

T. Buck Construction, Inc.

249 Merrow Road, Auburn, Maine 04210-8319
(207) 783-6223 * (FAX) 783-3970

POST TENSIONING SUBMITTAL Vermont Agency of Transportation

Vermont Agency of Transportation
Bridge rehabilitation in the town of Jamaica, VT
ER BHF 013-1(16)

Submitted: _____



General Procedure

- 1) Incorporate applicable materials and cast concrete for Precast Sub Cap. This will be supplied by SD Ireland.
- 2) Form and Place Pier Stem with pre tied cage that includes vertical thread bars. This step is critical to ensure proper orientation of the precast sub cap. We will ensure proper rotational location of the pre tied cage so that the vertical thread bars line up with the sleeves in the precast sub cap.
- 3) Set precast sub cap on stem using applicable shims to ensure correct elevations. We will install anchor plates and nuts to the vertical thread bars and tighten to “snug tight.” We will grout the vertical shear key between the column and precast sub cap. The couplers that will accept the short piece of thread bars will also be installed in this step.
- 4) Post tension bars 1 & 2 in sub cap. Once bars are tensioned, we will grout each bar in accordance with this plan. We will be utilizing a subcontractor to tension the bars and supply/install the grout.
- 5) Erect Structural Steel. We will shim girders to proper elevation.
- 6) Post Tension Bars 3, 4, &5 in the precast sub cap. Once the bars are tensioned, we will grout each bar in the same manner we completed bars 1 & 2.
- 7) The pour backs will be installed to “seal” and cover the post tensioning ports at each end of the sub cap. An approved material will be used from the list provided in the post tensioning specification.
- 8) The pier cap will be formed and placed using the approved 6000 psi concrete. The remaining post tensioning ducts will be installed and verified prior to placing the concrete.
- 9) After the pier cap has cured to a strength of 4,000 psi minimum, the bars will be post tensioned in the sequence shown on plan sheet 38 of 85 and the each bar will be grouted after it is tensioned. The ends of the pier cap will be covered using the same material used in the pour backs on the sub cap.
- 10) The bridge deck will be formed / placed and the project will progress from there.

CONSTRUCTIVE SERVICES, INC.

90 PLEASANT STREET DEDHAM, MA 02026
(781) 326-6066 FAX (781) 329-8452
e-mail: constructiveservices@rcn.com

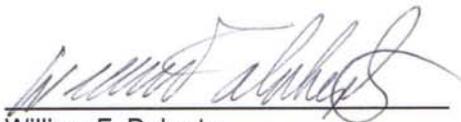
March 19, 2013

T. Buck Construction, Inc.
249 Merrow Road
Auburn, ME 04210
Attn: Brian Emmons

RE: Destressing Procedure
Jamaica ER BRF 013-1 (16)
Town of Jamaica, VT

DESTRESSING PROCEDURE

1. Open the cylinder on the jack 1".
2. Stress the bar to max. allowable load or until the anchor nut comes loose.
3. Back the anchor nut off.
4. Release the pressure.
5. If anchor nut is still tight, repeat the procedure until it is completely loose.



William F. Doherty
President

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March 19, 2013

T. Buck Construction, Inc.
249 Merrow Road
Auburn, ME 04210
Attn: Brian Emmons

RE: Grouting Plan and Procedure
Jamaica ER BRF 013-1 (16)
Town of Jamaica, VT

GROUTING PLAN

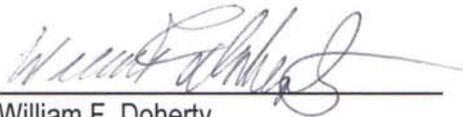
1. Material: Euco Cable Grout PTX with potable water.
2. Equipment: Colloidal mixer by ChemGrout, requiring 250 CFM compressor and one portable grout pump.
3. Inlets are made up of 21mm plastic grout tubes with twist shut-off valves.
4. Vents at grout caps are ½" NPT STL pipe with ½" ball valves.
5. Grout hose is 1" high pressure hose.
6. Mixing time is 4-5 minutes. Mix per manufacturer's recommendations is 1.5 to 1.7 gallons of potable water per 50# bag of grout mix.

GROUTING PROCEDURE

1. After approval of elongations, CSI will cut off ends of bars with an abrasive blade to prepare for grouting.
2. Rubber washer and permanent plastic grout caps will be placed as protection of the end anchors.
3. All grout vent shut-offs will be installed.
4. Oil-free air will be blown through ducts to remove any debris or water.
5. Shut-offs on vents will be closed to check for air leaks in order to locate potential grout leaks. Ducts should be able to achieve 30 psi pressure.
6. All grout openings and high points vents shall be open.
7. Grouting shall be done from the low side, uphill.
8. Proceed with grouting operation using one man on the grout pump and one man at the inlet.
9. Grout shall be allowed to flow from each vent until the consistency of the grout is equivalent to that of the grout injected, at which time the vent shall be capped.
10. Remaining vents shall be closed in the same manner, one after another in the direction of the flow.

Grouting Plan and Procedure
Jamaica ER BRF 013-1 (16)
Town of Jamaica, VT

11. The pumping pressure at the tendon inlet shall not exceed 250 psi. Normal operations shall be performed at 75 psi. If the actual grouting pressure exceeds the maximum recommended pumping pressure, grout may be injected at any vent which has been or is ready to be, capped as long as on-way flow is maintained. Grout shall not be injected in to a succeeding outlet from which grout has not yet flowed.
12. To ensure the duct remains filled with grout, the outlet shall be closed first and the inlet closed after holding the pumping pressure for that tendon duct. The inlet shall be sealed off under pressure.
13. Grout shall be pumped through the duct and continuously wasted at the outlet pipe until no visible slugs of water or air are ejected and efflux time of ejected grout is not less than the injected grout. To ensure the duct remains filled with grout, the outlet and inlet shall be closed. Plugs, caps, or valves at the inlets and outlets shall not be removed or opened until the grout has set. The filled ducts should not be subjected to shock or movement within twenty-four (24) hours of grouting. Grout shall not be above 90°F or lower than 40°F during mixing or pumping. If necessary, the mixing water shall be heated or cooled. The air temperature has to be a minimum of 40°F and rising for the next 24 hours, or the area must be heated. The waste fluid that is flushed from the ducts shall be captured and disposed of in compliance with applicable laws.
14. Grouting records such as efflux time in and time out, start time and finish time, and pressure will be recorded by pump operator throughout the grouting operation.



William F. Doherty
President

The New Hi-Pro Finisher Series

Equipment for surfacing, finishing and coating floors, walls and ceilings.

For pumping self-leveling underlayments
and spraying cementitious coatings.



New CG-502 Twin Mixer Grout Plant

Twin 34 gallon, five sack tanks feature ChemGrout's highly efficient mixers with instant mixing capability.

New open-throat pump, agitates material in hopper and offers easy access to all moving parts, elimination of build-up problems, a bolt-on stator, easy cleaning and a recirculation system.

Pumps 2½ bags/minute. Variable speed pumping 0.5 to 10 gpm.

Equipped with manual water meter featuring resettable digital readout in quarts. (automatic available)

Portable and skid-mounted on a heavy duty chassis with wheels for easy mobility.

All controls centrally located for one person operation.

Power options available—quiet, electro-hydraulic for indoor work, gasoline/hydraulic or air.

CG-540 Compact Pump/Sprayer

Two sack mixing tank mixes up to two bags of materials instantly . . . effective for fast setting materials.

Pumps 2 bags/minute. Variable speed pumping from 0.5 gpm to 8 gpm.

Large, screened hopper holds enough mixed materials to enable continuous, non-stop pumping of up to 2 bags/minute.

Mixer parts lift out for easy, quick tank cleanout.

All controls centrally located for one person operation.

Air-powered.

ChemGrout

"Widest Selection of Grouting Equipment in the World"

SEE COMPLETE
SPECIFICATIONS
OVER

CG-502 Twin Mixer Grout Plant

The new low profile, Twin Mixer Grout Plant is specifically designed for high production pumping of self-leveling floor underlayments. It's built with field-proven features for absolute ease of use.

You get twin variable-speed, open-tank mixers offering instant mixing capability of up to ten bags of material without beating air into the grout. A ten gallon storage hopper with screen allows a second visual inspection of the mix before pumping. The new open-throat pump delivers up to 10 gpm or 2½ bags/minute. Altogether, it's a balanced system allowing you to accomplish non-stop, continuous pumping and high production but with less labor and cost. The CG-502 requires only one operator to handle the centrally located mixing and pumping controls.

The units 30" width allows easy movement through doors. Low, shallow tanks provide easy bag entry to eliminate worker fatigue and allow easy cleanout.

Select from three power types—electro/hydraulic, gasoline/hydraulic or air.



Specifications

CG-502 Twin Mixer Group Plant

Pump open throat, non-pulsing
 Production 10 gpm @ 150 psi
 Size 72"L x 30"W x 48"H
 Weight 750 lbs.
 Wheels four (4), 2 fixed, 2 caster

Air-powered 175 cfm @ 100 psi

Electro/hydraulic-powered Drive 16 amps @ 240 volts

Gasoline/hydraulic-powered Drive 8 HP engine

Applications



Self-leveling floor underlayments
 Parking garage decks
 Bridge decks
 Concrete stadiums
 Pavement resurfacing
 Wherever a cementitious coating material is required

Accessories



REMOTE CONTROL for underlayment application.

WATER METER accurately monitors exact fluid input into the mix. Automatic or manual.



MULTI-PURPOSE SPRAY GUN allows the applicator to accurately control spray direction and material output.

HOSE—heavy-duty, 1" diameter.



CG-540 Compact Pump/Sprayer

Pump underlayments or spray-on cementitious coatings for floors, walls and ceilings. The two sack mixer and fifteen gallon storage hopper allow non-stop, continuous production of 2 sacks/minute.

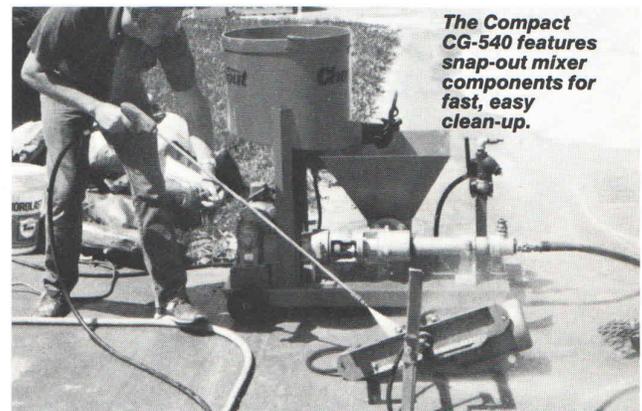


Specifications

CG-540 Compact Pump/Sprayer System

Pump progressing cavity, non-pulsing
 Production 8 gpm @ 150 psi
 Size 50"L x 30½"W x 52"H
 Weight 450 lbs.
 Wheels four (4), 2 fixed, 2 caster

Air-powered 175 cfm @ 100 psi



The Compact CG-540 features snap-out mixer components for fast, easy clean-up.

ChemGrout

"Experience in Grouting for 25 Years"

P.O. Box 1140 • La Grange Park, Illinois 60525 • 312-354-7112 (708-354-7112 November, 1989) • Telex: RCA 297242 • Fax: 312-354-3881

EUCO CABLE GROUT PTX

HIGH TOLERANCE CABLE GROUT

DESCRIPTION

EUCO CABLE GROUT PTX is designed to produce a pumpable, non-shrink, high strength grout. It provides corrosion protection for steel cables, anchorages and rods. EUCO CABLE GROUT PTX is extremely flowable, and cured grout is similar in appearance to concrete. EUCO CABLE GROUT PTX exhibits thixotropic properties defined in PTI specifications, and can be used to repair previously grouted cables.

PRIMARY APPLICATIONS

- Pre-tensioned/post-tensioned cables and rods
- Post-tensioned ducts
- Precast wall panels
- Beams
- Columns
- Cable anchor plates

FEATURES/BENEFITS

- Easy to pump or pour
- Non-shrink performance provides excellent bearing
- Flowable, high strength and self-leveling
- Aggregate free
- Pumpable for a minimum of 2 hrs @ 90°F (32°C)
- ▲ Can contribute to LEED points

TECHNICAL INFORMATION

| PROPERTY | RESULT |
|---|--|
| Fluid Consistency | 1.5 to 1.7 gal water/50 lb bag (5.7 to 6.4 L/22.7 kg) |
| Flow Rate (flow cone) ASTM C 939 & CRD C 621 | 9 to 20 seconds |
| Setting Time at 70°F (21°C) ASTM C 191 | 8 to 10 hours (will vary depending on material and ambient temperature) |
| Compressive Strength ASTM C 109 | 1 day: 2,000 psi (14 MPa) 3 days: 3,400 psi (23 MPa) 7 days: 5,500 psi (38 MPa) 28 days: 7,500 psi (52 MPa) |
| Hardened Height Change ASTM C 1090 | 24 hours: 0% to 0.1% 28 days: ≥ height at 24 hours (0.2%) |
| Plastic Expansion ASTM C 940 | 0% to 2% for up to 3 hours |
| Bleeding ASTM C 94 modified | 0% at 5 minutes 0% at 3 hours (200 mL Gellman Filter @ 100 psi) |
| Chloride Permeability ASTM C 1202 | 28 days (30V for 6 hrs): 660 coulombs |

EUCO CABLE GROUT PTX is a free flowing powder designed to be mixed with water. After mixing and placing, the color may initially appear much darker than the surrounding concrete. While this color will lighten up substantially as the grout cures, the grout may always appear somewhat darker than the surrounding concrete.

SHELF LIFE

2 years in original, unopened package.



The Euclid Chemical Company

19218 Redwood Rd. • Cleveland, OH 44110
Phone: [216] 531-9222 • Toll-free: [800] 321-7628 • Fax: [216] 531-9596
www.euclidchemical.com

An **RPM** Company



PACKAGING/YIELD

EUCO CABLE GROUT PTX is packaged in 50 lb (22.7 kg) bags or pails and yields 0.57 ft³ (0.016 m³) of fluid grout when mixed with 1.68 gal (6.4 L) of water.

SPECIFICATIONS/COMPLIANCES

- Complies with Post-Tensioning Institute Specifications (PTI)
- CRD C 621
- ASTM C 1107-05
- ASTM C 887
- ASTM C 1090

DIRECTIONS FOR USE

If the contractor is not familiar with standard grout placement techniques, a pre-job meeting is suggested to review the project details unique to the particular job. Contact your local Euclid Chemical representative for additional information.

Mixing:

Consistency Estimated Water Content*

| | |
|----------|--|
| Fluid | 1.5 to 1.7 gal/50 lb (5.7 to 6.4 L/22.7kg) |
| Flowable | 1.3 to 1.5 gal/50 lb (4.9 to 5.7 L/22.7kg) |

* Do not add water in an amount that will cause bleeding. Do not add aggregate or cement to the grout since this action will change its precision grouting characteristics. **Note:** To minimize bleeding in vertical applications greater than twenty feet, The Euclid Chemical Company recommends a water dosage no greater than 1.54 gal/50 lb (5.8 L/22.7 kg).

Curing and Sealing: Cure all exposed grout by wet curing for 24 hours. Then, cure the grout with a high solids curing and sealing compound, such as SUPER REZ-SEAL or SUPER AQUA-CURE VOX.

PRECAUTIONS/LIMITATIONS

- Clean tools and equipment with water before the material hardens.
- Do not add any admixture or fluidifiers.
- Do not use mixing water in an amount or at a temperature that will cause the mixed grout to bleed or segregate.
- Store materials in a dry place.
- Do not use material at temperatures that may cause premature freezing.
- Employ cold weather or hot weather grouting practices as the temperatures dictate.
- Rate of strength gain and setting times are significantly affected at temperature extremes.
- The Euclid Chemical Company is not responsible for stress corrosion caused by ingredients in the flushout, saturation, or mixing water, or for contaminants either in the space being grouted or from other materials used in the system.
- In all cases, consult the Material Safety Data Sheet before use.

Rev. 10.09

WARRANTY: The Euclid Chemical Company ("Euclid") solely and expressly warrants that its products shall be free from defects in materials and workmanship for one (1) year from the date of purchase. Unless authorized in writing by an officer of Euclid, no other representations or statements made by Euclid or its representatives, in writing or orally, shall alter this warranty. EUCLID MAKES NO WARRANTIES, IMPLIED OR OTHERWISE, AS TO THE MERCHANTABILITY OR FITNESS FOR ORDINARY OR PARTICULAR PURPOSES OF ITS PRODUCTS AND EXCLUDES THE SAME. If any Euclid product fails to conform with this warranty, Euclid will replace the product at no cost to Buyer. Replacement of any product shall be the sole and exclusive remedy available and buyer shall have no claim for incidental or consequential damages. Any warranty claim must be made within one (1) year from the date of the claimed breach. Euclid does not authorize anyone on its behalf to make any written or oral statements which in any way alter Euclid's installation information or instructions in its product literature or on its packaging labels. Any installation of Euclid products which fails to conform with such installation information or instructions shall void this warranty. Product demonstrations, if any, are done for illustrative purposes only and do not constitute a warranty or warranty alteration of any kind. Buyer shall be solely responsible for determining the suitability of Euclid's products for the Buyer's intended purposes.



SHOP DRAWINGS AND CALCULATIONS

For

**JAMAICA BRIDGE
ER-BRF 013-1(16)**

**1-3/8" GRADE 150 THREADBAR FOR PIER CAP
POST-TENSIONING AND PIER VERTICAL
REINFORCEMENT**

PREPARED FOR

T. BUCK CONSTRUCTION, INC.

SUBMITTED FOR APPROVAL

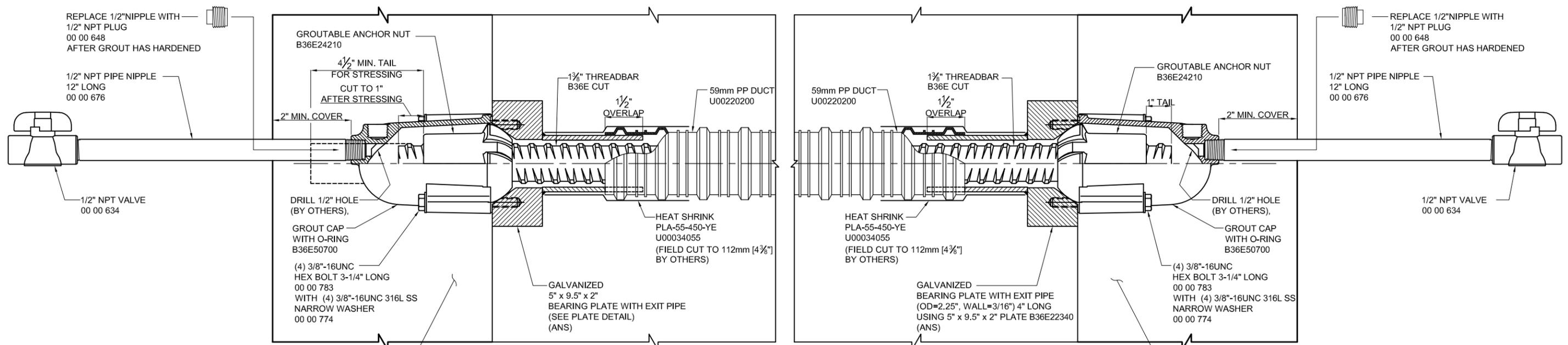
February 14, 2013



INDEX

PAGE NO.: CONTENTS:

| | | |
|--------|--|------|
| Page 3 | Precast Sub-Cap – 1-3/8” Threadbar Assembly | PT-1 |
| Page 4 | Pier Cap – 1-3/8” Threadbar Assembly | PT-2 |
| Page 5 | 1-3/8” Vertical Threadbar Assembly | PT-3 |
| Page 6 | Pier Schematic | PT-4 |
| Page 7 | Precast Sub-Cap – PT Threadbar Layouts and Details | PT-5 |
| Page 8 | Pier Cap – PT Threadbar Layouts and Details | PT-6 |
| Page 9 | Stressing Calculations. | |



FILL BLOCKOUT AFTER STRESSING AND GROUTING WITH NON-SHRINK GROUT OR APPROVED CONC. MIX (BY OTHERS)

FILL BLOCKOUT AFTER STRESSING AND GROUTING WITH NON-SHRINK GROUT OR APPROVED CONC. MIX (BY OTHERS)

STRESSING END ANCHOR DETAIL ELEVATION

DEAD END ANCHOR DETAIL ELEVATION

NOTES:

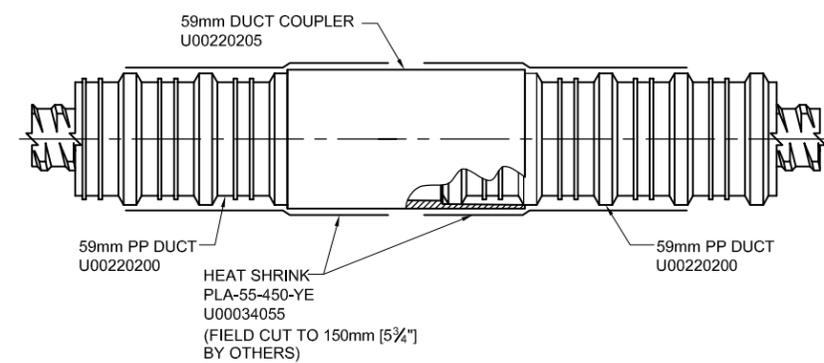
- REQUIRED REINFORCING BARS ARE NOT SHOWN ON THIS DRAWING.
- MAXIMUM ANGULAR MISALIGNMENT WHEN USING ANCHOR NUT: ±2°.
- DUCT IS DELIVERED IN STRAIGHT SECTIONS AND IS NOT INTENDED TO BE COILED.
- USE GROUT CAP (DRILL 1/2" HOLE IN GROUT PORT BEING USED. RECOMMEND USING HOLE SAW BIT OR SPADE BIT. BE CAREFULL TO PREVENT DAMAGE TO THREADS OR CAP).
- DUCT TO BE SUPPORTED EVERY 2 FT. MAXIMUM.

GENERAL NOTES:

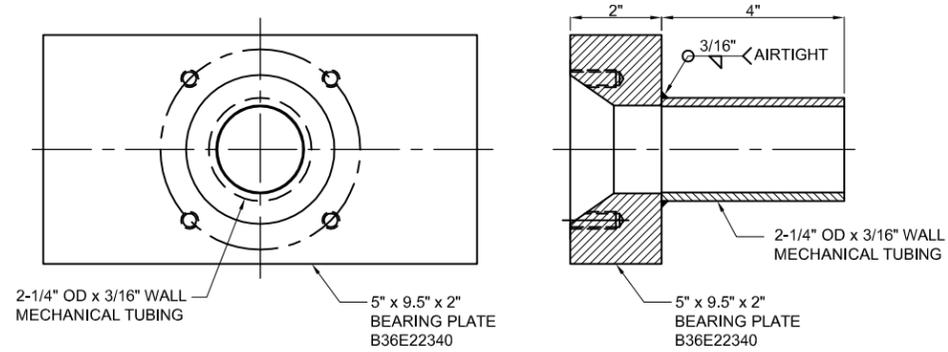
- BARS TO BE 1-3/8"Ø DYWIDAG THREADBAR WITH A MINIMUM ULTIMATE STRESS OF 150ksi CONFORMING TO STRENGTH REQUIREMENTS OF ASTM A-722 TYPE II-GALVANIZED AS PER ASTM A123.
- ANCHORAGES TO BE DYWIDAG STANDARD AND GALVANIZED.
- THE THREADBAR SHALL BE CAREFULLY UNLOADED AND STORED ON THE PROJECT SITE IN A MANNER TO AVOID DAMAGE AND CORROSION.
- THE CONTRACTOR SHALL EXERCISE CARE TO ENSURE THAT THE THREADBARS AND OTHER COMPONENTS WHEN INCORPORATED INTO THE WORK ARE FREE FROM RUST, DIRT, PAINT, OIL, GREASE OR OTHER FOREIGN SUBSTANCE.
- SHOP DRAWINGS REFER TO POST-TENSIONED SYSTEM DETAILS ONLY. FOR REINFORCEMENT DETAILS, SEE CONTRACT DRAWINGS.
- NO WELDING SHALL BE PERFORMED IN THE VICINITY OF HIGH TENSILE STEEL.
- ALL THREADBARS ARE ONE END STRESS ONLY, U.N.O.

THREADBAR STRESSING PROCEDURE:

- INSPECT BAR STRESSING EXTENSION AND NUT TO BE SURE THEY ARE CLEAN AND FREE OF RUST AND OF PROPER LENGTH.
- TIGHTEN ANCHOR NUT HAND. MEASURE AND RECORD LENGTH OF BAR EXTENDING OUT OF THE ANCHOR NUT.
- THREAD PULL ROD ONTO THE BAR.
- PLACE JACK OVER PULL ROD.
- SCREW STRESSING NUT ONTO PULL ROD TILL IT BEARS ON THE BACK OF THE JACK.
- STRESS BAR TO 20% OF JACKING FORCE AS PER SEQUENCE SHOWN IN THE TABLE AND MARK THE BAR FOR ELONGATION MEASUREMENT.
- STRESS BAR TO 100% OF JACKING FORCE AS PER SEQUENCE SHOWN IN THE TABLE.
- TIGHTEN NUT WITH RACHET HANDLE. (DO NOT USE CHEATER BAR)
- RELEASE PRESSURE. REMOVE JACK.
- MEASURE AND RECORD ELONGATIONS.



DUCT COUPLING DETAIL



NOTE: GALVANIZED AS PER ASTM A123 AFTER WELDING.

GALVANIZED BEARING PLATE (ANS)

| MATERIAL LIST | | |
|---------------|---|---|
| PART NO. | DESCRIPTION | MATERIAL SPECIFICATION |
| B36E CUT | 1-3/8" Ø THREADBAR | ASTM A722 TYPE II STEEL |
| ANS | 5" x 9.5" x 2" BEARING PLATE (USING B36E22340) WITH EXIT 2 1/4" x 3/16" WALL 4" LONG MECHANICAL TUBING PIPE & BOLT HOLES, GALV. | STEEL PLATE, ASTM A36 (GALV.) |
| B36E24210 | GROUTABLE ANCHOR NUT | STEEL FORGING, ASTM A521-76 (1987) NORMALIZED BHN=180-220 |
| B36E50700 | BAR GROUT CAP WITH O-RING | NYLON 6, 20% GLASS FIBER FILLED CAP |
| U00220200 | 59mm CORRUGATED PP DUCT | PPX3 |
| U00220205 | 59mm DUCT COUPLER | HDPE |
| 00 00 783 | 3/8"-16UNC HEX BOLT 3-1/4" LONG | |
| 00 00 774 | NARROW WASHER FOR 3/8"-16UNC HEX BOLT | 316L STAINLESS STEEL |
| 00 00 676 | 1/2" NPT NIPPLE, 12" LONG | SCH 40 BLACK WELDED STEEL |
| 00 00 634 | 1/2" NPT VALVE | PVC |
| 00 00 648 | 1/2" NPT PLUG | HDPE |
| U00034055 | HEAT SHRINK, PLA-55-450-YE | CANUSA |

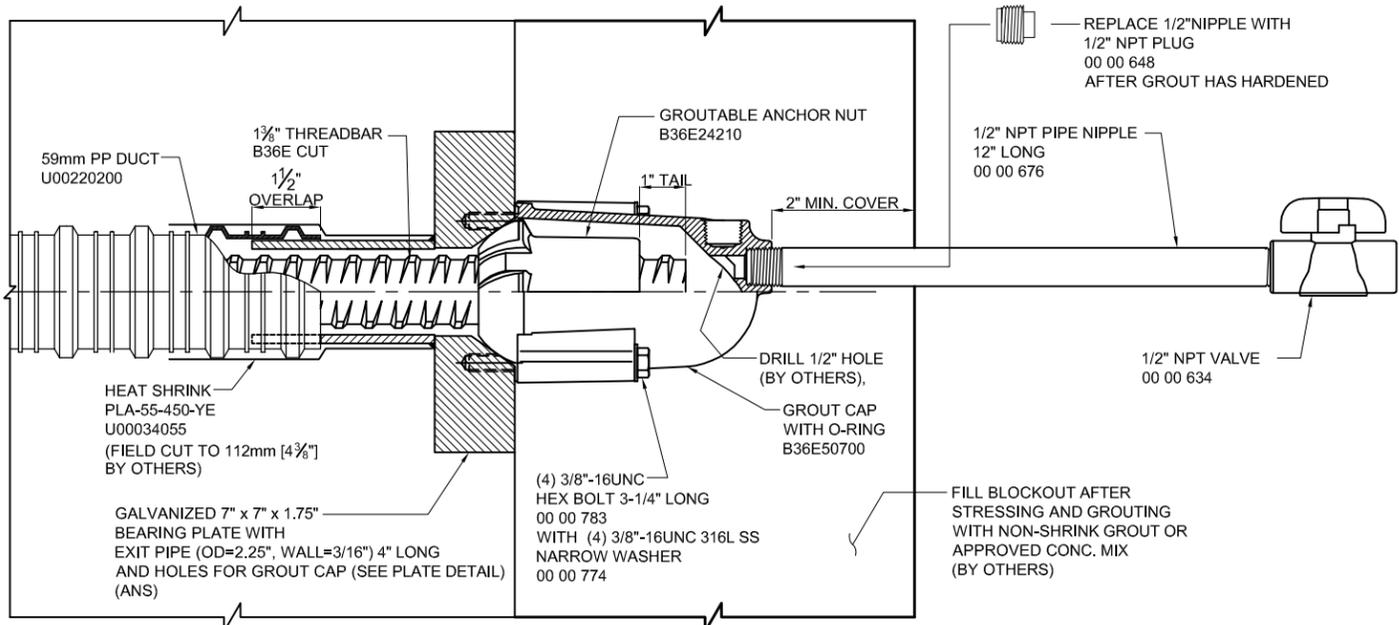
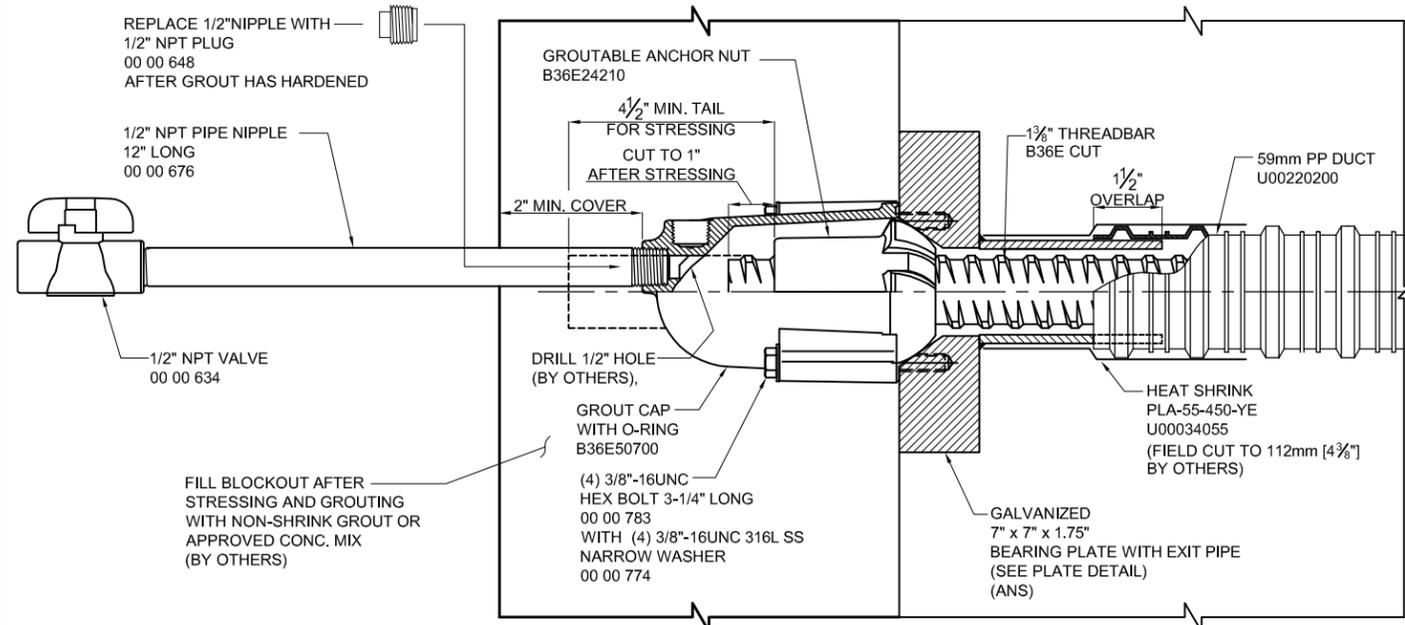
WARNING: READ AND COMPLY WITH ALL APPLICABLE SAFETY AND OPERATING INSTRUCTIONS AND WARNINGS FOR THREADBAR STRESSING BEFORE STARTING ANY WORK OR OPERATION.

CAUTION WHEN USING HIGH STRENGTH DYWIDAG THREADBAR® (GRADE 150) DO NOT WELD TO BAR. DO NOT USE BAR AS GROUND CONNECTION FOR WELDING. DO NOT ALLOW HOT SLAG OR SPARKS TO TOUCH BAR. DO NOT DAMAGE BAR SURFACE. DO NOT USE BARS WITH KINKS OR SHARP BENDS. FAILURE TO HEED THIS WARNING COULD CAUSE BAR TO BREAK RESULTING IN INJURY OR DAMAGE

CAUTION: WHEN PRESSURIZING GROUT CAPS, DO NOT STAND BEHIND CAPS!

| | | | | | | | | |
|--|--|--|-----------------|----------|-------------------|------|-------|------------|
| OWNER: STATE OF VERMONT, AGENCY OF TRANSPORTATION | | DYWIDAG SYSTEMS INTERNATIONAL, USA INC. DOES NOT ASSUME ANY LIABILITY FOR THE DESIGN OF THIS STRUCTURE. THIS SHOP DRAWING IS INTENDED TO PROVIDE POST TENSIONING DETAILS ONLY. | | | | | | |
| CONTRACTOR: T. BUCK CONSTRUCTION, INC. | | WEIGHT | REV. | DATE | ISSUE DESCRIPTION | NAME | CHKD. | JOB NUMBER |
| PROJECT: JAMAICA, ER-BRF 013-1(16) | | | 0 | 02/14/13 | FOR APPROVAL | IT | EZ | J092604 |
| PRECAST SUB-CAP 1-3/8" THREADBAR ASSEMBLY | | SCALE | DRAWING NUMBER: | | | | | |
| DATE: 02/06/13 DWG: LTIRA CHK: EZ APP: EZ | | 1:4 | PT-1 | | | | | |
| THIS DRAWING, THE PERTINENT ENCLOSURES, DESCRIPTIONS, CALCULATIONS ETC. AND THEIR CONTENTS ARE THE PROPERTY OF DYWIDAG SYSTEMS INTERNATIONAL, USA, INC. THEY ARE NOT ALLOWED TO BE DUPLICATED WITHOUT OUR PERMISSION. THEY ARE ALSO NOT TO BE SHOWN OR EXPLAINED FOR ANY REASON TO A THIRD PARTY OTHER THAN FOR REASONS EXPRESSLY INTENDED BY DSI'S SUBMITTAL TO THE ORIGINAL RECEIVER. THEY HAVE TO BE RETURNED UPON REQUEST. | | DYWIDAG-SYSTEMS INTERNATIONAL, USA, INC. POST TENSIONING / REINFORCING UNIT PHONE: 630-739-1100 320 MARMON DRIVE - BOLINGBROOK, IL FAX: 630-739-1405 | | | | | | |





NOTES:

1. REQUIRED REINFORCING BARS ARE NOT SHOWN ON THIS DRAWING.
2. MAXIMUM ANGULAR MISALIGNMENT WHEN USING ANCHOR NUT: ±2°.
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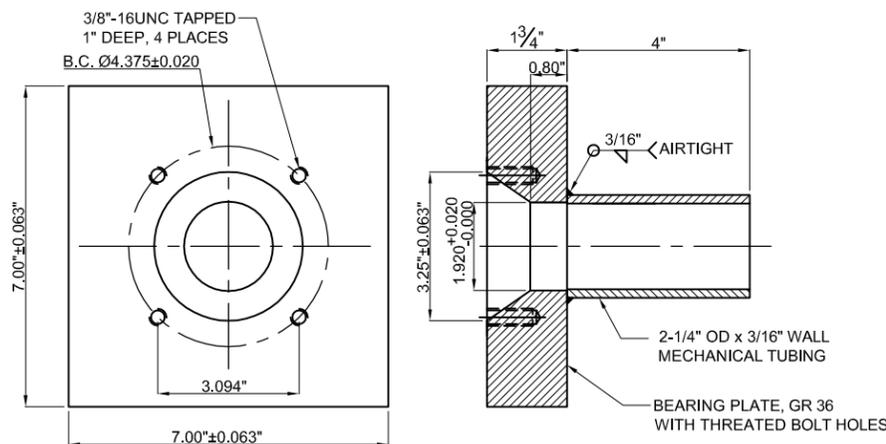
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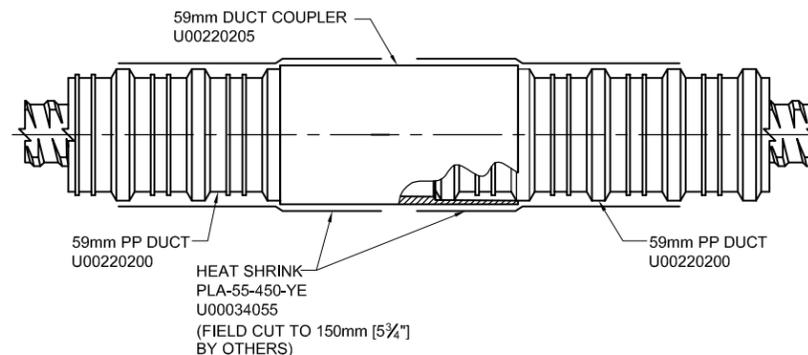
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4. PLACE JACK OVER PULL ROD.
5. SCREW STRESSING NUT ONTO PULL ROD TILL IT BEARS ON THE BACK OF THE JACK.
6. STRESS BAR TO 20% OF JACKING FORCE AS PER SEQUENCE SHOWN IN THE TABLE AND MARK THE BAR FOR ELONGATION MEASUREMENT.
7. STRESS BAR TO 100% OF JACKING FORCE AS PER SEQUENCE SHOWN IN THE TABLE.
8. TIGHTEN NUT WITH RACHET HANDLE. (DO NOT USE CHEATER BAR)
9. RELEASE PRESSURE. REMOVE JACK.
10. MEASURE AND RECORD ELONGATIONS.



NOTE: GALVANIZED AS PER ASTM A123 AFTER WELDING.

GALVANIZED BEARING PLATE (ANS)



DUCT COUPLING DETAIL

WARNING: READ AND COMPLY WITH ALL APPLICABLE SAFETY AND OPERATING INSTRUCTIONS AND WARNINGS FOR THREADBAR STRESSING BEFORE STARTING ANY WORK OR OPERATION.

CAUTION WHEN USING HIGH STRENGTH DYWIDAG THREADBAR® (GRADE 150) DO NOT WELD TO BAR. DO NOT USE BAR AS GROUND CONNECTION FOR WELDING. DO NOT ALLOW HOT SLAG OR SPARKS TO TOUCH BAR. DO NOT DAMAGE BAR SURFACE. DO NOT USE BARS WITH KINKS OR SHARP BENDS. FAILURE TO HEED THIS WARNING COULD CAUSE BAR TO BREAK RESULTING IN INJURY OR DAMAGE

CAUTION WHEN PRESSURIZING GROUT CAPS, DO NOT STAND BEHIND CAPS!

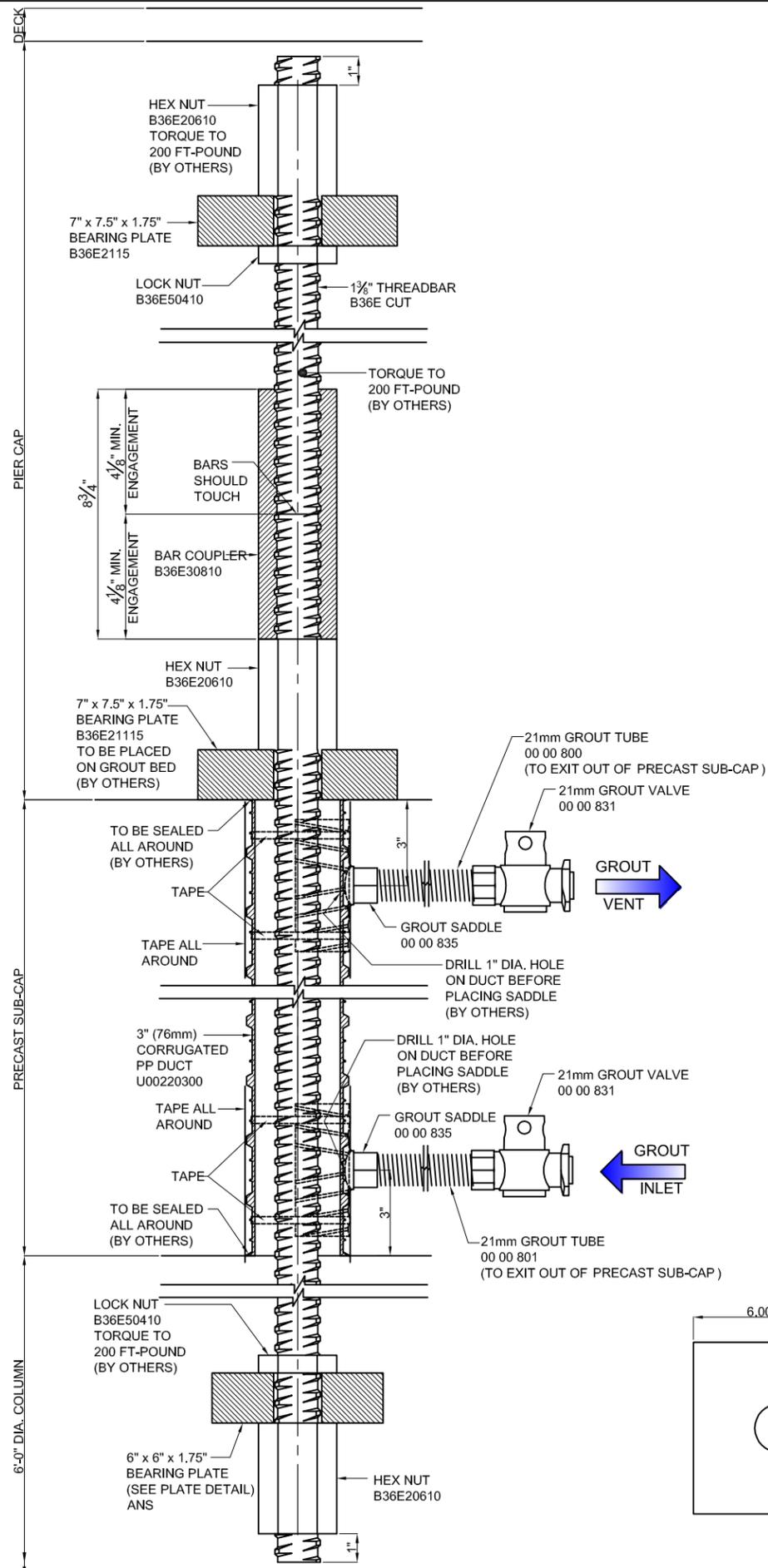
| MATERIAL LIST | | |
|---------------|--|---|
| PART NO. | DESCRIPTION | MATERIAL SPECIFICATION |
| B36E CUT | 1-3/8" Ø THREADBAR | ASTM A722 TYPE II STEEL |
| ANS | 7" x 7" x 1.75" BEARING PLATE WITH EXIT 2 1/4" x 3/16" WALL 4" LONG MECHANICAL TUBING PIPE & BOLT HOLES, GALV. | STEEL PLATE, ASTM A36 (GALV.) |
| B36E24210 | GROUTABLE ANCHOR NUT | STEEL FORGING, ASTM A521-76 (1987) NORMALIZED BHN=180-220 |
| B36E50700 | BAR GROUT CAP WITH O-RING | NYLON 6, 20% GLASS FIBER FILLED CAP |
| U00220200 | 59mm CORRUGATED PP DUCT | PPX3 |
| U00220205 | 59mm DUCT COUPLER | HDPE |
| 00 00 783 | 3/8"-16UNC HEX BOLT 3-1/4" LONG | |
| 00 00 774 | NARROW WASHER FOR 3/8"-16UNC HEX BOLT | 316L STAINLESS STEEL |
| 00 00 676 | 1/2" NPT NIPPLE, 12" LONG | SCH 40 BLACK WELDED STEEL |
| 00 00 634 | 1/2" NPT VALVE | PVC |
| 00 00 648 | 1/2" NPT PLUG | HDPE |
| U00034055 | HEAT SHRINK, PLA-55-450-YE | CANUSA |

| | | | | | | | |
|---|--|---------|---------------|--------------------------------|---------|----------|----------------------|
| OWNER: STATE OF VERMONT, AGENCY OF TRANSPORTATION | DYWIDAG SYSTEMS INTERNATIONAL, USA INC. DOES NOT ASSUME ANY LIABILITY FOR THE DESIGN OF THIS STRUCTURE. THIS SHOP DRAWING IS INTENDED TO PROVIDE POST TENSIONING DETAILS ONLY. | | | | | | |
| CONTRACTOR: T. BUCK CONSTRUCTION, INC. | WEIGHT | REV. 0 | DATE 02/14/13 | ISSUE DESCRIPTION FOR APPROVAL | NAME IT | CHKD. EZ | JOB NUMBER J092604 |
| PROJECT: JAMAICA, ER-BRF 013-1(16) | SCALE 1:4 | | | | | | DRAWING NUMBER: PT-2 |
| PIER CAP 1-3/8" THREADBAR ASSEMBLY | | | | | | | |
| DATE: 02/06/13 | DWG: LTIRA | CHK: EZ | APP: EZ | | | | |

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DYWIDAG-SYSTEMS INTERNATIONAL, USA, INC.
POST TENSIONING / REINFORCING UNIT PHONE: 630-739-1100
320 MARMON DRIVE - BOLINGBROOK, IL FAX: 630-739-1405





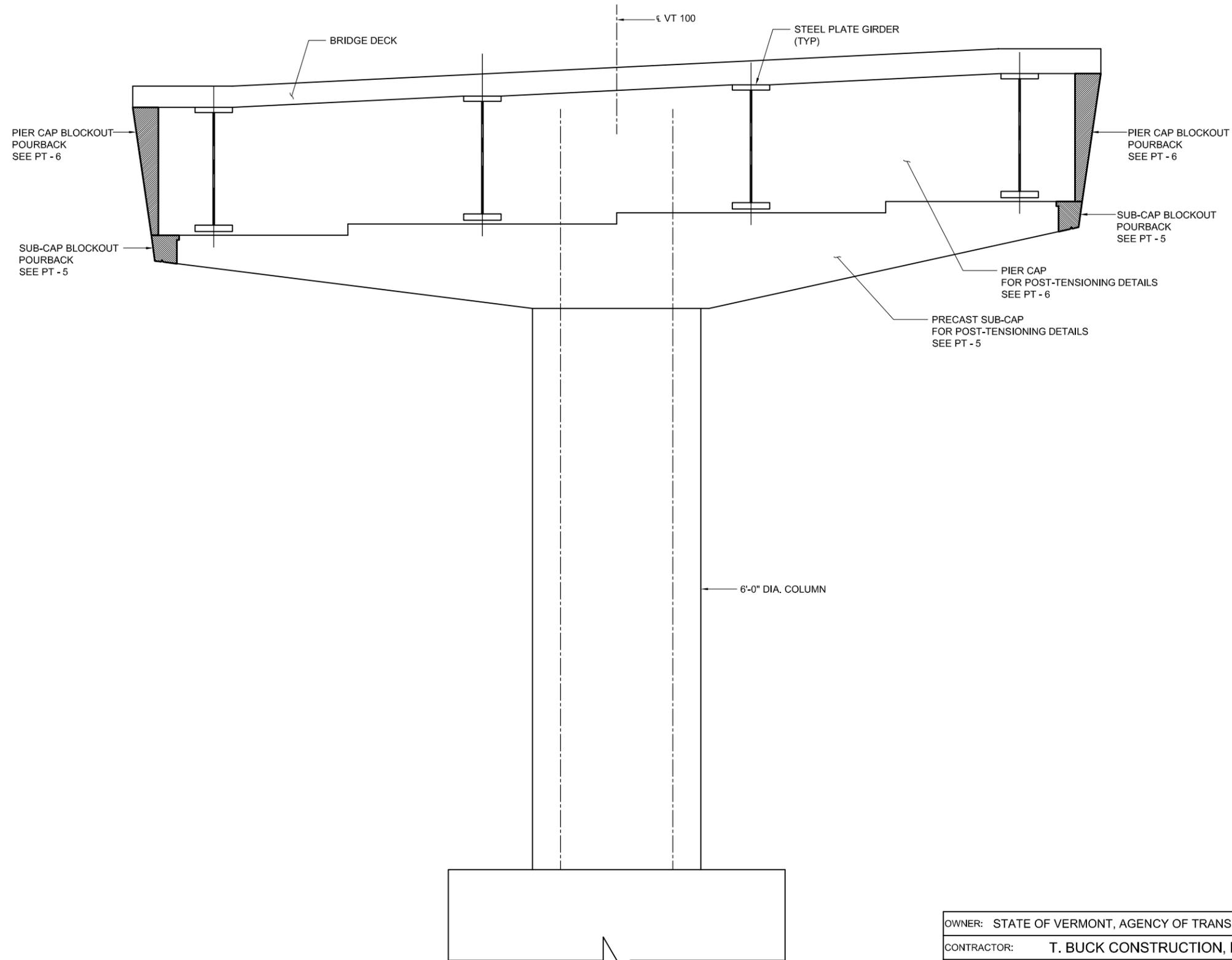
GENERAL NOTES:

1. BARS TO BE 1-3/8" Ø DYWIDAG THREADBAR WITH A MINIMUM ULTIMATE STRESS OF 150ksi CONFORMING TO STRENGTH REQUIREMENTS OF ASTM A-722 TYPE II.
2. ANCHORAGES TO BE DYWIDAG STANDARD.
3. THE THREADBAR SHALL BE CAREFULLY UNLOADED AND STORED ON THE PROJECT SITE IN A MANNER TO AVOID DAMAGE AND CORROSION.
4. THE CONTRACTOR SHALL EXERCISE CARE TO ENSURE THAT THE THREADBARS AND OTHER COMPONENTS WHEN INCORPORATED INTO THE WORK ARE FREE FROM RUST, DIRT, PAINT, OIL, GREASE OR OTHER FOREIGN SUBSTANCE.
5. SHOP DRAWINGS REFER TO THREADBAR SYSTEM DETAILS ONLY. FOR REINFORCEMENT AND INSTALLATION DETAILS, SEE CONTRACT DRAWINGS.
6. NO WELDING SHALL BE PERFORMED IN THE VICINITY OF HIGH TENSILE STEEL.
7. TORQUING AS INDICATED IS CRITICAL FOR PROPER PERFORMANCE OF THE THREADBAR SYSTEM.

