperature extremes must be avoided. Steps to control temperature extremes should be followed when grouting in 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.



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.

Epoxy grouts 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

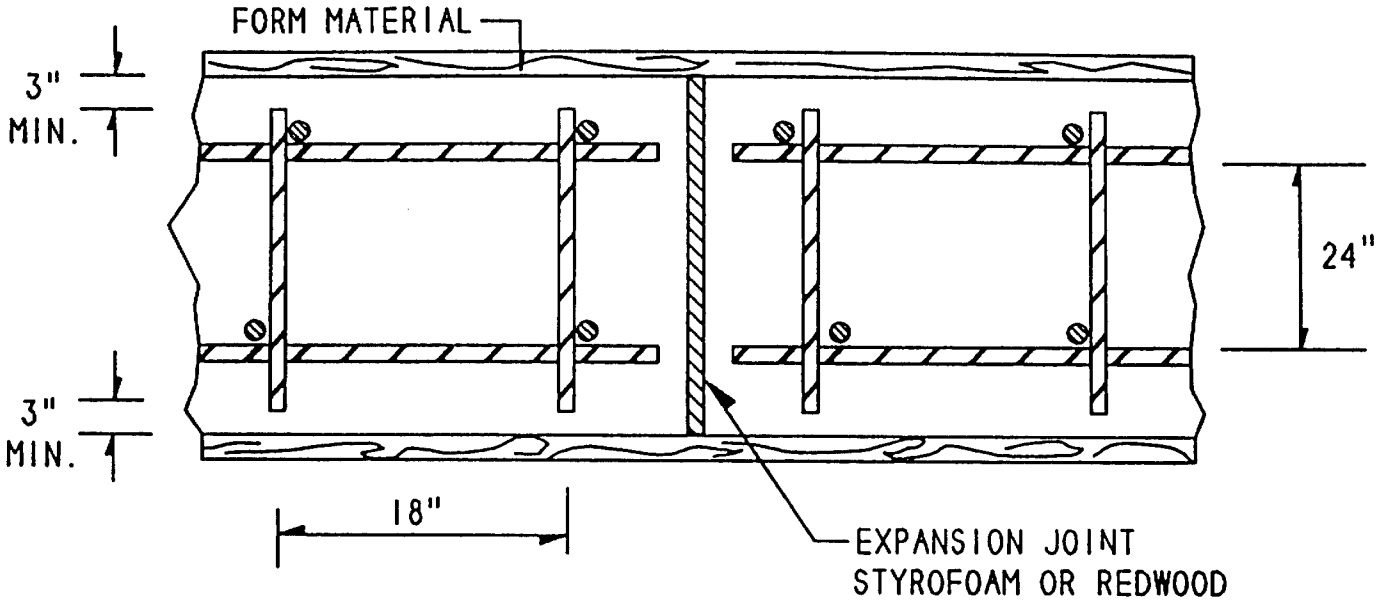
perimeter provide a mechanical lock between the grout and concrete. These pins will not usually precipitate a stress crack in a good quality epoxy grout, providing they are at least three inches in from any surface. Having a coefficient of expansion as close as possible to concrete and steel is also 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.

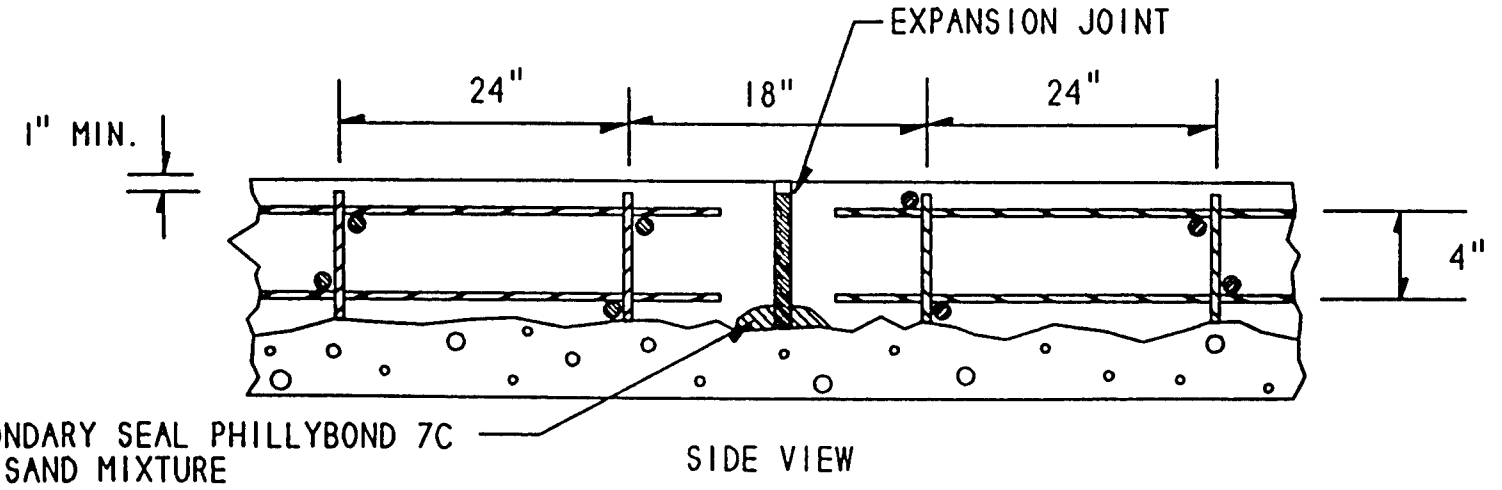
Various physical properties are published by grout manufacturers for their materials. Compressive strength, compressive modulus of elasticity, and tensile strength, while important, are overemphasized because they are far greater than concrete and usually loaded to a fraction of their limits. The most 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.