MATERIAL LIST

| PART NO. | DESCRIPTION | MATERIAL SPECIFICATION |
|-----------|---------------------------------|---|
| B36E CUT | 1-3/8" Ø THREADBAR | ASTM A722 TYPE II STEEL |
| B36E21115 | 7" x 7.5" x 1.75" BEARING PLATE | STEEL PLATE, ASTM A36 |
| ANS | 6" x 6" x 1.75" BEARING PLATE | |
| B36E20610 | HEX NUT | STEEL FORGING, ASTM A521-76 (1987) NORMALIZED BHN=180-220 |
| B36E50410 | LOCK NUT | SEAMLESS MECHANICAL TUBING C1026 CD |
| B36E30810 | BAR COUPLER | STEEL BAR, COLD DRAWN, AISI1117 |
| 00 00 835 | GROUT SADDLE | HDPE |
| 00 00 801 | 21mm GROUT TUBE | HDPE |
| 00 00 831 | 21mm GROUT VALVE | PLASTIC |
| U00220300 | 3" (76mm) CORRUGATED PP DUCT | PPX3 |

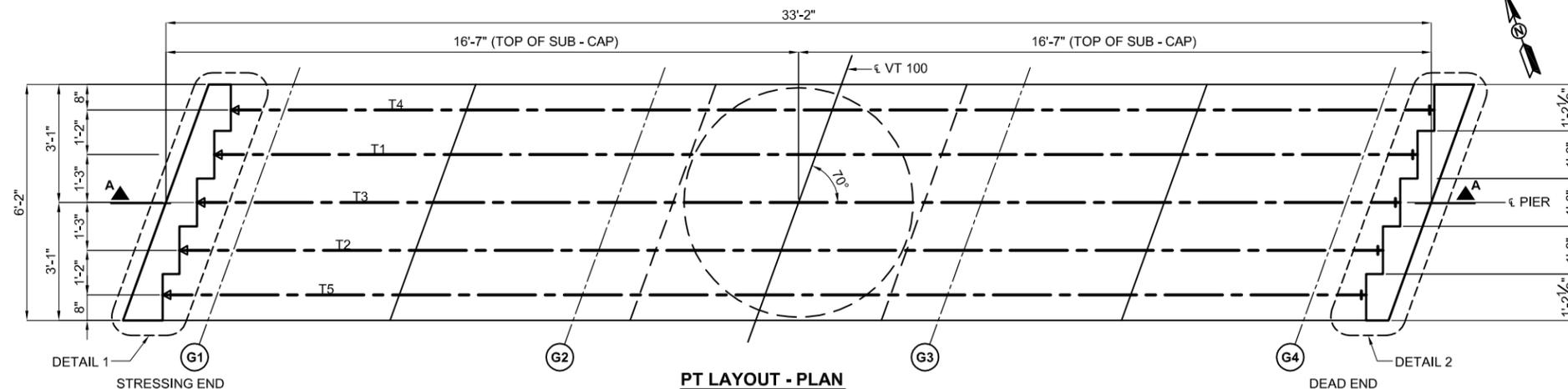
| | | | | | | | | |
|--|------------|--|---------|--|--------------------------------|---------|----------|----------------------|
| OWNER: STATE OF VERMONT, AGENCY OF TRANSPORTATION | | DYWIDAG SYSTEMS INTERNATIONAL, USA INC. DOES NOT ASSUME ANY LIABILITY FOR THE DESIGN OF THIS STRUCTURE. THIS SHOP DRAWING IS INTENDED TO PROVIDE POST TENSIONING DETAILS ONLY. | | | | | | |
| CONTRACTOR: T. BUCK CONSTRUCTION, INC. | | WEIGHT | REV. 0 | DATE 02/14/13 | ISSUE DESCRIPTION FOR APPROVAL | NAME IT | CHKD. EZ | JOB NUMBER J092604 |
| PROJECT: JAMAICA, ER-BRF 013-1(16) | | SCALE 3/16" = 1" | | | | | | DRAWING NUMBER: PT-3 |
| DATE: 02/06/13 | DWG: LTIRA | CHK: EZ | APP: EZ | DYWIDAG-SYSTEMS INTERNATIONAL, USA, INC. POST TENSIONING / REINFORCING UNIT PHONE: 630-739-1100 320 MARMON DRIVE - BOLINGBROOK, IL FAX: 630-739-1405 | | | | |
| THIS DRAWING, THE PERTINENT ENCLOSURES, DESCRIPTIONS, CALCULATIONS ETC. AND THEIR CONTENTS ARE THE PROPERTY OF DYWIDAG SYSTEMS INTERNATIONAL, USA, INC. THEY ARE NOT ALLOWED TO BE DUPLICATED WITHOUT OUR PERMISSION. THEY ARE ALSO NOT TO BE SHOWN OR EXPLAINED FOR ANY REASON TO A THIRD PARTY OTHER THAN FOR REASONS EXPRESSLY INTENDED BY DSI'S SUBMITTAL TO THE ORIGINAL RECEIVER. THEY HAVE TO BE RETURNED UPON REQUEST. | | DSI | | | | | | |



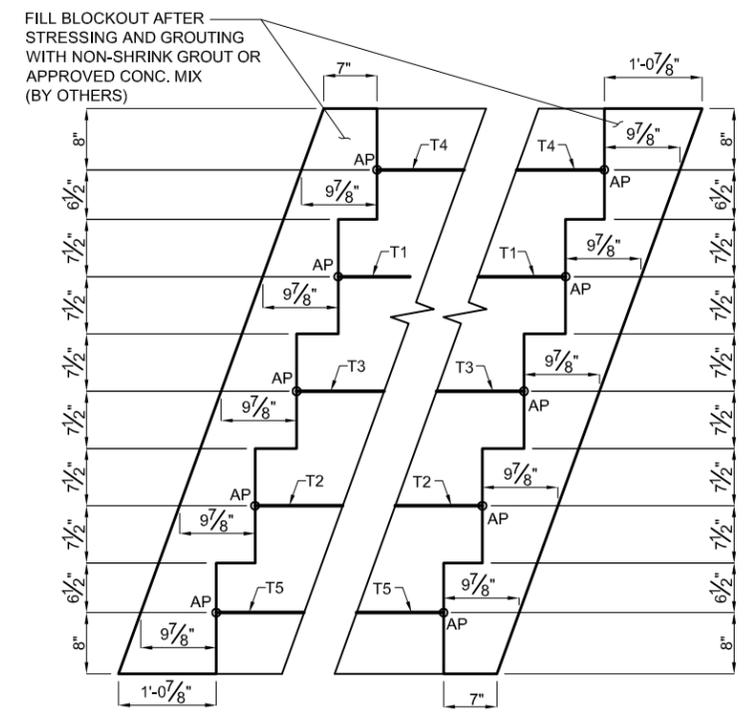
PIER SCHEMATIC

| | | | | | | | | |
|--|--|--|------|----------|-------------------|------|-------|------------|
| OWNER: STATE OF VERMONT, AGENCY OF TRANSPORTATION | | DYWIDAG SYSTEMS INTERNATIONAL, USA INC. DOES NOT ASSUME ANY LIABILITY FOR THE DESIGN OF THIS STRUCTURE. THIS SHOP DRAWING IS INTENDED TO PROVIDE POST TENSIONING DETAILS ONLY. | | | | | | |
| CONTRACTOR: T. BUCK CONSTRUCTION, INC. | | WEIGHT | REV. | DATE | ISSUE DESCRIPTION | NAME | CHKD. | JOB NUMBER |
| PROJECT: JAMAICA, ER-BRF 013-1(16) | | | 0 | 02/14/13 | FOR APPROVAL | IT | EZ | J092604 |
| PIER SCHEMATIC | | SCALE | | | | | | |
| DATE: 02/06/13 DWG: LTIRA CHK: EZ APP: EZ | | 1/4" = 1'-0" | | | | | | |
| THIS DRAWING, THE PERTINENT ENCLOSURES, DESCRIPTIONS, CALCULATIONS ETC. AND THEIR CONTENTS ARE THE PROPERTY OF DYWIDAG SYSTEMS INTERNATIONAL, USA, INC. THEY ARE NOT ALLOWED TO BE DUPLICATED WITHOUT OUR PERMISSION. THEY ARE ALSO NOT TO BE SHOWN OR EXPLAINED FOR ANY REASON TO A THIRD PARTY OTHER THAN FOR REASONS EXPRESSLY INTENDED BY DSI'S SUBMITTAL TO THE ORIGINAL RECEIVER. THEY HAVE TO BE RETURNED UPON REQUEST. | | DYWIDAG-SYSTEMS INTERNATIONAL, USA, INC. POST TENSIONING / REINFORCING UNIT PHONE: 630-739-1100 320 MARMON DRIVE - BOLINGBROOK, IL FAX: 630-739-1405 | | | | | | |



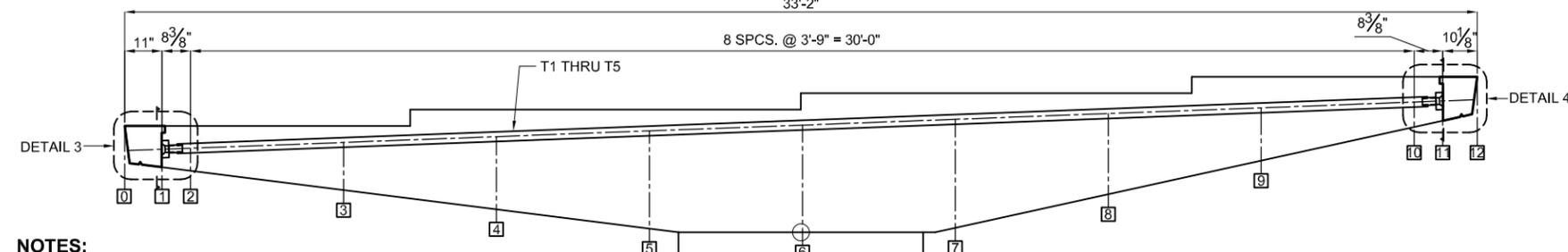


PT LAYOUT - PLAN
SCALE: 1/4" = 1'-0"



DETAIL 1 - BLOCKOUT
SCALE: 1/2" = 1'-0"

DETAIL 2 - BLOCKOUT
SCALE: 1/2" = 1'-0"



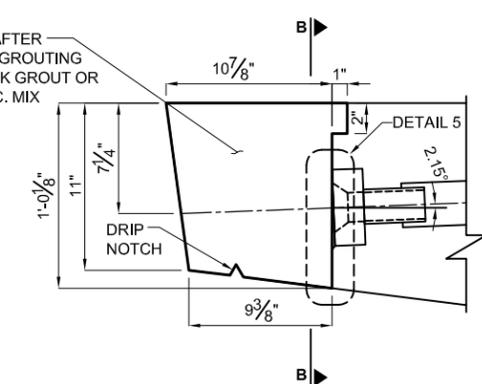
PROFILE - SECTION A-A
SCALE: 1/4" = 1'-0"

NOTES:

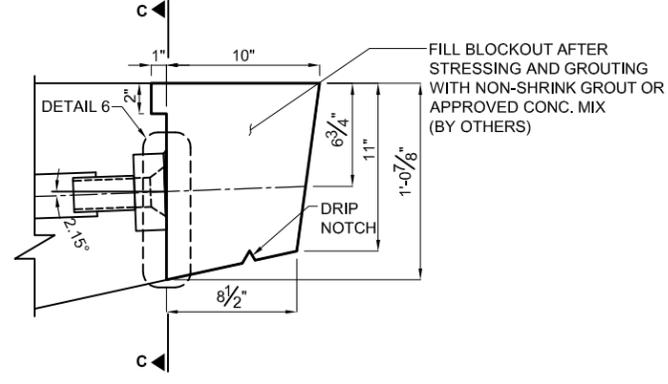
1. Y - DENOTES CENTER LINE OF TENDON DUCT MEASURED FROM SOFFIT OF BOTTOM SUB-CAP.
2. Y1 - DENOTES SUPPORT HEIGHTS, MEASURED FROM SOFFIT OF BOTTOM SUB-CAP TO THE BOTTOM OF DUCT.
3. ADD SUPPORT BARS BETWEEN CONTROL POINTS (NODES) EVERY 2 FT. MAXIMUM.
4. FOR DRIP NOTCH SEE SHEET 41 OF 85.

T1 ← **STRESSING SEQUENCE**
TENDON MARK

FILL BLOCKOUT AFTER STRESSING AND GROUTING WITH NON-SHRINK GROUT OR APPROVED CONC. MIX (BY OTHERS)



DETAIL 3 - BLOCKOUT
SCALE: 1" = 1'-0"



DETAIL 4 - BLOCKOUT
SCALE: 1" = 1'-0"

| TENDON MARK | Node | A.P. | | | | | | | | | | | | |
|-------------|-------------------------|------|------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| | Dist. from Point 0 (ft) | 0.00 | 0.92 | 1.62 | 5.37 | 9.12 | 12.87 | 16.62 | 20.37 | 24.12 | 27.87 | 31.62 | 32.32 | 33.17 |
| T1 thru T5 | Y (in) | | 5.28 | 6.65 | 13.98 | 21.32 | 28.65 | 31.42 | 31.81 | 23.65 | 15.49 | 7.33 | 5.80 | |
| | Y1 (in) | | 4.04 | 5.41 | 12.74 | 20.08 | 27.41 | 30.18 | 30.57 | 22.41 | 14.25 | 6.09 | | |

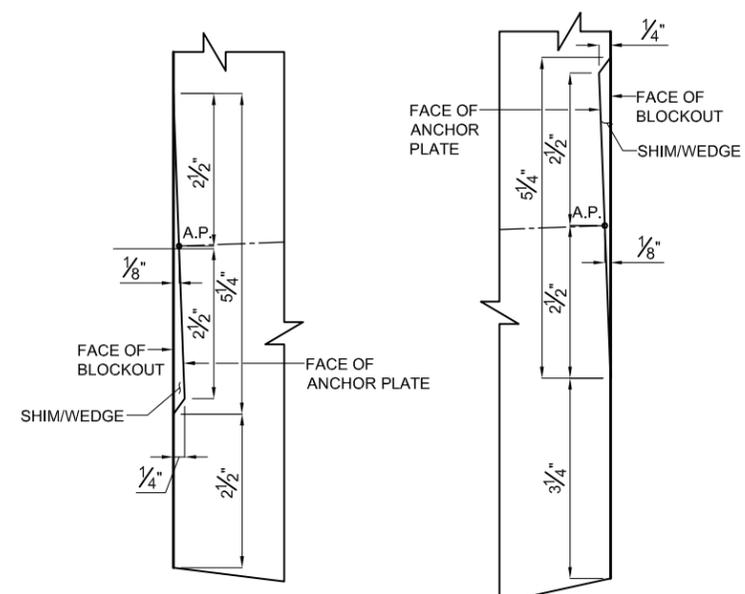
STRESSING SCHEDULE

| PIER SUB CAP TENDONS | STRESSING LENGTH | AREA OF BAR | JACKING FORCE | AVERAGE LOCK-OFF FORCE | TARGET ELONGATION AFTER LOCK-OFF |
|----------------------|------------------|----------------------|---------------|------------------------|----------------------------------|
| | L (FT) | A (IN ²) | JF (KIPS) | EF (KIPS) | TEAL (IN) |
| ALL | 31.42 | 1.58 | 165.9 | 157.6 | 1.27 |

NOTE:

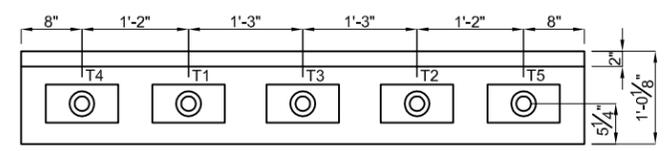
1. STRESSING OPERATIONS SHALL NOT BEGIN UNTIL CONCRETE HAS REACHED A COMPRESSIVE STRENGTH OF 4,000 PSI.
2. AS PER NOTE 52 IN SHEET 3 OF 85, TENSION SHALL BE VERIFIED BY PERFORMING A LIFT-OFF TEST PRIOR TO GROUTING.

SEE DRAWING PT-1 FOR ASSEMBLY DETAILS.

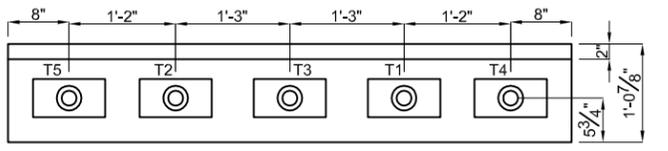


DETAIL 5 - BLOCKOUT
N.T.S.

DETAIL 6 - BLOCKOUT
N.T.S.



SECTION B-B
SCALE: 1/2" = 1'-0"



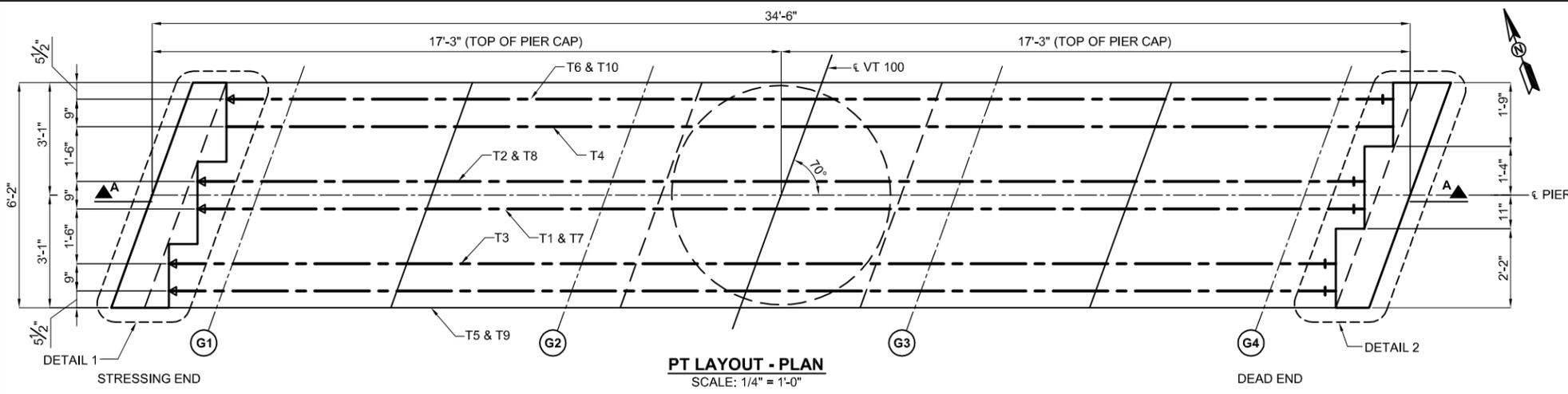
SECTION C-C
SCALE: 1/2" = 1'-0"

NOTES:

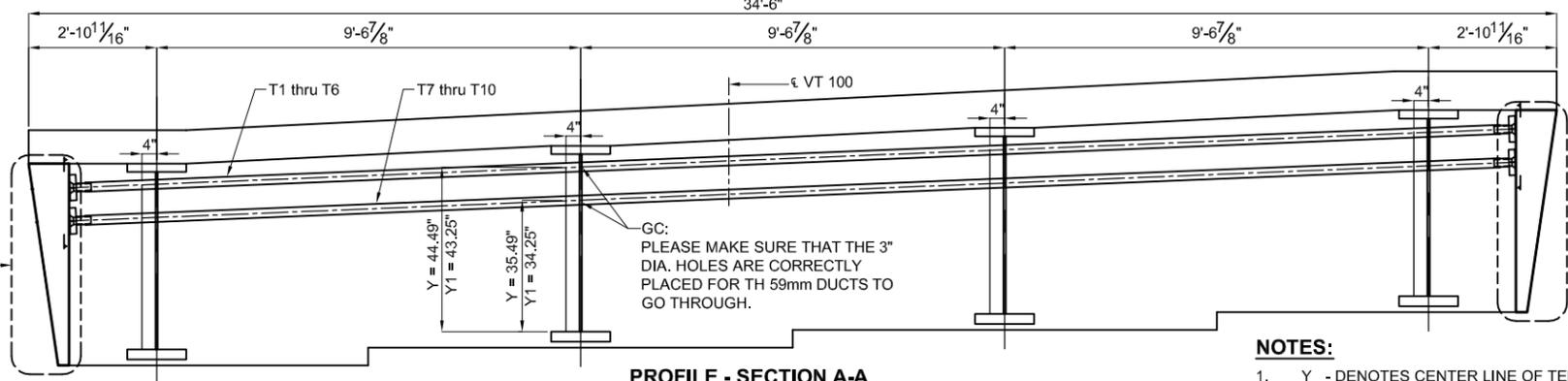
1. ONLY PLATE SHOWN.
2. FOR STRESSING STAGING SEE NOTES 4-6 IN SHEET 38 OF 85.

| | | | | | | | |
|--|--|------|----------|-------------------|------|--|-----------------|
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| CONTRACTOR: T. BUCK CONSTRUCTION, INC. | WEIGHT | REV. | DATE | ISSUE DESCRIPTION | NAME | CHKD. | JOB NUMBER |
| PROJECT: JAMAICA, ER-BRF 013-1(16) | | 0 | 02/14/13 | FOR APPROVAL | IT | EZ | J092604 |
| DATE: 02/06/13 DWG: LTIRA CHK: EZ APP: EZ | SCALE AS SHOWN | | | | | | DRAWING NUMBER: |
| | | | | | | | PT-5 |
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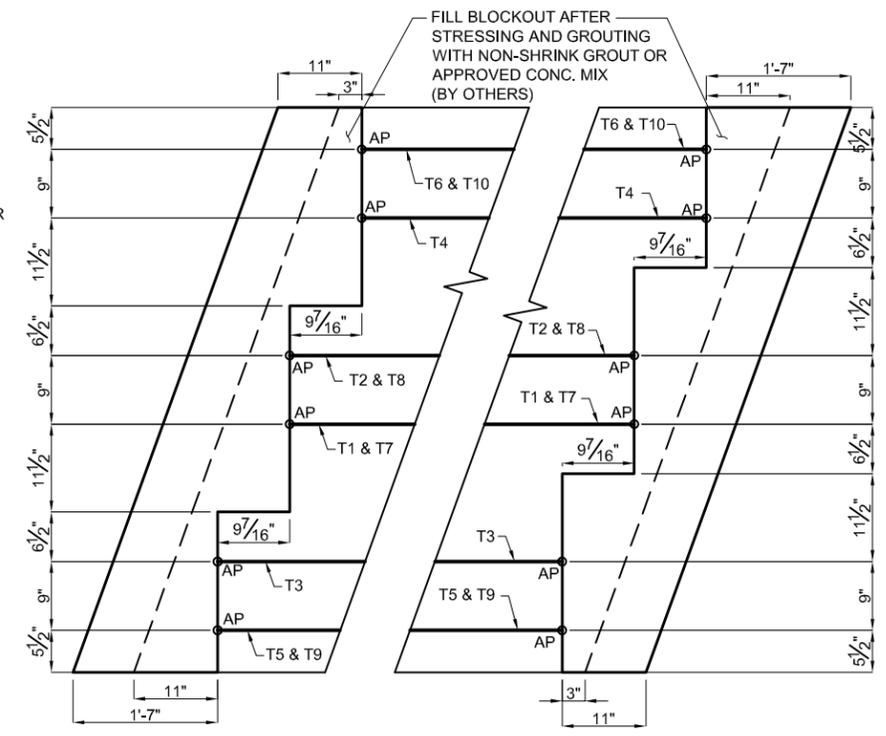




PT LAYOUT - PLAN
SCALE: 1/4" = 1'-0"



PROFILE - SECTION A-A
SCALE: 1/4" = 1'-0"

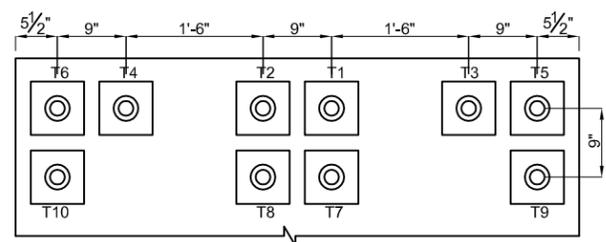


DETAIL 1 - BLOCKOUT
SCALE: 1/2" = 1'-0"

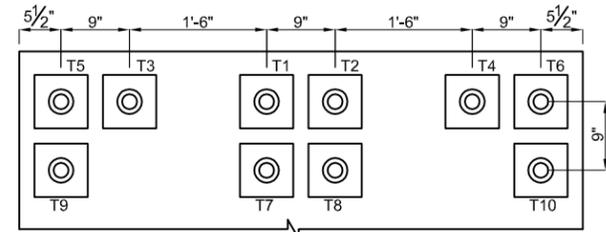
DETAIL 2 - BLOCKOUT
SCALE: 1/2" = 1'-0"

NOTES:

1. Y - DENOTES CENTER LINE OF TENDON DUCT MEASURED FROM TOP OF BOTTOM FLANGE OF STEEL PLATE GIRDER.
2. Y1 - DENOTES SUPPORT HEIGHTS MEASURED FROM TOP OF BOTTOM FLANGE OF STEEL PLATE GIRDER TO THE BOTTOM OF DUCT.
3. Y AND Y1 ARE TYPICAL AT EACH GIRDER.
4. SUPPORT DUCT EVERY 2 FT. MAXIMUM. ADD SUPPORT BARS BETWEEN GIRDER WEB.
5. FOR 3" DIA. HOLE ON WEBS SEE STRUCTURAL DRAWINGS.

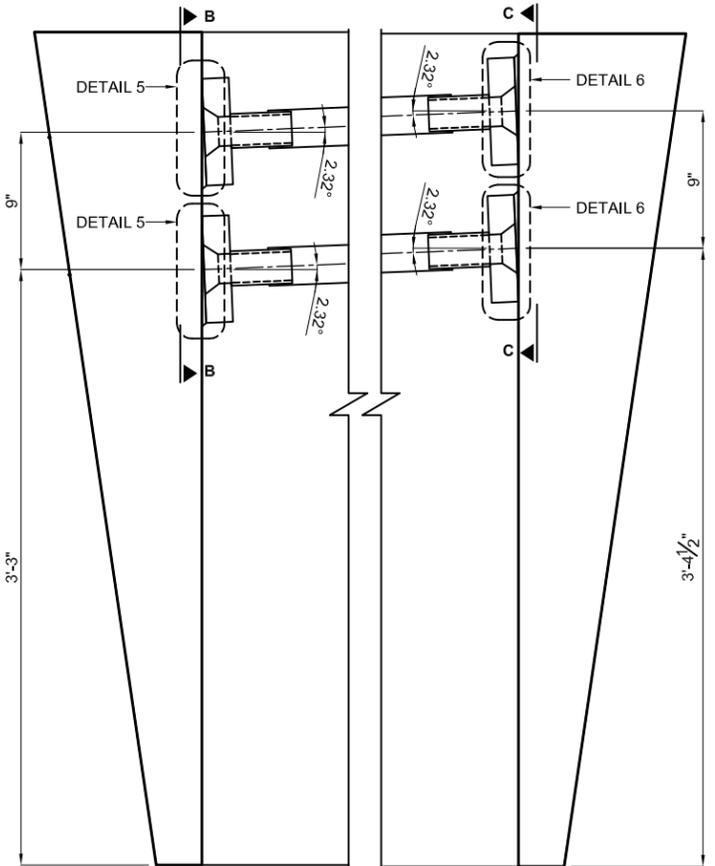


SECTION B-B



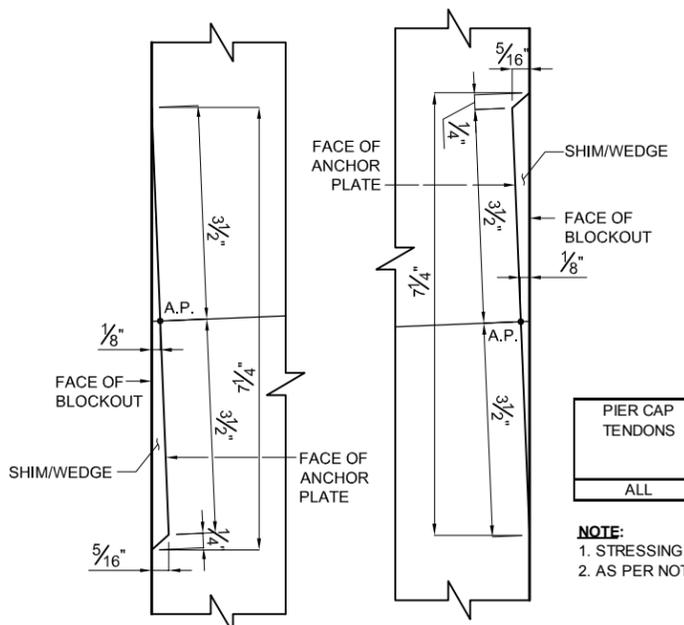
SECTION C-C

- NOTES:**
1. ONLY PLATE SHOWN.
 2. FOR STRESSING STAGING SEE NOTES IN SHEET 38 OF 85.



DETAIL 3 - BLOCKOUT
SCALE: 1" = 1'-0"

DETAIL 4 - BLOCKOUT
SCALE: 1" = 1'-0"



DETAIL 5 - BLOCKOUT
N.T.S.

DETAIL 6 - BLOCKOUT
N.T.S.



STRESSING SCHEDULE

| PIER CAP TENDONS | STRESSING LENGTH | AREA OF BAR | JACKING FORCE | AVERAGE LOCK-OFF FORCE | TARGET ELONGATION AFTER LOCK-OFF |
|------------------|------------------|----------------------|---------------|------------------------|----------------------------------|
| | L (FT) | A (IN ²) | JF (KIPS) | EF (KIPS) | TEAL (IN) |
| ALL | 32.67 | 1.58 | 165.9 | 157.9 | 1.32 |

- NOTE:**
1. STRESSING OPERATIONS SHALL NOT BEGIN UNTIL CONCRETE HAS REACHED A COMPRESSIVE STRENGTH OF 4,000 PSI.
 2. AS PER NOTE 52 IN SHEET 3 OF 85, TENSION SHALL BE VERIFIED BY PERFORMING A LIFT-OFF TEST PRIOR TO GROUTING.

SEE DRAWING PT-2 FOR ASSEMBLY DETAILS.

| | |
|--|--|
| OWNER: | STATE OF VERMONT, AGENCY OF TRANSPORTATION |
| CONTRACTOR: | T. BUCK CONSTRUCTION, INC. |
| PROJECT: | JAMAICA, ER-BRF 013-1(16) |
| PIER CAP PT THREADBAR LAYOUTS AND DETAILS | |
| DATE: | 02/06/13 |
| DWG: | L.TIRA |
| CHK: | EZ |
| APP: | EZ |

| | | | | | | |
|--|------|----------|-------------------|------|-------|-----------------|
| DYWIDAG SYSTEMS INTERNATIONAL, USA INC. DOES NOT ASSUME ANY LIABILITY FOR THE DESIGN OF THIS STRUCTURE. THIS SHOP DRAWING IS INTENDED TO PROVIDE POST TENSIONING DETAILS ONLY. | | | | | | |
| WEIGHT | REV. | DATE | ISSUE DESCRIPTION | NAME | CHKD. | JOB NUMBER |
| | 0 | 02/14/13 | FOR APPROVAL | IT | EZ | J092604 |
| SCALE | | | | | | DRAWING NUMBER: |
| AS SHOWN | | | | | | PT-6 |

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DYWIDAG-SYSTEMS INTERNATIONAL, USA, INC.
POST TENSIONING / REINFORCING UNIT PHONE: 630-739-1100
320 MARMON DRIVE - BOLINGBROOK, IL FAX: 630-739-1405





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|                                ADAPT CORPORATION                                |
|      1733 Woodside Road, Suite 220, Redwood City, CA 94061 USA      |
|      Tel: (650) 306 2400, Fax: (650) 364 4678                        |
|      E-mail: support@adaptsoft.com,  Web site: www.adaptsoft.com      |
-----

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|                                ADAPT-FELT Standard 4.07                                |
|      ADAPT POST-TENSIONING STRESS LOSS & ELONGATION PROGRAM          |
|                                LICENSED TO: DSI, USA Inc.                                |
-----

```

This program calculates the long-term and immediate stress losses in a post-tensioned tendon. It outputs the elongations at the stressing ends and the final stress profile along the tendon.

DATE: Feb 13, 2013

TIME: 10:27:59

PROJECT TITLE :
Jamaica VT Pier Sub Cap

SPECIFIC TITLE :
1-3/8" Threadbar

FR I C T I O N & E L O N G A T I O N C A L C U L A T I O N S :

INPUT PARAMETERS :

```

Coefficient of angular friction (meu)..... .25000 /radian
Coefficient of wobble friction (K)..... .00020 rad/ft
Ultimate strength of strand ..... 150.00 ksi
Ratio of jacking stress to strand's ultimate strength .70
Anchor set ..... .06 inch
Cross-sectional area of strand ..... 1.580 inch^2
Total Number of Strands per Tendon..... 1
Modulus of elasticity of strand ..... 29700.00 ksi
STRESSING ..... AT LEFT END

```

LEGEND :

P = Tendon profile type defined as: 1=reversed parabola;
2=partial/regular parabola; 3=harped; 4=general
X1/L etc = horizontal distances to control points in geometry of the
tendon divided by span length
Stresses tabulated are after anchor set but before long-term losses.

TENDON ID, GEOMETRY AND STRESS PROFILE (Sub Cap PT)

```

      LENGTH < TENDON HEIGHT in.> Horizontal ratios <- STRESS (ksi) -->
SPAN ft   P start center right X1/L X2/L X3/L start center right
-1----2-----3----4-----5-----6-----7----8----9-----10-----11-----12-
1  31.42  1   .00   .00   .00   .05  .50  .05   99.42  99.75 100.08

```

31.42 ft (total length of tendon)



SUMMARY :

| | | |
|--|---------|---------|
| Average initial stress (after release)..... | 99.75 | ksi |
| Long term stress losses | .00 | ksi |
| Final average stress | 99.75 | ksi |
| Final average force in tendon | 157.60 | k |
| Anchor set influence from left pull (100.08ksi; .667) .. | 31.42 | ft |
| Elongation at left pull before anchor set | 1.33 | inch |
| Elongation at left pull after anchor set | 1.27 | inch |
| Total elongation after anchor set | 1.27 | inch |
| Ratio of total elongation to tendon length after anchor set | .040302 | inch/ft |
| Jacking force | 165.90 | k |

CRITICAL STRESS RATIOS :

At stressing .700; At anchorage .667; Max along tendon .667

DETAIL OF STRESSES AT 1/20TH POINTS ALONG EACH SPAN

=====

Units are in ksi

| X/L | Span 1 |
|------|--------|
| .00 | 99.42 |
| .05 | 99.45 |
| .10 | 99.48 |
| .15 | 99.52 |
| .20 | 99.55 |
| .25 | 99.58 |
| .30 | 99.62 |
| .35 | 99.65 |
| .40 | 99.68 |
| .45 | 99.71 |
| .50 | 99.75 |
| .55 | 99.78 |
| .60 | 99.81 |
| .65 | 99.85 |
| .70 | 99.88 |
| .75 | 99.91 |
| .80 | 99.94 |
| .85 | 99.98 |
| .90 | 100.01 |
| .95 | 100.04 |
| 1.00 | 100.08 |



```

-----
|                                ADAPT CORPORATION                                |
|      1733 Woodside Road, Suite 220, Redwood City, CA 94061 USA      |
|      Tel: (650) 306 2400, Fax: (650) 364 4678                      |
|      E-mail: support@adaptsoft.com,  Web site: www.adaptsoft.com      |
-----

```

```

-----
|                                ADAPT-FELT Standard 4.07                                |
|      ADAPT POST-TENSIONING STRESS LOSS & ELONGATION PROGRAM          |
|                                LICENSED TO: DSI, USA Inc.                                |
-----

```

This program calculates the long-term and immediate stress losses in a post-tensioned tendon. It outputs the elongations at the stressing ends and the final stress profile along the tendon.

```

-----
DATE: Feb 13, 2013                                                    TIME: 10:35:29

```

PROJECT TITLE :
Jamaica VT Pier Cap

SPECIFIC TITLE :
1-3/8" Threadbar

FR I C T I O N & E L O N G A T I O N C A L C U L A T I O N S :

```

INPUT PARAMETERS :
Coefficient of angular friction (meu).....                .25000 /radian
Coefficient of wobble friction (K).....                   .00020 rad/ft
Ultimate strength of strand .....                        150.00   ksi
Ratio of jacking stress to strand's ultimate strength   .70
Anchor set .....                                       .06   inch
Cross-sectional area of strand .....                    1.580   inch^2
Total Number of Strands per Tendon.....                 1
Modulus of elasticity of strand .....                   29700.00 ksi
STRESSING .....                                       AT LEFT END

```

LEGEND :

P = Tendon profile type defined as: 1=reversed parabola;
2=partial/regular parabola; 3=harped; 4=general

X1/L etc = horizontal distances to control points in geometry of the tendon divided by span length

Stresses tabulated are after anchor set but before long-term losses.

TENDON ID, GEOMETRY AND STRESS PROFILE (Cap PT)

```

      LENGTH   < TENDON HEIGHT in.>  Horizontal ratios   <- STRESS (ksi) -->
SPAN  ft     P  start center right  X1/L X2/L X3/L   start center right
-1----2-----3----4-----5-----6-----7-----8-----9-----10-----11-----12-
1    32.67  1    .00   .00   .00   .05  .50  .05    99.58  99.92 100.26

```

32.67 ft (total length of tendon)



SUMMARY :

| | | |
|--|---------|---------|
| Average initial stress (after release)..... | 99.92 | ksi |
| Long term stress losses | .00 | ksi |
| Final average stress | 99.92 | ksi |
| Final average force in tendon | 157.88 | k |
| Anchor set influence from left pull (100.26ksi; .668) .. | 32.67 | ft |
| Elongation at left pull before anchor set | 1.38 | inch |
| Elongation at left pull after anchor set | 1.32 | inch |
| Total elongation after anchor set | 1.32 | inch |
| Ratio of total elongation to tendon length after anchor set | .040373 | inch/ft |
| Jacking force | 165.90 | k |

CRITICAL STRESS RATIOS :

At stressing .700; At anchorage .668; Max along tendon .668

DETAIL OF STRESSES AT 1/20TH POINTS ALONG EACH SPAN

=====

Units are in ksi

| X/L | Span 1 |
|------|--------|
| .00 | 99.58 |
| .05 | 99.61 |
| .10 | 99.65 |
| .15 | 99.68 |
| .20 | 99.72 |
| .25 | 99.75 |
| .30 | 99.79 |
| .35 | 99.82 |
| .40 | 99.85 |
| .45 | 99.89 |
| .50 | 99.92 |
| .55 | 99.96 |
| .60 | 99.99 |
| .65 | 100.03 |
| .70 | 100.06 |
| .75 | 100.09 |
| .80 | 100.13 |
| .85 | 100.16 |
| .90 | 100.20 |
| .95 | 100.23 |
| 1.00 | 100.26 |



Date: September 04, 2008

**DYWIDAG-Systems
International USA, Inc.**

Memo

DSI Engineering
320 Marmon Drive
Bolingbrook, IL 60440-3078
Tel.: 630/972-4025
Fax: 630/739-6155
E-Mail: said.nour@disamerica.com
www.dywidag-systems.com

Re: Revised Submittal for DSI 1-3/8" PT Bar System 100

Dear Mr. Boyd,

I am submitting herein a revised submittal for DSI 1-3/8" PT Bar System 100. This submittal is a revision of the previous submittal dated January 08, 2008.

This revised submittal is complete and contains the following:

1. DSI 1-3/8" PT Bar System Certification Letter with original signature
2. Assembly Drawing for Block-out and/or Surface Mount 1-3/8" Bar System: PT36E024
3. Assembly Drawing for 1-3/8" PT Bar System Coupling Details: PT36E031
4. Bar Grout Cap with O-Ring Details: B36E50700
5. Square End Anchorage with Inlet/Outlet Details for 1-3/8" PT Bar System: B36E22510
6. Rectangular End Anchorage with inlet/Outlet Details for 1-3/8" Bar System: B36E22610
7. Intermediate Square Anchorage Details for 1-3/8" PT Bar System: B36E24510
8. Intermediate Rectangular Anchorage Details for 1-3/8" PT Bar System: B36E24610
9. Groutable Anchor Nut Details for 1-3/8" PT Bar System: B36E24200
10. 59mm GTI PP Duct Drawing: U00220200
11. 59mm GTI PP Duct Coupler Drawing: U00220205
12. 1-3/8" PT Bar Coupler: B36E30810
13. 1-3/8" PT Bar: B36ECUT
14. Plate Coupler Housing Details for 1", 1-1/4" and 1-3/8" PT Bar Systems: B36E50210
15. Plate Coupler Connector Details for 1", 1-1/4" and 1-3/8" PT Bar Systems: B36E52210
16. Corr. PE Coupler Housing Details for 1", 1-1/4" and 1-3/8" PT Bar Systems: U06008010
17. Details for 1/2" NPT Ball Valve: 00 00 634
18. Details for 1/2" NPT Pipe Nipple: 00 00 676
19. Details for 3/4" NPT Ball Valve: 00 00 834
20. Details for 3/4" NPT Pipe Nipple: 00 00 876
21. DSI 21mm Grout Tube Details: 00 00 801
22. Details for 21mm Female-3/4" NPT Male Connector: 00 00 845
23. DSI 21mm Grout Tube Cap Details: 00 00 841
24. Details for BT 0750 (3/4") NPT Nylon Plug: 00 00 847
25. Details for BT 0500 (1/2") NPT Nylon Plug: 00 00 647

26. Details of Stainless Steel 316L Bolts and Washers for Grout Caps: 00 00 770
27. Heat Shrink Sleeve Sizes for Internal Applications Details: PLA-0-0-0
28. 1-3/8" PT Bar System Square & Rectangular Bearing Plate Design Calculations
29. Grout Cap Pressure Test Report for 1", 1-1/4" and 1-3/8" Bar Systems
30. 59mm Duct Test Report per FIB Bulletin No. 7
31. Accreditation Letter for Duct Testing Agency
32. Cell Classification & OIT Test Reports for GTI 59mm PP Duct and Red Coupler
33. Accreditation Letter for Cell Class & OIT Testing Agency
34. OIT & Stress Crack Resistance Test Reports for DSI 21mm Grout Tube
35. OIT & Stress Crack Resistance Test Reports for Bar Coupler Housing
36. OIT & NCLS Test Reports for Plate Coupler Housing and 21mm grout tube cap
37. Accreditation Letter for TRI, OIT/NCLS Testing Agency
38. Nylon Cell Classification Test Report for Grout Cap and Adaptors
39. Full scale pressure test report for Uncoupled 1" PT Bar System
40. Full Scale Pressure Test Report for Coupled 1" PT Bar System
41. Accreditation Letter for Full Scale Pressure Test Witness Agency
42. 1-3/8" PT Bar Coupler Test Reports
43. Nylon Plugs Data Sheets
44. PVC Schedule 40 Economy Ball Valves Data Sheet
45. CANUSA-CSP Heat Shrink Sleeves Material Data Sheets

Note: Some components of this system are standard parts common to our Post-Tensioning systems were therefore approved by FDOT in previous submittals. The part drawings of such components have an "Approved by FDOT" stamp on it.

Said Nour
Business Unit Engineer

c/c: Erich Aigner
c/c: Gary Pueschel
c/c: File

Enclosure (Sent by FedEx 9-4-08)

DYWIDAG SYSTEMS INTERNATIONAL



DYWIDAG-Systems
International USA, Inc.

DSI Engineering
320 Marmon Drive
Bolingbrook, IL 60440-3078
Tel.: 630/972-4027
Fax: 630/739-6155
E-Mail:
erich.aigner@disamerica.com
www.dywidag-systems.com

System Certification:

Dywidag System International USA, Inc., (DSI) herewith certifies that the DSI Internal Application System 100 for the

1-3/8" PT BAR WITH EXIT PIPE SYSTEM 100

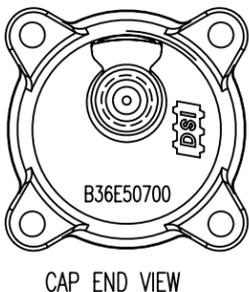
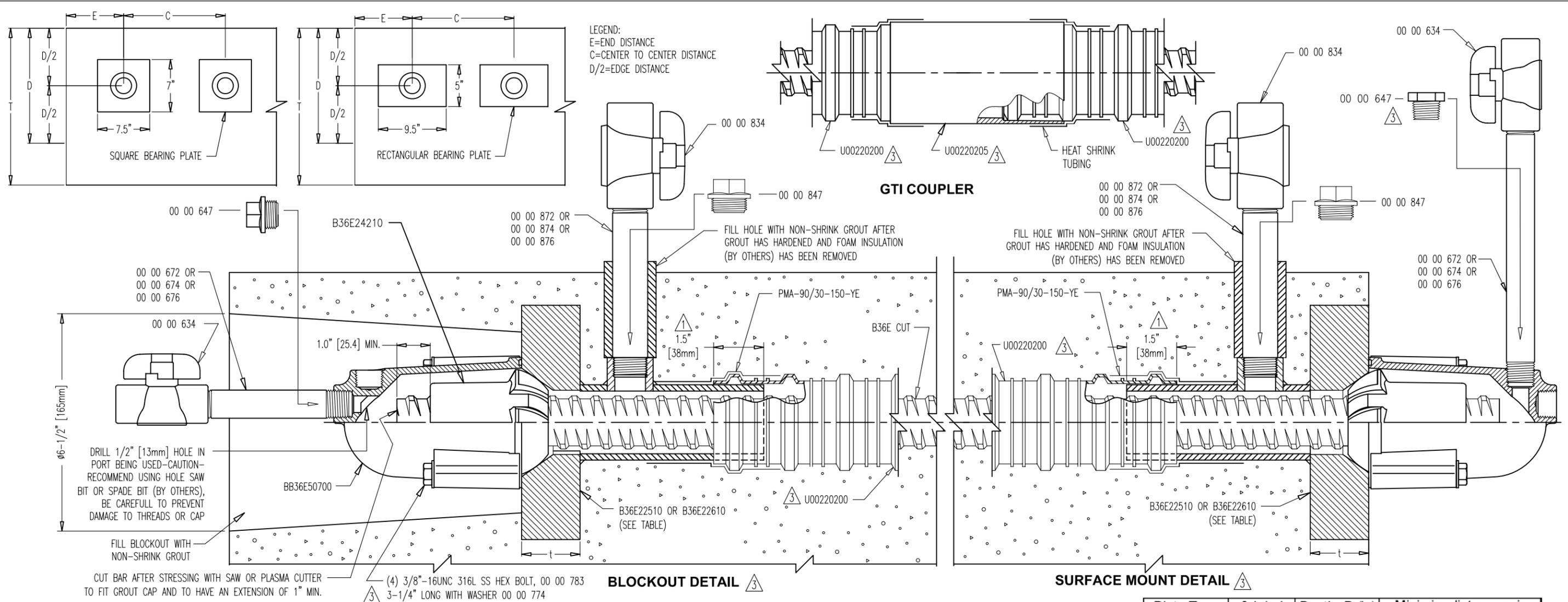
as shown in the following documentation conforms to the intent of Section 462 of the FDOT Post-Tensioning Specifications.

Bolingbrook, IL

January 08, 2008

A handwritten signature in black ink, appearing to read "Mark Milici".

Mark Milici



- NOTES:**
- REQUIRED REINFORCING BARS ARE NOT SHOWN ON THIS DRAWING.
 - MAXIMUM ANGULAR MISALIGNMENT WHEN USING ANCHOR NUT: ±2°.
 - CENTER TO CENTER, END AND EDGE DISTANCE DEPENDS ON THE LOCATION OF THE BAR AND CONCRETE STRENGTH, (SEE TABLE).
 - C/C DISTANCE = 2 X END DISTANCE - 2 X CONCRETE COVER (2" ASSUMED). TIGHTER C/C DISTANCE SHOULD BE EVALUATED.
 - GTI DUCT IS DELIVERED IN STRAIGHT SECTIONS AND IS NOT INTENDED TO BE COILED.
 - BURSTING REINFORCEMENT IS NOT SHOWN AND WILL BE INCLUDED WITH THE SHOP DRAWINGS.

| Plate Type | fci, ksi | Depth, D (in) | Minimum distances, in | |
|-------------|----------|---------------|-----------------------|-------------|
| | | | End dist, E | c/c dist, C |
| Square | 5.5 | 11.0 | 5.89 | 7.78 |
| | 5.0 | 12.0 | 6.41 | 8.83 |
| | 4.5 | 13.0 | 6.98 | 9.95 |
| Rectangular | 4.0 | 15.0 | 8.03 | 12.05 |
| | 5.0 | 9.0 | 8.55 | 13.10 |
| | 4.5 | 10.0 | 9.50 | 15.00 |
| | 4.0 | 12.0 | 11.40 | 18.80 |

| Plate Type | Part No | Width, in | Length, in | Thickness, in |
|-------------|-----------|-----------|------------|---------------|
| Square | B36E22510 | 7 | 7.5 | 1.75 |
| Rectangular | B36E22610 | 5 | 9.5 | 2 |

APPROVED BY FDOT 9-22-08

| PART NUMBER | DESCRIPTION | MATERIAL SPECIFICATION |
|------------------------|---|---|
| B36E22510 OR B36E22610 | 7"x7.5"x1.75" SQ. OR 5"x9.5"x2" RECT. BEARING PL. W/EXIT 2 1/4" x 3/16" WALL 5 1/2" LONG MECHANICAL TUBING PIPE & BOLT HOLES, GALV. | STEEL PLATE, ASTM A36, GALVANIZED |
| B36E50700 | BAR GROUT CAP WITH O-RING | NYLON 6, 20% GLASS FIBER FILLED CAP |
| 00 00 783 00 00 774 | 3/8"-16UNC HEX BOLT 3-1/4" LONG NARROW WASHER | 316L STAINLESS STEEL |
| B36E24210 | 1-3/8" GROUTABLE ANCHOR NUT | FORGING, NORMALIZED C1045 |
| 00 00 647 | 1/2" BT PLUG (NIAGARA PLASTICS #BT0500) | NYLON |
| 00 00 672/4/6 | 1/2" NPT NIPPLE, LENGTH AS REQUIRED | SCH 40 BLACK WELDED STEEL |
| 00 00 847 | 3/4" BT PLUG (NIAGARA PLASTICS #BT0750) | NYLON |
| 00 00 872/4/6 | 3/4" NPT NIPPLE, LENGTH AS REQUIRED | SCH 40 BLACK WELDED STEEL |
| 00 00 634 | 1/2" NPT VALVE | PVC |
| 00 00 834 | 3/4" NPT VALVE | PVC |
| U00220200 | 59mm CORRUGATED DUCT | PPEX3 PLASTIC |
| U00220205 | 59mm DUCT COUPLER | HDPE |
| PMA-90/30-150-YE | HEAT SHRINK TUBING, 4" (102mm) LONG | ACCORD. TO FDOT SPEC. P.T. SEC. 462-4,2,6,3 |
| B36E CUT | 1-3/8" THREADBAR | ASTM A722 TYPE II STEEL |

OWNER:

CONTRACTOR:

PROJECT:
1-3/8" THREADBAR PT BAR SYSTEM 100 FOR BLOCKOUT AND/OR SURFACE MOUNT

DATE: 08-13-07 DWG: A.T./G.M. CHK: S. N. APP: E. A.

THIS DRAWING, THE PERTINENT ENCLOSURES, DESCRIPTIONS, CALCULATIONS ETC. AND THEIR CONTENTS ARE THE PROPERTY OF DYWIDAG SYSTEMS INTERNATIONAL, USA, INC. THEY ARE NOT ALLOWED TO BE DUPLICATED WITHOUT OUR PERMISSION. THEY ARE ALSO NOT TO BE SHOWN OR EXPLAINED FOR ANY REASON TO A THIRD PARTY OTHER THAN FOR REASONS EXPRESSLY INTENDED BY DSI'S SUBMITTAL TO THE ORIGINAL RECEIVER. THEY HAVE TO BE RETURNED UPON REQUEST.

DYWIDAG SYSTEMS INTERNATIONAL, USA INC. DOES NOT ASSUME ANY LIABILITY FOR THE DESIGN OF THIS STRUCTURE. THIS SHOP DRAWING IS INTENDED TO PROVIDE POST TENSIONING DETAILS ONLY.

| REV. | DATE | ISSUE DESCRIPTION | NAME | CHKD. | JOB NUMBER |
|------|----------|-------------------|------|-------|------------|
| 1 | 11-07-07 | FOR APPROVAL | G.M. | S.N. | |
| 2 | 12-11-07 | FOR APPROVAL | G.M. | S.N. | |
| 3 | 08-15-08 | FOR APPROVAL | G.M. | S.N. | |

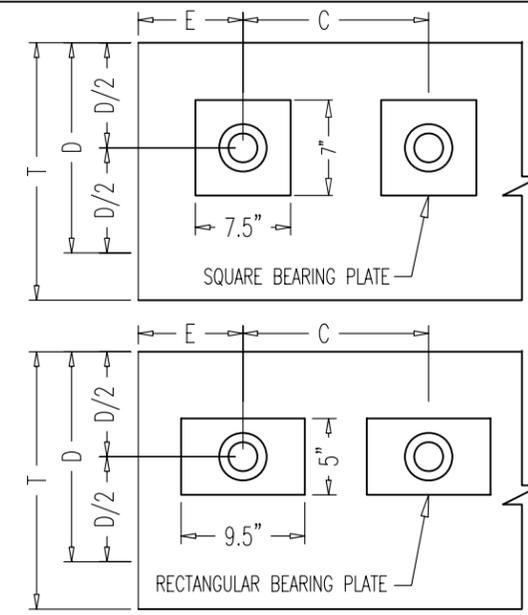
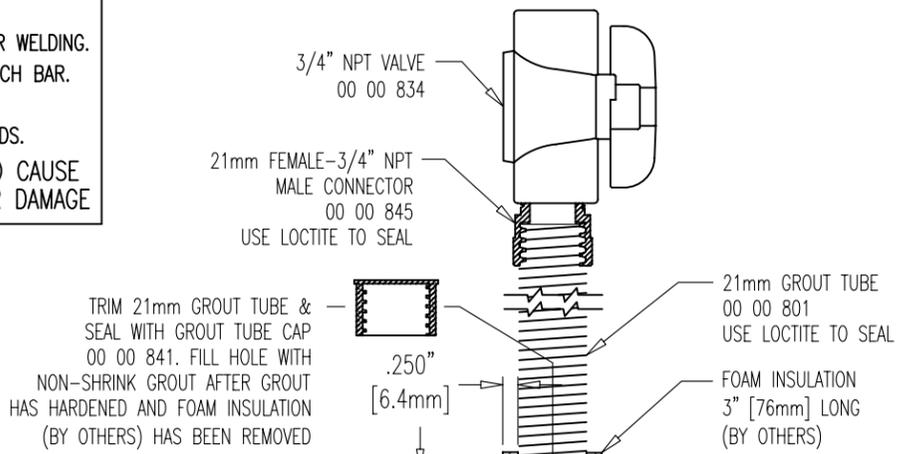
SCALE: 1:3

DRAWING NUMBER: PT 36E 024

DYWIDAG-SYSTEMS INTERNATIONAL, USA, INC.
 POST TENSIONING / REINFORCING UNIT PHONE: 630-739-1100
 320 MARMON DRIVE - BOLINGBROOK, IL FAX: 630-739-6155

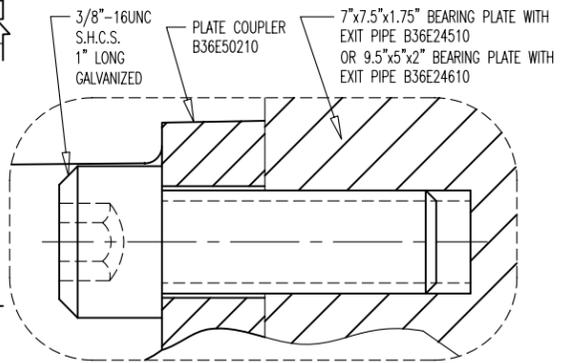
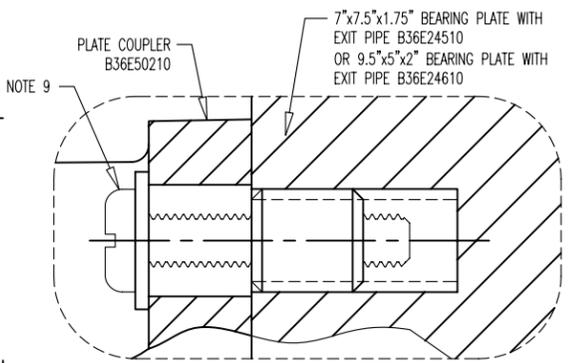
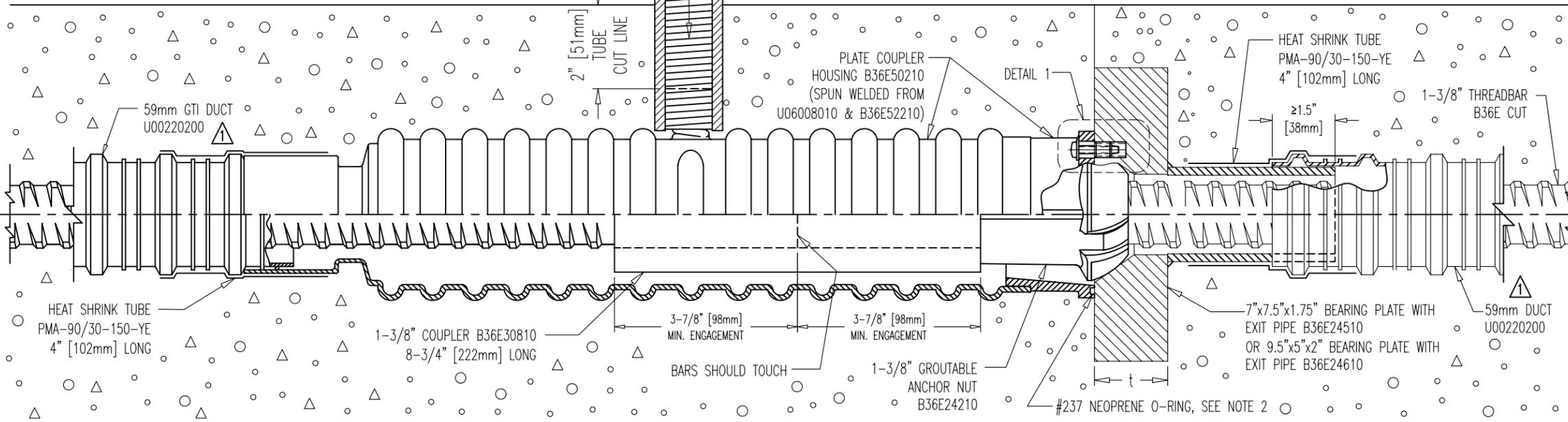
CAUTION WHEN USING HIGH STRENGTH DYWIDAG THREADBAR® (GRADE 150,160 & 178)
 DO NOT WELD TO BAR.
 DO NOT USE BAR AS GROUND CONNECTION FOR WELDING.
 DO NOT ALLOW HOT SLAG OR SPARKS TO TOUCH BAR.
 DO NOT DAMAGE BAR SURFACE.
 DO NOT USE BARS WITH KINKS OR SHARP BENDS.
 FAILURE TO HEED THIS WARNING COULD CAUSE BAR TO BREAK RESULTING IN INJURY OR DAMAGE

WARNING: READ AND COMPLY WITH ALL APPLICABLE SAFETY AND OPERATING INSTRUCTIONS AND WARNINGS FOR THREADBAR STRESSING BEFORE STARTING ANY WORK OR OPERATION.



| Plate Type | fci, ksi | Depth, D (in) | Minimum distances, in | |
|-------------|----------|---------------|-----------------------|-------------|
| | | | End dist, E | c/c dist, C |
| Square | 5.5 | 11.0 | 5.89 | 7.78 |
| | 5.0 | 12.0 | 6.41 | 8.83 |
| | 4.5 | 13.0 | 6.98 | 9.95 |
| | 4.0 | 15.0 | 8.03 | 12.05 |
| Rectangular | 5.0 | 9.0 | 8.55 | 13.10 |
| | 4.5 | 10.0 | 9.50 | 15.00 |
| | 4.0 | 12.0 | 11.40 | 18.80 |

| Plate Type | Part No | Width, in | Length, in | Thickness, in |
|-------------|-----------|-----------|------------|---------------|
| Square | B36E24510 | 7 | 7.5 | 1.75 |
| Rectangular | B36E24610 | 5 | 9.5 | 2 |



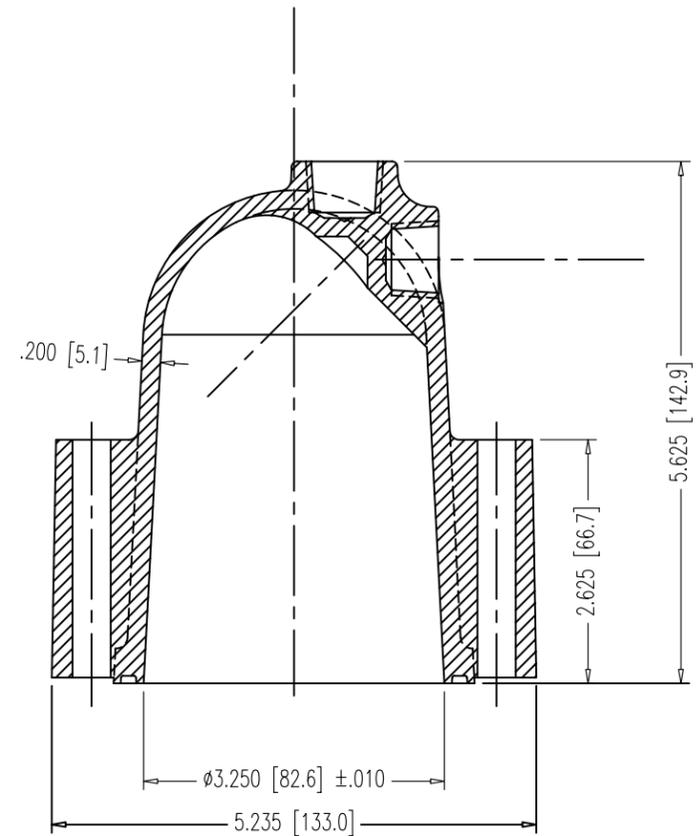
| PART NUMBER | DESCRIPTION | MATERIAL SPECIFICATION |
|------------------------|---|--|
| B36E CUT | 1-3/8" Ø THREADBAR | ASTM A722 TYPE II STEEL |
| B36E24510 OR B36E24610 | 7"x7.5"x1.75" BEARING PLATE W/EXIT PIPE 5"x9.5"x2" BEARING PLATE W/EXIT PIPE | STEEL PLATE, ASTM A36, HOT DIPPED GALVANIZED |
| B36E50210 | PLATE COUPLER HOUSING W/O-RING | POLYETHYLENE (U06008010 & B36E52210) W/NEOPRENE O-RING |
| B36E30810 | 1-3/8" COUPLER | STEEL BAR, COLD DRAWN, AISI 1117 |
| B36E24210 | 1-3/8" GROUTABLE ANCHOR NUT | STEEL FORGING, ASTM A521-76 (1987) NORMALIZED BHN=180-220 |
| U00220200 | 59mm CORRUGATED DUCT | PPEX3 PLASTIC |
| PMA-90/30-150-YE | HEAT SHRINK TUBING 4" (102mm) LONG | ACCORD. TO FDOT SPEC. P.T. SEC. 462-4,2,6,3 |
| 00 00 801 | 21mm GROUT TUBE | POLYETHYLENE (HARD, BLACK) |
| 00 00 845 | 21mm FEMALE-3/4" NPT MALE CONNECTOR | 20% GLASS FILLED NYLON |
| 00 00 834 | 3/4" NPT VALVE | PVC |
| 00 00 841 | 21mm GROUT TUBE CAP | H.D.P.E. |
| BY OTHERS | FOAM INSULATION | FOAM RUBBER |
| ANS | THREADED INSERT (2 REQ'D) | BLACK-FINISH STEEL, McMASTER-CARR #90248A068 |
| ANS | 10/32 PAN HEAD SLOTTED 1" (2 REQ'D) | NYLON, McMASTER-CARR #93135A833 |
| ANS | 3/8"-16UNC S.H.C.S. 1" LONG (4) REQ'D | ULTRA-COATED ALLOY, McM CARR #91274A308 OR EQUIV. (CIP CONCRETE) |
| ANS | 10/32 WASHER (2) REQ'D | NYLON |

- NOTES:
- REINFORCING BARS ARE NOT SHOWN ON THIS DRAWING.
 - MAXIMUM ANGULAR MISALIGNMENT WHEN USING ANCHOR NUT: ±1'.
 - CENTER TO CENTER, END AND EDGE DISTANCE DEPENDS ON THE LOCATION OF THE BAR AND CONCRETE STRENGTH, (SEE TABLE).
 - C/C DISTANCE = 2 X END DISTANCE - 2 X CONCRETE COVER (2" ASSUMED). TIGHTER C/C DISTANCE SHOULD BE EVALUATED.
 - GTI DUCT IS DELIVERED IN STRAIGHT SECTIONS AND IS NOT INTENDED TO BE COILED.
 - BURSTING REINFORCEMENT IS NOT SHOWN AND WILL BE INCLUDED WITH THE SHOP DRAWINGS.
 - PART B36E52210 IS CONNECTED TO U0600810 TO CREATE PART B36E50210.
 - INSTALL #237 NEOPRENE O-RING IN GROOVE USING DROPS OF LIQUID ADHESIVE BEFORE SHIPPING.
 - FOR PRE-CAST SEGMENTS, USE (2) THREADED INSERTS WITH 3/8"-16UNC OD, 10-32 ID, .406" LONG, McMASTER CARR #90248A068 OR EQUIVALENT. ALSO USE (2) 10-32 NYLON 6/6 PAN HEAD SLOTTED SCREWS, 1" LONG, McMASTER CARR #93135A833 OR EQUIVALENT WITH NYLON WASHERS. THESE SCREWS ARE RIPPED OUT WHEN SEGMENT IS SEPARATED. REMOVE INSERTS AFTER THE SEGMENTS ARE SEPERATED AND RE-USE.

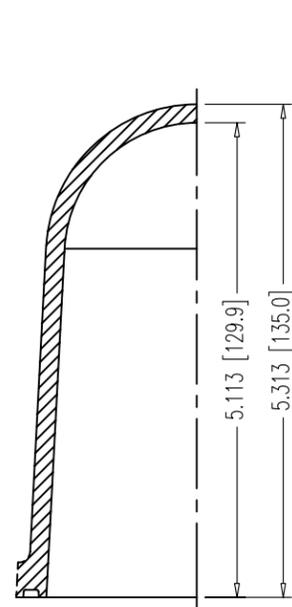
APPROVED BY FDOT 9-22-08

| | | | | | | | | |
|--|--|--|------|----------|-------------------|------|-------|------------|
| OWNER: | | DYWIDAG SYSTEMS INTERNATIONAL, USA INC. DOES NOT ASSUME ANY LIABILITY FOR THE DESIGN OF THIS STRUCTURE. THIS SHOP DRAWING IS INTENDED TO PROVIDE POST TENSIONING DETAILS ONLY. | | | | | | |
| CONTRACTOR: | | WEIGHT | REV. | DATE | ISSUE DESCRIPTION | NAME | CHKD. | JOB NUMBER |
| PROJECT: | | WEIGHT | 1 | 08-15-08 | FOR APPROVAL | G.M. | S.N. | |
| DATE: 12-11-07 DWG: I. TIRA/G.M. CHK: SN APP: EA | | SCALE | 1:3 | | | | | |
| THIS DRAWING, THE PERTINENT ENCLOSURES, DESCRIPTIONS, CALCULATIONS ETC. AND THEIR CONTENTS ARE THE PROPERTY OF DYWIDAG SYSTEMS INTERNATIONAL, USA, INC. THEY ARE NOT ALLOWED TO BE DUPLICATED WITHOUT OUR PERMISSION. THEY ARE ALSO NOT TO BE SHOWN OR EXPLAINED FOR ANY REASON TO A THIRD PARTY OTHER THAN FOR REASONS EXPRESSLY INTENDED BY DSI'S SUBMITTAL TO THE ORIGINAL RECEIVER. THEY HAVE TO BE RETURNED UPON REQUEST. | | DRAWING NUMBER: PT 36E 031 | | | | | | |
| | | DYWIDAG-SYSTEMS INTERNATIONAL, USA, INC. POST TENSIONING / REINFORCING UNIT PHONE: 630-739-1100 320 MARMON DRIVE - BOLINGBROOK, IL FAX: 630-739-1405 | | | | | | |

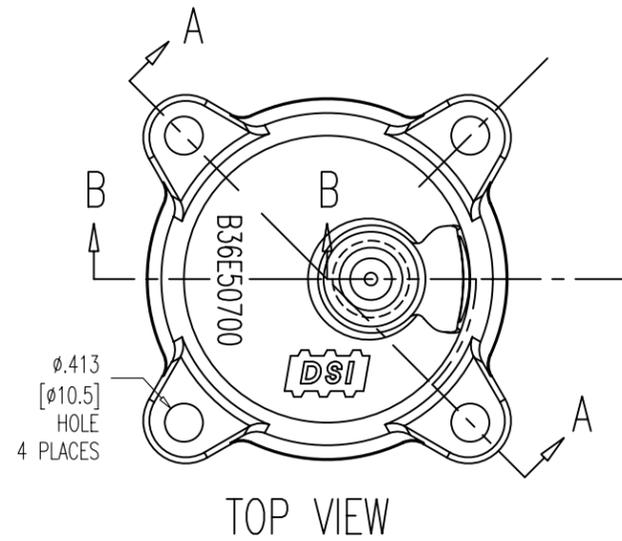




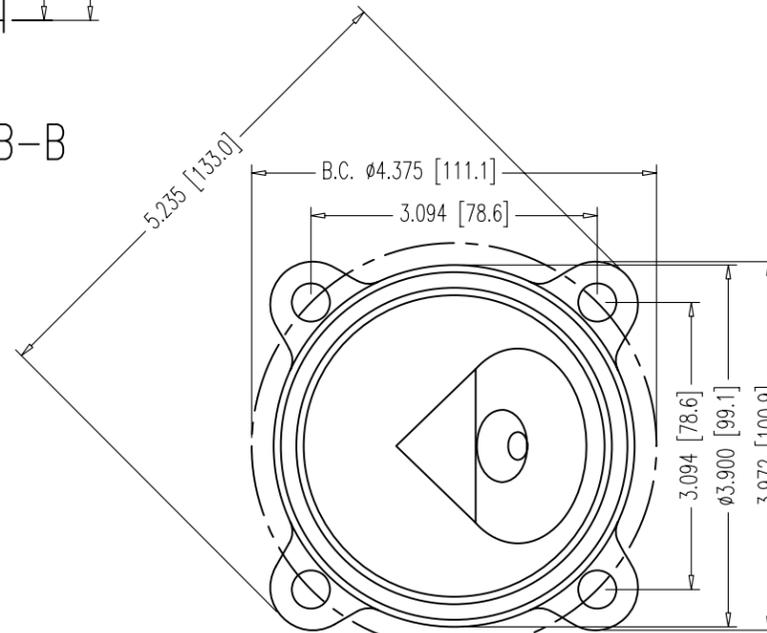
SECTION A-A



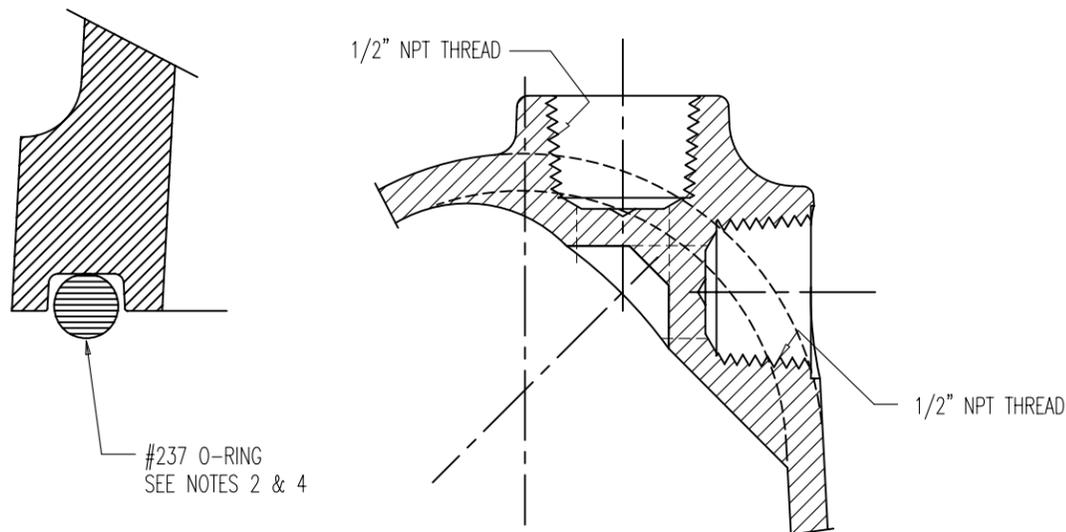
SECTION B-B



TOP VIEW



BOTTOM VIEW

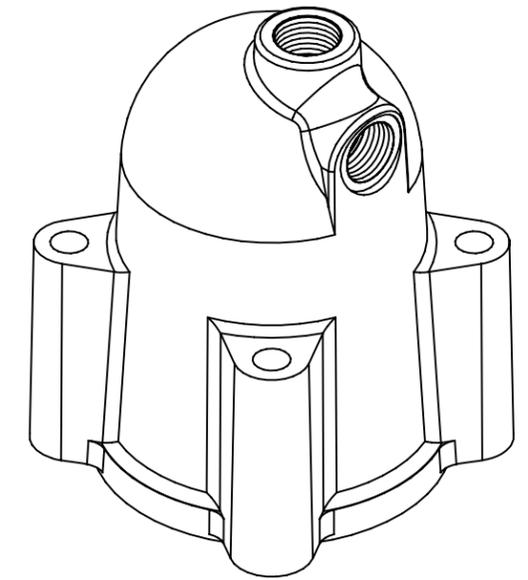


GROOVE DETAIL
SCALE 5:1 IN COMPUTER

GROUT PORT
DETAIL
SCALE 2:1 IN COMPUTER

Tolerance Note:
All tolerances are based on SP1/SPE and should be as follows unless specified otherwise:

| Dim. | Tolerance |
|--------|------------|
| 0-1" = | +/- 0.005" |
| 1-2" = | +/- 0.007" |
| 2-3" = | +/- 0.009" |
| 3-4" = | +/- 0.011" |
| 4-5" = | +/- 0.013" |
| 5-6" = | +/- 0.015" |



NOTES:

- USE 3/8"-16UNC 316L S.S. HEX BOLTS, 3-1/4" LONG 00 00 783 W/SMALL DIA. WASHER 00 00 774.
- INSTALL O-RING IN GROOVE USING DROPS OF LIQUID ADHESIVE BEFORE SHIPPING.
- THE NYLON CELL CLASSIFICATION SHALL CONFORM TO ASTM D5989 AND SHALL BE S-PA0141 (WEATHER RESISTANT), S-PA0231 OR S-PA0401 (TENSILE STRENGTH, YIELD 15000 PSI MIN., WITH UV STABILIZER ADDED).
- INSTALL #237 O-RING 3-3/8"x3-5/8"x1/8" IN CAP (SEE O-RING SPECIFICATIONS).
- DRILL 1/2" [12.7] HOLE IN PORT BEING USED-CAUTION-RECOMMEND USING HOLE SAW BIT OR SPADE BIT (BY OTHERS), BE CAREFULL TO PREVENT DAMAGE TO THREADS OR CAP.
- WHEN PRESSURIZING GROUT CAPS, DO NOT STAND BEHIND CAPS!

Furnish O-ring materials conforming to the following requirements:

Mechanical Properties:

- Shore hardness A ASTM D2240 30 -75
- Ultimate elongation % ASTM D412 > 300
- Tension Set @ 100%, 200% & ultimate elongation ASTM D412 < 5
- Tear Strength Die T , pli ASTM D624 110

Accelerated Testing:

- Thermal Deterioration 70 hours @ 125 C ASTM D573
- Change in tensile strength % < 3
- Change of elongation % < 25
- Change of hardness % < 5
- Compression Set 22 hours @ 125 C % ASTM D573 < 20
- Volume change due to absorption of H₂O for 70 hours @ 257^o F (125^oC) ASTM D471 ≤ 5 percent

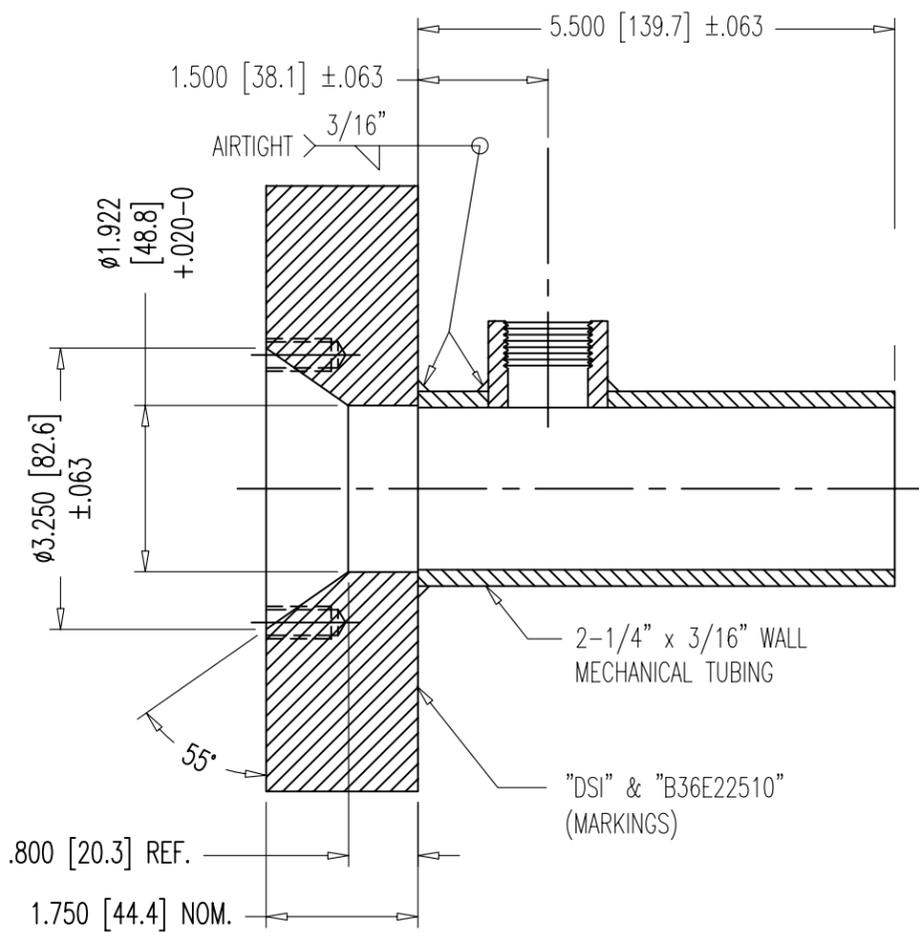
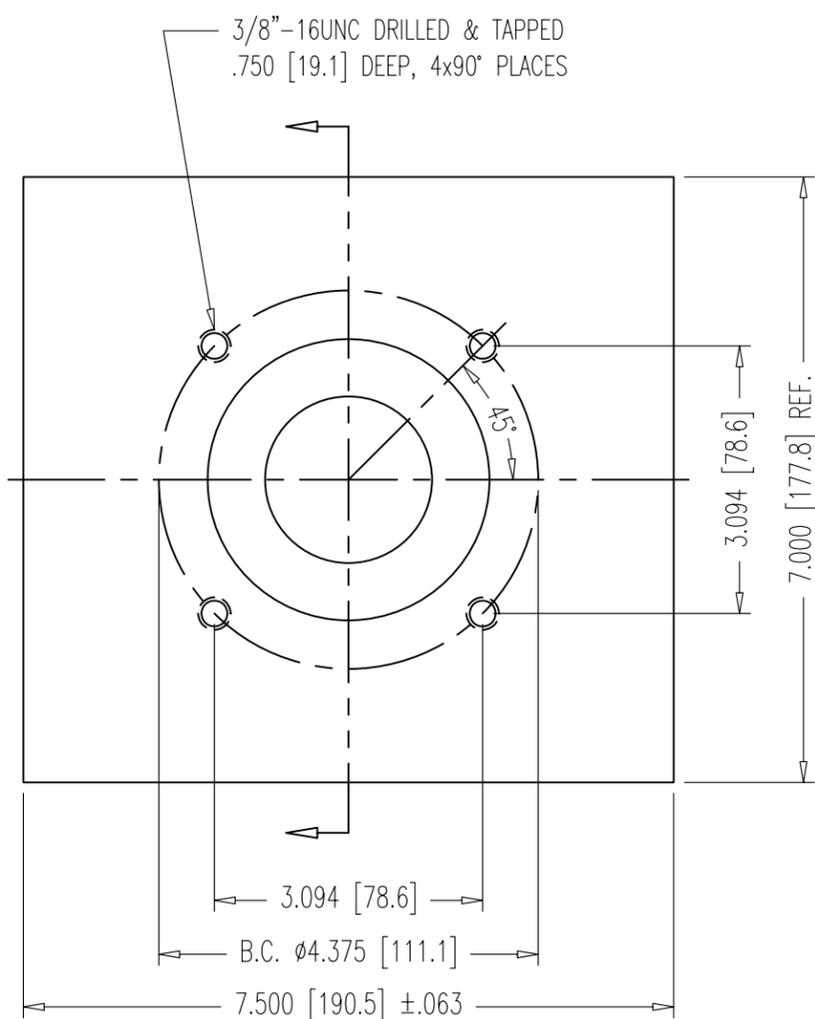
Environmental Resistance

- Ozone Resistance 70 hours @ 40 C & 50 MPa partial ozone pressure ASTM D1149 No Cracks
- Low Temp. @ -20 C ASTM D746 Not Brittle Pass

APPROVED BY FDOT 9-22-08

| DIMENSIONS: INCH [mm] mm FOR REFERENCE ONLY | | QUALITY PLAN NUMBER: QS60072300P | | TOLERANCES: SEE TOLERANCE NOTE | WEIGHT 0.817 LBS. | REV. | DATE | NAME | PART NUMBER: B36E50700 |
|---|-----------------|-------------------------------------|-----------|---|---------------------------------|------|------|------|-------------------------------------|
| BAR GROUT CAP WITH O-RING FOR ALL 1" & 1-1/4" NUTS AND 1-3/8" ANCHOR NUT | | | | MATERIAL: NYLON 6 20% GLASS FIBER FILLED COLOR: BLACK | SCALE 1:2 UNLESS NOTED | | | | DRAWING NUMBER: B36E50700 |
| DATE: 10-02-06 | DWG: G. MALECKI | CHK: E.A. | APP: K.S. | DYWIDAG-SYSTEMS INTERNATIONAL, USA, INC. 320 MARMON DRIVE - BOLINGBROOK, IL 60440 PHONE: 630-739-1100 FAX: 630-739-1405 | | | | | |





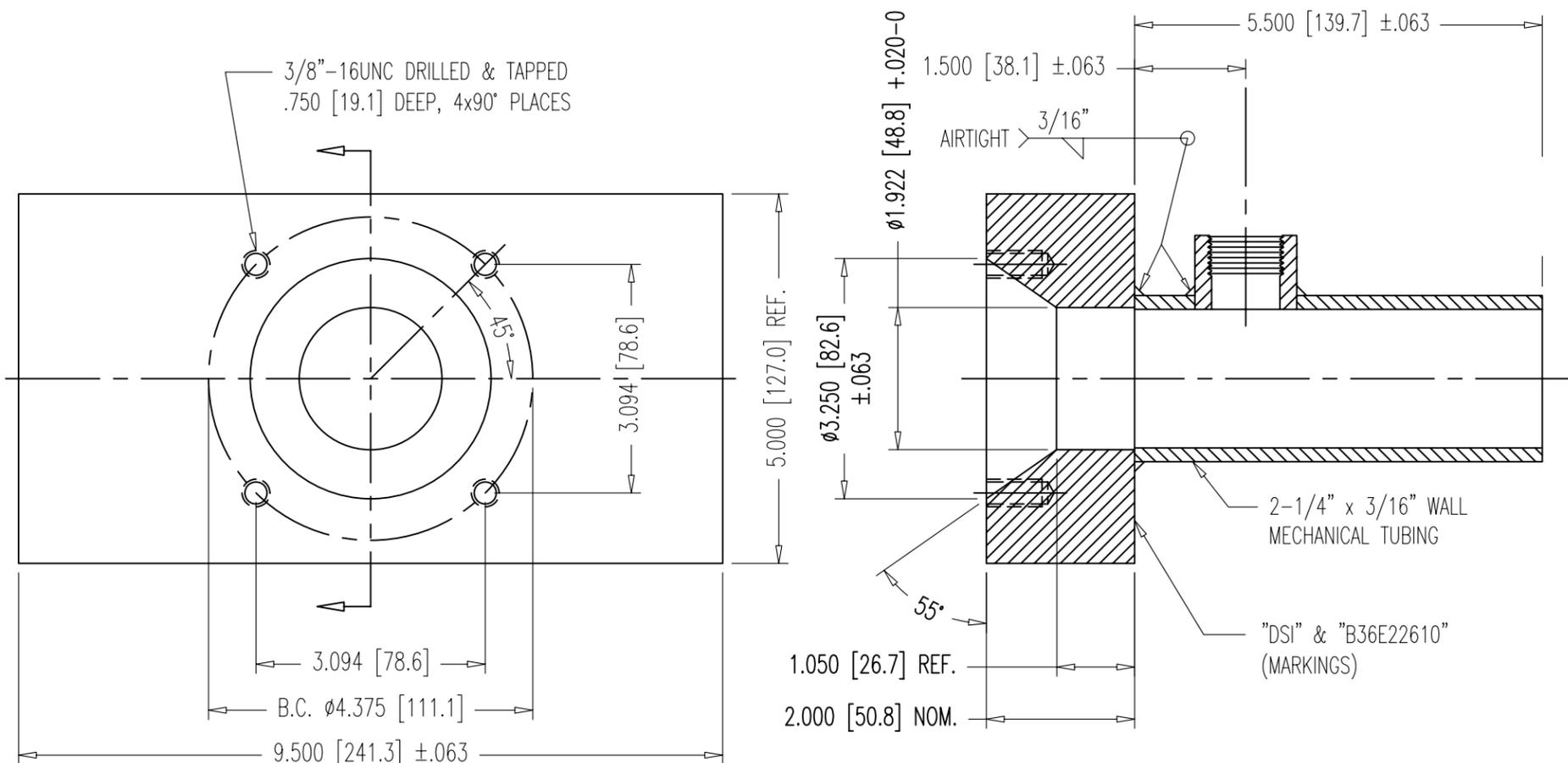
- NOTES:
1. ALSO SUITABLE FOR GR 160 THREADBAR.
 2. PLATE AND PIPE GALVANIZED ACCORDING TO ASTM A123 AFTER WELDING.
 3. 59mm DUCT U00220400 FITS OVER TUBING.
 4. SEE DRAWING B00E21191 FOR RAW MATERIAL PLATE WITHOUT HOLES.

MECHANICAL TUBE MATERIAL
SHALL BE A512, A513 OR A519.

APPROVED BY FDOT 9-22-08

| | | | | | | | | | |
|--|-----------------|-------------------------------------|-----------|---|-------------------------|--|------|------|-------------------------------------|
| DIMENSIONS: INCH [mm] mm FOR REFERENCE ONLY | | QUALITY PLAN NUMBER: QBE0021200L | | TOLERANCES: ±.020 UNLESS NOTED | WEIGHT: 25.8 LBS. | REV. | DATE | NAME | PART NUMBER: B36E22510 |
| SQUARE BEARING PLATE WITH EXIT PIPE FOR 1-3/8" THREADBAR | | | | PLATE MATERIAL: SEE MAT'L SPEC. PME0021100P | SCALE 1:3 | | | | DRAWING NUMBER: B36E22510 |
| DATE: 08-16-07 | DWG: G. MALECKI | CHK: S.N. | APP: E.A. | TUBE MATERIAL: SEE ABOVE | | | | | |
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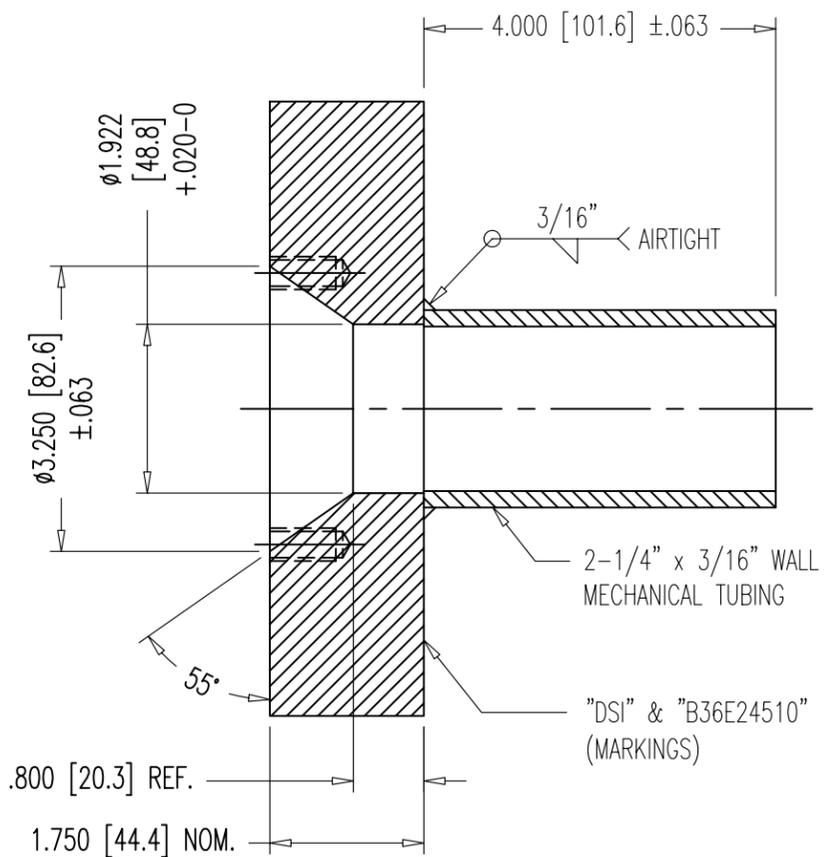
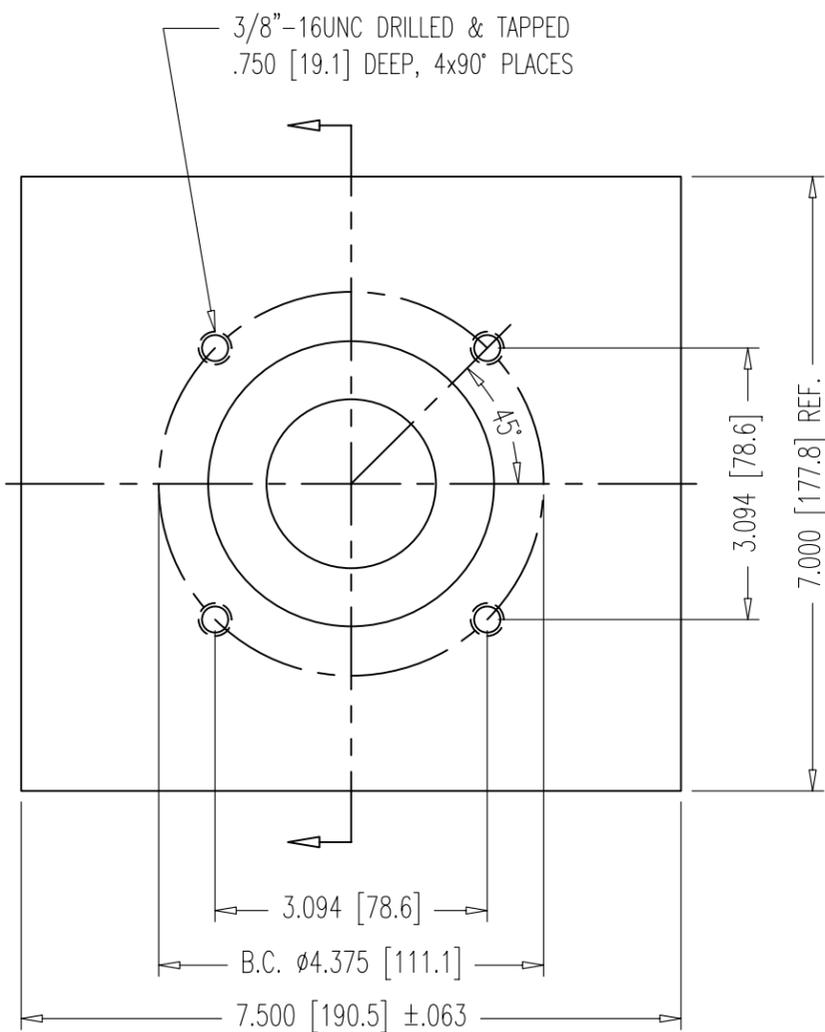


MECHANICAL TUBE MATERIAL
SHALL BE A512, A513 OR A519.

- NOTES:
1. ALSO SUITABLE FOR GR 160 THREADBAR.
 2. PLATE AND PIPE GALVANIZED ACCORDING TO ASTM A123 AFTER WELDING.
 3. 59mm DUCT U00220400 FITS OVER TUBING.
 4. SEE DRAWING B00E21192 FOR RAW MATERIAL PLATE WITHOUT HOLES.

APPROVED BY FDOT 9-22-08

| | | | | | | | | | |
|---|-----------------|-------------------------------------|-----------|---|---|------|------|---|-------------------------------------|
| DIMENSIONS: INCH [mm] mm FOR REFERENCE ONLY | | QUALITY PLAN NUMBER: QBE0021200L | | TOLERANCES: ±.020 UNLESS NOTED | WEIGHT: 26.5 LBS. | REV. | DATE | NAME | PART NUMBER: B36E22610 |
| RECT. BEARING PLATE WITH EXIT PIPE FOR 1-3/8" THREADBAR | | | | PLATE MATERIAL: SEE MAT'L SPEC. PME0021100P | SCALE 1:3 | | | | DRAWING NUMBER: B36E22610 |
| DATE: 08-16-07 | DWG: G. MALECKI | CHK: S.N. | APP: E.A. | TUBE MATERIAL: SEE ABOVE | | | | | |
| THIS DRAWING, THE PERTINENT ENCLOSURES, DESCRIPTIONS, CALCULATIONS ETC. AND THEIR CONTENTS ARE THE PROPERTY OF DYWIDAG SYSTEMS INTERNATIONAL, USA, INC. THEY ARE NOT ALLOWED TO BE DUPLICATED WITHOUT OUR PERMISSION. THEY ARE ALSO NOT TO BE SHOWN OR EXPLAINED FOR ANY REASON TO A THIRD PARTY OTHER THAN FOR REASONS EXPRESSLY INTENDED BY DSI 's SUBMITTAL TO THE ORIGINAL RECEIVER. THEY HAVE TO BE RETURNED UPON REQUEST. | | | | | DYWIDAG-SYSTEMS INTERNATIONAL, USA, INC. 320 MARMON DRIVE - BOLINGBROOK, IL 60440 PHONE: 630-739-1100 FAX: 630-739-1405 | | |  | |



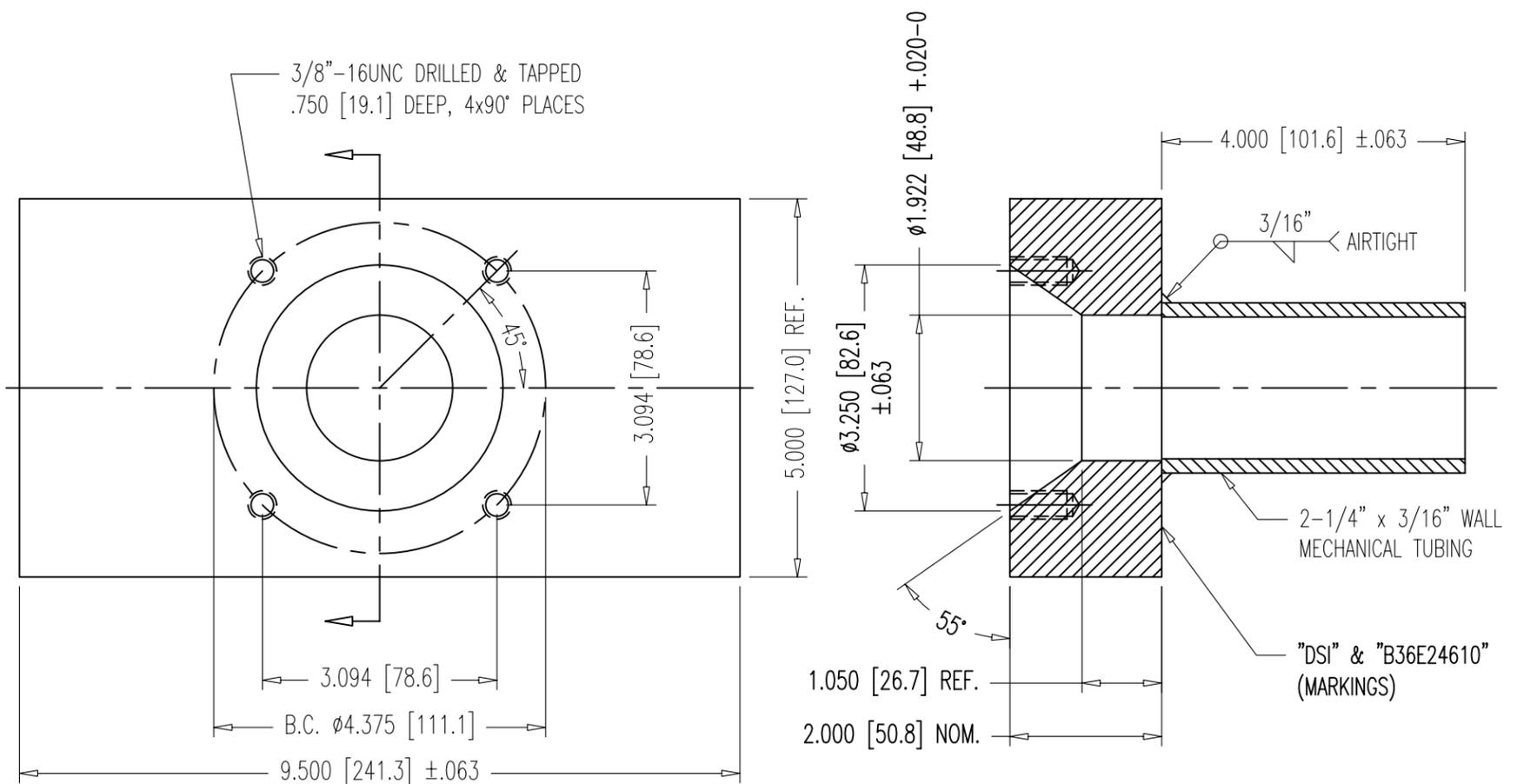
NOTES:

1. ALSO SUITABLE FOR GR 160 THREADBAR.
2. PLATE AND PIPE GALVANIZED ACCORDING TO ASTM A123 AFTER WELDING.
3. 59mm DUCT U00220400 FITS OVER TUBING.
4. SEE DRAWING B00E21191 FOR RAW MATERIAL PLATE WITHOUT HOLES.

MECHANICAL TUBE MATERIAL
SHALL BE A512, A513 OR A519.

APPROVED BY FDOT 9-22-08

| | | | | | | | | | | |
|--|-----------------|-------------------------------------|-----------|--|-------------------------|------|------|---|-------------------------------------|--|
| DIMENSIONS: INCH [mm] mm FOR REFERENCE ONLY | | QUALITY PLAN NUMBER: QBE0021200L | | TOLERANCES: ±.020 UNLESS NOTED | WEIGHT: 25.8 LBS. | REV. | DATE | NAME | PART NUMBER: B36E24510 | |
| SQUARE BEARING PLATE WITH EXIT PIPE FOR 1-3/8" THREADBAR | | | | PLATE MATERIAL: SEE MAT'L SPEC. PME0021100P | SCALE 1:3 | | | | DRAWING NUMBER: B36E24510 | |
| DATE: 12-04-07 | DWG: G. MALECKI | CHK: S.N. | APP: E.A. | TUBE MATERIAL: SEE ABOVE | | | | | | |
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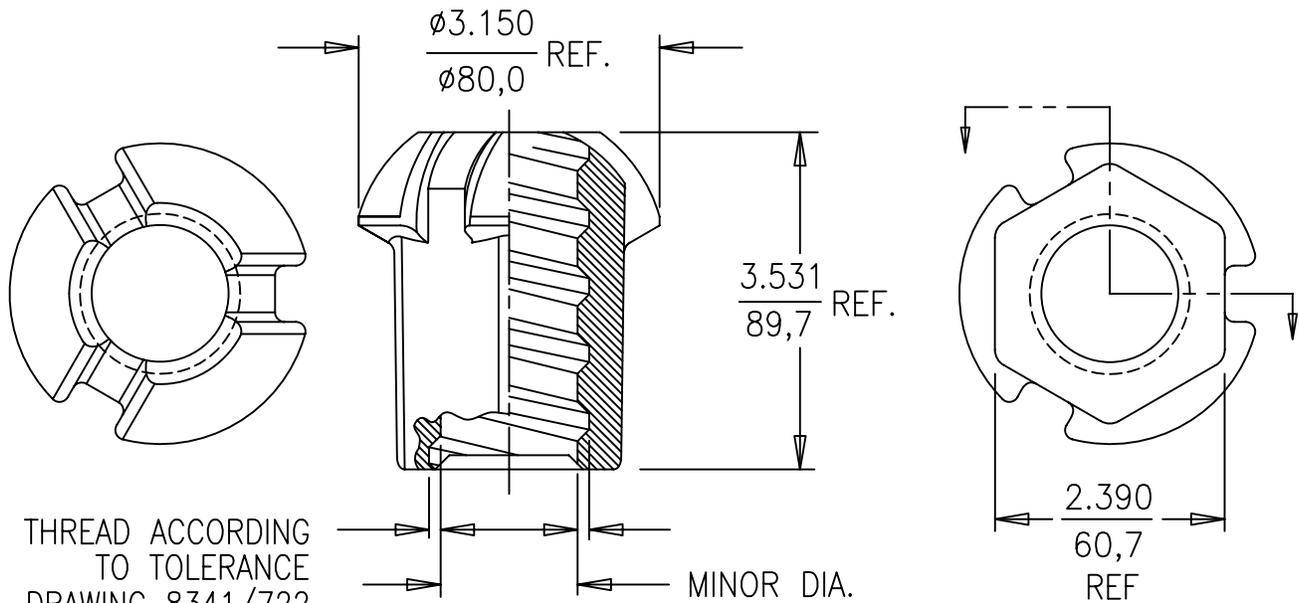
NOTES:

1. ALSO SUITABLE FOR GR 160 THREADBAR.
2. PLATE AND PIPE GALVANIZED ACCORDING TO TO ASTM A123 AFTER WELDING.
3. 59mm DUCT U00220400 FITS OVER TUBING.
4. SEE DRAWING B00E21192 FOR RAW MATERIAL PLATE WITHOUT HOLES.

MECHANICAL TUBE MATERIAL
SHALL BE A512, A513 OR A519.

APPROVED BY FDOT 9-22-08

| | | | | | | | | | |
|--|-----------------|-------------------------------------|-----------|---|---|------|------|---|-------------------------------------|
| DIMENSIONS: INCH [mm] mm FOR REFERENCE ONLY | | QUALITY PLAN NUMBER: QBE0021200L | | TOLERANCES: ±.020 UNLESS NOTED | WEIGHT: 26 LBS. | REV. | DATE | NAME | PART NUMBER: B36E24610 |
| RECT. BEARING PLATE WITH EXIT PIPE FOR 1-3/8" THREADBAR | | | | PLATE MATERIAL: SEE MAT'L SPEC. PME0021100P | SCALE 1:3 | | | | DRAWING NUMBER: B36E24610 |
| DATE: 12-04-07 | DWG: G. MALECKI | CHK: S.N. | APP: E.A. | TUBE MATERIAL: SEE ABOVE | | | | | |
| THIS DRAWING, THE PERTINENT ENCLOSURES, DESCRIPTIONS, CALCULATIONS ETC. AND THEIR CONTENTS ARE THE PROPERTY OF DYWIDAG SYSTEMS INTERNATIONAL, USA, INC. THEY ARE NOT ALLOWED TO BE DUPLICATED WITHOUT OUR PERMISSION. THEY ARE ALSO NOT TO BE SHOWN OR EXPLAINED FOR ANY REASON TO A THIRD PARTY OTHER THAN FOR REASONS EXPRESSLY INTENDED BY DSI's SUBMITTAL TO THE ORIGINAL RECEIVER. THEY HAVE TO BE RETURNED UPON REQUEST. | | | | | DYWIDAG-SYSTEMS INTERNATIONAL, USA, INC. 320 MARMON DRIVE - BOLINGBROOK, IL 60440 PHONE: 630-739-1100 FAX: 630-739-1405 | | |  | |



THREAD ACCORDING TO TOLERANCE DRAWING 8341/722 EXCEPT FOR MINOR DIA. SPECIFIED BELOW

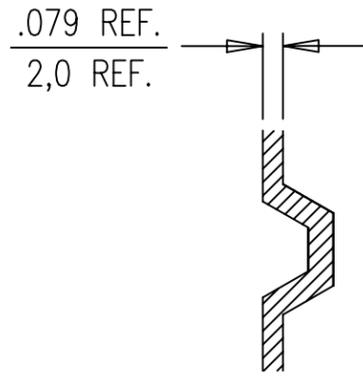
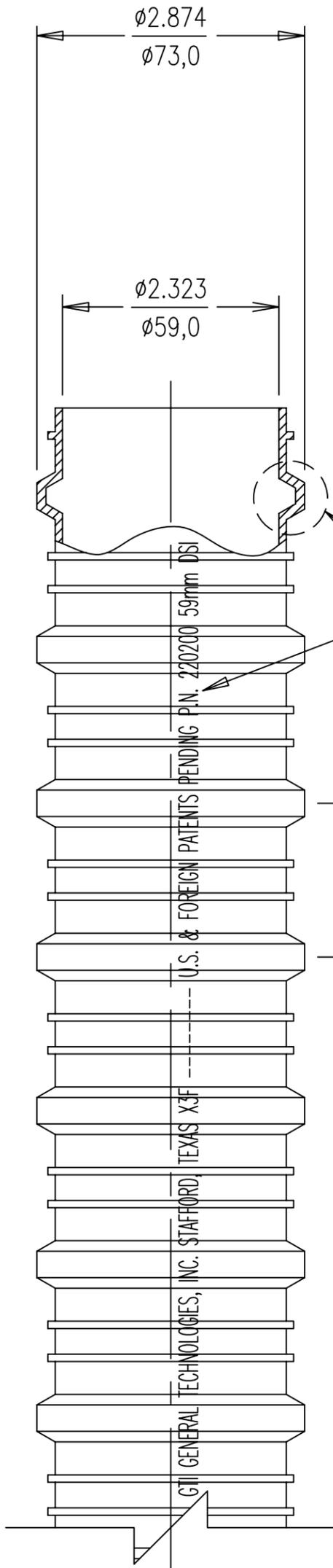
- NOTES:
1. ALL DIMENSIONS ARE FOR UNCOATED PARTS.
 2. I.D. DEVIATES FROM STANDARD THREADFORM DRAWING.

| PART NUMBER | HEAT TREATMENT | APPLICATION | MINOR DIA. IN. (mm) |
|-------------|--------------------------------------|--|------------------------------|
| B36E24210 | NORMALIZED BHN = 180-220 | FOR USE WITH UNCOATED BAR NOT REUSABLE | 1.429-1.433 (36.30-36.40) |
| B36E24220 | QUENCHED & TEMPERED BHN = 269-302 | FOR USE WITH UNCOATED BAR REUSABLE NUT | 1.434-1.438 (36.42-36.53) |
| B36E24251 | QUENCHED & TEMPERED BHN = 269-302 | RAW MATERIAL FOR B36E24255 & B36E24258 | 1.450-1.454 (36.83-36.93) |
| B36E24255 | QUENCHED & TEMPERED BHN = 269-302 | PART IS EPOXY COATED EXCEPT FOR THREAD, FOR USE WITH EPOXY COATED BAR | 1.450-1.454 (36.83-36.93) |
| B36E24258 | QUENCHED & TEMPERED BHN = 269-302 | PART IS HOT DIPPED GALVANIZED EXCEPT FOR THREAD, FOR USE WITH GALVANIZED BAR (ASTM A123) | 1.450-1.454 (36.83-36.93) |

| COATING SPECIFICATIONS | | |
|------------------------|---|-------------|
| X | EPOXY COATING | GALVANIZING |
| HARDWARE | ASTM A775 OR AASHTO M284 7-12 MIL OR ASTM A934 | ASTM A153 |
| THREADBAR | | ASTM A123 |

APPROVED BY FDOT 9-22-08

| | | | | | |
|---|-------------------------------------|---------------------------------------|-----------------------|---|-------------------------------------|
| DIMENSIONS: INCH/mm mm FOR REFERENCE ONLY | QUALITY PLAN NUMBER: QBE0020100F | TOLERANCES: ±.035 UNLESS NOTED | WEIGHT 3:2 LBS. | REV. DATE NAME | PART NUMBER: SEE TABLE |
| 1-3/8" GROUTABLE ANCHOR NUTS FOR THREADBAR GR. 150 | | MATERIAL: SEE DRAWING B36E24290 | SCALE 1:2 | 1 03-23-06 C.S. 2 11-09-07 S.Y. | DRAWING NUMBER: B36E24200 |
| DATE: 06-07-05 | DWG: G. MALECKI | CHK: H.K. | APP: K.S. | THIS DRAWING, THE PERTINENT ENCLOSURES, DESCRIPTIONS, CALCULATIONS ETC. AND THEIR CONTENTS ARE THE PROPERTY OF DYWIDAG SYSTEMS INTERNATIONAL, USA, INC. THEY ARE NOT ALLOWED TO BE DUPLICATED WITHOUT OUR PERMISSION. THEY ARE ALSO NOT TO BE SHOWN OR EXPLAINED FOR ANY REASON TO A THIRD PARTY OTHER THAN FOR REASONS EXPRESSLY INTENDED BY DSI'S SUBMITTAL TO THE ORIGINAL RECEIVER. THEY HAVE TO BE RETURNED UPON REQUEST. | |
| DYWIDAG-SYSTEMS INTERNATIONAL, USA, INC. 320 MARMON DRIVE - BOLINGBROOK, IL 60440 PHONE: 630-739-1100 FAX: 630-739-1405 | | | | | |



DETAIL
SCALE 1:1

SEE DETAIL

RUNNING LATEX PRINT: 1

"GTI GENERAL TECHNOLOGIES, INC. STAFFORD, TEXAS X3F ----- U.S. & FOREIGN PATENTS PENDING P.N. 220200 59mm DSI" (----- = BATCH NUMBER).

MATERIAL SPECIFICATIONS:

MANUFACTURE DUCTS FROM NON-COLORED, UNFILLED POLYPROPYLENE MEETING THE REQUIREMENTS OF ASTM D4101 WITH A CELL CLASSIFICATION RANGE OF PP0340B14541 TO PP0340B67884. THE DUCT SHALL BE WHITE IN COLOR CONTAINING ANTIOXIDANT(S) WITH A MINIMUM OXIDATION INDUCTION TIME (OIT) ACCORDING TO ASTM D 3895 OF 20 MINUTES AND CONTAINING A NON-YELLOWING LIGHT STABILIZER.

NOTES:

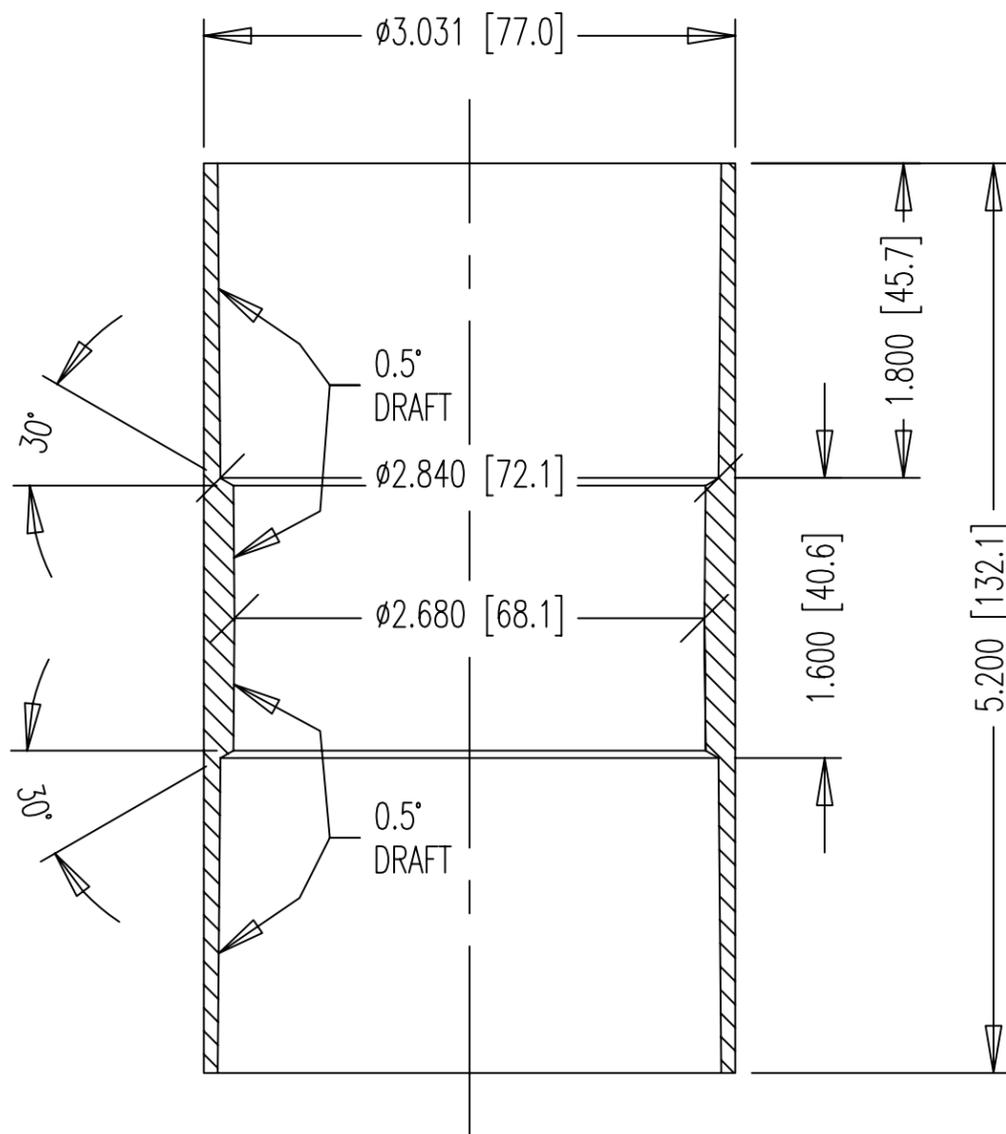
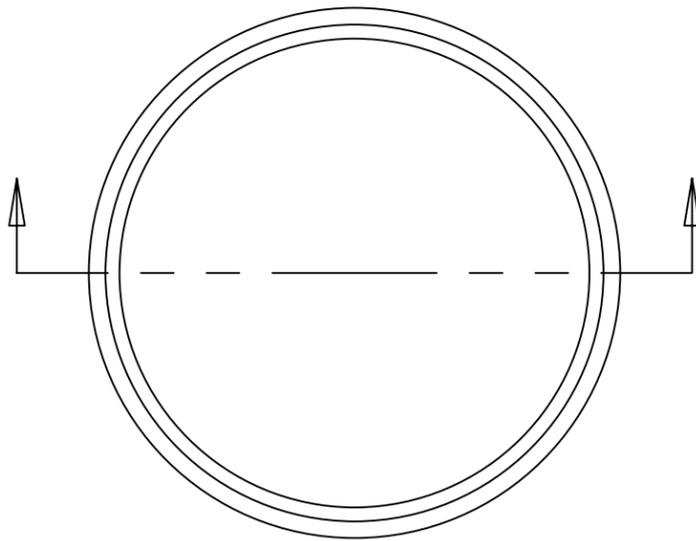