TOP VIEW



SIDE VIEW

NOTE: REBAR SHOULD NOT PENETRATE THE EXPANSION JOINT. TO DO SO DEFEATS THE PURPOSE OF THE EXPANSION JOINT.

EXPANSION JOINT & REBAR DETAIL
DRAWING NO. CF - 004E

Chockfast®

Section 5

ISO 9002

Montgomeryville, PA.
A 3790

Shannon, Ireland
FMT1623

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 regrout.

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

		DATE/BY
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_____

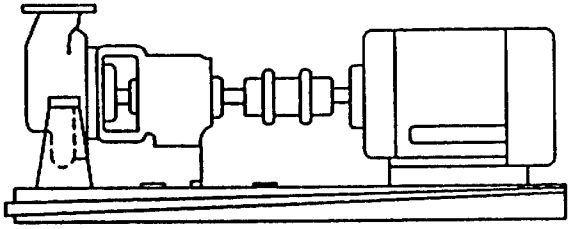
TIME_____AM-PM

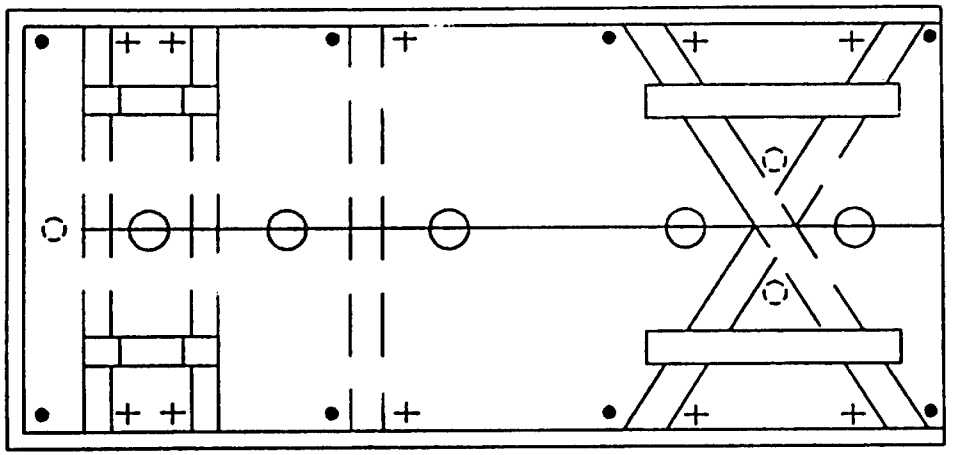
ALL THE FOLLOWING APPLY TO EPOXY GROUTING ONLY

		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.	_____

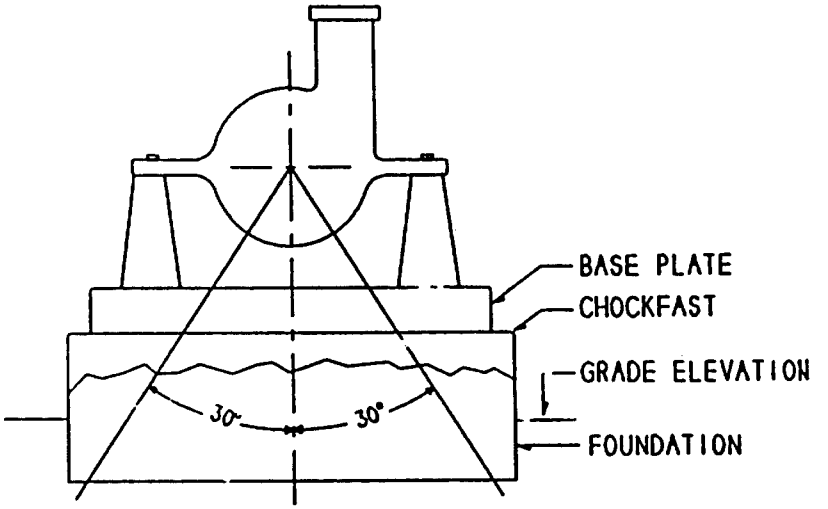
AFTER GROUT HAS CURED		DATE/INITIAL
10.	FORMS REMOVED.	_____
11.	JACKSCREWS REMOVED AND VOIDS FILLED.	_____
12.	ANCHOR BOLTS TIGHTENED.	_____

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





PUMP BASE PLAN VIEW



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

◯ 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 API PUMP
DRAWING NO. CF - 005

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 nesessarily 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 distortation 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.

Chockfast® Product Technical Bulletin

CHOCK-CRETE® HIGH PERFORMANCE NONSHRINK CEMENT GROUT

Bulletin #625D

CHOCK-CRETE 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, which meets the most demanding job conditions. It is recommended for grouting of anchor bolts, base plates, structural steel and precast columns, dowels, etc., which require non shrink, high tolerance, and high strength performance. It is flowable for easy placement, adheres well to concrete or steel, and exhibits good impact and vibration characteristics.