1. GTI GENERAL TECHNOLOGIES, INC. STAFFORD, TEXAS X3F ----- U.S. & FOREIGN PATENTS PENDING P.N. 220200 59mm DSI (----- IS BATCH NO.).
2. REFERENCE GTI DRAWING 220200.
- 1 3. STANDARD FIT FOR 5-0.6", 7-0.5", 7-0.6" AND 9-0.5" STRANDS.
4. THIS DRAWING IS NOT INTENDED FOR MANUFACTURING PURPOSES.
5. Min. BENDING RADIUS, $R_{min} = 22.8$ FT.
6. DUCT IS DELIVERED IN STRAIGHT SECTIONS AND IS NOT INTENDED TO BE COILED.

1 → PART WAS U00220400.

APPROVED BY FDOT 9-22-08

| | | | | | | | | | | |
|--|-----------------|-------------------------------------|-----------|--|---------------------------|-----------|------------------|--------------|-------------------------------------|---|
| DIMENSIONS: INCH [mm] mm FOR REFERENCE ONLY | | QUALITY PLAN NUMBER: QU00041110P | | TOLERANCES: ±.020 UNLESS NOTED | WEIGHT 0.296 LBS/FT | REV. 1 | DATE 08-04-08 | NAME S.N. | PART NUMBER: U00220200 | |
| 2-3/8" (59mm) CORRUGATED PP DUCT | | | | MATERIAL: SEE ABOVE | SCALE 1:2 | | | | DRAWING NUMBER: U00220200 | |
| DATE: 09-14-07 | DWG: G. MALECKI | CHK: H.K. | APP: K.S. | THIS DRAWING, THE PERTINENT ENCLOSURES, DESCRIPTIONS, CALCULATIONS ETC. AND THEIR CONTENTS ARE THE PROPERTY OF DYWIDAG SYSTEMS INTERNATIONAL, USA, INC. THEY ARE NOT ALLOWED TO BE DUPLICATED WITHOUT OUR PERMISSION. THEY ARE ALSO NOT TO BE SHOWN OR EXPLAINED FOR ANY REASON TO A THIRD PARTY OTHER THAN FOR REASONS EXPRESSLY INTENDED BY DSI's SUBMITTAL TO THE ORIGINAL RECEIVER. THEY HAVE TO BE RETURNED UPON REQUEST. | | | | | | DYWIDAG-SYSTEMS INTERNATIONAL, USA, INC. POST TENSIONING / REINFORCING UNIT PHONE: 630-739-1100 320 MARMON DRIVE - BOLINGBROOK, IL FAX: 630-739-1405 |

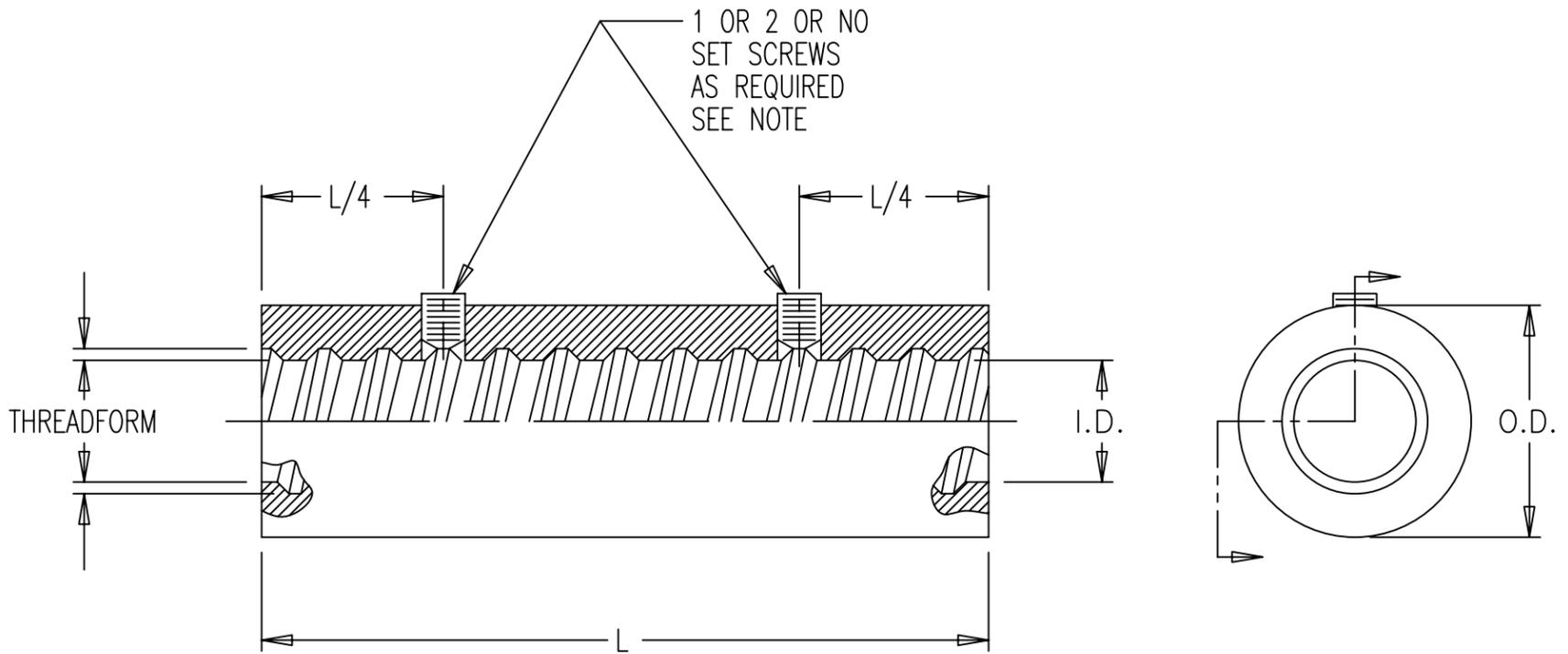




PART WAS U00220440. REFERENCE GTI DWG 220205.

APPROVED BY FDOT 9-22-08

| | | | | | | | | | | |
|--|--|-------------------------------------|--|---|------------------------|-----------|------------------|--------------|-------------------------------------|--|
| DIMENSIONS: INCH [mm] mm FOR REFERENCE ONLY | | QUALITY PLAN NUMBER: QSA0028000P | | TOLERANCES: ±.005 UNLESS NOTED | WEIGHT 0.23 LBS. | REV. 1 | DATE 08-12-08 | NAME S.N. | PART NUMBER: U00220205 | |
| Ø2-3/8" (59mm) DUCT COUPLER | | | | MATERIAL: HDPE | SCALE 2:3 | | | | DRAWING NUMBER: U00220205 | |
| | | | | DATE: 10-25-99 | DWG: G. MALECKI | CHK: S.Y. | APP: K.S. | | | |
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NOTES:

1. ALL COUPLERS ALSO SUITABLE FOR GRADE 160 THREADBARS.
2. LOCATE TAPPED HOLE FOR SET SCREW ON CENTER OF MAJOR DIA OF THREAD.

| | | | | | |
|----------------------------|-------------|-------------|-------------|--|--|
| NOMINAL SIZE | 1" | 1-1/4" | 1-3/8" | | |
| PART NUMBERS FOR COUPLERS: | 26mm | 32mm | 36mm | | |
| WITHOUT SET SCREWS | B26E30810 | B32E30810 | B36E30810 | | |
| WITH 1 SET SCREW | B26E30811 | B32E30811 | B36E30811 | | |
| WITH 2 SET SCREWS | B26E30815 | B32E30815 | B36E30815 | | |
| O.D. (IN./mm) | 2.000/50,8 | 2.375/60,3 | 2.750/69,9 | | |
| I.D. (IN./mm) | 1.049/26,6 | 1.272/32,3 | 1.433/36,4 | | |
| L (IN./mm) | 6.250/158,8 | 6.750/171,4 | 8.750/222,3 | | |
| THREADFORM: 8341/ | 496 | 754 | 722 | | |
| SET SCREW SIZE | 3/8-16UNC | 3/8-16UNC | 3/8-16UNC | | |
| TOLERANCE FOR: | | | | | |
| O.D. (IN.) | +0/-0.003 | +0/-0.003 | +0/-0.004 | | |
| I.D. (IN.) | +0/-0.004 | +0/-0.004 | +0/-0.004 | | |
| L (IN.) | ±1/16 | ±1/16 | ±1/16 | | |
| WEIGHT (LBS.) | 3.74 | 5.70 | 12.20 | | |

APPROVED BY FDOT 9-22-08

DYWIDAG POST-TENSIONING SYSTEMS

DIMENSIONS: INCH/mm
mm FOR REFERENCE ONLY

QUALITY PLAN NUMBER:
QB00030800S

DRAWING NUMBER
B00E30810

FULL LOAD COUPLERS
FOR GRADE 150 THREADBAR

DATE: 04-10-90 | DWG: G. MALECKI | CHK: | APP:

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MATERIAL:
PME0020700B

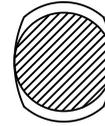
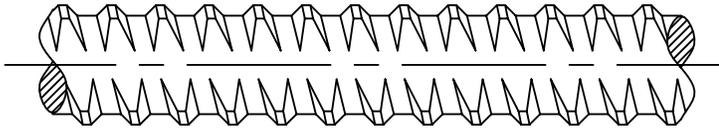
SCALE
1:1
FOR
1"

| REV. | DATE | NAME |
|------|----------|------|
| 4 | 11-15-94 | K.L. |
| 5 | 03-27-96 | C.S. |
| 6 | 08-12-98 | A.W. |
| 7 | 12-14-98 | A.W. |
| 8 | 08-08-00 | A.W. |
| 9 | 08-09-04 | H.K. |

DYWIDAG-SYSTEMS INTERNATIONAL, USA, INC.



RIGHT HAND THREAD



| | <u>PART NUMBERS</u> | <u>SPECIFICATIONS</u> |
|-----------------------|---------------------|--|
| FOR BARE BAR: | B36E CUT | ASTM A722 TYPE II |
| FOR EPOXY COATED BAR: | B36E COAT | ASTM A775 OR AASHTO M284 |
| FOR GALVANIZED BAR: | B36E GALV | ASTM A123, A143 AND DWG PME0000058B |

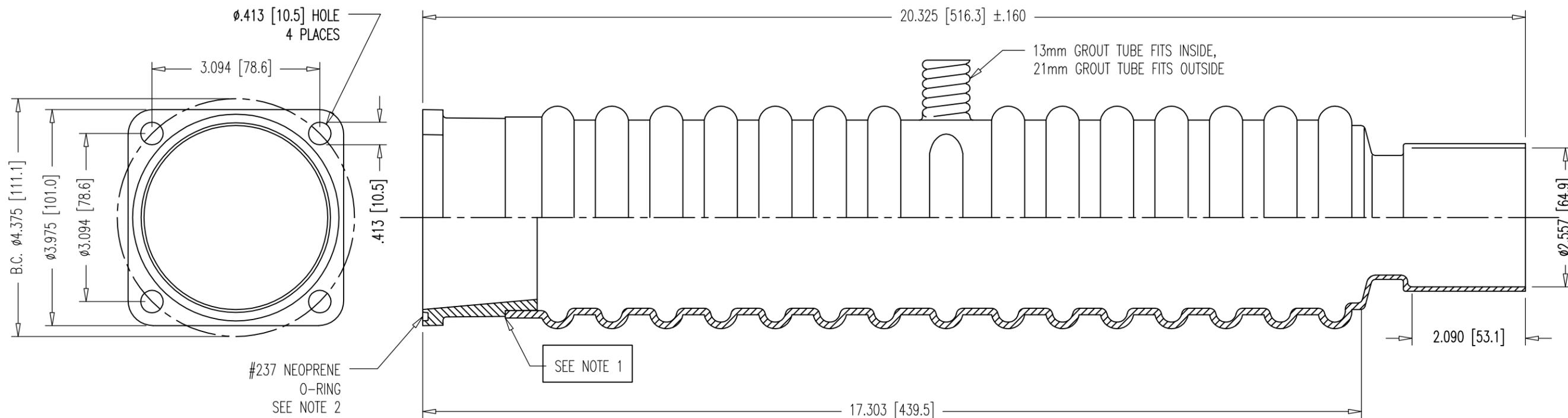
| <u>PHYSICAL PROPERTIES</u> | |
|-----------------------------|---------------------------|
| EFFECTIVE AREA: | 1.58 SQ.IN. (1019 SQ.mm) |
| ULTIMATE STRENGTH: | 150 KSI (1034 N/SQ.mm) |
| ULTIMATE LOAD: | 237 KIPS (1054 KN) |
| YIELD LOAD: | 191.2 KIPS (851 KN) |
| WEIGHT: | 5.56 LBS./FT. (8.27 Kg/m) |
| MAX. BAR ϕ INCL. RIBS: | 1.63 IN. (41.4mm) |
| AVERAGE CORE ϕ : | 1.40 IN. (35.6mm) |
| PITCH: | 0.709 IN. (18.0mm) |

NOTE:
ALL DIMENSIONS APPLY TO BARE BARS ONLY.

APPROVED BY FDOT 9-22-08

METRIC VALUES ADDED.

| | | | | | | | | | | | | |
|--|--|--|--|--|--|--------------|--|--|----------|------|-----------------------------|--|
| DYWIDAG POST-TENSIONING SYSTEMS | | | | DIMENSIONS: INCH [mm] mm FOR REFERENCE ONLY | | Q.A. | | QUALITY PLAN NUMBER: QB00000050B | | | DRAWING NUMBER B36E00000 | |
| 1-3/8" ϕ THREADBAR GRADE 150 KSI | | | | | | | | REV. | DATE | NAME | | |
| | | | | | | | | 1 | 12-11-98 | A.W. | | |
| DATE: 12-23-91 DWG: G. MALECKI CHK: H.K. APP: K.S. | | | | MATERIAL: SEE ABOVE | | SCALE NTS | | 2 | 06-13-03 | H.K. | | |
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| DYWIDAG-SYSTEMS INTERNATIONAL, USA, INC. | | | | | | | | | | | | |

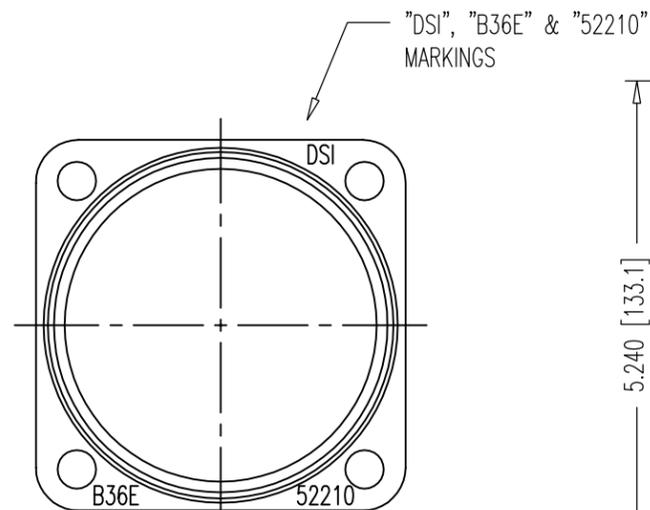
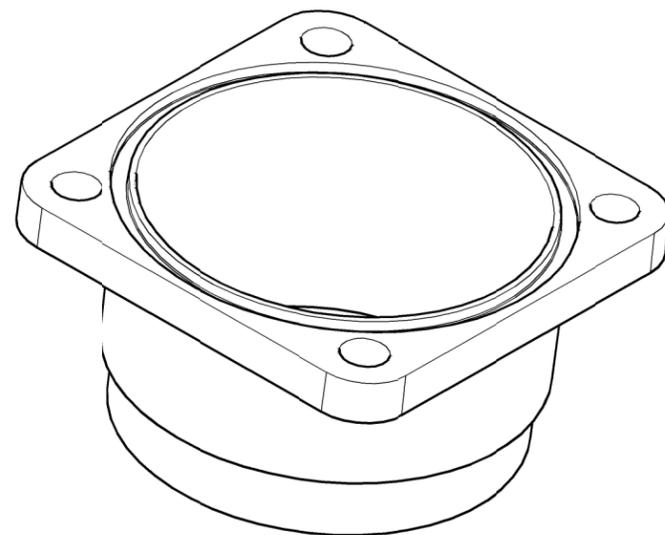
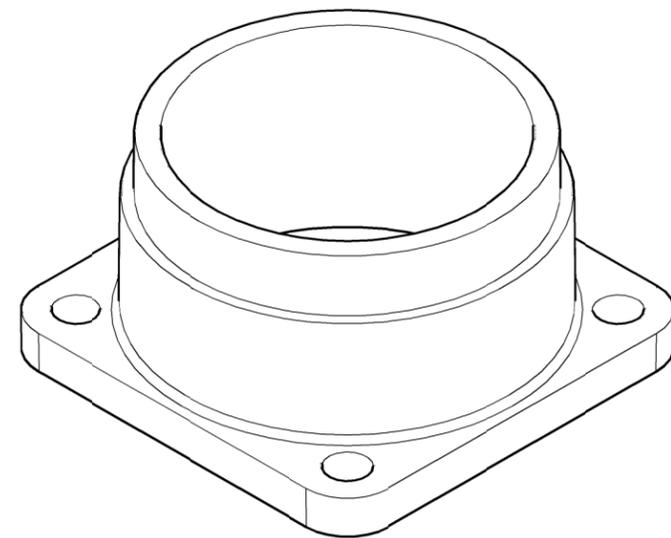


NOTES:

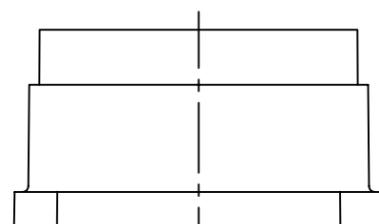
1. PART B36E52210 (PLATE COUPLER CONNECTOR) IS CONNECTED TO U06008010 (CORR. COUPLER HOUSING) TO CREATE PART B36E50210 (PLATE COUPLER HOUSING).
2. INSTALL #237 NEOPRENE O-RING IN GROOVE USING DROPS OF LIQUID ADHESIVE BEFORE SHIPPING.
3. FOR MATERIAL SPECIFICATIONS, SEE DRAWINGS U06008010 AND B36E52210.

APPROVED BY FDOT 9-22-08

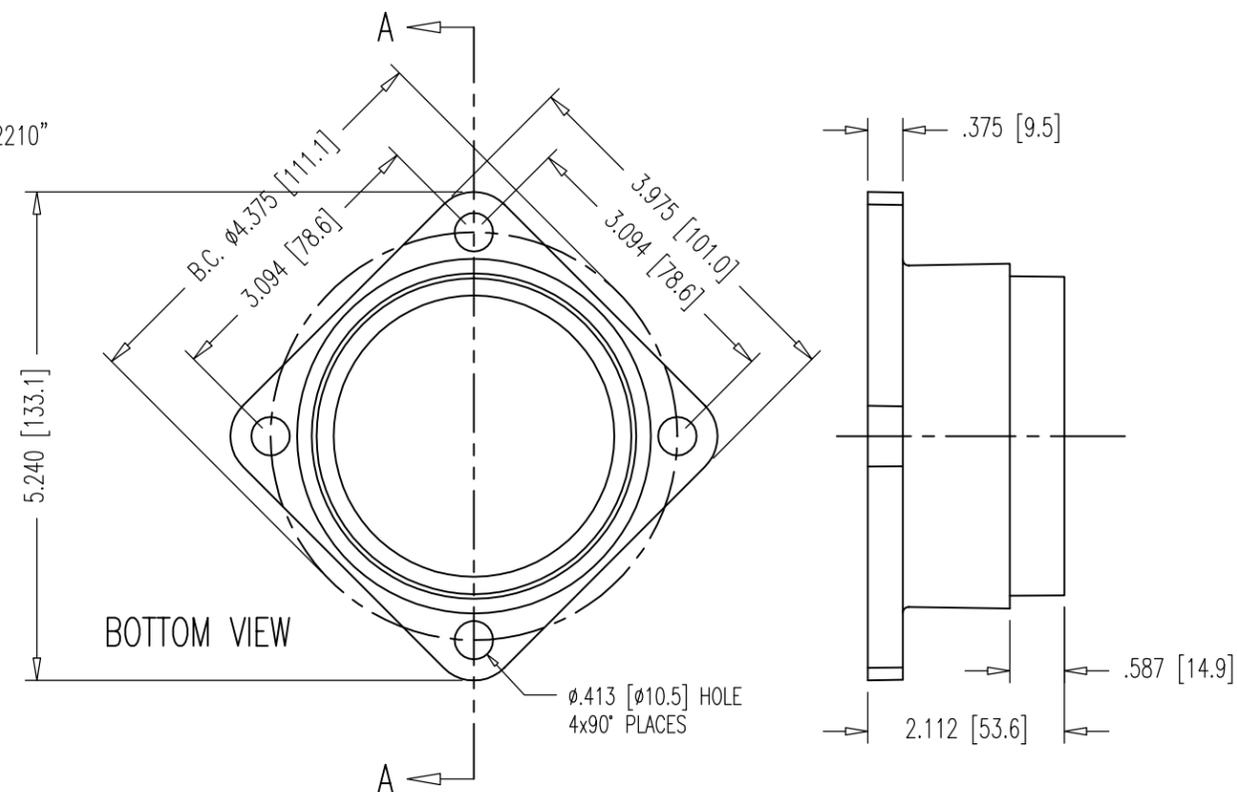
| | | | | | | | | |
|--|-----------------|----------------------|-----------|---|--------------|------|------|-------------------------------------|
| DIMENSIONS: INCH [mm] mm FOR REFERENCE ONLY | | QUALITY PLAN NUMBER: | | WEIGHT | REV. | DATE | NAME | PART NUMBER: |
| PLATE COUPLER HOUSING | | | | LBS. | | | | B36E50210 |
| | | | | MATERIAL: SEE DRAWINGS U06008010 AND B36E52210 | SCALE 1:2 | | | DRAWING NUMBER: B36E50210 |
| DATE: 11-21-07 | DWG: G. MALECKI | CHK: E.A. | APP: K.S. | DYWIDAG-SYSTEMS INTERNATIONAL, USA, INC. 320 MARMON DRIVE - BOLINGBROOK, IL 60440 PHONE: 630-739-1100 FAX: 630-739-1405 | | | | |
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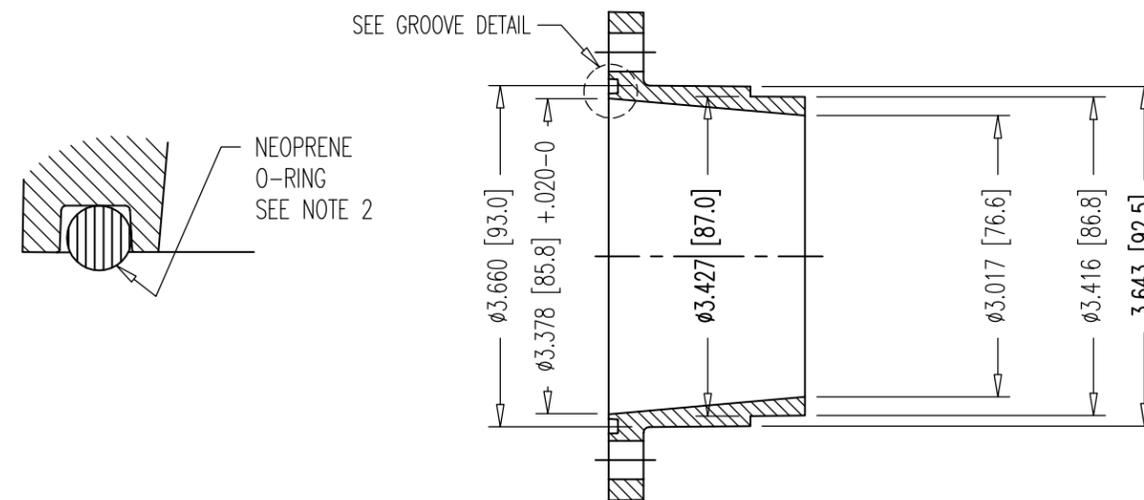
TOP VIEW



SIDE VIEW



BOTTOM VIEW



GROOVE DETAIL

SECTION A-A

APPROVED BY FDOT 9-22-08

MATERIAL SPECIFICATIONS:

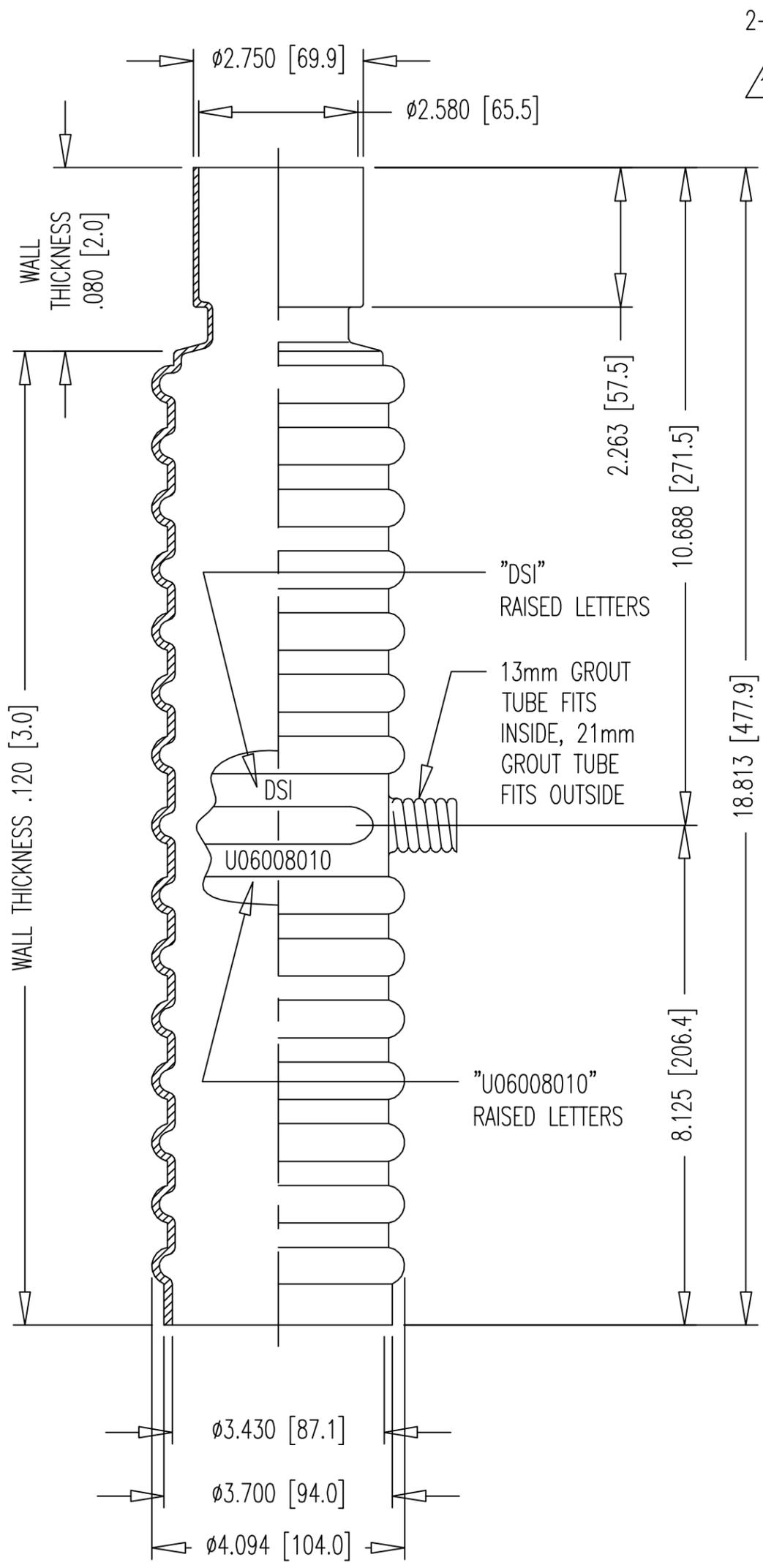
MANUFACTURE PLATE COUPLER CONNECTOR FROM NON-COLORED, UNFILLED POLYETHYLENE MEETING THE REQUIREMENTS OF ASTM D4976. THE PLATE COUPLER CONNECTOR SHALL CONTAIN ANTIOXIDANT(S) WITH A MINIMUM OXIDATION INDUCTION TIME (OIT) ACCORDING TO ASTM D 3895 OF 20 MINUTES AND CONTAINING A NON-YELLOWING LIGHT STABILIZER. THE STRESS CRACK RESISTANCE TEST OF THE PLATE COUPLER CONNECTOR SHALL RESULT IN A MINIMUM FAILURE TIME OF 3 HOURS ACCORDING TO ASTM F 2136 AT AN APPLIED STRESS OF 348 PSI

NOTES:

1. USE 3/8"-16UNC GALV. S.H.C.S. BOLTS, 1" LONG.
2. INSTALL #237 NEOPRENE O-RING 3-3/8"x3-5/8"x1/8" IN GROOVE IN CAP USING DROPS OF LIQUID ADHESIVE BEFORE SHIPPING.

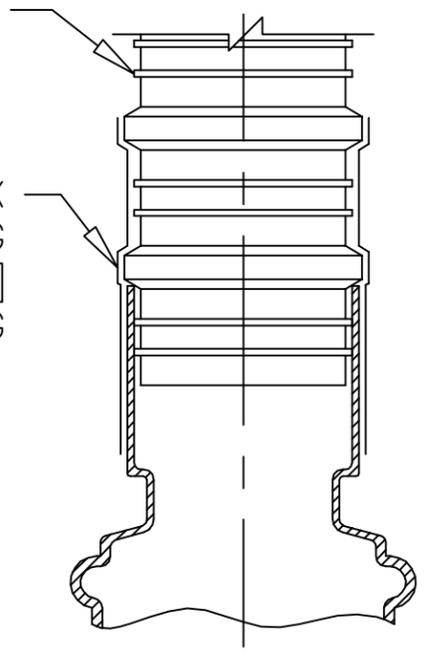
| | | | | | | | | | |
|--|--|----------------------|--|--|-----------------------------------|------|------|---|-------------------------------------|
| DIMENSIONS: INCH [mm] mm FOR REFERENCE ONLY | | QUALITY PLAN NUMBER: | | TOLERANCES: ±.020 UNLESS NOTED | WEIGHT XX LBS. | REV. | DATE | NAME | PART NUMBER: B36E52210 |
| PLATE COUPLER CONNECTOR | | | | MATERIAL: SEE ABOVE | SCALE 1:2 2:3 5:2 5:1 | | | | DRAWING NUMBER: B36E52210 |
| | | | | DATE: 10-15-07 DWG: G. MALECKI CHK: E.A. APP: K.S. | | | | DYWIDAG-SYSTEMS INTERNATIONAL, USA, INC. 320 MARMON DRIVE - BOLINGBROOK, IL 60440 PHONE: 630-739-1100 FAX: 630-739-1405 | |
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2-3/8" [59mm]
PP DUCT
U00220200

HEAT SHRINK TUBING
~4" [102mm]
LONG

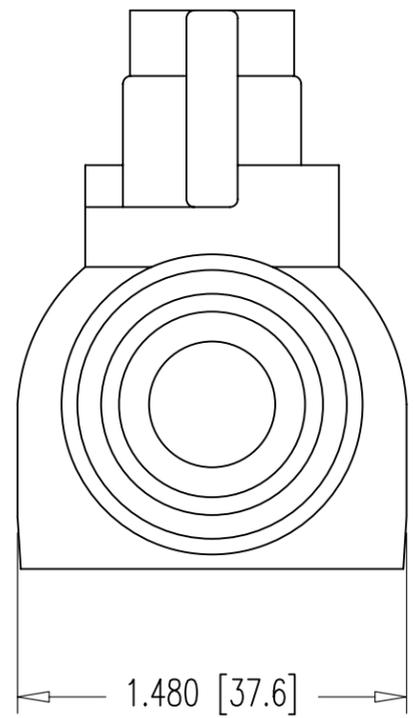
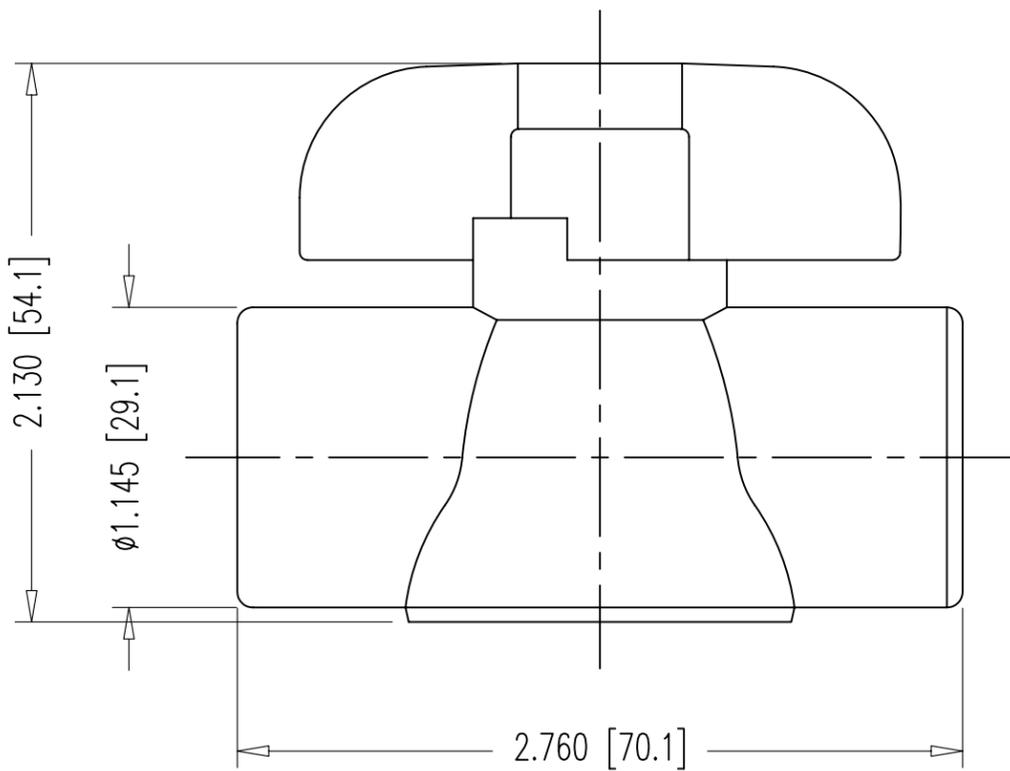
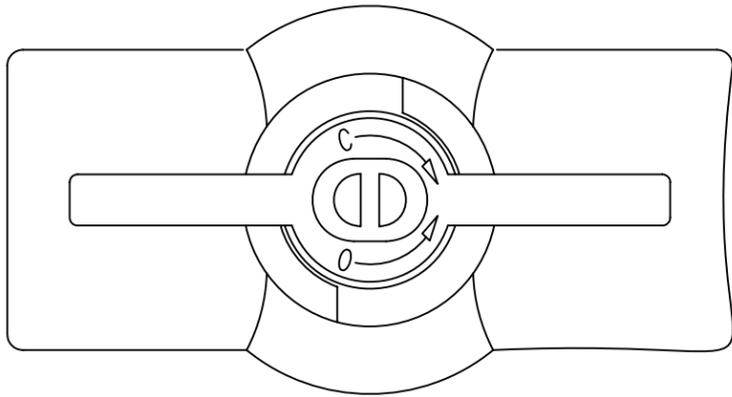


MATERIAL SPECIFICATIONS:
MANUFACTURE COUPLER HOUSING FROM NON-COLORED, UNFILLED POLYETHYLENE MEETING THE REQUIREMENTS OF ASTM D4976. THE COUPLER HOUSING SHALL BE WHITE IN COLOR CONTAINING ANTIOXIDANT(S) WITH A MINIMUM OXIDATION INDUCTION TIME (OIT) ACCORDING TO ASTM D 3895 OF 20 MINUTES AND CONTAINING A NON-YELLOWING LIGHT STABILIZER. THE STRESS CRACK RESISTANCE TEST OF THE COUPLER HOUSING SHALL RESULT IN A MINIMUM FAILURE TIME OF 3 HOURS ACCORDING TO F 2136 AT AN APPLIED STRESS OF 348 PSI

NOTES:
1. WALL THICKNESS AS SHOWN
2. ALL DIMENSIONS MEASURED.

APPROVED BY FDOT 9-22-08

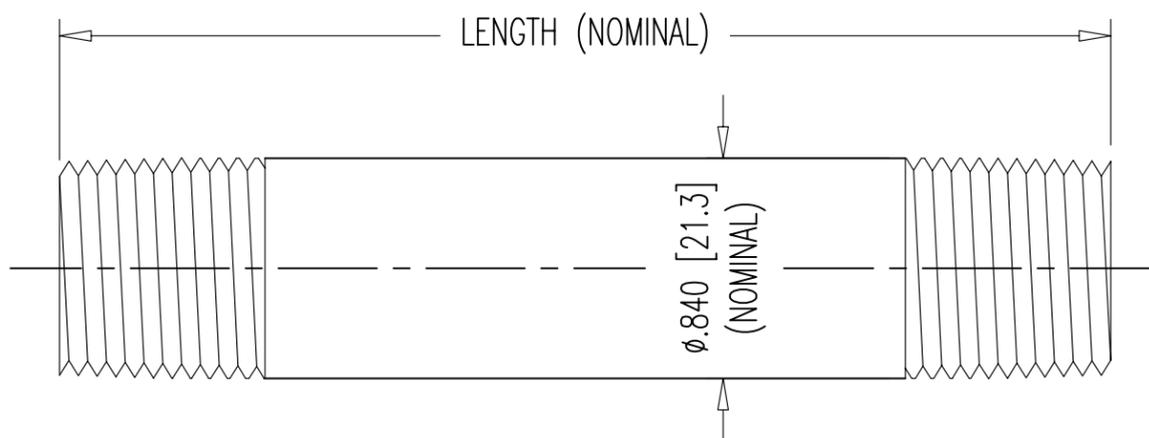
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|--|-----------------|-------------------------------------|-----------|---|------------------------|-----------|------------------|--------------|-------------------------------------|
| DIMENSIONS: INCH [mm] mm FOR REFERENCE ONLY | | QUALITY PLAN NUMBER: QUA0060810P | | TOLERANCES: ±.060 UNLESS NOTED | WEIGHT 0.49 LBS. | REV. 1 | DATE 09-23-08 | NAME S.N. | PART NUMBER: U06008010 |
| CORRUGATED PE COUPLER HOUSING | | | | MATERIAL: SEE ABOVE | SCALE 1:3 | | | | DRAWING NUMBER: U06008010 |
| DATE: 09-04-01 | DWG: G. MALECKI | CHK: S.Y. | APP: K.S. | DYWIDAG-SYSTEMS INTERNATIONAL, USA, INC. 320 MARMON DRIVE - BOLINGBROOK, IL 60440 PHONE: 630-739-1100 FAX: 630-739-1405 | | | | | |
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NOTE:
 ALL DIMENSION MEASURED.
 SPECIAL ORDER: NO STAMPED PART NUMBER.
 SUPPLIER: KING BROTHERS
 SUPPLIER PART NO. EBV-0500-T

APPROVED BY FDOT 09-14-07

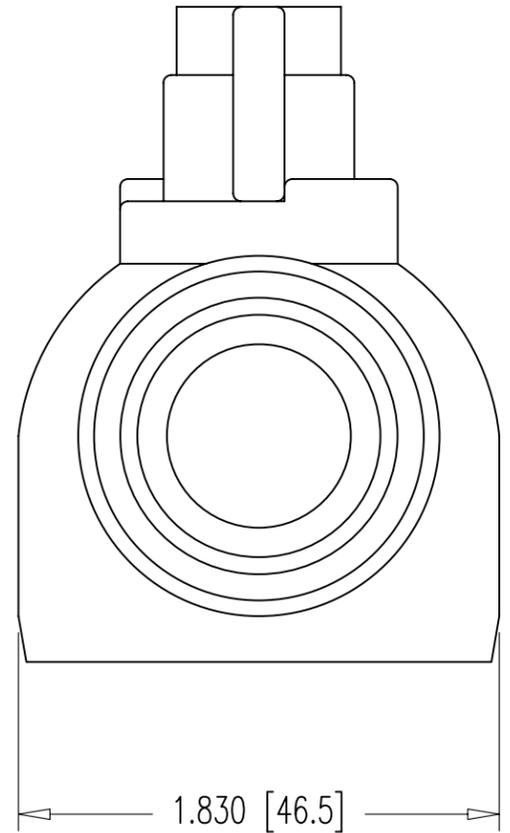
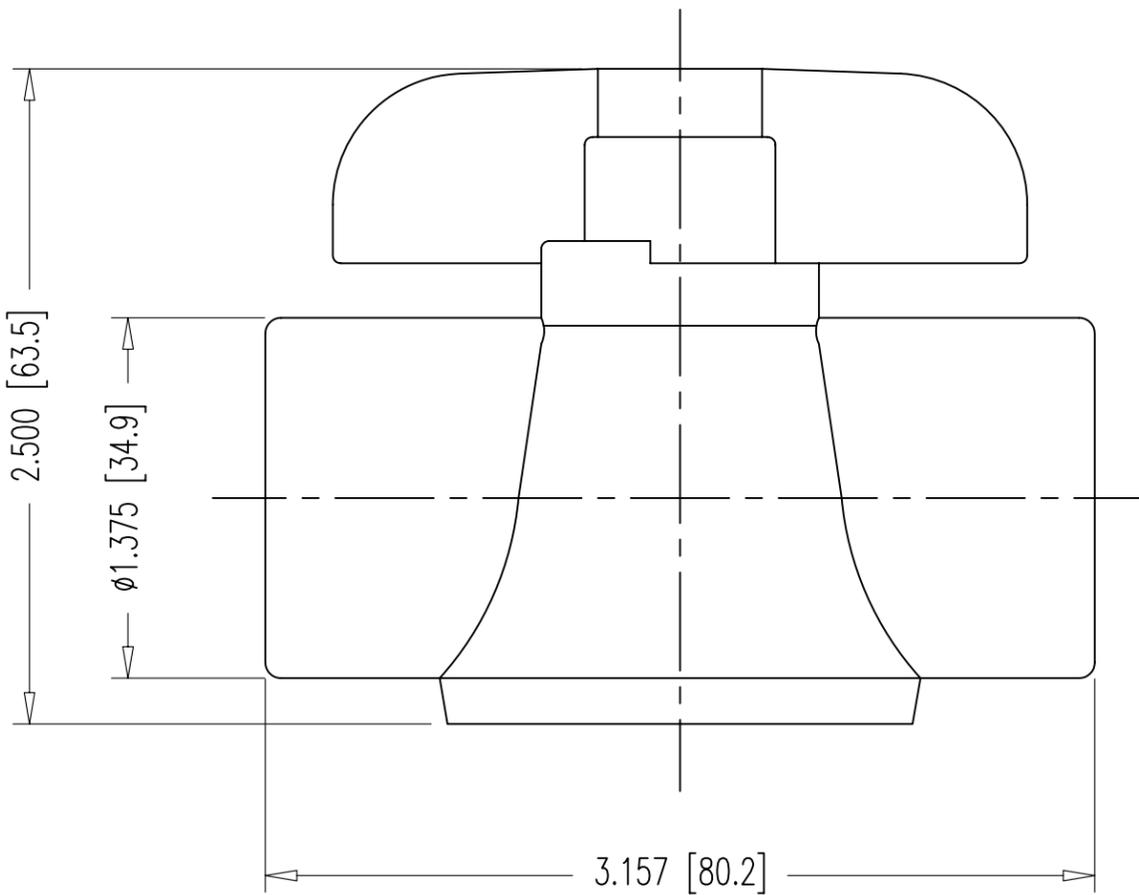
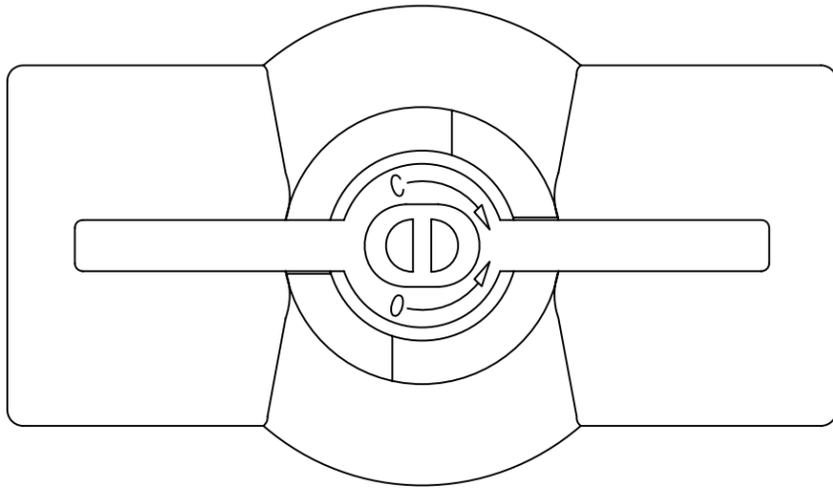
| | | | | | | | | |
|--|-----------------|----------------------|-----------|--|------|------|------|---|
| DIMENSIONS: INCH [mm] mm FOR REFERENCE ONLY | | QUALITY PLAN NUMBER: | | WEIGHT 0.138 LBS. | REV. | DATE | NAME | PART NUMBER: 00 00 634 |
| 1/2" NPT BALL VALVE | | | | | | | | |
| DATE: 09-14-07 | DWG: G. MALECKI | CHK: S.N. | APP: E.A. | DYWIDAG-SYSTEMS INTERNATIONAL, USA, INC. 320 MARMON DRIVE - BOLINGBROOK, IL 60440 PHONE: 630-739-1100 FAX: 630-739-1405 | | | |  |
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| PART NUMBER | LENGTH | WEIGHT |
|-------------|---------------|-----------|
| 00 00 672 | 4" [101.6mm] | 0.28 LBS. |
| 00 00 674 | 6" [152.4mm] | 0.43 LBS. |
| 00 00 676 | 12" [304.8mm] | 0.85 LBS. |

APPROVED BY FDOT 09-14-07

| | | | | | | | |
|--|-----------------|----------------------|-----------|---|--------------|------|---|
| DIMENSIONS: INCH [mm] mm FOR REFERENCE ONLY | | QUALITY PLAN NUMBER: | | REV. | DATE | NAME | PART NUMBER: |
| 1/2" PIPE NIPPLES | | | | MATERIAL: SCH 40 BLACK WELDED STEEL | SCALE 1:1 | | 00 00 672 |
| | | | | | | | 00 00 674 |
| DATE: 09-14-07 | DWG: G. MALECKI | CHK: S.N. | APP: K.S. | | | | DRAWING NUMBER: |
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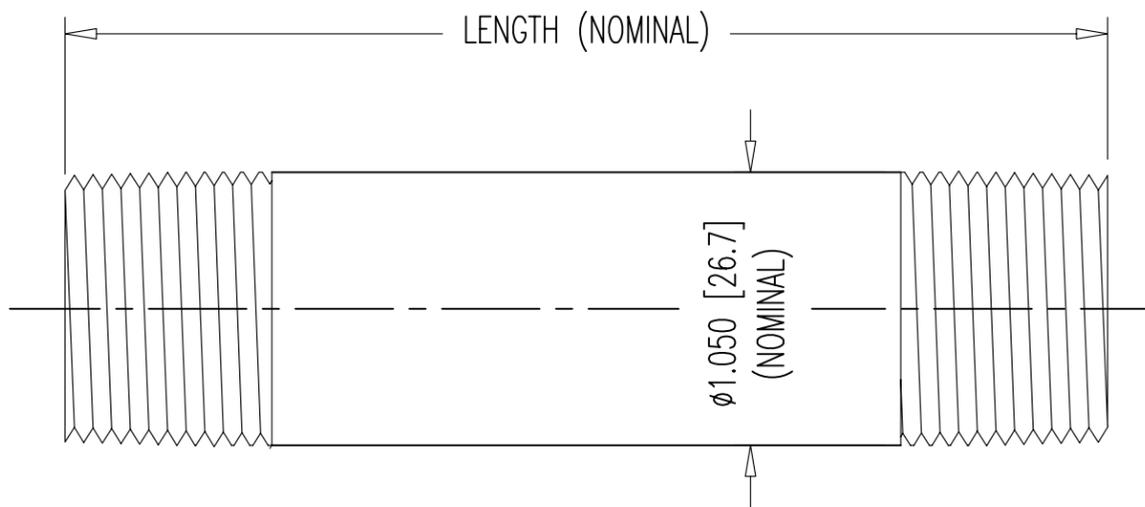


NOTE:
ALL DIMENSION MEASURED.

SUPPLIER: KING BROTHERS
SUPPLIER PART NO. EBV-0750-T

APPROVED BY FDOT 09-14-07

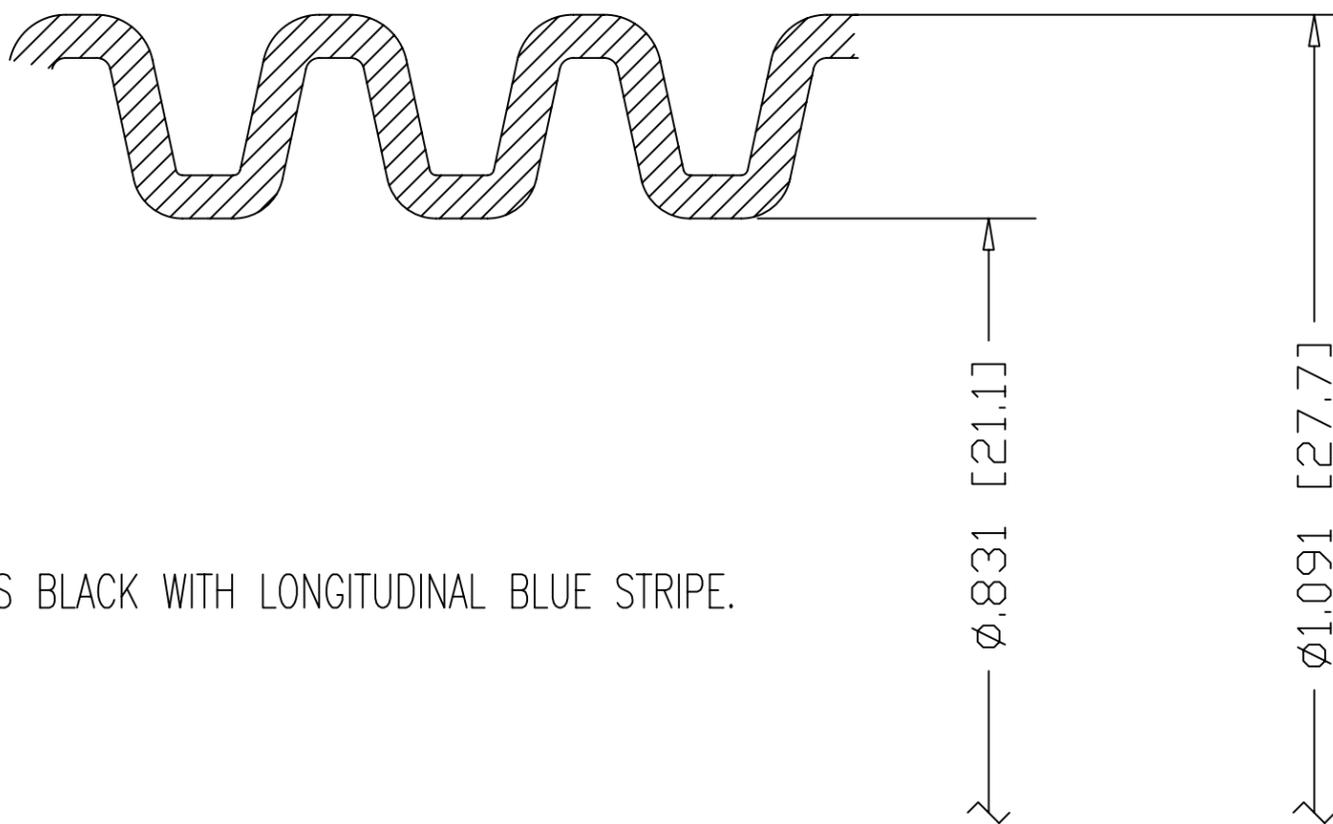
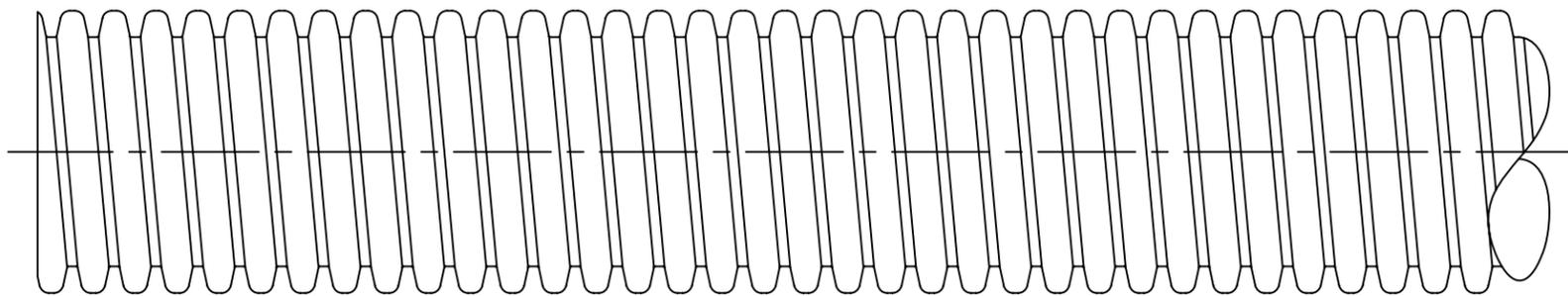
| | | | | | | | | |
|--|-----------------|----------------------|-----------|--|------|------|------|---|
| DIMENSIONS: INCH [mm] mm FOR REFERENCE ONLY | | QUALITY PLAN NUMBER: | | WEIGHT 0.213 LBS. | REV. | DATE | NAME | PART NUMBER: 00 00 834 |
| 3/4" NPT BALL VALVE | | | | | | | | |
| DATE: 09-14-07 | DWG: G. MALECKI | CHK: S.N. | APP: E.A. | DYWIDAG-SYSTEMS INTERNATIONAL, USA, INC. 320 MARMON DRIVE - BOLINGBROOK, IL 60440 PHONE: 630-739-1100 FAX: 630-739-1405 | | | |  |
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| PART NUMBER | LENGTH | WEIGHT |
|-------------|---------------|-----------|
| 00 00 872 | 4" [101.6mm] | 0.38 LBS. |
| 00 00 874 | 6" [152.4mm] | 0.57 LBS. |
| 00 00 876 | 12" [304.8mm] | 1.13 LBS. |

APPROVED BY FDOT 09-14-07

| | | | | | | | |
|--|--|----------------------|--|---|--------------|------|--|
| DIMENSIONS: INCH [mm] mm FOR REFERENCE ONLY | | QUALITY PLAN NUMBER: | | REV. | DATE | NAME | PART NUMBER: 00 00 872 00 00 874 00 00 876 |
| 3/4" PIPE NIPPLES | | | | MATERIAL: SCH 40 BLACK WELDED STEEL | SCALE 1:1 | | DRAWING NUMBER: 00 00 876 |
| | | | | | | | DATE: 09-14-07 DWG: G. MALECKI CHK: S.N. APP: K.S. |
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NOTES:

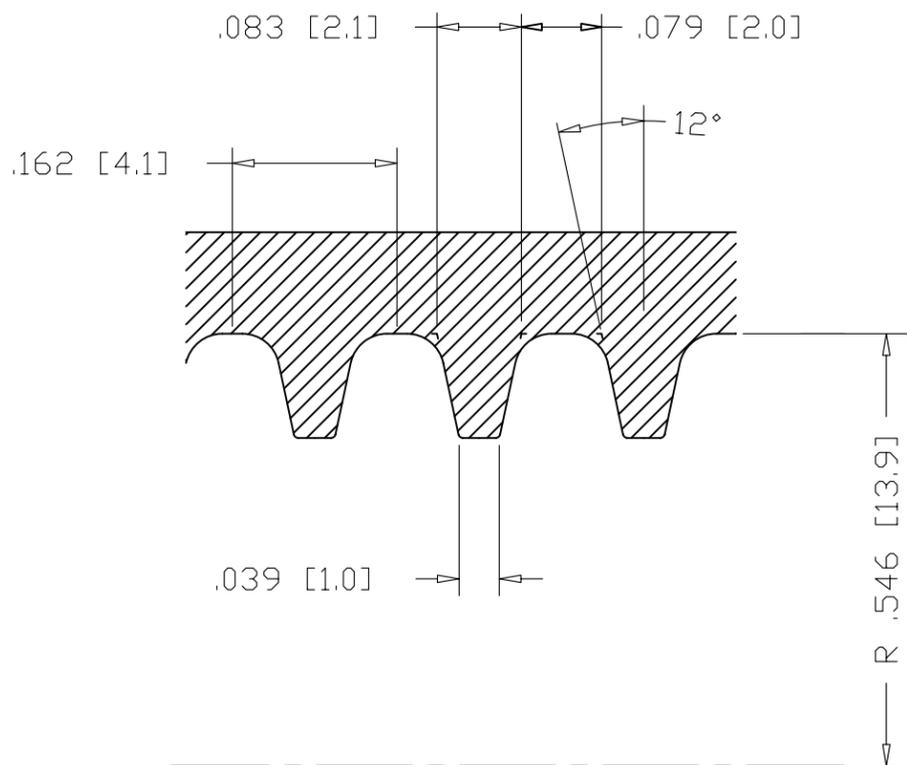
1. GROUT TUBE IS BLACK WITH LONGITUDINAL BLUE STRIPE.

MANUFACTURER: DSI

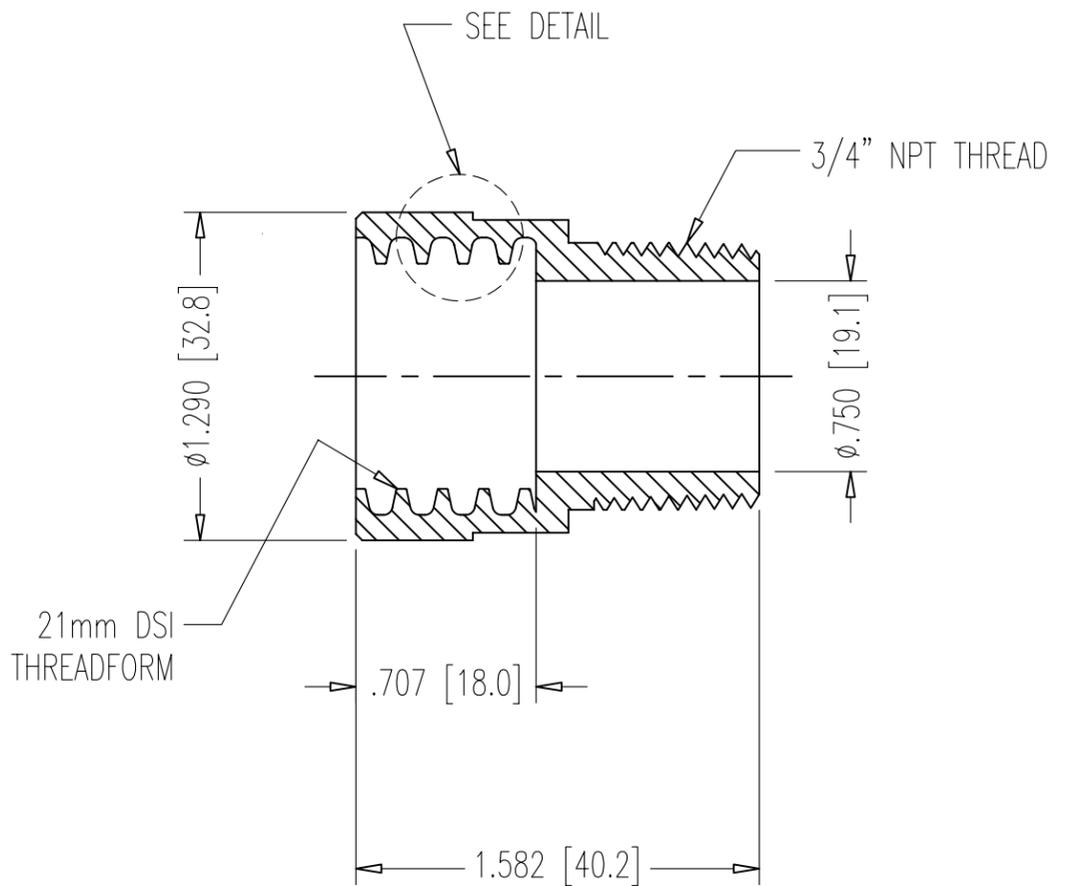
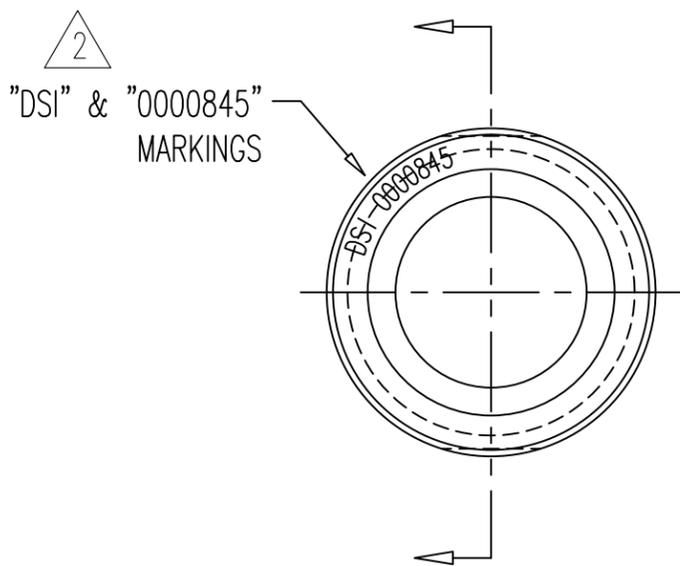
MANUFACTURER'S PART NUMBER: 00 00 801

APPROVED BY FDOT 09-14-07

| | | | | | | | | | | | |
|--|--|----------------------|--|---|--|---------------------|------|---|----------------------------------|-------------------------------------|-----------|
| DIMENSIONS: INCH [mm] IN. FOR REFERENCE ONLY | | QUALITY PLAN NUMBER: | | TOLERANCES: ±.020 UNLESS NOTED | | REV. | DATE | NAME | PART NUMBER: 00 00 801 | | |
| 21mm GROUT TUBE, STANDARD DUTY | | | | MATERIAL: HDPE MEETING OIT REQUIREMENTS | | SCALE 1:1 6:1 | | | | DRAWING NUMBER: 00 00 801 | |
| | | | | DATE: 09-14-07 | | DWG: G. MALECKI | | CHK: S.Y. | | | APP: K.S. |
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20% GLASS FILLED NYLON
 WITH A CELL CLASS S-PA 0141,
 S-PA 0231 OR S-PA 0401
 COLOR: BLACK

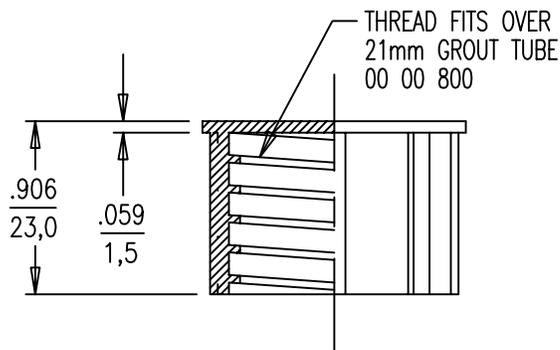
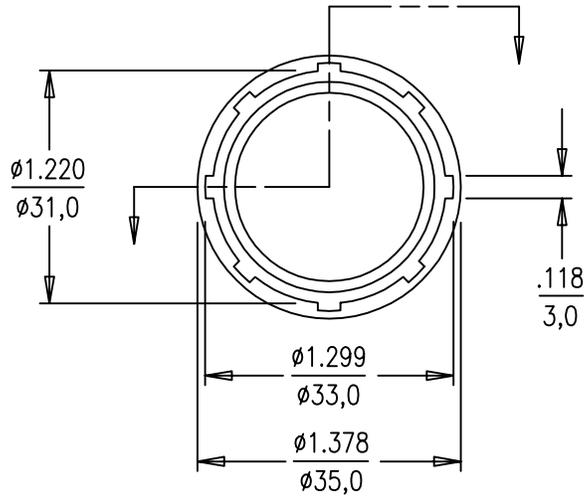


NOTE:
 PART FOR USE WITH 21mm GROUT TUBES
 00 00 801 OR 00 00 802.

MANUFACTURER: DSI
 MANUFACTURER'S PART NUMBER: 00 00 845

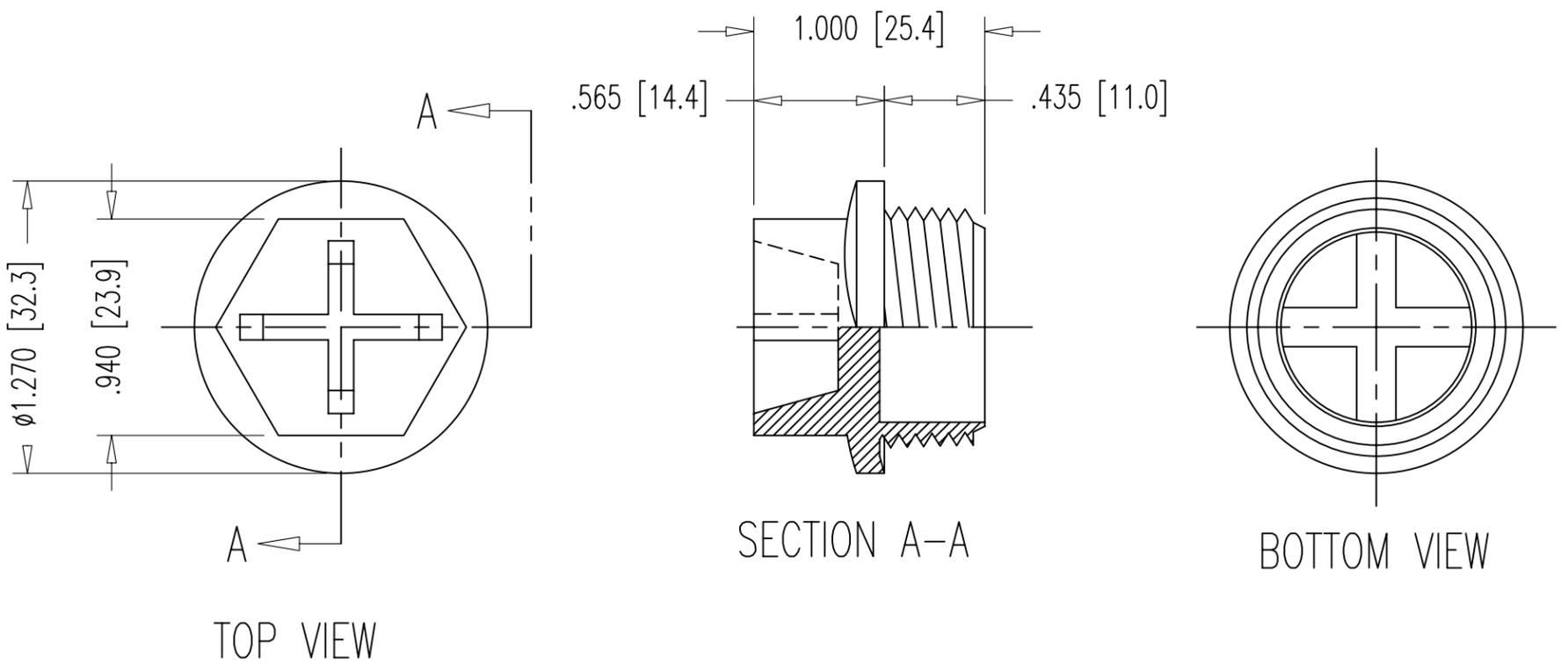
APPROVED BY FDOT 09-14-07

| | | | | | | | | | |
|--|-----------------|------------------------------------|-----------|--|------------------------|--------|---------------|-------------------------------------|----------------------------------|
| DIMENSIONS: INCH [mm] mm FOR REFERENCE ONLY | | QUALITY PLAN NUMBER: Q00000020P | | TOLERANCES: ±.020 UNLESS NOTED | WEIGHT 0.06 LBS. | REV. 1 | DATE 12-18-06 | NAME S.N. | PART NUMBER: 00 00 845 |
| 21mm FEMALE-3/4" NPT MALE CONNECTOR | | | | MATERIAL: SEE ABOVE | SCALE 1:1 4:1 | REV. 2 | DATE 05-09-07 | NAME S.N. | |
| | | | | | | REV. 3 | DATE 12-05-07 | NAME S.Y. | |
| DATE: 09-14-07 | DWG: G. MALECKI | CHK: E.A. | APP: K.S. | | | | | DRAWING NUMBER: 00 00 845 | |
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APPROVED BY FDOT 9-22-08

| DYWIDAG POST-TENSIONING SYSTEMS | | DIMENSIONS: INCH/mm mm FOR REFERENCE ONLY | REV. | DATE | NAME | PART NUMBER |
|---|--|--|--------------|------|------|-----------------------------|
| 21mm GROUT TUBE CAP | | TOLERANCES: ±.020 UNLESS NOTED | WEIGHT | | | 00 00 841 |
| DATE: 10-19-94 DRAWN: G. MALECKI APPROVED: | | MATERIAL: H.D.P.E. | SCALE 1:1 | | | DRAWING NUMBER 00 00 841 |
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| DYWIDAG SYSTEMS INTERNATIONAL, USA, INC. | | | | | | |

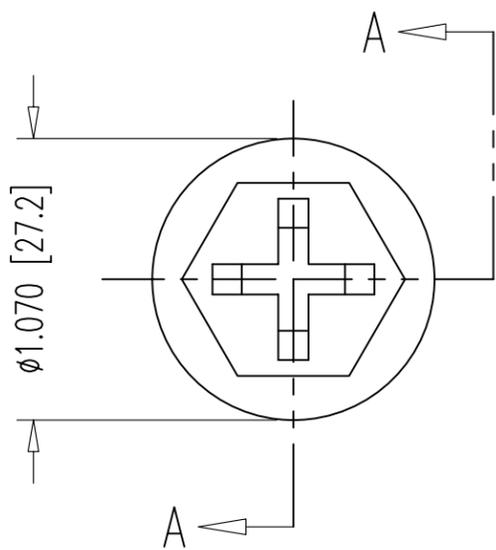


NOTE:
 ALL DIMENSIONS MEASURED.
 SPECIAL ORDER: NO STAMPED PART NUMBER.

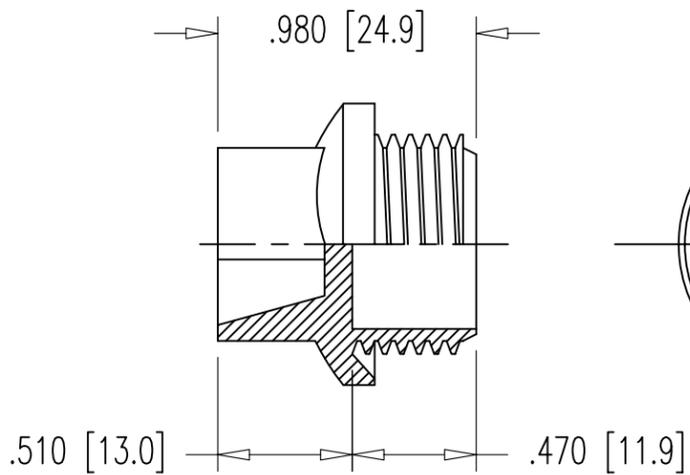
SUPPLIER:
 NIAGARA PLASTICS
 SUPPLIER PART # : BT 0750

APPROVED BY FDOT 05-31-07

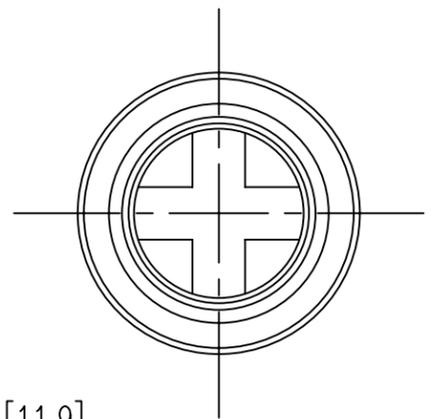
| | | | | | | | | | | |
|--|-----------------|-------------------------------------|-----------|--|----------------|------|------|---|-------------------------------------|--|
| DIMENSIONS: INCH [mm] mm FOR REFERENCE ONLY | | QUALITY PLAN NUMBER: Q000000040P | | TOLERANCES: ±.010 UNLESS NOTED | WEIGHT LBS. | REV. | DATE | NAME | PART NUMBER: 00 00 847 | |
| BT 0750 (3/4") NPT NYLON PLUG | | | | MATERIAL: NYLON 6 COLOR: BLACK | SCALE 1:1 | | | | DRAWING NUMBER: 00 00 847 | |
| DATE: 05-31-07 | DWG: G. MALECKI | CHK: S.Y. | APP: K.S. | | | | | | | |
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TOP VIEW



SECTION A-A



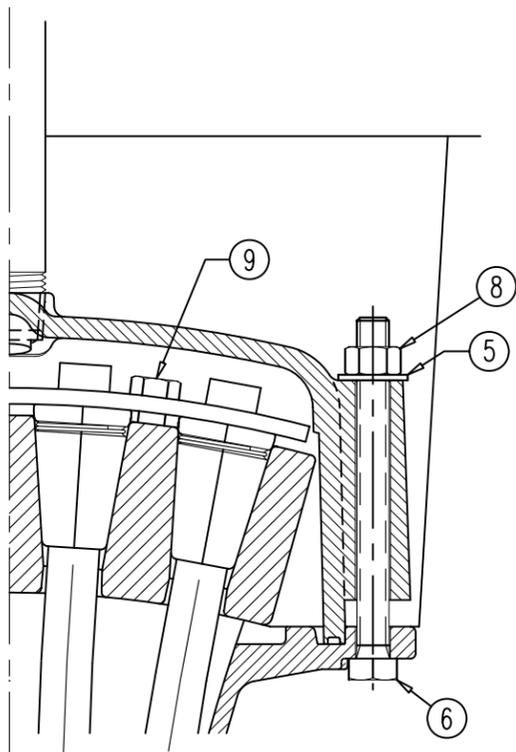
BOTTOM VIEW

NOTE:
 ALL DIMENSIONS FROM NIAGARA PLASTICS TABLE.
 SPECIAL ORDER: NO STAMPED PART NUMBER.

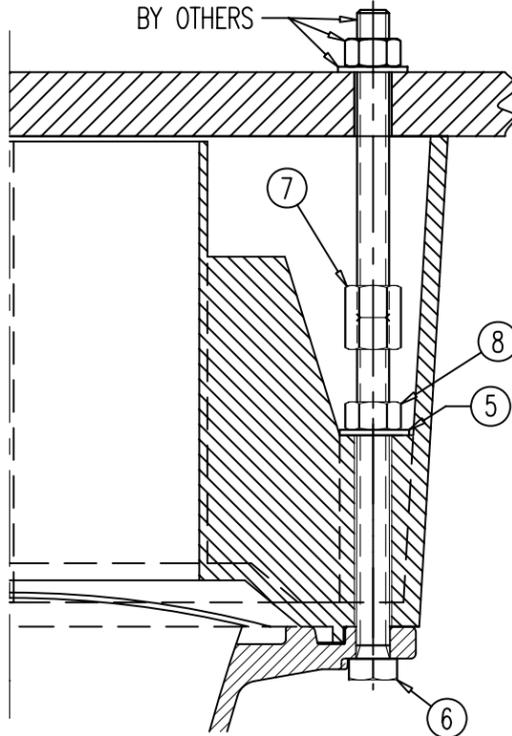
SUPPLIER:
 NIAGARA PLASTICS
 SUPPLIER PART # : BT 0500

APPROVED BY FDOT 12-12-07

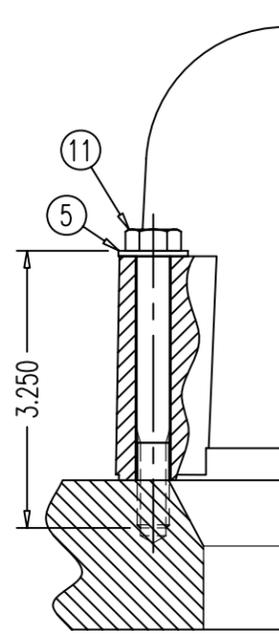
| | | | | | | | | | |
|--|--|-------------------------------------|--|--|-------------------------|-----------|---|------|-------------------------------------|
| DIMENSIONS: INCH [mm] mm FOR REFERENCE ONLY | | QUALITY PLAN NUMBER: Q000000040P | | TOLERANCES: ±.020 UNLESS NOTED | WEIGHT 0.019 LBS. | REV. | DATE | NAME | PART NUMBER: 00 00 647 |
| BT 0500 (1/2") NYLON PLUG | | | | MATERIAL: NYLON 6 COLOR: YELLOW | SCALE 1:1 | | | | DRAWING NUMBER: 00 00 647 |
| | | | | DATE: 01-17-07 | DWG: G. MALECKI | CHK: S.Y. | APP: K.S. | | |
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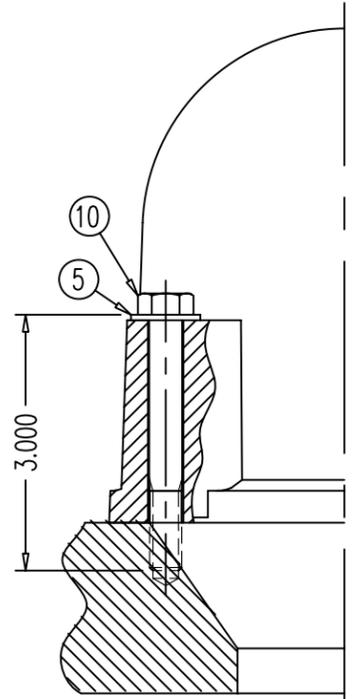
KEEPER PLATE 68 04 2637 ON
WEDGE PLATE 68 04 2534A &
GROUT CAP 68 04 2539 ON Δ
FLAT ANCHOR 68 04 2531



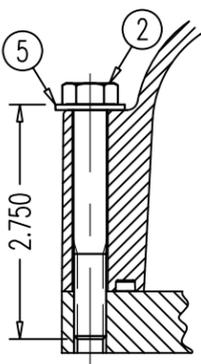
POCKET FORMER 68 04 2640
ON FLAT ANCHOR 68 04 2531



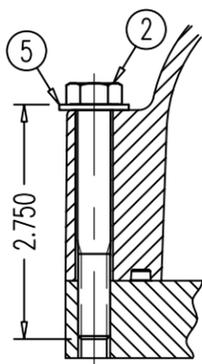
BAR GROUT CAP
B36E50700 & B65E50700



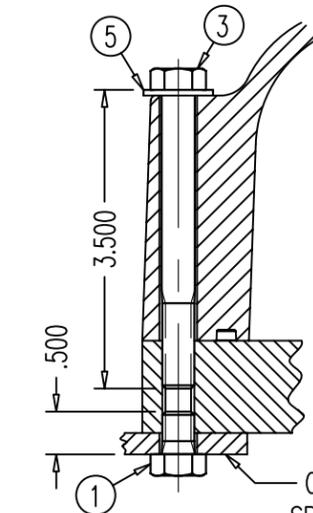
BAR GROUT CAP
B46E50700



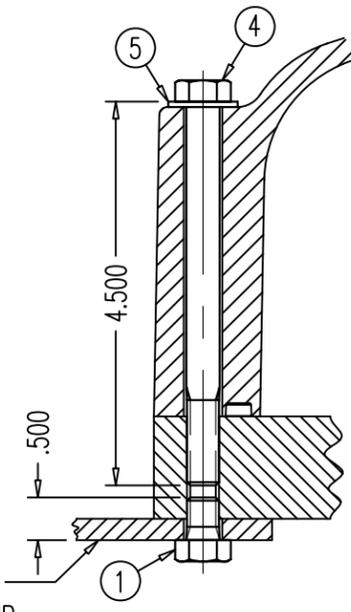
GROUT CAP 68 07 7230
ON MPA 68 07 216



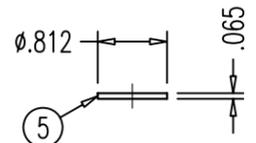
GROUT CAP 68 12 7230
ON MPA 68 12 216



GROUT CAP 68 19 7230
ON MPA 68 19 216



GROUT CAP 68 27 7230
ON MPA 68 27 216



TYPE A NARROW WASHER
FOR 3/8"-UNC BOLT

| POS. | PART NUMBER | DISCRIPTION (ALL PARTS 316L STAINLESS STEEL UNLESS NOTED) |
|------|-------------|---|
| ① | 00 00 770 | 3/8"-16UNC HEX BOLT, 1/2" LONG, ZINC PLATED |
| ② | 00 00 771 | 3/8"-16UNC HEX BOLT, 2-3/4" LONG (1" LONG THREAD) |
| ③ | 00 00 772 | 3/8"-16UNC HEX BOLT, 3-1/2" LONG (1" LONG THREAD) |
| ④ | 00 00 773 | 3/8"-16UNC HEX BOLT, 4-1/2" LONG (1" LONG THREAD) |
| ⑤ | 00 00 774 | TYPE A NARROW WASHER FOR 3/8"-UNC BOLT |
| ⑥ | 00 00 775 | 3/8"-16UNC HEX BOLT, 4" LONG (FULL THREAD) |
| ⑦ | 00 00 776 | 3/8"-16UNC COUPLER, ZINC COATED |
| ⑧ | 00 00 777 | 3/8"-16UNC HEX NUT |
| ⑨ | 00 00 778 | 5/16"-18UNC HEX BOLT, 7/8" LONG, ZINC PLATED |
| ⑩ | 00 00 782 | 3/8"-16UNC HEX BOLT, 3" LONG (1" LONG THREAD) |
| ⑪ | 00 00 783 | 3/8"-16UNC HEX BOLT, 3-1/4" LONG (1" LONG THREAD) |

NOTE:
THE 316L S.S. BOLTS ARE SPECIAL ORDER.
ALL WASHERS, HEX NUTS & COUPLERS HAVE
NO MARKINGS.

APPROVED BY FDOT 09-14-07

DIMENSIONS: INCH

QUALITY PLAN NUMBER:

STAINLESS STEEL 316L BOLTS AND WASHER FOR PLASTIC GROUT CAPS

DATE: 09-14-07 DWG: G. MALECKI CHK: E.A. APP: K.S.

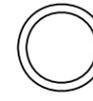
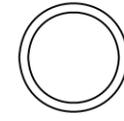
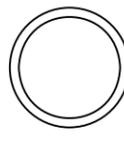
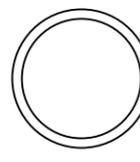
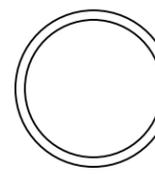
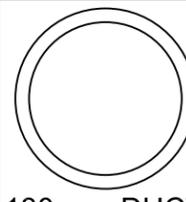
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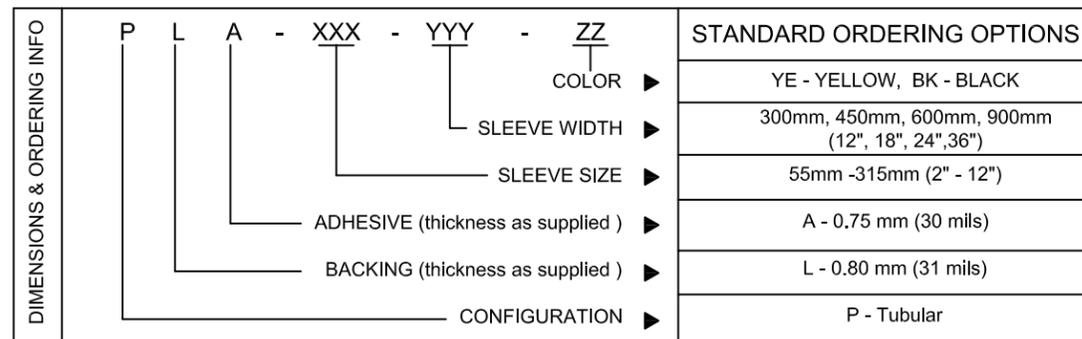
| REV. | DATE | NAME | PART NUMBERS: |
|------|------|------|---------------------|
| | | | 00 00 770 00 00 776 |
| | | | 00 00 771 00 00 777 |
| | | | 00 00 772 00 00 778 |
| | | | 00 00 773 00 00 782 |
| | | | 00 00 774 00 00 783 |
| | | | 00 00 775 |
| | | | DRAWING NUMBER: |
| | | | 00 00 770 |

DYWIDAG-SYSTEMS INTERNATIONAL, USA, INC.
POST TENSIONING / REINFORCING UNIT PHONE: 630-739-1100
320 MARMON DRIVE - BOLINGBROOK, IL FAX: 630-739-1405

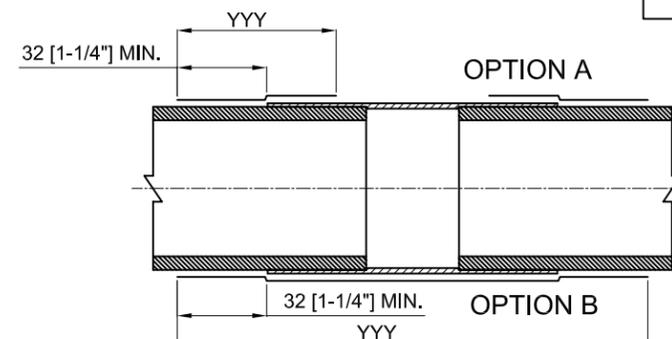


HEAT SHRINK SLEEVES - PLA TYPE UNO

| | | | | | | | | | | | |
|------------------------|-----------------|---|---|---|---|---|---|---|---|---|---|
| | |  |  |  |  |  |  |  |  |  |  |
| TENDON SIZE | | 1 x 0.6" | 3 x 0.6" | 4 x 0.6" | 1 x 0.6" | 7 x 0.6" 1 3/8" | 9 x 0.6" 1 3/4" | 12 x 0.6" 1 3/4" | 15, 19 x 0.6" | 27 x 0.6" | 37 x 0.6" |
| DUCT | ID | 0.90" [23 mm] x 1.50" [38 mm] | 0.827" [21 mm] x 2.835" [72 mm] | 0.984" [25 mm] x 2.992" [76 mm] | Ø 0.94" [23.879 mm] | Ø 2.323" [59 mm] | Ø 2.99" [75.9 mm] | Ø 3.346" [85.0 mm] | Ø 3.937" [100 mm] | Ø 4.528" [115.0 mm] | Ø 5.039" [128.0 mm] |
| | OD ₁ | 1.45" [37] x 2.05" [52 mm] | 1.378" [35] x 3.386" [86 mm] | 1.554" [39.5 mm] x 3.551" [90.2 mm] | Ø 1.48" [37.6 mm] | Ø 2.874" [73 mm] | Ø 3.58" [90.9 mm] | Ø 3.946" [100.2 mm] | Ø 4.573" [116.2 mm] | Ø 5.303" [134.7 mm] | Ø 5.96" [151.0 mm] |
| | OD ₂ | | 0.984" [25] x 2.992" [76 mm] | 1.142" [29 mm] x 3.15" [80 mm] | Ø 1.06" [26.9 mm] | Ø 2.480" [63 mm] | Ø 3.35" [85.1 mm] | Ø 3.546" [90.1 mm] | Ø 4.173" [106.0 mm] | Ø 4.803" [122.0 mm] | Ø 5.36" [136.0 mm] |
| GTI COUPLER Max. OD | | 1.63" [41 mm] x 2.23" [57 mm] | 1.565" [39.8 mm] x 3.565" [90.55 mm] | 1.714" [43.54 mm] x 3.674" [93.32 mm] | Ø 1.7" [43.2 mm] | Ø 3.031" [77 mm] | Ø 3.738" [94.9 mm] | Ø 4.134" [105 mm] | Ø 4.698" [119.3 mm] | Ø 5.599" [142.2 mm] | Ø 6.151" [156.2 mm] |
| ORDER PART # | OPTION A | N/A | PLA-55-112-YE | PLA-55-112-YE | N/A | PLA-55-112-YE | N/A | N/A | N/A | N/A | N/A |
| | OPTION B | N/A | PLA-55-225-YE | PLA-55-225-YE | N/A | PLA-55-225-YE | PLA-90-225-YE | N/A | N/A | N/A | N/A |
| DSI COUPLER Max. OD | | N/A | N/A | N/A | N/A | Ø 3.701" [94 mm] | N/A | Ø 4.824" [122.5 mm] | Ø 5.5" [139.7 mm] | Ø 6.278" [159.5 mm] | N/A |
| ORDER PART # | OPTION A | N/A | N/A | N/A | N/A | PLA-55-150-YE | N/A | PLA-90-150-YE | PLA-100-150-BK | PLA-125-150-YE | N/A |
| | OPTION B | N/A | N/A | N/A | N/A | PLA-55-450-YE | N/A | PLA-90-450-YE | PLA-100-450-BK | PLA-125-450-YE | N/A |
| COLOR | | YE | YE | YE | BK | YE | YE | YE | BK | YE | BK |
| SLEEVE SIZE | | PMA-90/30 | 55 | 55 | PMA-70/25 | 55 | 90 | 90 | 100 | 125 | 160 |



*PMA - HIGH SHRINK SLEEVE.
 - SPCCS. SAME AS PLA.
 - EXPENSIVE THAN PLA (NEEDS LONGER LEAD TIME).
 - HIGH SHRINK TUBULAR BACKING.



MATERIAL:

ACCORDING TO FDOT SPECIFICATION
 POST TENSIONING, SECTION 462 - 4, 2, 6, 3.

NOTES:

1. ORDER DIRECT FROM CANUSA
 TEL. 281 367 - 8866
 FAX. 281 367 - 4304
2. ABOVE TABLE APPLIES TO INTERNAL USE ONLY.
3. SELECT ORDER LENGTH AS A MULTIPLE OF THE ACTUAL LENGTH. SEE OPTION A OR B.
4. *NO CONNECTION DETAILS DEVELOPED.
5. OTHER COLORS SLEEVE MAY BE AVAILABLE UPON REQUEST.
6. OD₁ IS MAX. OD W/ RIBS AND OD₂ IS MAX. OD W/O RIBS
7. N/A MEANS NOT AVAILABLE OR NOT ASSIGNED YET.
8. ALWAYS HEAT THE DUCT ENDS FIRST.

APPROVED BY FDOT 05-31-07

| TUBULAR SLEEVE | TUBULAR SLEEVE DIAMETER | |
|----------------|-------------------------|-----------------|
| | AS SUPPLIED | FULLY RECOVERED |
| PLA 55-YYY ZZ | 3.5" [90mm] | 2.3" [55mm] |
| PLA 63-YYY ZZ | 3.5" [90mm] | 2.5" [63mm] |
| PLA 90-YYY ZZ | 4.8" [120mm] | 3.3" [81mm] |
| PLA 100-YYY ZZ | 5" [130mm] | 3.5" [90mm] |
| PLA 115-YYY ZZ | 5.5" [145mm] | 3.8" [98mm] |
| PLA 125-YYY ZZ | 6.3" [160mm] | 4.3" [110mm] |
| PLA 160-YYY ZZ | 7.5" [190mm] | 5.2" [130mm] |
| PLA 170-YYY ZZ | 8" [205mm] | 5.5" [140mm] |
| PLA 230-YYY ZZ | 10" [260mm] | 7" [180mm] |
| PLA 280-YYY ZZ | 12.3" [315mm] | 8.3" [211mm] |
| PLA 315-YYY ZZ | 14" [360mm] | 9.5" [245mm] |
| PMA 90/30 | 3.5" [90mm] | 1.2" [30mm] |
| PMA 70/25 | 2.8" [70mm] | 1.0" [25mm] |

| | | | | | |
|--|-------------|--------------------|-----------|--|--|
| DIMENSIONS: INCH [mm] mm FOR REFERENCE ONLY | | REV. DATE NAME | | PART NUMBERS: | |
| HEAT SHRINK SLEEVE SIZES FOR INTERNAL APPLICATIONS | | | | SEE TABLE ABOVE | |
| DATE: 05-31-07 | DWG: I.TIRA | CHK: E.A. | APP: K.S. | DRAWING NUMBER: PLA-0-0-0 | |
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DSI

POST-TENSIONING BARS

SYSTEM 100

1-3/8" PT Bar System

Square & Rectangular Bearing Plate Design

Sample Calculations

Per AASHTO LRFD

A thick red horizontal bar is located at the bottom of the page, mirroring the one at the top.



SAMPLE ANCHOR PLATE DESIGN FOR 1-3/8" GR 150 BAR

SQUARE BEARING PLATE

Assumptions:

Concrete strength at stressing $f'_{ci} = 5000$ psi

Thickness of slab = 12 in

Size of anchor plate = 7" x 7.5" x 1.75" of Grade 36 steel.

Area of 1-3/8" bar = 1.58 in².

Maximum anchoring stress = 105 ksi (70% of GUTS)

Maximum anchoring force = 1.58 x 105 = 165.9 kips

Load factor = 1.2 (AASHTO LRFD 3.4.3.2)

Factored anchoring force = 1.2 x 165.9 = 199.1 kips

Anchor plate is designed according to AASHTO LRFD 5.10.9.7.2

$$P_r = \phi f_n A_b$$

f_n is lesser of

$$f_n = 0.7f'_{ci} \sqrt{\frac{A}{A_g}}, \text{ and}$$

$$f_n = 2.25f'_{ci}$$

$$\phi = 0.7 \text{ (AASHTO LRFD 5.5.4.2)}$$

For 12" depth slab,

$$\sqrt{\frac{A}{A_g}} = \sqrt{\frac{12 \times 12.86}{7 \times 7.5}} = 1.71$$

$$f_n = 0.7f'_{ci} \sqrt{\frac{A}{A_g}} = 0.7 \times 5000 \times 1.71 = 5985 \text{ psi}$$

$$f_n = 2.25f'_{ci} = 2.25 \times 5000 = 11250 \text{ psi}$$

Use $f_n = 5985$ psi

$$p_r = \phi f_n = 0.7 \times 5985 = 4190 \text{ psi}$$

Developed factored bearing stress in concrete

$$= \frac{199100}{(7 \times 7.5 - \frac{\pi}{4} 1.875^2)} = 4003 \text{ psi} < 4190 \text{ psi, OK.}$$

The plate size is adequate in terms of bearing stress of concrete.

Check for stiffness of the plate:

As per AASHTO LRFD specs 5.10.9.7.2,

$$\frac{n}{t} \leq 0.083 \sqrt{\frac{E_b}{f_b}}$$

$$\frac{n}{t} = \frac{2.18}{1.75} = 1.25$$

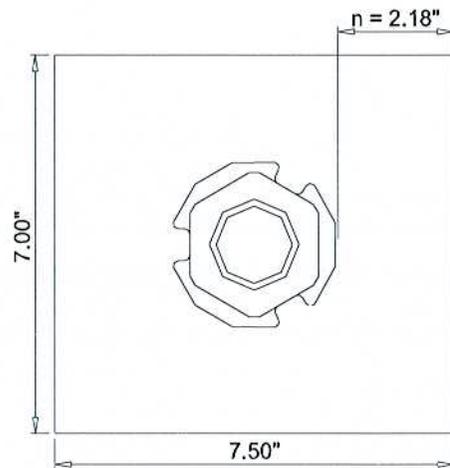
$$E_b = 29000 \text{ ksi}$$

$$f_b = 4.003/1.2 = 3.34 \text{ ksi}$$

$$0.083 \sqrt{\frac{E_b}{f_b}} = 0.083 \sqrt{\frac{29000}{3.34}} = 1.64$$