Strength of Anchors: (ASTM E-488)

	Tensile Load	Shear Load
1-1/4" dia. bolt 2-1/2" dia. hole 9" embedment	53,200 lbs.	24,300 lbs.
1/2" dia. bolt 1-1/8" dia. hole 4" embedment	7,100 lbs.	2,000 lbs.

Working Temperature: 45◦F Minimum
90◦F Maximum

Coefficient of Thermal Expansion: (ASTM C-531)

4.76×10^{-6} in/in ◦F

SURFACE PREPARATION: Remove all dirt, oil or loose foreign material from any steel surface to come in contact with CHOCK-CRETE. 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 CHOCK-CRETE.

FORMING: Forms should be at least 1" higher than the bottom of the item being grouted.

MIXING: 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:

Plastic
6.80 to 7.00 pints water
0.85 to 0.88 gal.
7.05 to 7.30 lbs.
3.18 to 3.29 liters

Flowable
7 to 8 pints water
0.88 to 0.94 gal.
7.30 to 7.80 lbs.
3.29 to 3.79 liters

Fluid
8.00 to 9.25 pints water
1.00 to 1.19 gal.
8.33 to 9.50 lbs.
3.79 to 4.40 liters

Yield

	Plastic	Flowable	Fluid
Approx.	0.43 $ft.^3$	0.44 $ft.^3$	0.45 $ft.^3$

CAUTION: **DO NOT OVER WATER.** Addition of water other 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 Philadelphia Resins.

CURING: Cover with clean wet rags and keep moist until final set.

DEEP POUR APPLICATIONS: Pre-washed graded 3/8" pea gravel may be used in applications thicker than 2".

2" to 5" - Add 25% 3/8" pea gravel by wt.
5" & deeper - Add 50% 3/8" pea gravel by wt.

HOT WEATHER GROUTING: Provide shade around the area to be grouted. Use cool mixing water. Protect the grout from the sun for up to 48 hours.

COLD WEATHER GROUTING: 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.

STORAGE: CHOCK-CRETE should be kept in a shaded, dry area. At no time should the packaged material be exposed to moisture.

PLACEMENT: The grout should be placed continuously by pouring from one side to the other to avoid air entrapment.

PHYSICAL PROPERTIES

	Plastic	Flowable	Fluid
Compressive Strength (ASTM C-109), psi			
3 days	5900	5400	4800
7 days	8900	7700	6200
28 days	11500	8400	7700
Set Time (ASTM C-266)			
Initial:	3.5 hrs.	4 hrs.	3.6 hrs.
Final:	4.75 hrs.	4.8 hrs.	4.75 hrs.
Expansion Percentage (CRD C-621)			
3 days	0.07%	0.03%	0.02%
14 days	0.07%	0.03%	0.02%
28 days	0.07%	0.03%	0.02%

Static Modulus of Elasticity (ASTM C-469)
3 days 2.64×10^6 psi
7 days 2.79×10^6 psi
28 days 3.00×10^6 psi

Flexural (ASTM C-78)
3 days 1,055 psi
7 days 1,230 psi
28 days 1,430 psi

Splitting Tensile (ASTM C-496)
3 days 550 psi
7 days 680 psi
28 days 750 psi

ITW PHILADELPHIA RESINS
130 Commerce Drive • Montgomeryville, PA 18936 • 215-855-8450 • Fax 215-855-4688

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 pressuring 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 circumstance 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.

Chockfast®

Section 6

ISO 9002

Montgomeryville, PA.
A 3790

Shannon, Ireland
FMT1623

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**

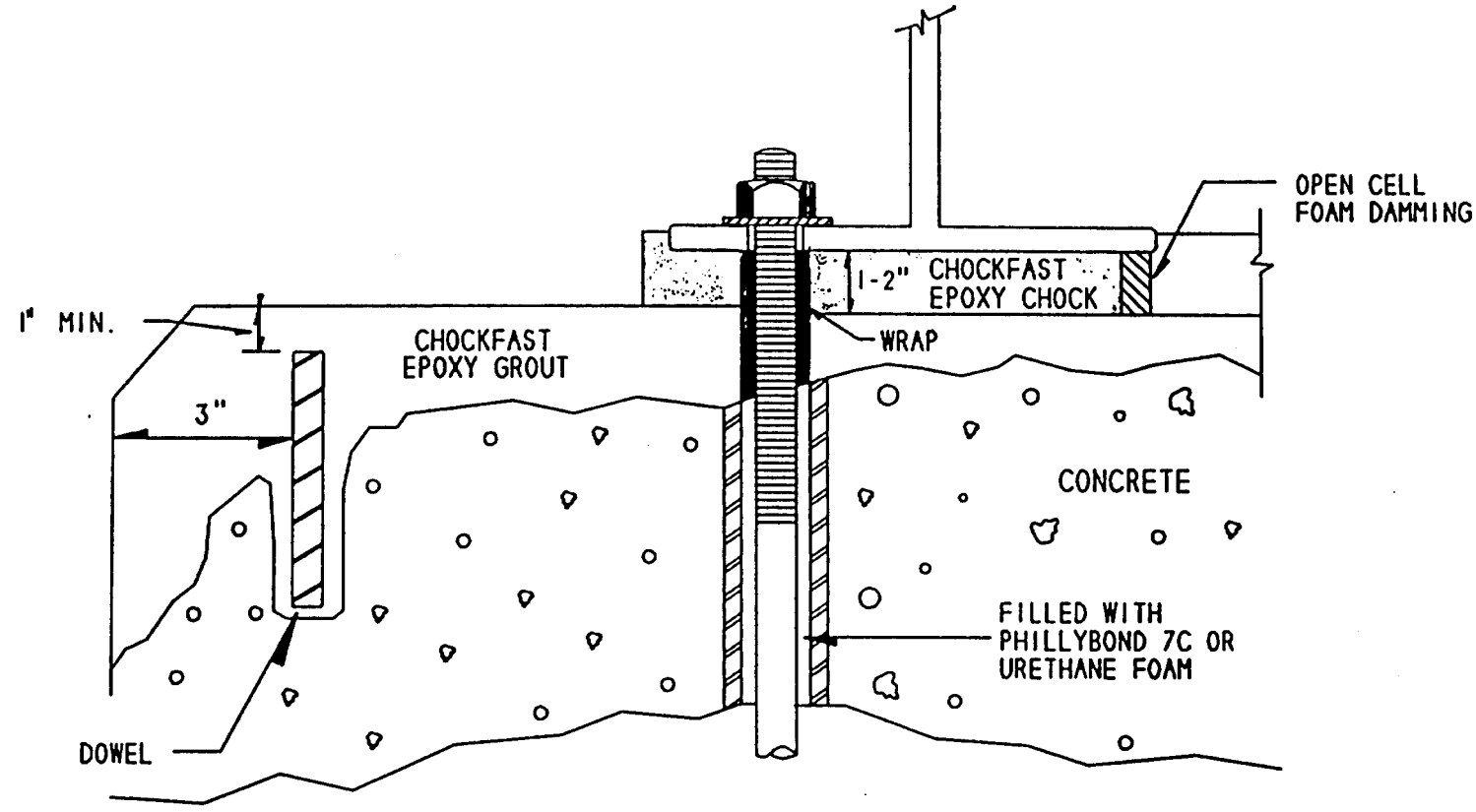
Prior to setting the skid on the foundation, the expansion joints are installed and secured. All anchor bolt sleeves (where required) are filled with Phillybond 7C or other suitable material. Anchor bolts are wrapped, then the Chockfast Red grout is poured a minimum of 2" thick. If using Chockfast Blue 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**

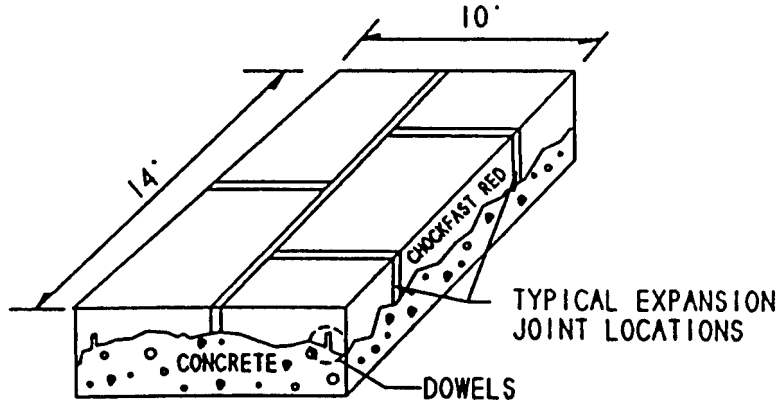
Very similar to A., this technique allows the Chockfast Black chocks to bear directly on the concrete. When using this type of installation, the following guidelines should be followed.

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.