$$\frac{n}{t} < 0.083 \sqrt{\frac{E_b}{f_b}}, \text{ OK.}$$

The plate is adequate in terms of stiffness.



Design the plate for 199.1 kips, which is equivalent to 3.40- ϕ 0.6" strand system.

As per attached DSI bearing plate calculation program output, the plate is adequate in terms of shear and bending.

Use 7" x 7.5" x 1.75" of Grade 36 steel anchor plate.

BEARING PLATE CALCULATION

Title: SQUARE PLATE FOR 1-3/8" BAR (FDOT SPECS)

System > (3.4) - 0 .6 in. dia.
Wedge plate size > 2.77 in. dia x 3.531 in thick
Bearing plate size > 7 x 7.5 x 1.75 (1.949 in. dia hole)
Hole under bearing plate > 1.949 (in. dia hole)

Average concrete stress (under %100.0% of GUTS) 4.02 ksi

Yield (Str.Bearing Plate) > 36.00 ksi

The following under load of %100.0% of GUTS:

Steel bearing stress > 65.47 ksi
Vertical shear in bearing plate . . > 3.84 ksi
Bending stress in bearing plate . . > 12.42 ksi
Bending stress-bottom > 2.49 ksi
Bending stress-top of Wpl > -3.61 ksi
Friction coefficient > 0.04

Contact slen, OK
} *OK*

Print, Rerun, Quit, Edit, Save, or Load . . (P/R/Q/E/S/L)

John Griffin
1-9-08



SAMPLE ANCHOR PLATE DESIGN FOR 1-3/8" GR 150 BAR

RECTANGULAR BEARING PLATE

Assumptions:

Concrete strength at stressing $f'_{ci} = 4000$ psi

Thickness of slab = 12 in

Size of anchor plate = 5" x 9.5" x 2.0" of Grade 36 steel.

Area of 1-3/8" bar = 1.58 in².

Maximum anchoring stress = 105 ksi (70% of GUTS)

Maximum anchoring force = 1.58 x 105 = 165.9 kips

Load factor = 1.2 (AASHTO LRFD 3.4.3.2)

Factored anchoring force = 1.2 x 165.9 = 199.1 kips

Anchor plate is designed according to AASHTO LRFD 5.10.9.7.2

$$P_r = \phi f_n A_b$$

f_n is lesser of

$$f_n = 0.7f'_{ci} \sqrt{\frac{A}{A_g}}, \text{ and}$$

$$f_n = 2.25f'_{ci}$$

$$\phi = 0.7 \text{ (AASHTO LRFD 5.5.4.2)}$$

For 12" depth slab,

$$\sqrt{\frac{A}{A_g}} = \sqrt{\frac{12 \times 22.8}{5 \times 9.5}} = 2.4$$

$$f_n = 0.7f'_{ci} \sqrt{\frac{A}{A_g}} = 0.7 \times 4000 \times 2.4 = 6720 \text{ psi}$$

$$f_n = 2.25f'_{ci} = 2.25 \times 4000 = 9000 \text{ psi}$$

Use $f_n = 6720$ psi

$$p_r = \phi f_n = 0.7 \times 6720 = 4704 \text{ psi}$$



Developed factored bearing stress in concrete

$$= \frac{199100}{(5 \times 9.5 - \frac{\pi}{4} 1.875^2)} = 4450 \text{ psi} < 4704 \text{ psi, OK.}$$

The plate size is adequate in terms of bearing stress of concrete.

Check for stiffness of the plate:

As per AASHTO LRFD specs 5.10.9.7.2,

$$\frac{n}{t} \leq 0.083 \sqrt{\frac{E_b}{f_b}}$$

$$\frac{n}{t} = \frac{3.18}{2.0} = 1.59$$

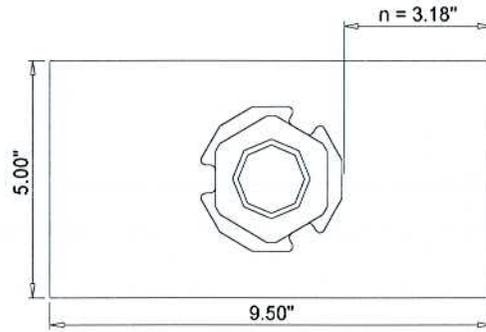
$$E_b = 29000 \text{ ksi}$$

$$f_b = 4.45/1.2 = 3.71 \text{ ksi}$$

$$0.083 \sqrt{\frac{E_b}{f_b}} = 0.083 \sqrt{\frac{29000}{3.71}} = 1.59$$

$$\frac{n}{t} = 0.083 \sqrt{\frac{E_b}{f_b}}, \text{ OK.}$$

The plate is adequate in terms of stiffness.



Design the plate for 199.1 kips, which is equivalent to 3.40- ϕ 0.6" strand system.

As per attached DSI bearing plate calculation program output, the plate is adequate in terms of shear and bending.

Use 5" x 9.5" x 2.0" of Grade 36 steel anchor plate.

BEARING PLATE CALCULATION

Title: RECTANGULAR PLATE FOR 1-3/8" BAR (FDOT SPECS)

System > (3.4)- 0 .6 in. dia.
Wedge plate size > 2.77 in. dia x 3.531 in thick
Bearing plate size > 5 x 9.5 x 2 (1.949 in. dia hole)
Hole under bearing plate > 1.875 (in. dia hole)

Average concrete stress (under %100.0% of GUTS) 4.47 ksi

Yield (Str.Bearing Plate) > 36.00 ksi

The following under load of %100.0% of GUTS:

Steel bearing stress > 65.47 ksi, contact stress, OK
Vertical shear in bearing plate . . > 3.93 ksi
Bending stress in bearing plate . . > 17.90 ksi
Bending stress-bottom > 3.35 ksi
Bending stress-top of Wpl > -3.85 ksi
Friction coefficient > 0.04

} OK

Print, Rerun, Quit, Edit, Save, or Load . . (P/R/Q/E/S/L)

John Smith
1-9-08



DSI

SYSTEM 100

**1", 1-1/4" Nuts & 1-3/8" Anchor Nut
Bar System Grout Cap**

GROUT CAP PRESSURE TEST REPORTS

Per FDOT 462-4.2.7.1

Tests & Reports by Rone Engineering (2006)

REPORT OF 1", 1 1/4", & 1 3/8" BAR GROUT CAP

Client: DSI
Mr. Mark Milici
525 Wanaque Ave
Pompton Lakes NJ 07442

Report No.: 902333
Project No.: 0510217
Date of Service: 08/24/2006
Report Date: 09/28/2006

Project: Florida DOT Testing

Services: Witness external system pressure test on bar grout cap.

Report of Test

On this date, a representative of Rone Engineering Services, Ltd. was present at the DSI facility in Bolingbrook, IL to witness an external system pressure test on a bar grout cap/bearing plate assembly. The grout cap, P/N B36E50700, is utilized on 1" and 1-1/4" nuts and 1-3/8" anchor nuts. The test was performed in accordance with Florida DOT Specification 462-4.2.7.1. Results are given below.

STAGE 1

The grout cap was secured to a steel plate (simulating attachment to bearing plate) utilizing four 3/8" stainless steel bolts. An O ring was installed to seal the grout cap to bearing plate connection. A 3/4" pipe was installed at the vent port with a shutoff valve and pressure gauge in line, through which to introduce air and monitor air pressure. The test setup passes the Stage 1 criteria.

STAGE 2

The assembly was pressurized to 150 psi and conditioned for three hours. Upon completion of the conditioning period the shutoff valve was closed and the pressure monitored for five minutes. Pressure was measured with a 160 psi pressure gauge calibrated on 07/17/06. After five minutes, a pressure loss of 3 psi was sustained by the grout cap assembly. The test passes the Stage 2 criteria.

Technician: Jack Gary
Report Distribution:
(1) DSI

Rone Engineering



Jack Gary
Special Testing



DSI

POST-TENSIONING BARS

SYSTEM 100

59mm GTI PP DUCT TEST REPORTS
59mm DUCT MINIMUM BENDING RADUIS

Per FIB Bulletin No.7
“Corrugated Plastic Ducts for Internal Bonded Post-tensioning”

Test & Reports by Professional Services Industries (PSI)

A thick red horizontal bar is located at the bottom of the page, below the text.

General Technologies, Inc.
13002 Trinity
Stafford, Texas 77477

Project: 59 MM
Polypropylene
(PP) Corrugated Duct
P/N: 220200

Date: 4/6/05

Project No: 202-48050

The following test was witnessed by Professional Service Industries, Inc. (PSI) in accordance with test procedures and samples supplied by General Technologies, Inc. Test data and results are documented below:

Test #1 Dimensional Tolerance of Duct

Test Procedure

A test specimen of 59mm duct with a length of approximately 500mm was used. The internal diameter, d_1 was determined by means of a Vernier caliper (accuracy 0.1mm) (see Fig. A1.1). Measurements were taken at both ends of the specimen in two directions at right angles to one another. The mean values were calculated from the values obtained. Actual and mean values were recorded.

The following results were recorded:

Date of Test: 10-1-04

| 1) Wall Thickness "T" | | 2) Inside Diameter "D" | 3) Rib Height "H" | |
|-----------------------|-----------|------------------------|----------------------|-----------|
| a.) 0.093 | e.) 0.097 | a.) 2.281 | a.) 0.278 | e.) 0.289 |
| b.) 0.100 | f.) 0.095 | b.) 2.282 | b.) 0.275 | f.) 0.288 |
| c.) 0.092 | g.) 0.089 | c.) 2.266 | c.) 0.264 | g.) 0.274 |
| d.) 0.088 | h.) 0.105 | d.) 2.285 | d.) 0.286 | h.) 0.286 |
| Avg. 0.094 (2.49 mm) | | Avg. 2.278 (57.86 mm) | Avg. 0.280 (7.11 mm) | |

Test #2 Flexural Behavior of Duct without Coupler

Specimen

A section of 1100 mm length of duct under consideration was taken.

Test Procedure

The specimen was subjected to three-point-bending as shown in Fig. A2.1 by increasing the load F. The distance between the supports was 1000 mm.

The following results were recorded:

- Load F at instantaneous mid-span deflection of $f = 20$ mm,
- Load F after 2 minutes of mid-span deflection of $f = 20$ mm,
- Instantaneous residual mid-span deflection, f , after release of load F,
- Residual mid-span deflection f , 2 minutes after release of load F.

Date of Test: 08-20-04

- a) Test span – 1 meter
- b) Test deflection – 20 mm
- c) Initial Load at 20 mm deflection – 25 newtons
- d) 2-minute load at 20 mm deflection – 20 newtons
- e) Initial deflection at release of load – 16.3 mm
- f) Deflection after 2 minute load release – 18 mm

Test # 3 Flexibility of Duct with Coupler

Test Procedure

The specimen was bent slowly by hand around the template in each direction and repeated (see figure A3.1) over a length of 800 mm. For the sequence of bending, see Fig. A3.2. While in the last bent position in either bending direction, a steel plunger with the shape and the dimensions of $d_i=59$, $d_p=56$, $h_1=70$, $h_2=28$, $h_3=42$, $r=5$ was inserted and passed the specimen in the whole length, after the specimen had been held in the bent position for 2 minutes.

Date of Test: 10-1-04

- Radius – 1500 mm
- Radius length – 800 mm
- Duct length – 1100 mm with coupler at midspan – 550 mm
- Flexcycles – 2
- Plunger at drop test after 2 flexcycles – 56 mm plunger passed freely through duct after 2 cycles.

Test #4 – Lateral Load Resistance of Duct Only

Test Procedure

An 1100 mm long duct specimen was placed on a firm, 500 mm long base as shown on Fig. A4.1 and was subjected to a 150 lbs. load by means of a plunger provided with a cylindrical end with a diameter of 12 mm. Each test specimen was loaded twice in two different places between the ribs, where possible. The places of loading were situated in the middle part of the specimen and had a distance of 150 mm minimum from one another. The time of load application was 30 seconds. Immediately and 2 minutes after unloading, the smallest irreversible internal diameter of the sheath was determined at each loading point, and was recorded.

Date of Test: 10-1-04

| | <u>Location 1</u> | <u>Location 2</u> |
|--|-------------------|-------------------|
| Deflection Immediately after Unloading | 0.099”(2.51mm) | 0.085”(2.16mm) |
| Deflection Two Minutes after Unloading | 0.052”(1.32mm) | 0.083”(2.11mm) |

Test #5 Longitudinal Load Resistance with Coupler

Test Procedure

An 1100 mm long duct specimen was connected to at least one duct coupler and/or connection to an anchorage, and was subjected to an applied load as specified below over a period of 10 minutes (see Fig. A5.1). The applied deformation was 8 mm/m of free duct length between connector and base (1100 mm – 1₁). No internal stiffeners were used. The displacement of the coupler or connection in relation to the duct, occurring under the applied, was measured. This value was recorded.

Date of Test: 10-1-04

| | | | |
|-----------------------------------|-------------|-------------|---------------------|
| Load Applied | 150 newtons | 225 newtons | 305 newtons |
| Deflection 1 (750mm) | 3mm | 4 mm | 7 mm |
| Deflection 2 (958 mm) | 2 mm | 4 mm | 6 mm |
| Deflection 3 (1104 mm) | 3 mm | 4 mm | 6 mm |
| Final Deflection after 10 minutes | | | 265 newtons at 6 mm |

Test #6 Leak Tightness of Duct System with Coupler

Test Procedure

The test was conducted on an 1100 mm long duct specimen which has previously been subjected to test #'s 3, 4 and 5 including a connector but without re-assembly of duct/coupler connection. The duct specimen was bent with a template as described in Fig. A3.1, to the minimum radius of tendon curvature specified by the system holder including an allowance for specified duct placement tolerances on tendon supports further reducing the bending radius.

The specimen was pressure tested with water applied under a pressure of 0.5 bar (50 kPa) by sealing at both ends and inducing air pressure over a period of 5 minutes. The water pressure was first applied on the inside of the duct. Subsequently, the water pressure was applied from the outside of the duct.

Date of Test: 10/1/04

External Pressure by Internal Vacuum Test

- 1) Vacuum Pressure - 0.5 bar
- 2) Duration – 5 minutes
- 3) Results – no water visible inside duct after test.

Internal Pressure Test

- 1) Pressure – 0.5 bar
- 2) Duration – 5 minutes
- 3) Results – no water visible on outside of duct.

Test #7 Wear Test of Duct

Test Specimen

A four (4") inch length of the 59 mm duct was sectioned and formed in an aluminum holder with polyester resin.

Test Procedure

A twenty (20') foot test frame was assembled with 0.6" diameter strand stressed to 70% of total load (43.9 kips). The test specimen was compressed in its holder against the pre-tensioned cable to a load of 1500 lbs. while pulled 750 mm along the cable over a period of 20 minutes. The load was released after three (3) minutes from the specimen/holder and measurements of the duct specimen were recorded.

Date of Test: 09-15-04

| | <u>1</u> | <u>2</u> | <u>3</u> | <u>AVG</u> |
|-----------------------------------|---------------|---------------|---------------|---------------|
| Duct Wall Thickness (Before Test) | .093"(2.36mm) | .091"(2.31mm) | .091"(2.31mm) | .092"(2.34mm) |
| Duct Wall Thickness (After Test) | .067"(1.70mm) | .068"(1.72mm) | .056"(1.42mm) | .064"(1.63mm) |

Minimum Bend Radium Test

Test Specimen

A four (4") inch length of the 59 mm duct was sectioned and formed in an aluminum holder with shep rock used as a fill material.

Test Procedure

A thirty (30') foot test frame was assembled with 0.6" diameter strand stressed to 70% of total load (43.9 kips). The test specimen was compressed in its holder against the pre-tensioned cable to a load of 1500 lbs. The load was maintained for seven (7) days. The Load was released after seven (7) days and the specimens were removed from the holders And measurements of the duct specimen were recorded at three (3) locations.

Date of Test: 9/22/04

| | <u>1</u> | <u>2</u> | <u>3</u> | <u>AVG</u> |
|---|---------------|---------------|---------------|---------------|
| Duct Wall Thickness (Before Test) | .122"(3.10mm) | .100"(2.54mm) | .112"(2.84mm) | .111"(2.82mm) |
| Duct Wall Thickness (After Test) | .087"(2.21mm) | .068"(1.73mm) | .074"(1.88mm) | .076"(1.93mm) |

Test #8 Bond Test 59 mm Polypropylene (PP) Corrugated Duct P/N: 220200

Test procedure

Using 3 samples of 2 3/8" Polypropylene (PP) corrugated duct, pregrouted inside the duct, for a length of 40", 4 – 0.6" diameter strands. Strands supplied by GTI and reported to conform to ASTM 416. 4-0.6" strands were used inside the duct in order to apply the pull-out load on the sample.

Install pregrouted duct samples inside a reinforced concrete test block, in the horizontal position at 24" center to center, as shown on the attached drawings. Duct length embedded was 40" = 16 x 2.323" diameter (59mm) + 3". The 3" length was a short piece of coupler placed at the end of the corrugated sheathing as a bond breaker. An extra 5' length bare strand was provided for stressing tail.

Concrete compressive strength at time of stressing was 7,130 psi.

Following stressing sequence shown and using a calibrated hydraulic jack, gradually increase the load in 4 increments until 164.08 kips is reached. The load was increased to 175.62 kips the equivalent of 40% of 7 -15.7mm Supers strand force for Europe applications and then released. GTI indicated the purpose of the test is to prove that 16 diameters of duct length can provide enough bond to the surrounding concrete when the tendon is loaded to 40% GUTS of 7-0.6" strands (164.08 kips) then further increased to 40% GUTS of 7 -15.7mm Super strands (176.62 kips).

Date of Test: 03-25-04

Test Results

Fu=410.2 kips for 7-0.6",

Fu_{fib}=439 kips for 7-15.7mm Super Strand (62.72 kips/strand)

Gauge I.D.: 6-10304

Ram I.D.: B305

Concrete compressive strength of concrete at time of stressing= 7130 psi

Grout Compressive strength at time of stressing=8430 psi

See Attached Data sheet



| Sample | Recorded Pressure (psi) | Recorded Load (kips) | Grout Column Dial gauge (inch) | Cable 1 Dial gauge (inch) | Cable 2 Dial gauge (inch) | Cable 3 Dial gauge (inch) | Duct Dial gauge (inch) | Grout Movement (inch) | Avg cable Movement (inch) | Duct Movement (inch) | P/Fu (%) | P/Fu _{lib} (%) |
|--------|-------------------------|--------------------------|--------------------------------|---------------------------|---------------------------|---------------------------|------------------------|-----------------------|---------------------------|----------------------|----------|-------------------------|
| 59-1 | 1150 | 41.5 | 0.402 | 1.514 | 1.607 | 1.482 | 0.986 | 0.000 | 0.000 | 0.000 | 10.1% | 9.5% |
| | 2300 | 83.1 | 0.401 | 1.514 | 1.607 | 1.482 | 0.986 | 0.001 | 0.000 | 0.000 | 20.3% | 18.9% |
| | 3400 | 122.8 | 0.400 | 1.514 | 1.605 | 1.481 | 0.986 | 0.002 | 0.000 | 0.000 | 30.0% | 28.0% |
| | 4600 | 166.2 | 0.400 | 1.514 | 1.605 | 1.480 | 0.985 | 0.002 | 0.000 | 0.001 | 40.5% | 37.9% |
| | 4900 | 177.0 | 0.399 | 1.513 | 1.605 | 1.480 | 0.985 | 0.003 | 0.001 | 0.001 | 43.2% | 40.3% |
| 59-2 | 1150 | 41.5 | 0.028 | 1.452 | 1.456 | 0.601 | 1.016 | 40.9485 | -0.988 | -0.988 | 10.1% | 9.5% |
| | 2300 | 83.1 | 0.026 | 1.451 | 1.455 | 0.599 | 1.016 | 82.5 | -0.99 | -0.99 | 20.3% | 18.9% |
| | 3400 | 122.8 | 0.025 | 1.451 | 1.453 | 0.599 | 1.016 | 122.243 | -0.991 | -0.991 | 30.0% | 28.0% |
| | 4600 | 166.2 | 0.025 | 1.449 | 1.452 | 0.597 | 1.016 | 165.601 | -0.991 | -0.991 | 40.5% | 37.9% |
| | 4900 | 177.0 | 0.023 | 1.447 | 1.451 | 0.595 | 1.015 | 176.442 | -0.992 | -0.992 | 43.2% | 40.3% |
| 59-3 | 1150 | 41.5 | 0.195 | 1.266 | 0.772 | 1.152 | 0.634 | 40.3975 | -0.439 | -0.439 | 10.1% | 9.5% |
| | 2300 | 83.1 | 0.195 | 1.265 | 0.772 | 1.150 | 0.632 | 81.949 | -0.437 | -0.437 | 20.3% | 18.9% |
| | 3400 | 122.8 | 0.194 | 1.265 | 0.772 | 1.150 | 0.632 | 121.692 | -0.438 | -0.438 | 30.0% | 28.0% |
| | 4600 | 166.2 | 0.192 | 1.263 | 0.771 | 1.149 | 0.631 | 165.049 | -0.439 | -0.439 | 40.5% | 37.9% |
| | 4900 | 177.0 | 0.192 | 1.263 | 0.771 | 1.147 | 0.631 | 175.89 | -0.439 | -0.439 | 43.2% | 40.3% |
| | | | 0.003 | 0.001 | 0.002 | 0.002 | 0.001 | | | | | |
| | | Movement (Inches) | 0.003 | 0.001 | 0.002 | 0.002 | 0.001 | | | | | |
| | | Movement (Inches) | 0.005 | 0.005 | 0.005 | 0.006 | 0.001 | | | | | |
| | | Movement (Inches) | 0.003 | 0.003 | 0.001 | 0.005 | 0.003 | | | | | |

Witnessed by: Joe Yarborough, inspector with PSI
Test Location: 132111 Royal Avenue, Stafford

Limitations:

The services performed by PSI were performed in accordance with our proposed scope of services and the standard of care as practiced by professionals performing similar services in this geographic locale. Our testing and observations were not performed on a full time basis. Our testing and observations represent samples selected by our client. General Technologies, Inc. asserts that the samples were representative of the product produced. While the samples were selected by our client and reported to be representative of production materials, the specific test results are valid for the location and the material actually tested. No other warrantee or guarantee is expressed or implied. This report may not be copied, except in the entirety, without the expressed written permission of PSI.

If you have any questions or require any additional information, please contact us at your convenience.

Respectfully submitted,
Professional Service Industries, Inc.



Michael D. Phares, CWI
District Manager



Iradj Ayazi, P.E.
Vice President



4/12/05



Erich Aigner
DSI Bolingbrook

January 7, 2008

Dear Sir:

RE: 59mm Corrugated Plastic Duct Minimum Bending Radius

This letter will confirm that the 1,500 pound clamping force (1.5 kips) used in the testing corresponds to a 22.76 foot minimum bending radius for a 59mm diameter duct with 7 strands as calculated below.

fib formula for clamping force, Page 36 of fib Bulletin 7.



$$\text{Clamping Force } Q = 0.7 \cdot F_{tk} \cdot A_p \cdot k \cdot l / R_{min}$$

- $F_{tk} = 270$ ksi
- $A_p = 0.217$ square inches
- $k =$ Cable Factor according to Fig. A 7.3
- $l = 2 \cdot s \Rightarrow 100$ mm; assumed 4 inches!
- $R_{min} =$ Minimum Bending Radius

Therefore

Mini Bending Radius

$$\begin{aligned}
 R_{min} &= (0.7 \cdot F_{tk} \cdot A_p \cdot k \cdot L) / Q && \text{where } k = 2.5 \text{ for } 7 \text{ strands} \\
 & && s = 4.0" \text{ or } .333\text{ft} \\
 &= (0.7 \times 270\text{ksi} \times 0.217\text{in}^2 \times 2.5 \times 0.333 \text{ft}) / 1.5\text{k} \\
 &= \mathbf{22.76 \text{ feet}} && (\text{K/in}^2) \cdot \text{in}^2 \cdot \text{ft} / \text{K}
 \end{aligned}$$

We trust that this information will be satisfactory.

Sincerely,

Joe Harrison, P.E.
Vice President, Marketing



**THE AMERICAN
ASSOCIATION
FOR LABORATORY
ACCREDITATION**

ACCREDITED LABORATORY

A2LA has accredited

PROFESSIONAL SERVICE INDUSTRIES, INC.
Houston, TX

for technical competence in the field of

Construction Materials Testing

The accreditation covers the specific tests and types of tests listed on the agreed scope of accreditation. This laboratory meets the requirements of ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration Laboratories" and any additional program requirements in the identified field of testing.

Presented this 9th day of August 2005.



President
For the Accreditation Council
Certificate Number 0037.01
Valid to April 30, 2007

For tests or types of tests to which this accreditation applies,
please refer to the laboratory's Construction Materials Scope of Accreditation.



American Association for Laboratory Accreditation

SCOPE OF ACCREDITATION TO ISO/IEC 17025-1999

PROFESSIONAL SERVICE INDUSTRIES, INC.
1714 Memorial Drive
Houston, TX 77007
Michael Lavelle Phone: 713 224 2047

Valid To: April 30, 2007

Certificate Number: 0037.01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory for:

CONSTRUCTION MATERIALS ENGINEERING

ASTM: E329 (materials), C1077 (concrete), D3666 (bituminous), D3740 (soils), E543 (nondestructive)

CONSTRUCTION MATERIALS TESTING

Concrete:

| | | | | | | | | | |
|-------|-------|-------|-------|--------|-------|-------|-------|-------|------|
| ASTM: | C31* | C39 | C42* | C78 | C138* | C143* | C172* | C173* | C174 |
| | C192 | C231* | C293 | C341 | C403* | C490 | C495 | C496 | C513 |
| | C567 | C617 | C642 | C684 | C803* | C805* | C823* | C878 | C918 |
| | C939* | C942 | C1064 | C1074* | C1140 | C1231 | | | |

Masonry, Mortar, Grout, and Ceramic Tile:

| | | | | | |
|-------|------------------------------|-----------------------------|------|------|------|
| ASTM: | C67 (compression/absorption) | C109 (compressive strength) | C140 | C426 | C780 |
| | C1019 | C1314 | | | |

Aggregates:

| | | | | | | | | | |
|-------|------|------|------|------|------|------|------|------|------|
| ASTM: | C29 | C40 | C70 | C88 | C117 | C123 | C127 | C128 | C136 |
| | C142 | C566 | C702 | D75* | | | | | |

TSDHPT: TEX200F TEX201F TEX202F

Soils:

| | | | | | | | | | |
|-------|--------|--------|--------|--------|-------|-------|-------|-------|--------|
| ASTM: | D421 | D422 | D427 | D558 | D559 | D698 | D854 | D1140 | D1194* |
| | D1556 | D1557 | D1633 | D2168 | D2216 | D2217 | D2487 | D2488 | D2901* |
| | D2922* | D2937* | D3017* | D3155* | D3282 | D3668 | D4253 | D4254 | D4318 |
| | D4718 | D4972 | | | | | | | |

TSDHPT: TEX101E TEX112E TEX113E TEX114E TEX120E TEX128E TEX130E (Part II)
TEX140E

Bituminous:

| | | | | | | | | | |
|-------|-------|-------|--------|-------|-------|-------|-------|-------|-------|
| ASTM: | D290* | D546 | D979* | D1074 | D1075 | D1188 | D1559 | D1560 | D2041 |
| | D2172 | D2726 | D2950* | D3203 | D3549 | D3665 | | | |

TSDHPT: TEX204F TEX205F TEX206F TEX207F TEX208F TEX210F TEX221F TEX222F
TEX225F TEX226F TEX227F TEX233F

(A2LA Cert. No. 0037.01) 08/09/05

Page 1 of 2



Lime:

TSDHPT: TEX600J (Hydrate Alkalinity, Dry Solids Content, Bulk Density at 77°F,
Dry Lime Concrete, and Screen Analysis)

Roofing:

ASTM: D1863 (excluding hardness test)D1864

*Steel:

AISC: Bolt-Torque

AISC, ASME, AWS: Erection (visual), Fabrication, Welding (visual),
Welding Qualification (both field and shop inspection)

*Nondestructive:

ASTM: E94 E114 E142 E164 E165 E213 E709

Floors:

ASTM: E1155*

* Site Tests





DSI

POST-TENSIONING BARS

SYSTEM 100

- **59mm GTI PP DUCT OIT TEST REPORTS**
- **59mm GTI PP DUCT CELL CLASS TEST REPORTS**
- **GTI 59mm DUCT COUPLER OIT TEST REPORTS**
- **GTI 59mm DUCT COUPLER NCLS TEST REPORTS**
- **TESTING AGENCY ACCREDITATION LETTER**

Per FDOT 462.4.2.5.5

Test & Reports by HAUSER Laboratories

A thick red horizontal bar is located at the bottom of the page, below the text "Test & Reports by HAUSER Laboratories".

CLIENT: General Technologies, Inc.
13022 Trinity Drive
Stafford, TX 77477
Attention: Joe Harrison PO 998009

SAMPLES: Two lengths of extruded white plastic corrugated duct were received from the Client, identified as White Polypropylene (PP) duct, with the printline indicating "X3F" and a date indication of "D42". One specimen of each piece was tested for Oxygen Induction Time (OIT).

All other specimens were received from the Akron Rubber Development Laboratory (ARDL), who molded ground-up PP duct which they received from the Client. Test specimens were molded there in accordance with ASTM D3641, as referenced by ASTM D4101 section 11. In addition, approximately one pound of ground-up PP duct from the same production run was received. All cell class testing was performed using these specimens.

TESTS: Specimens were compression-molded at 190°C to a thickness of 0.010 inches, and then were rapidly cooled to room temperature, for Oxidation Induction Time (OIT) tests. Testing was performed at 200°C in accordance with ASTM D3895-03. Specimens were die-cut from compression-molded films, and were tested in crimped aluminum pans.