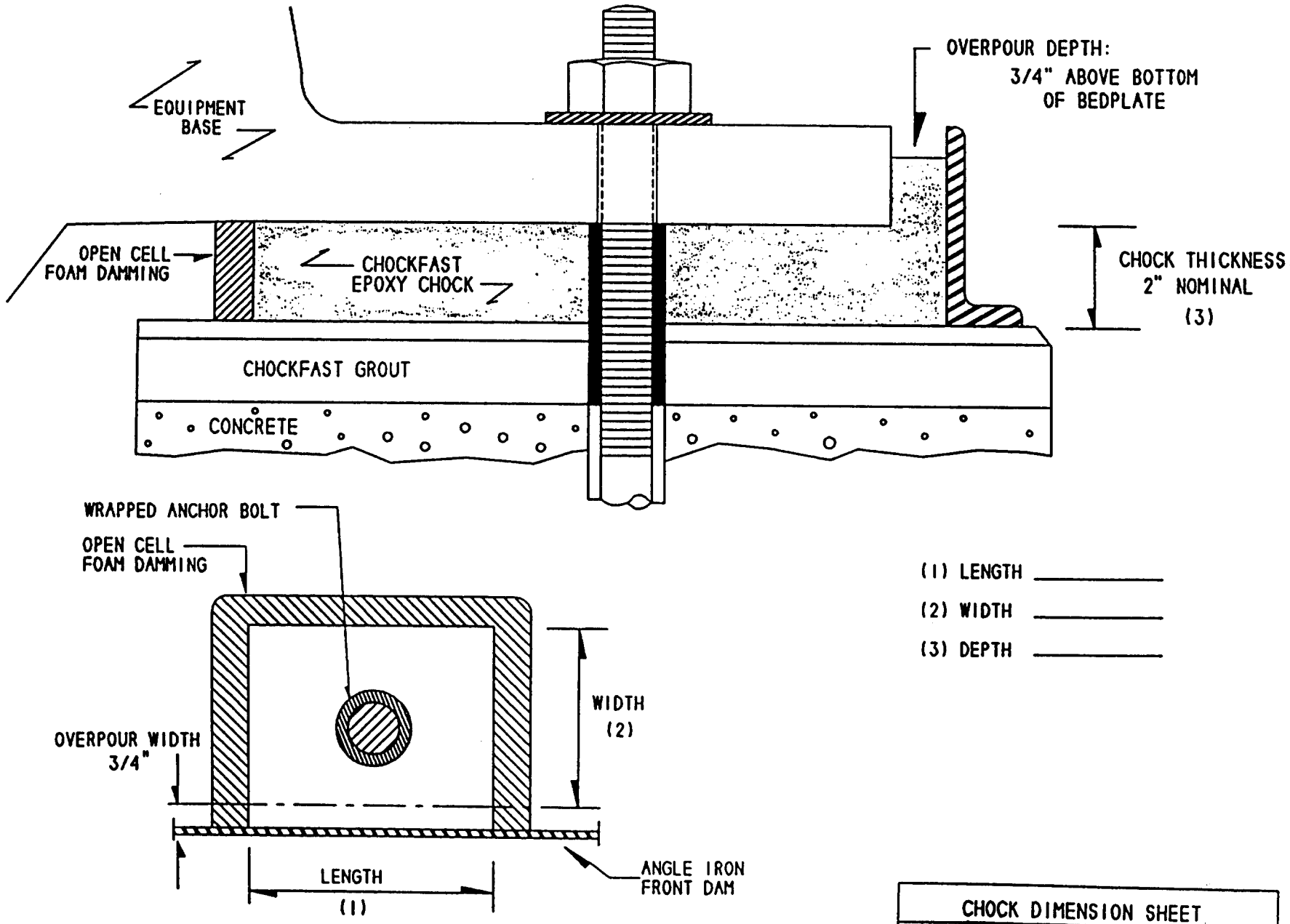


TYPICAL CHOCKED SKID UNIT



FOUNDATION GROUTED PRIOR TO SETTING THE SKID. THIS TECHNIQUE IS USED IN CONJUNCTION WITH EPOXY CHOCKS.

SKID GROUTING AND CHOCKING
ARRANGEMENT
DRAWING NO. CF - 006



(1) LENGTH _____

(2) WIDTH _____

(3) DEPTH _____

CHOCK DIMENSION SHEET
DRAWING NO. CF - 006A

CHOCK DESIGN WORKSHEET

Common Torque and Loading Values for Anchor Bolts

		Common Steel		High Strength 4140	
Bolt Dia. In.	Bolt Area Sq. In.	Torque Ft.-Lb.	Bolt Load Lb.	Torque Ft.-Lb.	Bolt Load Lb.
0.75	0.44	60	5,940	95	8,910
1.00	0.79	150	10,840	225	16,260
1.25	1.23	300	17,560	375	26,340
1.50	1.77	530	25,560	800	38,340
1.75	2.41	835	34,560	1,250	51,840
2.00	3.14	1,250	45,560	1,875	68,250
2.25	3.97	1,840	53,560	2,760	78,550
2.50	4.90	2,525	67,000	3,780	88,800

(1) _____lb. ÷ _____ = _____lb.
unit dead weight | no. anchor bolts | dead weight per bolt

(2) _____lb. + _____lb. = _____lb.
dead wt. per bolt | bolt load from table | total load per bolt

(3) _____lb. ÷ _____psi = _____sq.in.
total load per bolt | chock load | chock area under frame to the next highest whole number

(4) _____sq.in. ÷ _____in. = _____ in.
chock area under frame | chock width under frame | chock length

(5) _____in.+ .75 =_____x_____in.x_____ =_____cu.in.
chock width under frame from Line 4 | overpour | chock length from Line 4 | chock depth (thickness) | Total Volume per chock

(6) _____cu.in. x _____ = _____cu.in.
Total Volume per chock | No. of chocks | chocking compound required

(7) _____cu.in. x 1.2 ÷ _____cu.in. = _____
Chocking compound required | loss/waste | volume/unit | units needed to the next highest whole number

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.

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Section 7

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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.

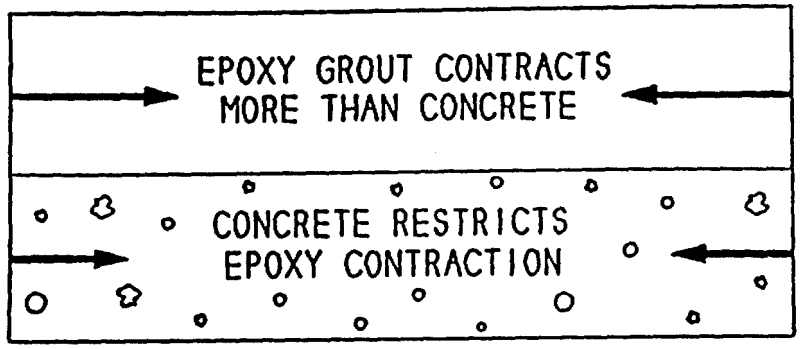
There are several ways to eliminate edge lifting, one of which is to expose peripheral rebar or install doweling around the outside edge of the foundation as shown in Fig. 5. This is normally done when the epoxy grout cap is poured 8" to 12" (or greater) away from the machinery base and is done for cosmetic 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.

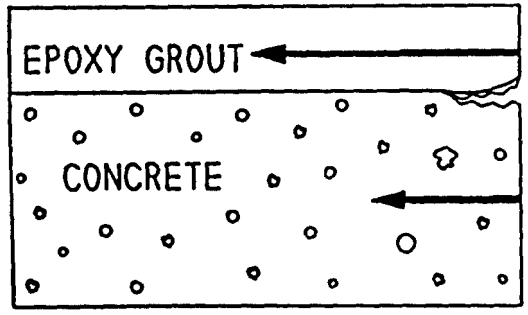
Fig. 7 shows that by reducing dimension X to the same as or less than dimension Y, we can reduce the possibility of edge lifting. Edge lifting will not occur where the epoxy grout is in compression. When utilizing this type of application one must be sure that dimension X allows sufficient room for proper 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.



CONCRETE IN COMPRESSION

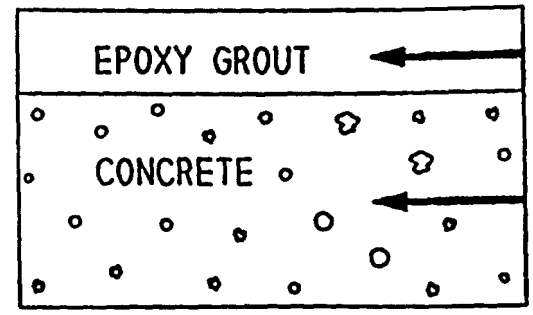
FIGURE: 1



CRACK OPENS

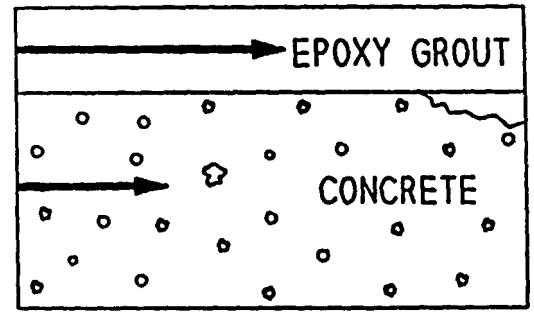
THE SYSTEM DURING THE COOLING CYCLE.
GROUT CONTRACTS MORE THAN CONCRETE.