Cell class testing was performed in accordance with the test methods and conditions referenced in ASTM D4101-02b.

RESULTS: See Table 1 for cell class and Table 2 for OIT.

The white PP duct exhibited test properties consistent with cell class PP_ _ _ _B45754, with Group, Class, and Grade specified by the Client as 03, 4, and 0 respectively. This gives an overall cell classification per ASTM D4101 PP0340B45754.

This report applies only to the sample(s) tested or analyzed. This report may be copied only in its entirety.

Table 1: Cell Class per ASTM D4101
Table B Property Levels

| Designation Order No. | 1 | 2 | 3 | 4 | 5 |
|------------------------------|-----------------------|----------------------------|-------------------------|-----------------------------------|------------------------------|
| Property | Tensile yield stress | Flexural 1% secant modulus | Izod Impact resistance | Deflection Temperature at 455 kPa | Flow Rate condition 230/2.16 |
| ASTM Test Method | D638-03 Type I, 2 ipm | D790-03 (A) | D256-04 @ 23°C, notched | D648-04 | D1238-04 |
| Average: SI Units | 22.55 MPa | 1020 MPa | 624 J/m | 91.7°C | 4.42 g/10 min |
| Standard Dev: SI units | 0.15 MPa | 25 MPa | 22 J/m | 9.1°C | NA |
| Average: US units | 3270 psi | 147,900 psi | 11.70 ft*lb/in | 197°F | NA |
| Standard Deviation: US units | 22 psi | 3600 psi | 0.42 ft*lb/in | 16°F | NA |
| Cell digit | 4 | 5 | 7 | 5 | 4 |

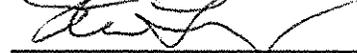
Table 2: OIT Values in minutes

| Sample | OIT 1 (minutes) | OIT 2 (minutes) | Average (minutes) |
|-------------------------|-----------------|-----------------|-------------------|
| Re-molded White PP Duct | 24.8 | 21.1 | 23.0 |

REPORT WRITTEN BY:


David W. Woods
Senior Scientist

REPORT REVIEWED BY:


Steve Ferry
Director, Hauser Laboratories

This report applies only to the sample(s) tested or analyzed. This report may be copied only in its entirety.

ESCORENE[®]

Polypropylene

PP7032 E2 Copolymer Grade for Injection Molding

Description

Medium impact copolymer resin for general purpose injection molding.

| Resin Properties | ASTM Method | Typical Values ¹ | SI Units |
|---|-----------------------|-----------------------------|-----------|
| Melt Flow Rate (230°C/2.16 kg) | D 1238 | 4.5 g/10 min | |
| Density | D 792 | 0.90 g/cm ³ | |
| Mechanical Properties | | | |
| Tensile Strength @ Yield (2 in/min, 50 mm/min) | D 638 | 3.4 kpsi | 24 MPa |
| Elongation @ Yield (2 in/min, 50 mm/min) | ExxonMobil Method | 13 % | |
| Flexural Modulus, 1% Secant (0.05 in/min, 1.3 mm/min) | D 790A | 146 kpsi | 1010 MPa |
| Izod Impact Strength Notched, @ 23°C (73°F) | D 256 Method A | No Break | |
| Gardner Impact Strength 0.125 in. (3.2 mm) thick disk @ -29°C (-20°F) | D 5420 Geometry GC | 300 in-lb | 34 J |
| Thermal Properties | | | |
| Heat Deflection Temperature @66 psi, 455 kPa | D 648 | 181°F | 83°C |
| Typical Processing Temperature | | 400-475°F | 204-246°C |

1. Values given are typical and should not be interpreted as specification

FDA Status

This resin complies with FDA regulations 21 CFR 177.1520 (c)3.1a and (c)3.2a, and may be used as articles or components of articles intended for packing or holding food during cooking.

CLIENT: General Technologies, Inc.
 13022 Trinity Drive
 Stafford, TX 77477
 Attention: Joe Harrison PO 998009

SAMPLES: Four molded plastic parts were received, identified as "Red Couplers" by the Client. The same box also contained one plastic bag containing irregular-shaped granular plastic material of the same color, identified by the Client as being "Ground-up Red Couplers." The material was further identified as being polyethylene, made to conform to "Item 462-4.2.3."

TESTS: All specimens were taken from plaques compression-molded from the ground-up couplers.

Testing was performed for Oxidation Induction Time (OIT) at 200°C in accordance with ASTM D3895-03. Specimens were die-cut from compression-molded films approximately 0.010 inches in thickness, and were tested in crimped aluminum pans.

Specimens die-cut from a compression-molded plaque 0.075 inches in thickness were tested for Notched Constant Ligament Stress (NCLS) in accordance with ASTM F2136-01, at a stress of 348 psi, at 50°C.

RESULTS: See Table 1 for NCLS and Table 2 for OIT.

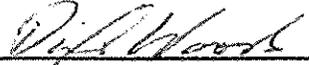
Table 1: NCLS values in hours

| Sample | average hours | std dev hours | Minimum hours |
|-----------------------|---------------|---------------|---------------|
| Re-molded Red Coupler | 18.12 | 6.43 | 11.9 |

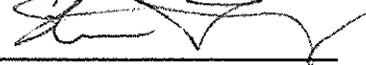
Table 2: OIT Values in minutes

| Sample | OIT 1 (minutes) | OIT 2 (minutes) | Average (minutes) |
|-----------------------|-----------------|-----------------|-------------------|
| Re-molded Red Coupler | 99.7 | 126 | 113 |

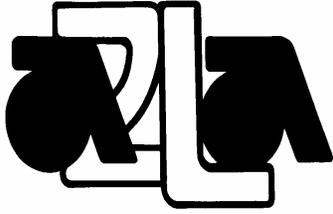
REPORT WRITTEN BY:


 David W. Woods
 Senior Scientist

REPORT REVIEWED BY:


 Steve Ferry
 Director, Hauser Laboratories

This report applies only to the sample(s) tested or analyzed. This report may be copied only in its entirety.



**THE AMERICAN
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ACCREDITATION**

ACCREDITED LABORATORY

A2LA has accredited

**MICROBAC LABORATORIES, INC
HAUSER LABORATORIES DIVISION
Boulder, CO**

for technical competence in the field of

Mechanical Testing

The accreditation covers the specific tests and types of tests listed on the agreed scope of accreditation. This laboratory meets the requirements of ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration Laboratories" and any additional program requirements in the identified field of testing.

Presented this 12th day of December 2005.



A handwritten signature in cursive script, reading 'Peter Abney'.

President
For the Accreditation Council
Certificate Number 0018.04
Valid to June 30, 2007

For the tests or types of tests to which this accreditation applies,
please refer to the laboratory's Mechanical Scope of Accreditation.

SCOPE OF ACCREDITATION TO ISO/IEC 17025-1999

MICROBAC LABORATORIES, INC.
HAUSER LABORATORIES DIVISION
4750 Nautilus Court South, Unit A
Boulder, CO 80301
Steve Ferry Phone: 720 406 4800

MECHANICAL

Valid To: June 30, 2007

Certificate Number: 0018.04

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following tests or testing sections of specifications on the following products and materials: plastics, furniture, plastic furniture, pipes, hoses, valves & fittings, pressure vessels, rubber & rubber products, sporting goods, composites, and metals:

GENERAL TESTING

| <u>Method</u> | <u>Title</u> |
|---------------|--|
| ASTM B117 | Practice for Operating Salt Spray Apparatus |
| ASTM C165 | Method for Measuring Comprehensive Properties of Thermal Insulation |
| ASTM C203 | Test Methods for Breaking Load and Flexural Properties of Block Type Thermal Insulation |
| ASTM D257 | Test Methods for D-C Resistance or Conductance of Insulating Materials |
| ASTM D4060 | Test Method for Abrasive Resistance of Organic Coatings by the Taber Abraser |
| ASTM D4329 | Practice for Operating Light and Water Apparatus for Exposure of Plastics |
| ASTM G154 | Standard Practice for Operating Fluorescent Light Apparatus for UV Exposure of Nonmetallic Materials |
| MIL-STD 810 | Method 509 |
| MIL-STD 883 | 1001, 1002, 1004.7, 1009.8, 1010.7, 1011.9, 2001.2 |
| MIL-STD 3010 | M2065 Puncture |
| UBC 15-5 | Roof Tile |

METALS TESTING

| <u>Method</u> | <u>Title</u> |
|---------------|---|
| ASTM A90 | Test Method for Weight of Coating on Iron and Steel Articles with Zinc-Alloy Coatings |
| ASTM B487 | Standard Test Method for Measurement of Metal and Oxide Coating Thickness by Microscopical Examination of a Cross Section |
| ASTM E3 | Method of Preparation of Metallographic Specimens |
| ASTM E8 | Test Method for Tension Testing of Metallic Materials |
| ASTM E18 | Test Methods for Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials |
| ASTM E340 | Test Method for Macroetching Metals and Alloys |
| ASTM E384 | Test Method for Microhardness of Materials |
| ASTM E407 | Practice for Microetching Metals and Alloys |

PLASICS, ELASTOMERS, COMPOSITES, ADHESIVES TESTING

| <u>Method</u> | <u>Title</u> |
|---------------|--|
| ASTM E1382 | Test Methods for Determining the Average Grain Size Using Semiautomatic and Automatic Image Analysis |
| ASTM D256 | Test Method for Determining the Pendulum Impact Resistance of Notch Specimens of Plastic |
| ASTM D395B | Test Method for Rubber Property – Compressive Set |
| ASTM D412 | Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers |
| ASTM D471 | Test Method for Rubber Property - Effect of Liquids |
| ASTM D543 | Test Method for Resistance of Plastics to Chemical Reagents |
| ASTM D570 | Test Method for Water Absorbency of Plastics |
| ASTM D624 | Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic |
| ASTM D638 | Test Method for Tensile Properties of Plastics |
| ASTM D648 | Test Method for Deflection Temperature of Plastics under Flexural Load |
| ASTM D695 | Test Method for Compressive Properties of Rigid Plastics |
| ASTM D696 | Test Method for Coefficient of Linear Thermal Expansion |
| ASTM D732 | Test Method for Shear Strength of Plastics by Punch Tool |
| ASTM D746 | Test Method for Brittleness Temperature of Plastics and Elastomers by Impact |
| ASTM D785 | (Scales E, M and L only) |
| ASTM D790 | Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials |
| ASTM D792 | Test Methods for Density and Specific Gravity of Plastics by Displacement |
| ASTM D882 | Test Methods of Tensile Properties of Thin Plastic Sheet |
| ASTM D903 | Test Method for Peel or Stripping Strength of Adhesive Bonds |
| ASTM D1002 | Test Method for Apparent Shear Strength of Single Lap Joint Adhesively Bonded Metal Specimens by Tension Loading |
| ASTM D1004 | Test Method for Initial Tear Resistance of Plastic Film and Sheet |
| ASTM D1062 | Test Method for Cleavage Strength of Metal to Metal Adhesive Bonds |
| ASTM D1238 | Test Method for Flow Rates of Thermoplastics by Extrusion Plastometer |
| ASTM D1505 | Test Method for Density of Plastics by the Density Gradient Column Technique |
| ASTM D1525 | Test Method for Vicat Softening Temperature of Plastics |
| ASTM D1603 | Test Method for Carbon Black in Olefin Plastics |
| ASTM D1621 | Test Method for Compressive Properties of Rigid Cellular Plastics |
| ASTM D1622 | Test Method for Apparent Density of Rigid Cellular Plastics |
| ASTM D1623 | Test Method for Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics |
| ASTM D1693 | Test Method for Environmental Stress Cracking of Ethylene Plastics |
| ASTM D1708 | Test Method for Tensile Properties of Plastics by Use of Microtensile Specimens |
| ASTM D1790 | Test Method for Brittleness Temperature of Plastic Sheet by Impact |
| ASTM D1876 | Test Method for Peel Resistance of Adhesives |
| ASTM D1894 | Test Method for Static and Kinetic Coefficients of Friction of Plastic Film and Sheet |
| ASTM D2126 | Test Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging |
| ASTM D2240 | Test Method for Rubber Property – Durometer Hardness |
| ASTM D2290 | Test Method for Apparent Tensile Strength of Ring or Tubular Plastics and Reinforced Plastics by Split Disk Method |
| ASTM D2583 | Test Method for Indentation Hardness of Rigid Plastic by Means of a Barcol Impresser |
| ASTM D2584 | Test Method for Ignition Loss of Cured Reinforced Resins |

PLASICS, ELASTOMERS, COMPOSITES, ADHESIVES TESTING (Continued)

| <u>Method</u> | <u>Title</u> |
|---------------|---|
| ASTM D2990 | Test Method for Tensile, Compressive and Flexural Creep and Creep Rupture of Plastics |
| ASTM D3846 | Test Method for In-Plane Shear Strength of Reinforced Plastics |

PLASTIC PIPE & FITTINGS

| <u>Method</u> | <u>Title</u> |
|---------------|--|
| AASHTO M-294 | Standard Specification for Polyethylene Pipe, 300- to 1500-mm diameter (Sizes 12" through 18" only) |
| ASTM D1598 | Test Method for Time-to-Failure of Plastic Pipe Under Constant Internal Pressure |
| ASTM D1599 | Test Method for Short-Time Hydraulic Failure Pressure of Plastic Pipe, Tubing and Fittings |
| ASTM D1784 | Specifications for Rigid PVC Compounds and CPVC Compounds |
| ASTM D1785 | Specification for PVC Plastic Pipe Schedules 40, 80 and 120 |
| ASTM D2122 | Test Method for Determining Dimensions of Thermal Pipe and Fittings |
| ASTM D2143 | Test Method for Cyclic Pressure Strength of Reinforced Thermosetting Plastic Pipe |
| ASTM D2152 | Test Method for Adequacy of Fusion of Extruded PVC Pipe and Fittings by Acetone Immersion |
| ASTM D2241 | Specification for PVC Pressure Rated Pipe-SDR Series |
| ASTM D2412 | Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate |
| ASTM D2444 | Test Method for Determination of the Impact Resistance of Thermoplastic Pipe and Fittings by Means of a Tup (Failing Weight) |
| ASTM D2513 | Specification for Thermoplastic Gas Pressure Pipe, Tubing and Fittings |
| ASTM D2837 | Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials |
| ASTM D2846 | Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Hot- and Cold-Water Distribution Systems |
| ASTM D3034 | Specification for Type PSM PVC Sewer Pipe and Fittings |
| ASTM D3350 | Specification of Polyethylene Plastic Pipe and Fittings Materials |
| ASTM D3567 | Standard Practice for Determining Dimensions of "Fiberglass" (Glass-Fiber-Reinforced Thermosetting Resin) Pipe and Fittings |
| ASTM D3681 | Test Method for Resistance of Fiberglass Pipe in Deflected Position |
| ASTM D5813 | Specification for Cured-In Place Thermosetting Resin Sewer Pipe |
| ASTM F441 | Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80 |
| ASTM F477 | Specification for Elastomeric Seals for Joining Plastic Pipe |
| ASTM F876 | Specification for Crosslinked PEX Tubing |
| ASTM F877 | Specification for Crosslinked PEX Plastic Hot and Cold Water Distribution Systems |
| ASTM F1057 | Practice for Estimating the Quality of Extruded PVC Pipe by the Heat Reversion Technique |
| ASTM F1216 | Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin Impregnated Tube |
| ASTM F1336 | Specification for Poly(Vinyl Chloride) (PVC) Gasketed Sewer Fittings |
| ASTM F1743 | Practice for Rehabilitation of Existing Pipelines and Conduits by Pulled-in-Place Installation of Cured-in-Place Thermosetting Resin Pipe (CIPP) |

PLASTIC PIPE & FITTINGS (Continued)

| <u>Method</u> | <u>Title</u> |
|---------------|--|
| ASTM F2136 | Test Method for Notched, Constant Ligament-Stress (NCLS) Test to Determine Slow-Crack-Growth Resistance of HDPE Resins or HDPE Corrugated Pipe |
| ASTM F2160 | Specification for Solid Wall High Density Polyethylene (HDPE) Conduit Based on Controlled Outside Diameter (OD) |
| AWWA | C900, C901, C905, C906, C909 |
| FDOT | Florida Method of Test for Determining Slow Crack Growth Resistance of HDPE Corrugated Pipes, Designation FM 5-572 |
| PPI TR-3/05 | Pipe HDB Testing |

FLAMMABILITY

| <u>Method</u> | <u>Title</u> |
|---------------|--|
| ASTM D1929 | Test Method for Ignition Properties of Plastic |
| ASTM E681 | Concentration Limits of Flammability of Chemical ((UEL: UEL) |
| FMVSS: 302 | Flammability of Interior Materials-Automation |
| FTMS: 191a | Vertical Flame Resistance |
| CA106 | Cigarette Test of Mattresses & Mattress Pads |
| CA116 | Cigarette Test of Upholstered Furniture |
| CA117 | Flame and Smolder Resistance – Test of Furniture Components |
| 16 CFR 1610 | Flammability of Clothing and Textiles |

THERMAL

| <u>Method</u> | <u>Title</u> |
|---------------|---|
| ASTM D3418 | Standard Test Method for Transition Temperatures of Polymers by Differential Scanning Calorimetry (DSC) |
| ASTM D3895 | Oxidative Induction Time for Polyolefins using DSC |
| ASTM E793 | Standard Test Method for Enthalpies of Fusion and Crystallization by Differential Scanning Calorimetry (DSC) |
| ASTM E794 | Test Method for Melting and Crystallization Temperatures by Thermal Analysis |
| ASTM E1269 | Test Method for Determining Specific Heat Capacity by Differential Scanning Calorimetry |
| ASTM E1356 | Test Method for Glass Transition Temperatures by Differential Scanning Calorimetry or Differential Thermal Analysis |
| FDOT | Florida Method of Test for Predicting the Oxidation Resistance of HDPE Corrugated Pipes Designation FM 5-574 |



DSI

POST-TENSIONING BARS

SYSTEM 100

OIT AND STRESS CRACK RESISTANCE TEST REPORTS FOR:

- **DSI 21mm Standard and Heavy Duty Grout Hoses**
- **Bar Coupler Housing for 1", 1-1/4" & 1-3/8" Bar Systems**
- **Plate Coupler Housing & 21mm grout tube cap**

TRI/ENVIRONMENTAL TEST AGENCY ACCREDITATION LETTER

Test & Reports by TRI/ENVIRONMENTAL

A thick red horizontal bar is located at the bottom of the page, below the text.



May 17, 2007

Mail To:

Mr. Mark Cwiertniak
Dywidag-Systems International USA, Inc. (DSI)
320 Marmon Drive
Bolingbrook, IL 60440

email: mark.cwiertniak@dsiamerica.com

Bill To:

<= Same (P.O. # 265740)

Dear Mr. Cwiertniak:

Thank you for consulting TRI/Environmental, Inc. (TRI) for your geosynthetics testing needs. TRI is pleased to submit this final report for laboratory testing.

TRI Job Reference Number: E2277-96-09

Material(s) Tested: 2 21mm Standard and Heavy Duty Grout Hoses
(DSI Part #'s 00 00 801 & 00 00 802)

Test(s) Requested: Oxidative Induction Time (ASTM D 3895)
NCLS (ASTM F 2136 @ 348 psi)

If you have any questions or require any additional information, please call us at 1-800-880-8378.

Sincerely,

A handwritten signature in black ink that reads 'M Patel'.

Dr. Mansukh Patel
Sr. Laboratory Coordinator
Geosynthetic Services Division
www.GeosyntheticTesting.com

cc: Sam R. Allen, Vice President and Division Manager



LABORATORY TEST RESULTS

TRI Client: Dywidag-Systems International USA, Inc. (DSI)
Project: PO No. PO265740

Material: Plastic
Sample Identification: 21mm Heavy Duty Grout Tube
TRI Log #: E2277-96-09

| PARAMETER | MEAN | | | | | | | | | | |
|--|---|--|--|-----|---|---|-----|-----|-----|-----|-----|
| Oxidative Induction Time (ASTM D 3895) | | | | | | | | | | | |
| OIT (minutes) 171 | 171 | | | | | | | | | | |
| Notched Constant Ligament Stress Crack Test (ASTM F 2136) | | | | | | | | | | | |
| SURFACTANT: <u>CO-630</u> EXPOSURE PERIOD: <u>24 hours</u> DATE TEST STARTED: <u>16-May-07</u> TEST TEMPERATURE: <u>50C</u> | | | | | | | | | | | |
| <table style="width: 100%; border: none;"> <tr> <td style="width: 50%;"> Standard Stress <u>348</u> (psi) x hinge thickness (in) <u>0.0600</u> (80 % of nominal sheet thickness) x specimen width <u>0.125</u> (0.125") Load <u>2.61</u> (lbs) </td> <td style="width: 50%;"> Mechanical Advantage <u>5</u> Lever Weight <u>0.33</u> (lbs) Grip Weight <u>0.09</u> (lbs) </td> </tr> </table> | | Standard Stress <u>348</u> (psi) x hinge thickness (in) <u>0.0600</u> (80 % of nominal sheet thickness) x specimen width <u>0.125</u> (0.125") Load <u>2.61</u> (lbs) | Mechanical Advantage <u>5</u> Lever Weight <u>0.33</u> (lbs) Grip Weight <u>0.09</u> (lbs) | | | | | | | | |
| Standard Stress <u>348</u> (psi) x hinge thickness (in) <u>0.0600</u> (80 % of nominal sheet thickness) x specimen width <u>0.125</u> (0.125") Load <u>2.61</u> (lbs) | Mechanical Advantage <u>5</u> Lever Weight <u>0.33</u> (lbs) Grip Weight <u>0.09</u> (lbs) | | | | | | | | | | |
| Applied load = (Load - Lever Weight + Grip Weight)/Mechanical Advantage = <u>0.47</u> lbs = 215 grams | | | | | | | | | | | |
| Replicate No.: No. Hours to Failure: | <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="width: 20px; text-align: center;">1</td> <td style="width: 20px; text-align: center;">2</td> <td style="width: 20px; text-align: center;">3</td> <td style="width: 20px; text-align: center;">4</td> <td style="width: 20px; text-align: center;">5</td> </tr> <tr> <td style="text-align: center;">>24</td> </tr> </table> >24 | 1 | 2 | 3 | 4 | 5 | >24 | >24 | >24 | >24 | >24 |
| 1 | 2 | 3 | 4 | 5 | | | | | | | |
| >24 | >24 | >24 | >24 | >24 | | | | | | | |

The testing is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claim as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.



July 12, 2006

(Updated May 9, 2007 to include DSI Part #s)

Mail To:

Mr. Jerry Buchanan
Dywidag-Systems International USA, Inc. (DSI)
320 Marmon Drive
Bolingbrook, IL 60440

email: jerry.buchanan@dsiamerica.com

Bill To:

<= Same (P.O. # 235062)

Dear Mr. Buchanan:

Thank you for consulting TRI/Environmental, Inc. (TRI) for your geosynthetics testing needs. TRI is pleased to submit this final report for laboratory testing.

TRI Job Reference Number: E2262-52-02

Material(s) Tested: Trumpet & Coupler and Bar Coupler Housing, P/N U06008010
(DSI Part #'s 68 27 587, 68 27 585, 68 12 587 & 68 12 585)

Test(s) Requested: Oxidative Induction Time (ASTM D 3895)
NCLS (ASTM F 2136 @ 348 psi)

If you have any questions or require any additional information, please call us at 1-800-880-8378.

Sincerely,

Sam R. Allen
Vice President and Division Manager
Geosynthetic Services Division
www.GeosyntheticTesting.com



GEOMEMBRANE TEST RESULTS

TRI Client: Dywidag-Systems International USA, Inc. (DSI)
Project: PO No. PO235062

Material: Plastic

Sample Identification: Trumpet and Coupler for 27-0.6 System and for 1", 1-1/4", 1-3/8" PT Bar Coupler Housing, P/N U06008010
TRI Log #: E2262-52-02

| PARAMETER | MEAN |
|--|--|
| Oxidative Induction Time (ASTM D 3895) | |
| OIT (minutes) 92 | 92 |
| Notched Constant Ligament Stress Crack Test (ASTM F 2136) | |
| SURFACTANT: CO-630 | |
| EXPOSURE PERIOD: Failure | |
| DATE TEST STARTED: 26-Jun-06 | |
| TEST TEMPERATURE: 50C | |
| Standard Stress <u>348</u> (psi) x hinge thickness (in) <u>0.0600</u> (80 % of nominal sheet thickness) x specimen width <u>0.125</u> (0.125") Load <u>2.61</u> (lbs) | Mechanical Advantage <u>5</u> Lever Weight <u>0.33</u> (lbs) Grip Weight <u>0.09</u> (lbs) |
| Applied load = (Load - Lever Weight + Grip Weight)/Mechanical Advantage = <u>0.48</u> lbs = 218 grams | |
| Replicate No.: | 1 2 3 4 5 |
| No. Hours to Failure: | >24 |
| | >24 |

The testing is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claim as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.



GEOMEMBRANE TEST RESULTS

TRI Client: Dywidag-Systems International USA, Inc. (DSI)
Project: PO No. PO235062

Material: Plastic

Sample Identification: Trumpet and Coupler for 12-0.6 System and for 1", 1-1/4", 1-3/8" PT Bar Coupler Housing, P/N U06008010
TRI Log #: E2262-52-02

| PARAMETER | MEAN |
|--|---------------|
| Oxidative Induction Time (ASTM D 3895) | |
| OIT (minutes) 100 | 100 |
| Notched Constant Ligament Stress Crack Test (ASTM F 2136) | |
| SURFACTANT: CO-630 | |
| EXPOSURE PERIOD: Failure | |
| DATE TEST STARTED: 26-Jun-06 | |
| TEST TEMPERATURE: 50C | |
| Standard Stress <u>348</u> (psi) Mechanical Advantage <u>5</u> x hinge thickness (in) <u>0.0600</u> (80 % of nominal sheet thickness) Lever Weight <u>0.33</u> (lbs) x specimen width <u>0.125</u> (0.125") Grip Weight <u>0.09</u> (lbs) Load <u>2.61</u> (lbs) | |
| Applied load = (Load - Lever Weight + Grip Weight)/Mechanical Advantage = <u>0.48</u> lbs = 218 grams | |
| Replicate No.: 1 2 3 4 5 | |
| No. Hours to Failure: >24 >24 >24 >24 >24 | >24 |

The testing is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claim as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.



November 29, 2007

Mail To:

Mr. Mark Cwiertniak
Dywidag-Systems International USA, Inc. (DSI)
320 Marmon Drive
Bolingbrook, IL 60440

email: mark.cwiertniak@dsiamerica.com

Bill To:

<= Same (P.O. # PO280269)

Dear Mr. Cwiertniak:

Thank you for consulting TRI/Environmental, Inc. (TRI) for your geosynthetics testing needs. TRI is pleased to submit this final report for laboratory testing.

TRI Job Reference Number: E2299-80-08

Material(s) Tested: One 5-1/2" Odx 2-1/4" ID Pipe (See NOTES on Page 2 for DSI Part Numbers)

Test(s) Requested: NCLS (ASTM F 2136 @ 348 psi)
Oxidative Induction Time (ASTM D 3895)

If you have any questions or require any additional information, please call us at 1-800-880-8378.

Sincerely,

Dr. Mansukh Patel
Sr. Laboratory Coordinator
Geosynthetic Services Division
www.GeosyntheticTesting.com

cc: Sam R. Allen, Vice President and Division Manager

Accreditation #:
GAI-LAP-1-95
TEL (610) 522-8440

Geosynthetic Institute
475 Kedron, Ave.
Folsom, PA 19033

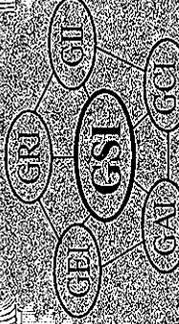


TRI Environmental, Inc.

*is granted accreditation
for designated geosynthetic test methods in accordance with the
Geosynthetic Accreditation Institute - Laboratory Accreditation Program
(GAI-LAP), as published in its annual directory.
This accreditation is valid until June 30, 2007.*

Robert M. Koerner, Ph.D., P.E.
Director

George R. Koerner, Ph.D., P.E. & CQA
Auditor



Geosynthetic Institute

475 Kedron Avenue
Folsom, PA 19033-1208 USA
TEL (610) 522-8440
FAX (610) 522-8441



Mr. Sam Allen
TRI/ Environmental Inc.
9063 Bee Caves Road
Austin, TX 78733-6201

June 28, 2006

Re: GAI-LAP Accreditation

Dear Mr. Allen,

The Geosynthetic Institute (GSI) is pleased to acknowledge TRI/ Environmental Inc. on its repertoire of Geosynthetic Accreditation Institute's-Laboratory Accreditation Program (GAI-LAP) accredited tests. This letter should serve as notification that TRI/ Environmental Inc. located in Austin, TX is currently accredited for the following one hundred and eighteen test methods until June 30, 2007.

1. ASTM D413 Test Methods for Rubber Property — Adhesion to Flexible Substrate
2. ASTM D570 Test Method for Water Absorption of Plastics
3. ASTM D638 Test Method for Tensile Properties of Plastics
4. ASTM D696 Test Method for Coefficient of Linear Thermal Expansion of Plastics
5. ASTM D746 Test Method for Brittleness Temperature of Plastics and Elastomers by Impact
6. ASTM D751 Test Methods for Coated Fabrics (thickness), (mass/unit area), (tongue tear), (grab), (hydrostatic resistance) and/or (bonded seam strength)
7. ASTM D790 Test Method for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
8. ASTM D792 Test Method for Specific Gravity (Relative Density) and Density of Plastics by Displacement
9. ASTM D882 Test Methods for Tensile Properties of Thin Plastic Sheeting (strip tensile)
10. ASTM D1004 Test Method for Initial Tear Resistance of Plastic Film and Sheeting
11. ASTM D1203 Test Method for Volatile Loss from Plastics Using Activated Carbon Methods
12. ASTM D1204 Test Method for Linear Dimensional Changes of Nonrigid Thermoplastic Sheeting or Film at Elevated Temperature
13. ASTM D1238 Test Method for Flow Rates of Thermoplastics by Extrusion Plastometer
14. ASTM D1388 Test Method for Stiffness of Fabrics
15. ASTM D1505 Test Method for Density of Plastics by the Density-Gradient Technique
16. ASTM D1593 Specification for Nonrigid Vinyl Chloride Plastic Sheeting (thickness)
17. ASTM D1603 Test Method for Carbon Black in Olefin Plastics
18. ASTM D1621 Test Method for Compressive Properties of Rigid Cellular Plastics

19. ASTM D1693 Test Method for Environmental Stress-Cracking of Ethylene Plastics
20. ASTM D1777 Test Method for Measuring Thickness of Textile Materials
21. ASTM D1987 Test Method for Biological Clogging of Geotextile or Soil Geotextile Filters
22. ASTM D2122 Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings
23. ASTM D2136 Test Method for Coated Fabrics-Low Temperature Bend Test
24. ASTM D2240 Test Method for Measuring Durometer Hardness
25. ASTM D2412 Test Method for Determination of the External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading
26. ASTM D2444 Test Method for Determination of the Impact Resistance of Thermoplastic Pipe Fittings by Means of a Tup (Falling Weight)
27. ASTM D3015 Standard Practice for Microscopic Examination of Pigment Dispersion in Plastic Compounds
28. ASTM D3030 Test Method for Volatile Matter (Including Water) of Vinyl Chloride Resins
29. ASTM D3083 Standard Specification for Flexible Poly (Vinyl Chloride) Plastic Sheeting for Pond, Canal, and Reservoir Lining, (soil burial), (water extraction) and/or (bonded seam strength)
30. ASTM D3350 Specification for Polyethylene Plastic Pipe and Fittings Materials
31. ASTM D3776 Test Method for Mass Per Unit Area (Weight) or Woven Fabric
32. ASTM D3786 Test Method for Hydraulic Burst Strength of Knitted Goods and Nonwoven Fabrics (Diaphragm Bursting Strength Tester Method)
33. ASTM D3895 Test Methods for Oxidative-Induction Time of Polyolefins by Differential Scanning Calorimetry
34. ASTM D4218 Test Method for Carbon Black Content in Polyethylene Compounds by the Muffle-Furnace Technique
35. ASTM D4355 Test Method for Determination of Geotextiles from Exposure to Ultraviolet Light and Water (Xenon-Arc Type Apparatus)
36. ASTM D4437 Standard of Practice for Determining the Integrity of Field Seams Used in Joining Flexible Polymeric Sheet Geomembranes, peel, shear
37. ASTM D4491 Test Methods for Water Permeability of Geotextiles by Permittivity
38. ASTM D4533 Test Method for Index Trapezoidal Tearing Strength of Geotextiles
39. ASTM D4545 Standard Practice for Determining the Integrity of Factory Seams used in Joining Manufactured Flexible Sheet Geomembranes, peel, shear
40. ASTM D4594 Test Method for Effects of Temperature on Stability of Geotextile
41. ASTM D4595 Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method
42. ASTM D4603 Test Method for Determining Inherent Viscosity of Poly (Ethylene Terephthalate) (PET)
43. ASTM D4632 Test Method for Grab Breaking Load and Elongation of Geotextiles
44. ASTM D4716 Test Method for Determining the (In-Plane) Flow Rate per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head
45. ASTM D4751 Test Method for Determining Apparent Opening Size of a Geotextile
46. ASTM D4833 Test Method for Index Puncture Resistance of Geotextiles, Geomembranes and Related Products

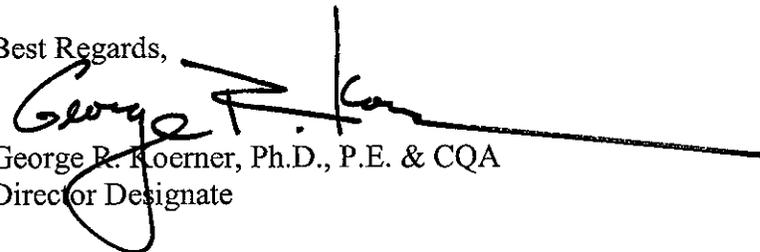
47. ASTM D4884 Test Method for Seam Strength of Sewn Geotextiles
48. ASTM D4885 Test Method for Determining Performance Tensile Strength of Geomembranes Using Wide Strip Testing
49. ASTM D4886 Test Method for Abrasion Resistance of Geotextiles (Sand Paper/Sliding Block Method)
50. ASTM D5035 Test Method for Breaking Strength and Elongation of Textile Fabrics (Strip Method)
51. ASTM D5101 Test Method for Measuring the Soil-Geotextile System Clogging Potential by the Gradient Ratio
52. ASTM D5199 Test Method for Measuring Nominal Thickness of Geotextiles and Geomembranes
53. ASTM D5261 Test Method for Measuring Mass per Unit Area of Geotextiles
54. ASTM D5262 Test Method for Evaluating the Unconfined Tension Creep Behavior of Geosynthetics
55. ASTM D5321 Test Methods for Determining the Coefficient of Soil and Geosynthetic or Geosynthetic and Geosynthetic Friction by the Direct Shear Method,
56. ASTM D5322 Standard Practice for Immersion Procedures for Evaluating the Chemical Resistance of Geosynthetics to Liquids
57. ASTM D5323 Determination of 2% Secant Modulus for Polyethylene Geomembranes
58. ASTM D5397 Test Method for Evaluation of Stress Crack Resistance of Polyolefin Geomembranes using Notched Constant Tension Load Test
59. ASTM D5493 Test Method for the Permittivity of Geotextiles Under Load
60. ASTM D5494 Test Methods for the Determination of Pyramidal Puncture Resistance of Unprotected and Protected Geomembranes
61. ASTM D5514 Test Method for Large Scale Hydrostatic Puncture Testing of Geosynthetics
62. ASTM D5596 Test Methods for Microscopic Evaluation of the Dispersion of Carbon Black in Polyolefin Geosynthetics
63. ASTM D5617 Test Methods for Multi-Axial Tension Test for Geosynthetics
64. ASTM D5721 Standard Practice for Air-Oven Aging of Polyolefin Geomembranes
65. ASTM D5818 Standard Practice for Obtaining Samples of Geosynthetics from a Test Section for Assessment of Installation Damage
66. ASTM D5884 Test Method for the Tearing Strength of Internally Reinforced Geomembranes
67. ASTM D5885 Standard Test Method for Oxidative Induction Time of Polyolefin Geosynthetics by High-Pressure Differential Scanning Calorimetry
68. ASTM D5887 Standard Test Method for Measurement of Index Flux Through Saturated Geosynthetic Clay Liners Specimens Using a Flexible Wall Permeameter
69. ASTM D5890 Standard Test Method for Swell Index of Clay Mineral Component of Geosynthetic Clay Liners
70. ASTM D5891 Standard Test Method for Fluid Loss of Clay Component of Geosynthetic Clay Liners
71. ASTM D5993 Test Method for Measuring the Mass Per Unit Area of GCL
72. ASTM D5994 Test Method for Measuring the Core Thickness of Textured Geomembranes

73. ASTM D6140 Test Method for Determine of Asphalt Retention of Paving Fabrics Used in Asphalt Paving for Full Width Applications
74. ASTM D6214 Test Method for Determining the Integrity of Field Seams Used in Joining Geomembranes by Chemical Fusion Methods
75. ASTM D6241 Test Method for the Static Puncture Strength of Geotextiles and Geotextile Related Products Using a 50-mm Probe
76. ASTM D6243 Test Method for Determine the Internal and Interface Shear Resistance of Geosynthetic Clay Liners by the Direct Shear Method
77. ASTM D6364 Test Method for Determining the Short-Term Compression Behavior of Geosynthetics
78. ASTM D6392 Standard Test Method for Determining the Integrity of Nonreinforced Geomembrane Seams Produced Using Thermo-Fusion Methods
79. ASTM D6454 Standard Test Method for Determining the Short-Term Compression Behavior of Turf Reinforcement Mats (TRMs)
80. ASTM D6475 Test Method for Measuring Mass Per Unit Area of Erosion Control Blankets
81. ASTM D6496 Test Method for Determining the Average Bonding Peel Strength Between Top and Bottom Layers of Needle-Punched Geosynthetic Clay Liners
82. ASTM D6524 Test Method for Measuring Resiliency of Turf Reinforcement Mats (TRMs)
83. ASTM D6525 Test Method for Measuring Nominal Thickness of Permanent Erosion Control Products
84. ASTM D6566 Test Method for Measuring Mass per Unit Area of Turf Reinforcement Mats (TRMs)
85. ASTM D6567 Test Method for Measuring Light Penetration of Turf Reinforcement Mat (TRM)
86. ASTM D6574 Test Method for Determining the In-plane Hydraulic Transmissivity of a Geosynthetic by Radial Flow
87. ASTM D6575 Test Method for Determining Stiffness of Geosynthetics used as Turf Reinforcement Mats
88. ASTM D6636 Test Method for Determination of Ply Adhesion Strength of Reinforced Geomembranes
89. ASTM D6637 Test Method for Determining Tensile Properties of Geogrids by the Single or Multi-Rib Tensile Method
90. ASTM D6638 Test Method for Determining Connection Strength Between Geosynthetic Reinforcement and Segmental Concrete Units (Modular Concrete Blocks)
91. ASTM D6693 Test Method for Determining Tensile Properties of Nonreinforced Polyethylene and Nonreinforced Flexible Polypropylene Geomembranes
92. ASTM D6706 Test Method for Determining Pull-Out Resistance of Geosynthetics
93. ASTM D6766 Test Method for Evaluation of Hydraulic Properties of Geosynthetic Clay Liners Permeated with Potentially Incompatible Liquids
94. ASTM D6768 Test Method for Tensile Strength of Geosynthetic Clay Liners
95. ASTM D6818 Test Method for Ultimate Tensile Properties of Turf Reinforcement Mats

96. ASTM D6992 Test Method for Time-Temperature Superposition Using Stepped Isothermal Method
97. ASTM D7003 Test Method for Strip Tensile Properties of Reinforced Geomembranes
98. ASTM D7004 Test Method for Grab Tensile Properties of Reinforced Geomembranes
99. ASTM D7005 Test Method for Determining the Bond Strength (Ply Adhesion) of Geocomposites
100. ASTM E96 Test Method for Water Vapor Transmission of Materials
101. ASTM F904 Test Method for Comparison of Bond Strength or Ply Adhesion of Similar Laminates Made from Flexible Materials
102. ASTM F1473 Test Method for Notched Tensile Test to Measure the Resistance to Slow Crack Growth of Polyethylene Pipes and Resins
103. ASTM F2136 Test Method for Notched, Constant-Ligament-Stress (NCLS) Test to Determine Slow Crack-Growth Resistance of HDPE Resins and HDPE Corrugated Pipe
104. FTM STD. No. 101c (method 2065-82), Puncture Resistance and Elongation Test (1/8 in. radius probe)
105. GRI GG-1 Geogrid Rib Tensile Strength
106. GRI GG-2 Geogrid Junction Strength
107. GRI GG-7 Carboxyl End Group Content of PET Yarns
108. GRI GG-8 Determination of the Number Average Molecular Weight of PET Yarns Based on Relative Viscosity Value
109. GRI GM-11 Accelerated Weathering of Geomembranes Using a Fluorescent UVA Device
110. GRI GM-12 Asperity Measurement of Textured Geomembranes Using a Depth Gage
111. GRI GS-7 Determining the Index Friction Properties of Geosynthetics
112. ISO 10319 Wide Width Tensile Test of Geotextiles and Geogrids
113. ISO 10722 Installation Damage
114. ISO 12236 Determination of Static CBR Puncture Test
115. ISO 12957 (1&2) Coefficient of Friction
116. ISO 13431 Determination of the Tensile Creep and Creep Rupture Behavior
117. ISO 13438 Temperature (Oxidation) Stability
118. ISO 13439 Hydrolysis Resistance

Any questions regarding your accreditation should be directed to George or Robert Koerner at (610) 522-8440. Once again congratulation and thank you for participating in the GAI-LAP.

Best Regards,



George R. Koerner, Ph.D., P.E. & CQA
Director Designate

Visit us on the Web at www.jcplastics.com



3-22-07

DSI International
320 Marmon Dr.
Boilingbrook IL 60440-3078

Attn: Mr. Mark Cwiertniak

Dear Mr. Cwiertniak

Please let this letter serve as certification that EPS Polymer Distribution material, grade PA6 GF 20 BK Nylon 6, 20% GF complies with ASTM Specification D 5989 – 03 Cell Classification S-PA 0141.

We use the above-mentioned material for the following DSI Parts:

68 07 7230 Grout Cap
68 12 7230 Grout Cap
68 19 7230 Grout Cap
68 27 7230 Grout Cap
68 04 2539 Grout Cap 4.06

B36E 50700 Bar Cap
B46E 50700 Bar Cap
B65E 50700 Bar Cap

00 00 845 21mm Female $\frac{3}{4}$ NPT Male Adaptor
00 00 846 21mm Male $\frac{3}{4}$ NPT Female Adaptor

68 07 589 Filler Piece
68 12 589 Filler Piece
68 19 589 Filler Piece
68 27 589 Filler Piece

Sincerely,
Paul Sirus
VP Manufacturing.
JC Plastics, Inc.



DSI

POST-TENSIONING BARS

SYSTEM 100

FULL SCALE PRESSURE TEST REPORTS FOR:

- **1-3/8" uncoupled PT Bar System**
- **1", 1-1/4" and 1-3/8" coupled PT Bar Systems**

Concrete Technology Laboratories TEST AGENCY ACCREDITATION LETTER

Test & Reports by CTL

A thick red horizontal bar is located at the bottom of the page, below the text "Test & Reports by CTL".

Report of 1-3/8" DSI Post-tensioning Threadbar Full Scale System Pressure Test
TEST Witnessed for Dywidag Systems International, USA, Inc.

Date of Report: 7/19/2007

CTLGroup Project Number: 330093

Date of Test: 07/17/2007

DSI Contact Information:

Mr. Said Nour, Dywidag Systems International, USA, Inc.
320 Marmon Drive Bolingbrook, IL 60440

DSI Project:

Florida DOT Testing

Client:

DSI BOLINGBROOK

Test Witnessed by:

Varsha Singh, CTLGroup

Report of Test

On 07/17/2007, a representative of CTL, Skokie, IL was present at the DSI facility in Bolingbrook, IL to witness an internal system pressure test on a 1-3/8" Post-tensioning Bar System assembly as shown in the attached drawing. The test was performed in accordance with Florida Specifications Section 462-4.2.7.3 and FIB Technical Report, Bulletin 7, Chapter 4, Article 4.2, Stages 1 and 2.

Stage 1:

The full scale system was constructed 4.57 meters (15 foot) with no post-tensioning bar installed (See Fig.1). The system was installed as a straight system. The full scale system consisted of the following components (end-to-end): DSI Bar Grout Cap with O-Ring, P/N B36E50700. The grout cap was secured to the anchorage using (4) 3/8"-16UNC 316L SS bolts with Hex Nuts and Washers. The anchorage consisted of a square bearing plate with 5-1/2" long exit pipe welded to the plate, P/N B26E22510. A 59mm GTI PP duct was fitted over the exit pipe, P/N U00220400. Heat Shrink tube, P/N PMA-90/30-150-YE, was used over the pipe-duct overlap to seal for an airtight connection (See Fig.2). A duct coupler, P/N U00220440, was used to splice the duct (See. Fig.3). The same size and type of heat shrink tube was used over the splice. Since the two ends of the actual system are identical, the other end of the duct was sealed with a special closed-end trumpet and heat shrink only to facilitate the test. A calibrated pressure gauge and shut off valve were installed in line through the 3/4" NPT half coupler welded on the side of the exit pipe (See Fig.4). The calibration chart is attached herein. The system PASSED the Stage 1 requirements of the Florida Specifications Section 462-4.2.7.3 and FIB Technical Report, Bulletin 7, Chapter 4, Article 4.2, Stages 1.

Stage 2:

The full scale system was pressurized to 1.5 psi with compressed air. The pressure was monitored for five minutes. After the five minutes of holding period, the system showed no pressure loss. Therefore the system PASSED the Stage 2 requirements of the Florida Specifications Section 462-4.2.7.3 and FIB Technical Report, Bulletin 7, Chapter 4, Article 4.2, Stages 2.



Figure 1. Full Scale System

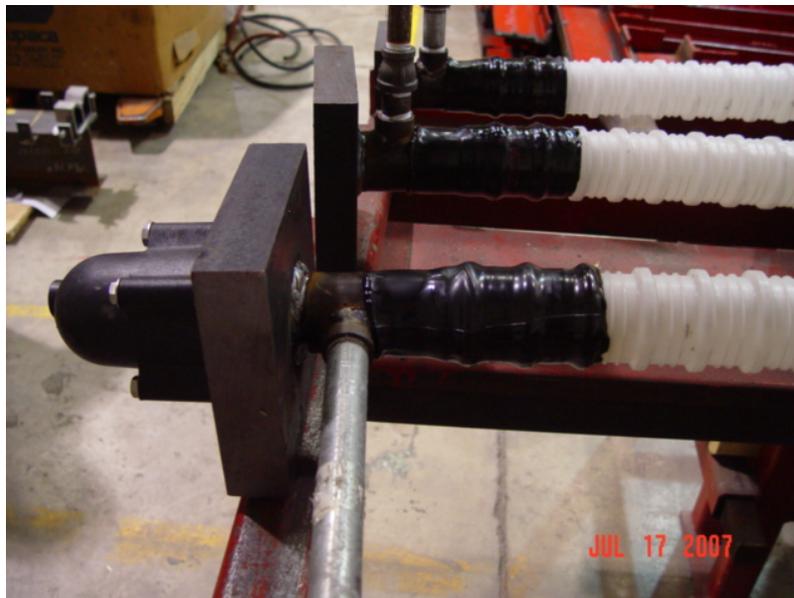


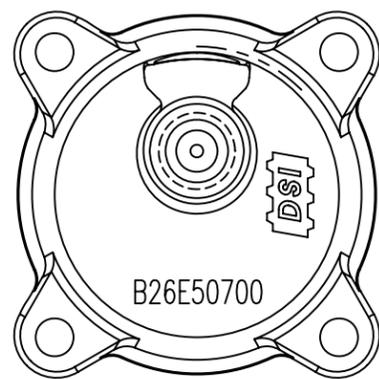
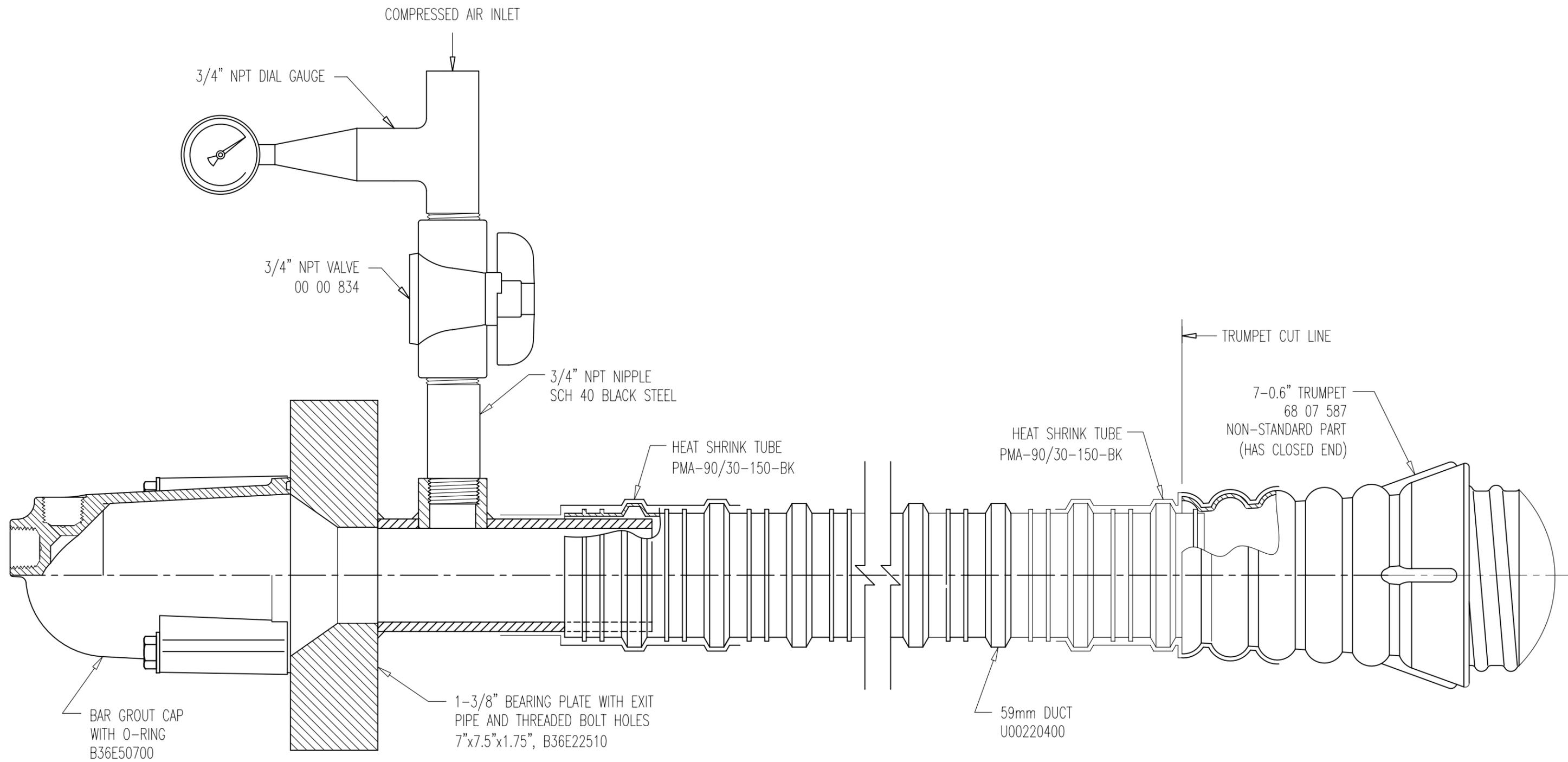
Figure 2. Pipe-Duct overlap Seal



Figure 3. GTI Coupler



Figure 4. Pressure measurement



CAP END VIEW

| | | | | | | |
|--|--|--|------------|------------|----------------------------|--|
| OWNER: | | DYWIDAG SYSTEMS INTERNATIONAL, USA INC. DOES NOT ASSUME ANY LIABILITY FOR THE DESIGN OF THIS STRUCTURE. THIS SHOP DRAWING IS INTENDED TO PROVIDE POST TENSIONING DETAILS ONLY. | | | | |
| CONTRACTOR: | | | | | | |
| PROJECT: | | SCALE 1:2 | | | | |
| DATE: 07-19-07 | | DWG: G.M. | CHK: S. N. | APP: E. A. | DRAWING NUMBER: PT 36E 027 | |
| THIS DRAWING, THE PERTINENT ENCLOSURES, DESCRIPTIONS, CALCULATIONS ETC. AND THEIR CONTENTS ARE THE PROPERTY OF DYWIDAG SYSTEMS INTERNATIONAL, USA, INC. THEY ARE NOT ALLOWED TO BE DUPLICATED WITHOUT OUR PERMISSION. THEY ARE ALSO NOT TO BE SHOWN OR EXPLAINED FOR ANY REASON TO A THIRD PARTY OTHER THAN FOR REASONS EXPRESSLY INTENDED BY DSI'S SUBMITTAL TO THE ORIGINAL RECEIVER. THEY HAVE TO BE RETURNED UPON REQUEST. | | DYWIDAG-SYSTEMS INTERNATIONAL, USA, INC. POST TENSIONING / REINFORCING UNIT PHONE: 630-739-1100 320 MARMON DRIVE - BOLINGBROOK, IL FAX: 630-739-6155 | | | | |

2006 - 9511 - 34149

CALIBRATION CERTIFICATE AND DATA SHEET

DYWIDAG SYSTEMS INTERNATIONAL, USA, INC.
 320 MARMON DRIVE
 BOLINGBROOK , IL 60440
 DAVID PRASEK
 244375 OE19108
 P.O. RMA Number Quote

PRESSURE GAUGE PG-026990
 Description Serial No.
McDANIEL 026990
 Manufacturer Control No. Asset No.
E(0-10 PSI)
 Model Number Department Cust Location

Environmental 68 °F 54 %RH Specs. MFG.
 Conditions 990 mB Gals Procedure ICP-005

365 9/8/2006 9/8/2007
 Cycle Cal Date Cal Due Date
 Intervals are assigned by contractual agreement unless specifically explained

| Received | | Returned | | Special Services | | Equipment Accessories | |
|--|---|--|-----------------------------------|---|--|-------------------------------------|--|
| <input checked="" type="checkbox"/> In Tolerance | <input checked="" type="checkbox"/> Initial Cal | <input checked="" type="checkbox"/> In Tolerance | <input type="checkbox"/> Adjusted | <input type="checkbox"/> Repair | <input type="checkbox"/> Warranty Service | <input type="checkbox"/> Manual | <input type="checkbox"/> Shipping Case |
| <input type="checkbox"/> Out Of Tolerance | <input type="checkbox"/> Dirty | <input type="checkbox"/> Limited Use | <input type="checkbox"/> Repaired | <input type="checkbox"/> On-Site | <input type="checkbox"/> Estimate Required | <input type="checkbox"/> Adapters | <input type="checkbox"/> Handles |
| <input type="checkbox"/> Inoperative | <input type="checkbox"/> NCR | <input type="checkbox"/> Return As Is | <input type="checkbox"/> Cleaned | <input checked="" type="checkbox"/> Calibration | <input type="checkbox"/> ISO 17025 | <input type="checkbox"/> Cables | <input type="checkbox"/> Head |
| <input type="checkbox"/> Damaged | <input type="checkbox"/> Off Zero | <input type="checkbox"/> Eval Only | <input type="checkbox"/> Rejected | <input type="checkbox"/> Conformance | | <input type="checkbox"/> Power Cord | <input type="checkbox"/> React. Post |
| <input type="checkbox"/> Parts Missing | | <input type="checkbox"/> NCR | | <input type="checkbox"/> Outside Service | | <input type="checkbox"/> Equip Case | <input type="checkbox"/> Ldg. Bar |

Fault/Symptom
 COMMISSION NEW GAUGE

Technical Evaluation
 New instrument, initial calibration and certification required.

Work Performed
 Performed initial calibration, meets manufacturers specifications, no adjustments were required.

| Qty | Description | Qty | Description |
|-----|-------------|-----|-------------|
| | | | |

| Asset | Asset Model | Due Date | Traceability to NIST Through Report No. |
|-------|-------------|------------|---|
| 59 | MK-100 | 12/15/2006 | 822/266929-02 |

| Parameters Tested/ Specification | Nominal | - Limit | + Limit | As Found | As Left |
|-----------------------------------|---------|---------|---------|----------|---------|
| <i>Pressure ±0.5% Full Scale.</i> | | | | | |
| <i>All Readings In PSI 10 PSI</i> | | | | | |
| <i>Measured Readings</i> | 0 | — | — | 0.00 | |
| | 1 | 0.95 | 1.05 | 1.00 | |
| | 2 | 1.95 | 2.05 | 2.00 | |
| | 3 | 2.95 | 3.05 | 3.00 | |
| | 4 | 3.95 | 4.05 | 4.00 | |
| | 5 | 4.95 | 5.05 | 5.00 | |
| | 6 | 5.95 | 6.05 | 6.00 | |
| | 7 | 6.95 | 7.05 | 7.00 | |
| | 8 | 7.95 | 8.05 | 8.00 | |
| | 9 | 8.95 | 9.05 | 9.00 | |
| | 10 | 9.95 | 10.05 | 10.00 | |

⊙ This calibration was performed with equipment controlled in compliance with ISO/IEC 17025 pursuant to A2LA Accreditation Certificate Number 1753.01 and is traceable to N.I.S.T. or fundamental or natural physical constants, or by accepted radiometric techniques. Mfg. Specs along with measurement uncertainty was used to determine In/Out of tolerance.
 ⊙ This calibration is traceable to N.I.S.T. or fundamental or natural physical constants, or by accepted radiometric techniques. Mfg. Specs without regard with measurement uncertainty was used to determine In/Out of tolerance.

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 Written Authorization From JLW Instruments /
 Metrology Concepts.

Troy Jensen *TJ* Certified By
 Chris Waldron *C.W* Inspected By

**REPORT OF 1", 1-1/4" and 1-3/8" DSI THREABARS WITH BAR COUPLER
FULL SCALE SYSTEM PRESSURE TEST** witnessed for Dywidag Systems
International USA Inc.

Date of Report: 12/10/2007 CTL Group Project Number: 330110
Date of Test: 12/05/2007
DSI Contact Information: Mr. Said I. Nour
Dywidag Systems International USA Inc.
320 Marmon Drive, Bolingbrook, IL 60400
DSI Project: System 100 for Florida DOT Testing
Client: DSI BOLINGBROOK
Test Witnessed by: Varsha Singh, CTL GROUP

Report of Test

On this date, a representative of CTL was present at the DSI facility in Bolingbrook, IL to witness an internal system pressure test on a full scale Post-tensioning Bar System representing 1", 1-1/4" and 1-3/8" DSI bar assemblies in use for Precast Segmental Construction. The test was performed in accordance with Florida Specifications Section 462-4.2.7.3 and FIB Technical Report, Bulletin 7, Chapter 4, Article 4.2, Stages 1 and 2.

Stage 1:

The full scale system was constructed 5.18 meters (17 foot) with no post-tensioning bar installed (See Dwg No. P36E030). The system was installed as a straight system. The full scale system consisted of the following components (end-to-end): A 59mm GTI PP duct sealed with a plug and heat shrink at one end. The other end of the PP duct is fitted over DSI Coupler Housing, P/N U06008010. Heat Shrink tube, P/N PMA-90/30-150-YE was used over the Duct/Coupler Housing joint to create an airtight connection. Using Loctite, a 21mm Grout Tube, P/N 00 00 801, 21mm Female-3/4" NPT Male Connector, P/N 00 00 845 and 3/4" NPT Valve, P/N 00 00 834 were installed on the Coupler Housing (See Fig.1). The Coupler Housing is spun welded to DSI Plate Connector, P/N B36E52210. The Coupler Housing and Plate Connector formed DSI Plate Coupler Housing, P/N B36E50210. The Plate Connector was secured to the intermediate anchorage using O-Ring and (4) 3/8"-16UNC bolts with Washers. The intermediate anchorage used in this test consisted of a square bearing plate with 5-1/2" long exit pipe welded to the plate, P/N B36E22510. A 59mm GTI PP duct was fitted over the exit pipe, P/N U00220400. Heat

Shrink tube, P/N PMA-90/30-150-YE, was used over the pipe-duct overlap to seal for an airtight connection. A GTI coupler, P/N U00220440, was used to splice the duct. Same size and type of heat shrink tube was used over the splice. Since the two ends of the actual system are identical, the other end of the duct was sealed with a special closed-end trumpet and heat shrink to facilitate the test only. A calibrated pressure gauge and shut off valve were installed in line through the ¾” NPT half coupler welded on the side of the exit pipe (See Fig.2). The pressure gauge calibration chart is attached herein. The ¾” NPT half coupler on the side of the exit pipe may or may not be needed in the actual proposed system but it is used here to facilitate the pressure test air inlet. For this test, the plate, the welded pipe stub (i.e. exit pipe) and the connecting bolts were not galvanized which has no effect on the leak tightness of the system.

Fig.3 shows the overall DSI full scale bar system 100 assembly

The system PASSES the Stage 1 requirements.

Stage 2:

The full scale system was pressured to 1.5 psi with compressed air. The pressure was monitored for five minutes. After the five minutes holding period, the system had no pressure loss.

The system PASSES the Stage 2 requirements.

Note:

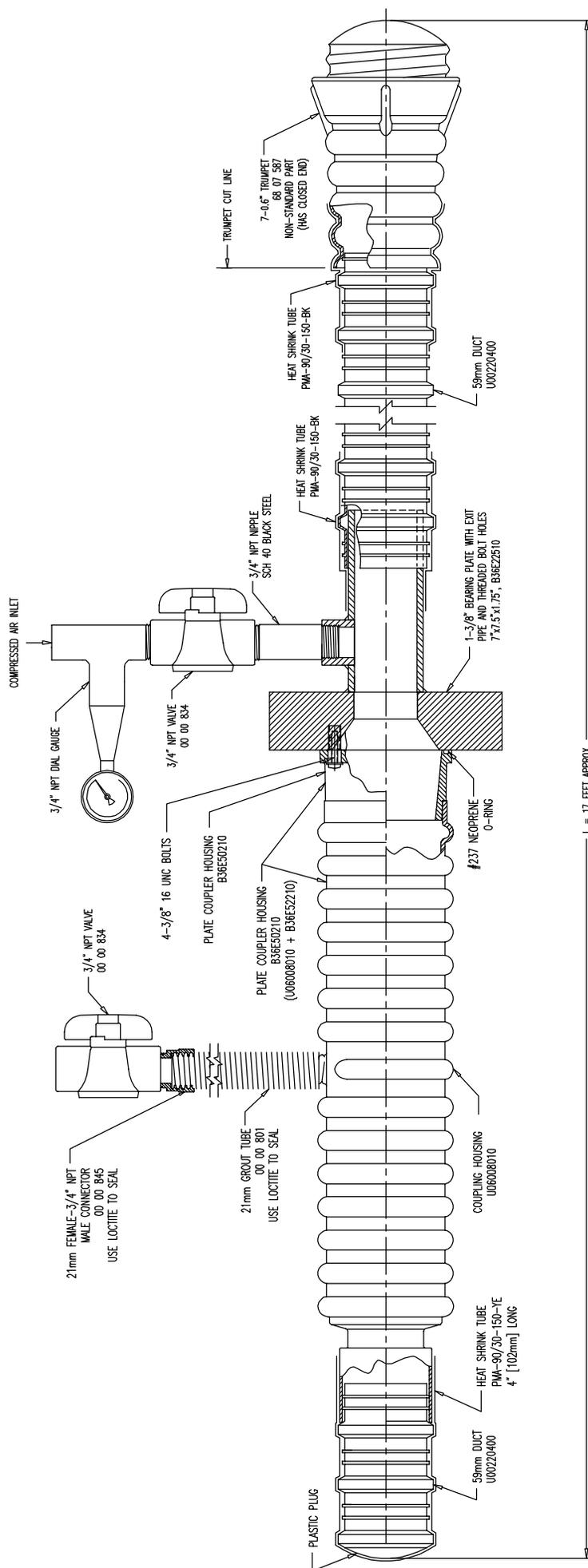
The system setup used in this test is similar for all DSI 1”, 1-1/4” and 1-3/8” Bar System 100 having an exit pipe (i.e. pipe stub) welded to the bearing plate.

The following DSI Part Numbers are the various anchorages consisting of a square or rectangle bearing plate with a welded pipe stub and are equivalent to the anchorage used in this test. This test is therefore valid for all DSI Bar System 100 using these anchorages.

Anchorage for 1” Bar System: B26E22510, B26E22610, B26E24510 and B26E24610

Anchorage for 1-1/4” Bar System: B32E22510, B32E22610, B32E24510 and B32E24610

Anchorage for 1-3/8” Bar System: B36E22510, B36E22610, B36E24510 and B36E24610



L = 17 FEET APPROX.

OWNER: _____

CONTRACTOR: _____

PROJECT: _____

DATE: 12-08-07 DWG: G.M.L. CHK: S.N. APP: E.A.

1-3/8" PT BAR SYSTEM WITH COUPLING PRESSURE TEST

SCALE: 1/8"

| REV. | DATE | ISSUE DESCRIPTION | NAME | CHKD. | JOB NUMBER |
|------|------|-------------------|------|-------|------------|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

DRAWING NUMBER: PT 36E 030

DYWIDAG SYSTEMS INTERNATIONAL, USA, INC.
 320 INARION DRIVE - BOLINGBROOK, ILL. PHONE: 630-739-1100 FAX: 630-739-6159

DYWIDAG-SYSTEMS INTERNATIONAL, USA, INC.
 POST TENSIONING / REINFORCING UNIT PHONE: 630-739-1100

DSI

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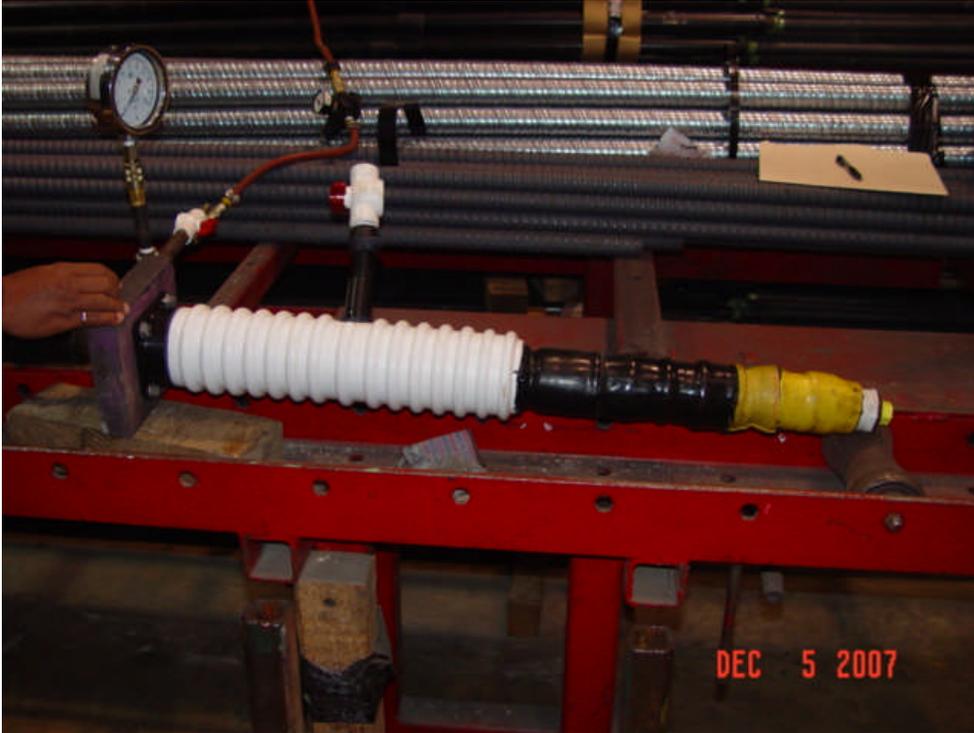


Fig.1: Plate Coupler Housing for Segmental Construction