FIGURE: 3



THE SYSTEM AT THERMAL STABILITY

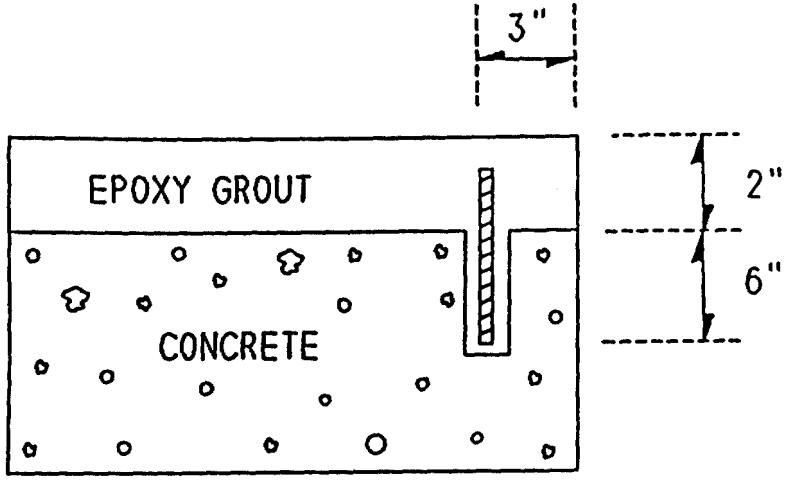
FIGURE: 2



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

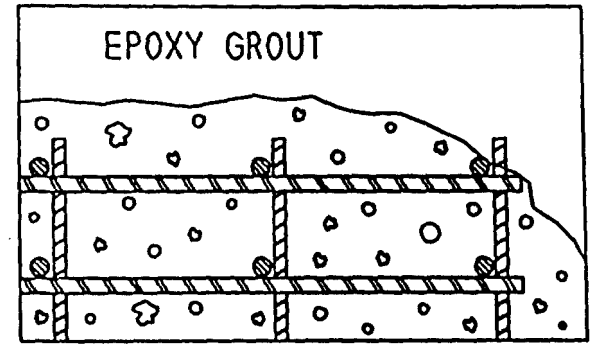
FIGURE: 4

EDGE LIFTING CAUSE AND CURE
DRAWING NO. CF - 007



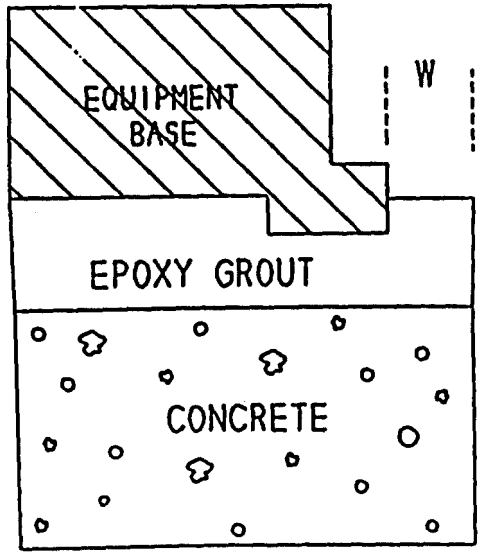
DOWELING TO PREVENT
EDGE LIFTING

FIGURE: 5



45° CHAMFER TO EXPOSE
PERIPHERAL REBAR

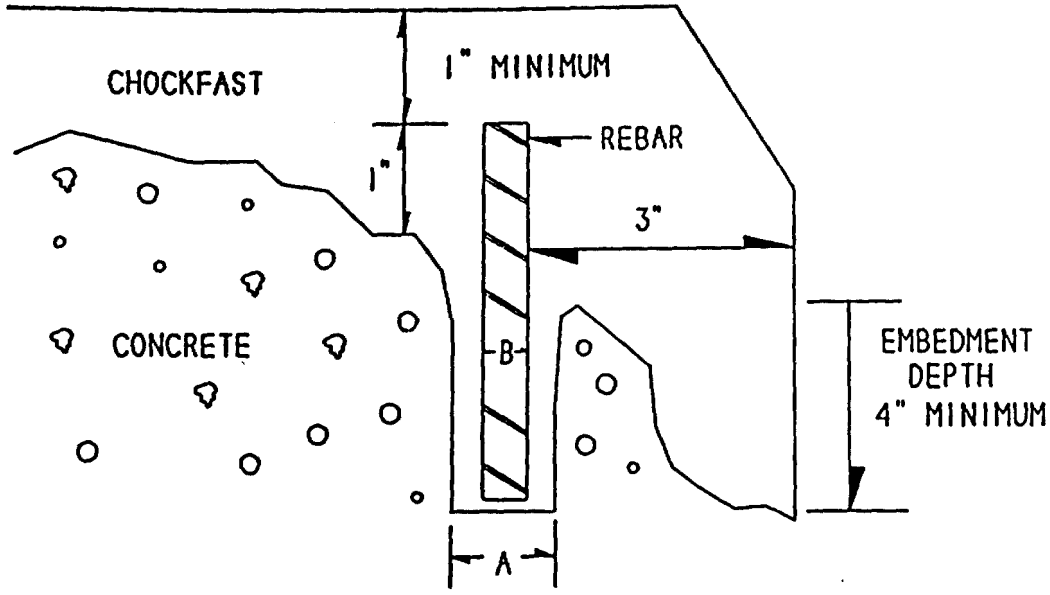
FIGURE: 6

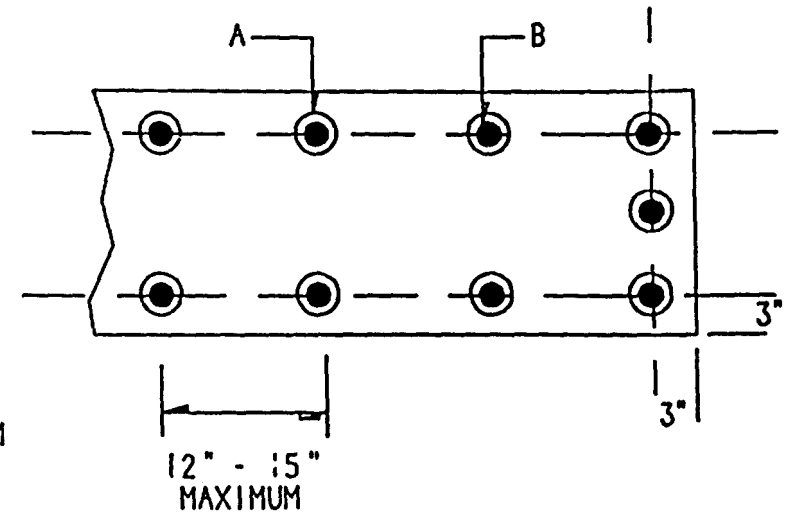


SHOULDER WIDTH (W)
SHOULD BE LESS THAN
GROUT DEPTH (D)

FIGURE: 7

EDGE LIFTING CAUSE AND CURE
DRAWING NO. CF - 007A





REBAR LAYOUT

A - 1" LARGER THAN THE REBAR DIAMETER

B - 1/2" DIAMETER MINIMUM

DOWELS TO PREVENT EDGE LIFTING
DRAWING NO. CF - 007B

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Section 8

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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:

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

CALCULATED ANCHOR BOLT PULL

NO. 691

CALCULATED ANCHOR BOLT PULL AND CONCRETE BOND STRENGTH WHEN SETTING ANCHOR BOLTS WITH EPOXY GROUT

1. Use a clean, threaded rod or bolt with a coarse surface profile. A nut and washer, to act as a mechanical interference, should be used on the bottom to assist in secure anchoring.

2. The anchor bolt hole should be clean and dry, with no contaminants.

3. The bond of the grout to the concrete will exceed the shear strength of concrete. A conservative value for concrete shear strength is 800 psi. To determine the shear force at the concrete-grout interface, use the following calculation:

   $F = d \times \pi \times 1 \times 800$ psi
   Where d = hole dia. (in.), 1 = grouted length (in.), F = bolt force (lbs.)

CALCULATED BOLT PULL IN PSI (#) AT 800 PSI CONCRETE SHEAR GROUT TO CONCRETE BOND LENGTH

HOLE DIAMETER	3"	4"	5"	10"
5/8"	4710#	6280#	7850#	15700#
3/4"	5650#	7530#	9420#	18840#
1"	7530#	10050#	12560#	25130#
1.5"	11309#	15070#	18840#	37690#
2.0"	15070#	20100#	25130#	50260#

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

   $F = BD \times \pi \times 1 \times 1600$ psi
   Where BD = bolt dia. (in.)

CALCULATED BOLT PULL IN PSI (#) AT 1600 PSI GROUT BOND TO BOLT GROUTED BOLT LENGTH

BOLT DIAMETER	3”	4”	5”	10”
3/8"	5650#	7530#	9420#	18840#
1/2"	7540#	10040#	12560#	25120#
3/4"	11300#	15070#	18840#	37680#
1"	15070#	20100#	25130#	50260#
1.5	22610#	30150#	37690#	75380#

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Section 9

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CHOCKFAST GROUTING SYSTEMS

GROUT MATERIAL AND EQUIPMENT CHECKLIST

ITEM	QUANTITY	
		CHOCKFAST SUPPLIED PRODUCTS
1.	_____	CHOCKFAST RED (1.6 FT^3 207 LB) UNIT
2.	_____	CHOCKFAST RED SG (1.6 FT^3 207 LB) UNIT
3.	_____	CHOCKFAST BLUE (800 $IN.^3$ 58 LB) UNIT
4.	_____	CHOCKFAST GRAY (187 $IN.^3$ 11 LB) UNIT
5.	_____	CHOCKFAST GRAY (816 $IN.^3$ 48 LB) UNIT
6.	_____	CHOCKFAST BLACK (265 $IN.^3$ 19 LB) UNIT
7.	_____	CHOCKFAST ORANGE (120 $IN.^3$ 7.5 LB) UNIT
8.	_____	CHOCKFAST ORANGE (260 $IN.^3$ 15 LB) UNIT
9.	_____	PR225 MOLD RELEASE AEROSOL CAN
10.	_____	PIECES CHOCKFAST OPEN CELL FOAM DAMMING FOR EPOXY CHOCKS 1" X 1-3/4" X 6' OR 1" X 2-3/4" X 6'
11.	_____	1775/620TS CONCRETE BONDING AGENT AND PRESSURE INJECTION MATERIAL (1 GAL)
12.	_____	PHILLYBOND BLUE 6A FAIRING COMPOUND (22 LB)
	2 GAL UNIT	
13.	_____	PHILLYBOND 7C EXPANSION JOINT COMPOUND 1 GAL UNIT (168 $IN.^3$)
14.	_____	PHILLYCLAD 1000 FOR PAINTING CONCRETE OR PRIMING STEEL (2 GAL UNIT) 500-600 SQ FT COVERAGE.
15.	_____	PRT 59 SOLVENT, 1 GAL / 5 GAL, FOR GENERAL CLEAN UP OF CHOCKFAST PRODUCTS
16.	_____	PRT 61 SOLVENT/REDUCER FOR PHILLYCLAD 1000 1 GAL OR 5 GAL
17.	_____	M61 KOL MIXER WITH TREMCO PADDLE FOR MIXING CHOCKFAST BLUE

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 CHOCKS)
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:

	DIMENSIONS	NUMBER OF EACH
BASE	_____	_____
RAILS	_____	_____
SOLEPLATES	_____	_____

ANCHOR BOLTS:

STANDARD _____ HIGH STRENGTH (4140)_____

	FREESIDE	COMP.SIDE	X-HEAD	PEDESTAL	OTHER
DIAMETER	_____	_____	_____	_____	_____
NUMBERS	_____	_____	_____	_____	_____
TORQUE	_____	_____	_____	_____	_____

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
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 _____

	TEMPERATURE °F			BATCH NUMBER		
PRODUCT: ~~Units~~	~~Resin~~	~~Hrdnr~~	~~Agg~~	~~Resin~~	~~Hrdnr~~	~~Agg~~
RED	_____	_____	_____	_____	_____	_____
	_____	_____	_____	_____	_____	_____

_____ _____ _____ _____ _____ _____ _____

_____ _____ _____ _____ _____ _____ _____

_____ _____ _____ _____ _____ _____ _____

_____ _____ _____ _____ _____ _____ _____

BLUE _____ _____ _____ _____ _____

_____ _____ _____ _____ _____

_____ _____ _____ _____ _____

BLACK _____ _____ _____ _____ _____

_____ _____ _____ _____ _____

_____ _____ _____ _____ _____

_____ _____ _____ _____ _____

ORANGE _____ _____ _____ _____ _____

_____ _____ _____ _____ _____

_____ _____ _____ _____ _____

_____ _____ _____ _____ _____

7C _____ _____ _____ _____ _____

_____ _____ _____ _____ _____

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? _____

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

_____

_____

_____

_____

_____

SKETCH

_____
Name/Date

ITW **Philadelphia Resins**

Chockfast® Foundation Systems

"Proven Solutions to Difficult Problems"

ISO 9002

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