Fig.2: Calibrated Gauge for Monitoring Pressure Loss



Fig.3: DSI Bar System 100 Full Scale Pressure Test Setup



2007 - 9511 - 41125

CALIBRATION CERTIFICATE AND DATA SHEET

DYWIDAG SYSTEMS INTERNATIONAL, USA, INC.
 320 MARMON DRIVE
 BOLINGBROOK, IL 60440
 MARK CWIERTNIAK 1 630 972 4059
 281610 R2890-1
 P.O. RMA Number Quote
 Environmental 71.8 °F 21.9 %RH Specs. MFR.
 Conditions 1003 mB Gals Procedure ICP-005

Pressure Gauge PG-026990
 Description Serial No.
 McDANIEL 026990
 Manufacturer Control No. Asset No.
 E (10)
 Model Number Department Cust Location
 366 11/30/2007 11/30/2008
 Cycle Cal Date Cal Due Date
 Intervals are assigned by contractual agreement unless specifically explained

| Received | | Returned | | Special Services | | Equipment Accessories | |
|--|--------------------------------------|--|-----------------------------------|---|--|-------------------------------------|--|
| <input checked="" type="checkbox"/> In Tolerance | <input type="checkbox"/> Initial Cal | <input checked="" type="checkbox"/> In Tolerance | <input type="checkbox"/> Adjusted | <input type="checkbox"/> Repair | <input type="checkbox"/> Warranty Service | <input type="checkbox"/> Manual | <input type="checkbox"/> Shipping Case |
| <input type="checkbox"/> Out Of Tolerance | <input type="checkbox"/> Dirty | <input type="checkbox"/> Limited Use | <input type="checkbox"/> Repaired | <input type="checkbox"/> On-Site | <input type="checkbox"/> Estimate Required | <input type="checkbox"/> Adapters | <input type="checkbox"/> Handles |
| <input type="checkbox"/> Inoperative | <input type="checkbox"/> NCR | <input type="checkbox"/> Return As Is | <input type="checkbox"/> Cleaned | <input checked="" type="checkbox"/> Calibration | <input type="checkbox"/> ISO 17025 | <input type="checkbox"/> Cables | <input type="checkbox"/> Head |
| <input type="checkbox"/> Damaged | <input type="checkbox"/> Off Zero | <input type="checkbox"/> Eval Only | <input type="checkbox"/> Rejected | <input type="checkbox"/> Conformance | | <input type="checkbox"/> Power Cord | <input type="checkbox"/> React. Post |
| <input type="checkbox"/> Parts Missing | <input type="checkbox"/> NCR | <input type="checkbox"/> NCR | | <input type="checkbox"/> Outside Service | | <input type="checkbox"/> Equip Case | <input type="checkbox"/> Ldg. Bar |

Fault/Symptom
 CALIBRATION (INCLUDES CERTIFICATE)

Technical Evaluation
 Meets manufacturers specifications as received. Uncertainty of measurement is 0.0313 psi.

Work Performed
 Verified to manufacturers specifications. No adjustments were performed. As Left data is same as As Found data.

| Qty | Description | Qty | Description |
|-----|-------------|-----|-------------|
| | | | |

| Asset | Asset Model | Due Date | Traceability to NIST Through Report No. |
|--------|-------------|-----------|---|
| 000059 | MK-100 | 4/30/2008 | 2007-0261-36002 |

| Parameters Tested/ Specification | Nominal | - Limit | + Limit | As Found | As Left |
|----------------------------------|---------|---------|---------|----------|---------|
| Pressure ±0.5% Full Scale | | | | | |
| All Readings In PSI. 10 PSI. | | | | | |
| Measured Readings | 0 | ----- | ----- | 0.00 | 0.00 |
| | 2 | 1.95 | 2.05 | 2.00 | 2.00 |
| | 4 | 3.95 | 4.05 | 4.00 | 4.00 |
| | 6 | 5.95 | 6.05 | 6.00 | 6.00 |
| | 8 | 7.95 | 8.05 | 8.00 | 8.00 |
| | 10 | 9.95 | 10.05 | 10.00 | 10.00 |

This calibration was performed with equipment controlled in compliance with ISO/IEC 17025, pursuant to A2LA Accreditation Certificate #1753.01, and is traceable to N.I.S.T. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a level of confidence of approximately 95%.

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Troy Jensen Certified By
 Mark Cunney Inspected By

**American Association of State Highway and Transportation Officials
AASHTO Accreditation Program - Certificate of Accreditation**

This is to signify that

Construction Technology Laboratories, Inc.
Skokie, Illinois

has demonstrated proficiency for the testing of construction materials and has met the minimum requirements in AASHTO R18 set forth by the AASHTO Highway Sub-Committee on Materials.

The scope of accreditation can be obtained by viewing the AAP Directories of Accredited Laboratories (www.nist.gov/amrl) or by contacting AMRL.


Executive Director


Chair, AASHTO Highway
Sub-Committee on Materials



1914



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847-972-3098

Accreditations

CTLGroup is a nationally accredited, independent engineering and testing firm that participates in a variety of laboratory certification, inspection, and monitoring programs. CTLGroup's quality program meets the ISO/IEC Guide 17025 standards (equivalent to the relevant requirements of ISO 9000 and QS9000 series standards). Accreditations, certifications, and laboratory approvals include:

- IAS Certification
- Miami Dade County Certified Testing Laboratory
- Association of American Railroads approved test facility
- CCRIL - CTLGroup has participated in the Cement and Concrete Proficiency Sample Program since its inception for portland cement, blended portland cement, masonry cement, pozzolan, masonry brick, and concrete. CCRIL inspects CTLGroup's laboratories once every two years.
- ACI - All CTLGroup physical testing technician personnel have been certified by the American Concrete Institute as ACI Level I Concrete Field Technicians.

- AASHTO - CTLGroup has been accredited by the American Association of State Highway and Transportation Officials for the testing of fine and coarse aggregates, portland cement concrete, and hydraulic cement (chemical and physical tests).
- DOE - CTLGroup has been audited by the nuclear industry and the Department of Energy for use as a commercial laboratory. Work for the DOE has been performed under a direct surveillance program.

- U.S. Army Corps of Engineers - CTLGroup has received validation from the Army Corps of Engineers to perform material tests on aggregates, concrete, masonry, mortar, cement, pozzolan, and grout.

Affiliations

CTLGroup and its employees actively participate in a wide range of professional and technical organizations, including:

- Post-Tensioning Institute Consultant Member (PTI)
- American Concrete Institute (ACI)
- ASTM International
- The Masonry Society (TMS)
- Precast/Prestressed Concrete Institute (PCI)
- American Segmental Bridge Institute (ASBI)
- International Concrete Repair Institute (ICRI)
- Construction Specifications Institute (CSI)
- Association of American Railroads (AAR)
- American Association of State Highway and Transportation Officials (AASHTO)
- Transportation Research Board (TRB)
- American Society of Civil Engineers (ASCE)
- BOMA International
- Society for Protective Coatings (SSPC)
- U.S. Green Building Council

RESOURCES:  



IAS Certificate 2006

(Download PDF - 256 KB)



**U.S. Army Corps of
Engineers Lab
Validation**

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AASHTO Certificate

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1 7/8 COUPLER NEEDS TO SEE 100% OF BAR ULTIMATE LOAD = 237 KIPS
 COUPLERS SAW MORE THAN 250 KIPS



PACKER

ENGINEERING INC.

RECEIVED (A2)
 JAN 31 1990
 USA, INC. - LEMONT

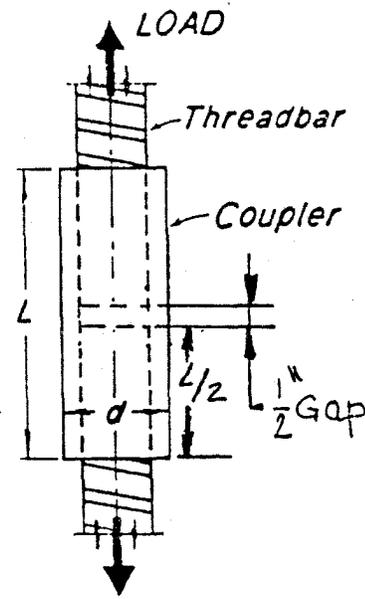
DATE 24 JAN 90 MACHINE USED 40k BT5
 FOR DYWIDAG TESTED BY D.DYL.
SYSTEM INTERNATIONAL WITNESS _____
 FILE REF. N 50424

REPORT OF TESTS

THREADBAR COUPLER TEST

TESTED IN TENSION TO FAILURE
 AS SHOWN UNLESS OTHERWISE NOTED.
 YIELD POINT WAS DETERMINED BY
 THE "HALT OF THE POINTER" METHOD.

BAR CROSS-SECTIONAL AREA
 TAKEN FROM ASTM A-615 -



| Specimen No. | 1 | 2 | 3 |
|--------------------|---------------|---------------|--------|
| Bar Size | 1 3/8 | 1 3/8 | |
| Coupler Dim | | | |
| d, in. | 2.745 | 2.744 | 2.745 |
| L, in. | 8.750 | 8.750 | 8.750 |
| Yield Load, lb | 197700/221800 | 194800/22200 | 221100 |
| Max Load, lb | 252300 | 252900 | 253300 |
| Yield Point, psi | 126730/142180 | 124872/162115 | 141730 |
| Ult. Str., psi | 1461730 | 162115 | 162372 |
| Failure | BAR | BAR | BAR |
| BAR SPEC. TOP/BOT. | 1/4 | 2/5 | 6/3 |

ORIGINAL

| | | |
|--|------------------------------|---|
| BAR PRODUCT TEST PLAN | | Plan No. |
| (Results) | | |
| Test Title: | 36mm Bar/Coupler Static Load | Page of |
| Project: | Ref. No. | Tested By: M Emerson Date: 11-30-2007 |
| Purpose of Test: Routine. To determine if the threads on the bar/coupler can hold the nominal full load of the 36mm bar. | | |

Test Location: Gerdau-Ameristeel St Paul MN

| | | | |
|-------------------------|-----------------|--------------------------|------------------|
| | Part No. | Heat/Roll Lot No. | Material |
| Tested Hardware: | B36E30810 | n/a | C1117 |
| Tested Bar: | B36E | M073741 / M639310 | ASTM A 722 Gr150 |

| Dimensions: | Specified (See Dwg) | | As Measured | | | |
|--------------------------------|----------------------------|-----------|--------------------|--------------------|---------------|---------------|
| | From | To | Sample | 1 | Sample | Sample |
| For Hardware: | | | | | | |
| Length (in) | 8.687 | 8.813 | ok | | | |
| Outside Dim. (in) | 2.746 | 2.75 | ok | | | |
| ID (in) | 1.429 | 1.433 | ok | | | |
| | | | | | | |
| For Bar: | | | Sample | 1A & 1B | Sample | Sample |
| Major Dia (in) @ center | 1.587 | 1.63 | 1.608 | | | |
| Minor Dia (in) @ center | 1.406 | 1.425 | 1.410 | | | |
| Flat (in) | 1.378 | 1.425 | 1.381 | | | |
| | | | | | | |

| | | | |
|--------------------------|-------|-------|--|
| Test Results: | | | |
| Yield Load (kips) | 189.6 | 231.9 | |
| Ult. Load (kips) | 237.0 | 262.0 | |

| | |
|--|----------------------------------|
| Failure Mode: A) Bar Break B) Bar Thread C) Hardware Break D) Hardware Thread | A) Bar broke outside of coupler. |
|--|----------------------------------|





DSI

POST-TENSIONING BARS

SYSTEM 100

MISCELLANEOUS ITEMS & MATERIAL DATA SHEETS

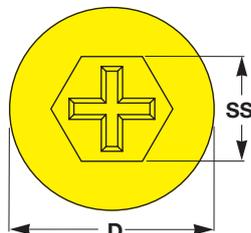


Threaded Sealing Plugs, PA 6, yellow

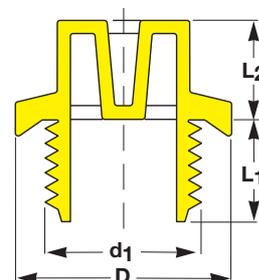
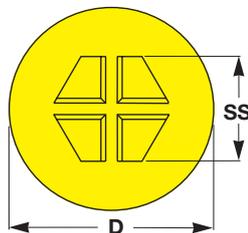
Suitable for internal threads according to DIN 3852, ISO 6149, SAE J 1926 with recessed Flange

NEXT
Express
Service
MORNING

Type »A«



Type »B«



STANDARD RANGE

EP 435

BSP

All dimensions in mm

| Thread Size | Flange | Total height | | Spanner Size | Reference No. | Type |
|-------------------|--------|----------------|----------------|--------------|-----------------|------|
| | | Thread Length | Head Length | | | |
| d ₁ | D | L ₁ | L ₂ | SS | | |
| NEW G 1/8" | 16.8 | 9.0 | 10.0 | 13.0 | EP 435 - 1/8" | A |
| G 1/4" | 19.2 | 9.0 | 10.0 | 13.0 | EP 435 - 1/4" | A |
| G 3/8" | 22.2 | 9.0 | 11.0 | 17.0 | EP 435 - 3/8" | A |
| G 1/2" | 27.2 | 12.0 | 13.0 | 19.0 | EP 435 - 1/2" | A |
| G 3/4" | 32.3 | 12.0 | 13.0 | 24.0 | EP 435 - 3/4" | A |
| G 1." | 40.0 | 15.0 | 14.0 | 27.0 | EP 435 - 1." | B |
| G 1.1/4" | 50.4 | 15.0 | 15.0 | 36.0 | EP 435 - 1.1/4" | B |
| G 1.1/2" | 55.4 | 15.0 | 15.0 | 41.0 | EP 435 - 1.1/2" | B |
| G 2." | 68.4 | 15.0 | 15.0 | 55.0 | EP 435 - 2." | B |

Metric

| | | | | | | |
|-----------------------|------|------|------|------|---------------------|---|
| NEW M 10 x 1 | 14.2 | 7.0 | 10.0 | 10.0 | EP 435 - M 10 x 1 | A |
| M 12 x 1.5 | 17.2 | 10.0 | 10.0 | 13.0 | EP 435 - M 12 x 1.5 | A |
| M 14 x 1.5 | 19.2 | 10.0 | 10.0 | 13.0 | EP 435 - M 14 x 1.5 | A |
| M 16 x 1.5 | 22.0 | 10.0 | 10.0 | 17.0 | EP 435 - M 16 x 1.5 | A |
| M 18 x 1.5 | 24.0 | 10.0 | 11.0 | 17.0 | EP 435 - M 18 x 1.5 | A |
| M 20 x 1.5 | 26.0 | 10.0 | 14.0 | 19.0 | EP 435 - M 20 x 1.5 | A |
| M 22 x 1.5 | 27.2 | 10.0 | 14.0 | 19.0 | EP 435 - M 22 x 1.5 | A |
| NEW M 24 x 1.5 | 31.5 | 12.0 | 14.0 | 24.0 | EP 435 - M 24 x 1.5 | A |
| M 26 x 1.5 | 32.0 | 10.0 | 14.0 | 24.0 | EP 435 - M 26 x 1.5 | A |
| M 27 x 2 | 32.3 | 13.0 | 14.0 | 24.0 | EP 435 - M 27 x 2 | A |
| M 33 x 2 | 40.4 | 13.0 | 14.0 | 27.0 | EP 435 - M 33 x 2 | B |
| M 42 x 2 | 50.0 | 13.0 | 15.0 | 36.0 | EP 435 - M 42 x 2 | B |

UNF / UN

| | | | | | | |
|----------------------------|------|------|------|------|--------------------------|---|
| NEW .7/16" - 20 UNF | 20.8 | 11.0 | 9.0 | 13.0 | EP 435 - .7/16" - 20 UNF | A |
| NEW .1/ 2" - 20 UNF | 22.8 | 11.0 | 10.0 | 13.0 | EP 435 - .1/ 2" - 20 UNF | A |
| NEW .9/16" - 18 UNF | 24.8 | 11.0 | 10.0 | 13.0 | EP 435 - .9/16" - 18 UNF | A |
| NEW .5/ 8" - 18 UNF | 24.8 | 12.0 | 12.0 | 17.0 | EP 435 - .5/ 8" - 18 UNF | A |
| .3/ 4" - 16 UNF | 26.0 | 10.0 | 13.0 | 17.0 | EP 435 - .3/ 4" - 16 UNF | A |
| NEW .7/ 8" - 14 UNF | 33.8 | 14.0 | 12.0 | 19.0 | EP 435 - .7/ 8" - 14 UNF | A |
| NEW 1.1/16" - 12 UN | 40.8 | 14.0 | 12.0 | 24.0 | EP 435 - 1.1/16" - 12 UN | A |
| 1.5/16" - 12 UN | 42.0 | 15.0 | 15.0 | 27.0 | EP 435 - 1.5/16" - 12 UN | A |
| NEW 1.5/ 8" - 12 UN | 57.8 | 17.0 | 15.0 | 36.0 | EP 435 - 1.5/ 8" - 12 UN | A |
| 1.5/ 8" - 16 UN | 57.8 | 17.0 | 15.0 | 36.0 | EP 435 - 1.5/ 8" - 16 UN | A |

Should your requirements not be shown please ask for separate quotation.
PROTEC products and specifications are subject to improvement and change without notice.



Fax (0191) 442 4222



Threaded Sealing Plugs, PA 6, yellow

Suitable for internal threads according to DIN 3852, ISO 6149, SAE J 1926 with recessed Flange

- Nylon 6 is used for its stability to withstand temperatures of up to 150 °C and pressures up to 10 bar (during painting processing and testing).
- 5 complete threads for optimum use.
- The hexagon head allows tightening and removal with either a screwdriver or a spanner or special tool.
- Guaranteed seal.
- Nylon 6 guarantees a very high resistance against hydraulic fluids, acids, base alkalines and Solvents.
- Extremely economical when compared to metal.

DELIVERY
24
hrs.
SERVICE

STANDARD RANGE

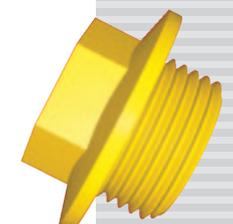
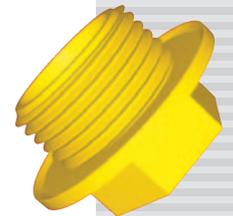
EP 435

Type «B»

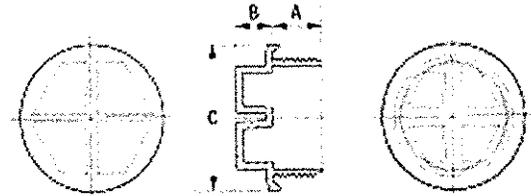


NEW
UN / UNF

Type «A»



Materials : nylon (PA 6)
Colours : yellow



1 2 3 4 5 6 7 8 9 10
scroll over numbers to rotate part

threaded (bsp) sealing plugs
BT series

Designed to protect British Standard Pipe fittings. Plug is engineered with five complete threads to provide an absolute tight fit. The "sealing lip" enables each plug to provide a perfect seal. The BT Series can be applied or removed with a screwdriver, socket wrench, power tool or by hand. Will withstand pressure up to 10 psi and intermittent temperatures up to 170°C or approximately 300°F.

specifications:

- **Material:** Nylon 6
- **Color:** Yellow

| Part No. | To Plug Thread Size | Dimensions | | | | | | Standard Package | | Red-E-Pak | |
|---------------------|---------------------|------------|-------|-----|-------|------|-------|------------------|------|-----------|------|
| | | A | | B | | C | | Pieces | Lbs. | Pieces | Lbs. |
| | | in | mm | in | mm | in | mm | | | | |
| <u>BT</u> 0250 | G 1/4 | .35 | 8.89 | .39 | 9.91 | .76 | 19.30 | 7000 | 34 | 1400 | 7 |
| <u>BT</u> 0375 | G 3/8 | .35 | 8.89 | .43 | 10.92 | .87 | 22.10 | 4000 | 31 | 800 | 6 |
| <u>BT</u> 0500 | G 1/2 | .47 | 11.94 | .51 | 12.95 | 1.07 | 27.18 | 2500 | 29 | 500 | 6 |
| * <u>BT</u> 0750 | G 3/4 | .47 | 11.94 | .51 | 12.95 | 1.27 | 32.26 | 1600 | 26 | 320 | 5 |
| <u>BT</u> 1000 | G 1 | .59 | 14.99 | .55 | 13.97 | 1.57 | 39.88 | 900 | 20 | 180 | 4 |
| <u>BT</u> 1250 | G 1-1/4 | .59 | 14.99 | .59 | 14.99 | 1.98 | 50.29 | 550 | 19 | 110 | 4 |



| | | | | | | | | | | | |
|-------------------|-------------|-----|-------|-----|-------|------|-------|-----|----|----|---|
| <u>BT</u> 1500 | G 1- 1/2 | .59 | 14.99 | .59 | 14.99 | 2.18 | 55.37 | 450 | 19 | 90 | 4 |
| <u>BT</u> 2000 | G 2 | .59 | 14.99 | .59 | 14.99 | 2.69 | 68.33 | 250 | 17 | 50 | 4 |

Note: If carton information is not listed, call Niagara.



QS 9000 – ISO 9001 CERTIFIED

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Phone: 1-800-458-0465 or 1-814-868-3671 • Fax: 1-800-358-4391 or 1-814-864-2423 • e-mail: plastics@niagaraplastics.com



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Tolerances

- Tolerances on all decimal dimensions $\pm .010$ per inch.
Example: $1.000 \pm .010 = .010"$
 $2.500 \pm .010$ per inch - $.025"$
- Tolerances on all metric decimal dimensions $\pm .25\text{mm}$ per 25mm
Example: $25 \pm .25$ per 25mm = $\pm .25\text{mm}$
 $60 \pm .25\text{mm} = \pm .60\text{mm}$
- Tolerance for fractional dimensions $\pm 1/32"$ per inch.
- Tolerances on vinyl
Example: wall $\pm .010$ of spec
length ± 0.40 of spec
- Tolerances for nylon fasteners:
Any tolerances that are not specified in the catalog are $+.010, -.015"$.



material properties

home about Niagara products/search faq online ordering samples/literature contact us
products product search new products quotation material properties tolerances reference center

| Properties | Polyethylene | | | Polypropylene | Ethylene Vinyl Acetate | Nylon | Thermoplastic Rubber | Vinyl | |
|---|----------------------------|------------------------------------|------------------------------------|-----------------------------|-----------------------------|--------------------|----------------------------|----------------------------|-----------------------|
| | Low Density | Medium Density | High Density | | | | | Standard | High Temp. |
| Specific Gravity | 0.910-0.925 | 0.926-0.940 | 0.941-0.965 | 0.902-0.906 | .931-933 | 1.13-1.15 | 0.94 | 0.98-2.0 | 1.22-1.32 |
| Tensile Strength P.S.I. | 600-2300 | 1200-3500 | 3100-5500 | 4300-5500 | 1700-2000 | 900-12000 | 2750 | 50-5000 | 2175min |
| Elongation% | 90-800 | 50-600 | 15-100 | 200-700 | 700-800 | 60-300 | 600 | 50-550 | 175mmin |
| Compressive Strength P.S.I. | — | — | 3200 | 5500-8000 | — | 6700-12500 | — | — | — |
| Flexural Strength P.S.I. | — | 4800-7000 | 1000 | 6000-8000 | — | No Break | — | — | — |
| Specific Heat Cal/C/gm | 0.55 | 0.55 | 0.55 | 0.46 | 0.55 | 0.04 | — | — | — |
| Resistance to Heat °F | 180-200 | 220-250 | 250 | 250-320 | 160-185 | 180-300 | 300 | 300-325 | 450 |
| Heat Distortion Temperature °F | 100-121 (66 P.S.I.) | 120-165 (66 P.S.I.) | 140-180 (66 P.S.I.) | 205-230 (66 P.S.I.) | 95-105 | 360-365 | — | — | — |
| Water Absorption %24 hr. 1/8" Thickness | <0.01 | 0.01 | 0.01 | 0.01 | .005-0.13 | — | — | — | — |
| Effect of Sunlight | **see below | **see below | **see below | Crazes Rapidly | **see below | Discolors Slightly | Excellent Ozone Resistance | Excellent Ozone Resistance | Good Ozone Resistance |
| Effect of Weak Acids | Resistant | Very Resistant | Very Resistant | None | Resistant | Resistant | Resistant | Resistant | Resistant |
| Effect of Strong Acids | Attacked by Oxidizing Acid | Attacked by Slowly Oxidizing Acids | Attacked by Slowly Oxidizing Acids | Attacked by Oxidizing Acids | Attacked by Oxidizing Acids | Attacked | Resistant | Fair Resistance | Fair Resistance |
| Effect of Weak Alkalies | Resistant | Very Resistant | Very Resistant | None | Resistant | None | Resistant | Resistant | Fair |
| Effect of Strong Alkalies | Resistant | Very Resistant | Very Resistant | Very Resistant | Resistant | None | Resistant | Fair Resistance | Poor |
| Effect of Organic Solvents | Resistant Below 60°C | Resistant Below 60°C | Resistant Below 80°C | Resistant Below 80°C | Resistant Below 50°C | Resists Most | Resistant | Fair Resistance | Poor |
| Effect of Oils and Greases | Attacked by Some | Attacked by Some | Slight | Attacked by Some | Attacked by Some | None | Somewhat Resistant* | Fair Resistance | Poor |
| Impact Strength ft./in. Notch | No Break | 0.5-16 | 1.5-20 | 0.4 | No Break | 1.0-5.5 | No Break | — | — |

ASTM test methods apply. Niagara cannot be held responsible for accuracy of these figures.

* Hydrocarbons will cause thermoplastic rubber to swell if soaked; it will not affect the properties.

MATERIALS

Materials Properties Chart

| Material | Temperature Resistance | | resistant against | | | | | | | | | | non resistant against | | | | transparency | | |
|----------|------------------------|------------|---------------------|-----------------------|---------|----------|-------|------|---------|------------|------------------|--------------------|-----------------------|--------|-------|------------|--------------|--------|-------------|
| | intermittent | continuous | non oxidising acids | non oxidising alkalis | alcohol | solvents | fuels | oils | greases | weak acids | oxidising agents | chlorohydrocarbons | solvents | benzol | acids | translucid | transparent | opaque | translucent |
| LD-PE | 60 | 40 | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| HD-PE | 100 | 80 | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| LLD-PE | 90 | 70 | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| PHT | 150 | 120 | | | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| TPE | 150 | 120 | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Posicon | 250 | 170 | | | | | | ● | | | ● | | | | | ● | | | |
| PP | 130 | 100 | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| PS | 80 | 60 | ● | ● | ● | | | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| SB | 80 | 60 | ● | ● | ● | | | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| PA 6 | 150 | 90 | ● | | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |

CAPTOP®, DURASAFE® and QUICKFIT® Plastic Parts are predominantly manufactured from polyethylene (LD-PE, HD-PE), polypropylene (PP) and nylon (PA6). This involves the use of carbon and hydrogen. These plastic parts are completely recyclable. Please refer to the individual product descriptions in this catalogue for further properties. For special requirements of a mechanical, thermal or chemical nature, we can also manufacture in a wide choice of other materials. Please contact us with further details of your specific needs.

Standard Colour Options

| Colour | Remark | Colour code |
|----------------|-----------------------------|-------------|
| sulphur yellow | Colour to DIN 4818 Standard | RAL 1016 |
| orange | Colour to DIN 4818 Standard | RAL 2004 |
| red | Colour to DIN 4818 Standard | RAL 3000 |
| blue | Colour to DIN 4818 Standard | RAL 5012 |
| green | Colour to DIN 4818 Standard | RAL 6001 |
| dark grey | Colour to DIN 4818 Standard | RAL 7001 |
| light grey | Colour to DIN 4818 Standard | RAL 7035 |
| brown | Colour to DIN 4818 Standard | RAL 8007 |
| white | Colour to DIN 4818 Standard | RAL 9010 |
| black | Colour to DIN 4818 Standard | RAL 9005 |

CAPTOP®, DURASAFE® and QUICKFIT® Plastic Parts are manufactured in a range of standard colours corresponding to the individual product descriptions in this catalogue. In addition, further colours are available for special production runs at an additional cost. Variations in standard colours may occur occasionally. This is unavoidable due to differences in both pigments and raw plastic material properties. For additional colours, please contact us with your specific needs.

General Tolerances

The table values indicated above are theoretical averages which may vary with tolerances in the production process in accordance with DIN 16901. General dimensional tolerances are: +/- 2% and do not exceed +/- 1.0mm.



The Professional's Choice

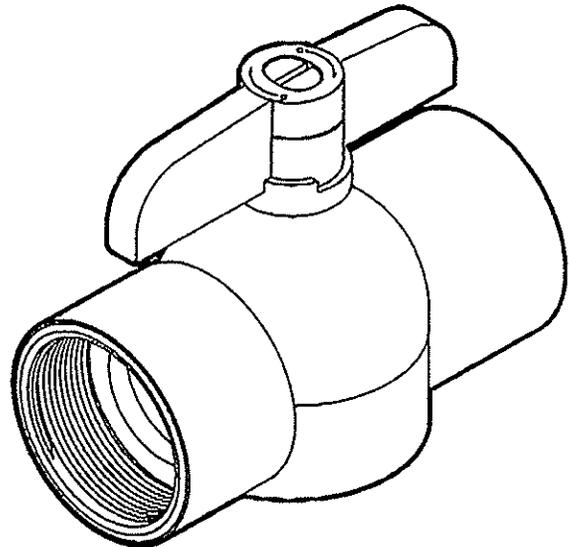
King Bros. Industries
 29101 The Old Road, Valencia, CA 91355
 Toll Free: (800) 325-9468 Fax: (661) 257-4320
 E-mail: valves@kbico.com Web: www.kbico.com

Attn: Saïd Nour

PVC Schedule 40 Economy Ball Valves

Features:

- EPDM O'rings.
- Viton O'rings available.
- Meets/Exceeds ASTM schedule 40 socket and material standards.
- Made of High-Impact PVC Type II material.
- Molded in the **USA** by KBI.
- 150 psi working pressure (tested to 500 psi static @ 72°F)
Nominal operating pressure.
- NSF Standard listed.



| Models | | Size | A | L | H | W | Case | Weight | List |
|------------|------------|--------|------|------|------|------|------|--------|---------|
| Socket | Thread | | | | | | | | |
| EBV-0500-S | EBV-0500-T | 1/2" | 2.3" | 2.7" | 2.1" | 1.2" | 36 | 5.2 | \$ 3.70 |
| EBV-0750-S | EBV-0750-T | 3/4" | 2.6" | 3.1" | 2.4" | 1.4" | 24 | 5.4 | \$ 4.40 |
| EBV-1000-S | EBV-1000-T | 1" | 3.2" | 3.5" | 2.7" | 1.7" | 18 | 6.2 | \$ 6.00 |
| EBV-1250-S | EBV-1250-T | 1 1/4" | 4.2" | 4.9" | 4.0" | 2.0" | 6 | 4.2 | \$ 8.00 |
| EBV-1500-S | EBV-1500-T | 1 1/2" | 4.2" | 5.2" | 4.0" | 2.5" | 6 | 4.4 | \$12.00 |
| EBV-2000-S | EBV-2000-T | 2" | 5.2" | 6.0" | 5.0" | 2.7" | 6 | 7.6 | \$15.40 |

FEATURES COMMON TO KBI PVC PRODUCTS

- NSF listed *
- IAPMO (UPC) listed *
- Molded in the USA by KBI
- Limited LIFETIME Warranty
- 150 psi working pressure (tested to 500 psi static @ 72°F)
- Meets/Exceeds ASTM Standards
- Made with Hi-Impact PVC Type II Cell Class 15344-C
- * See individual products for details



CanusaTube™ - PLA

Tubular sleeve for pipeline corrosion protection

Canusa-CPS is a leading manufacturer of specialty pipeline coatings which, for over 30 years, have been used for sealing and corrosion protection of pipeline joints and other substrates. Canusa high performance products are manufactured to the highest quality standards and are available in a number of configurations to accommodate your specific project applications.

Product Description

The CanusaTube™ is a heat shrinkable tubular sleeve designed for corrosion protection of buried and exposed steel pipelines. CanusaTube™ consists of a crosslinked polyolefin backing, coated with a protective heat sensitive adhesive which effectively bonds to steel substrates and common pipeline coatings including polyethylene and fusion bonded epoxy.

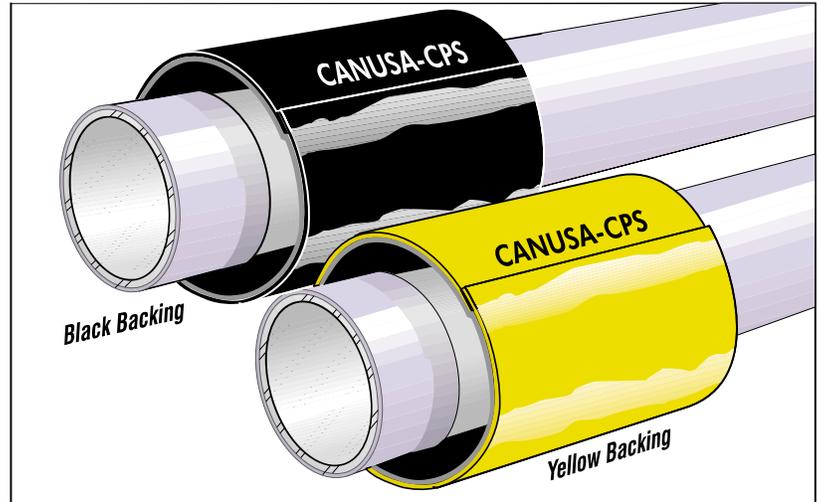
Features & Benefits

Rapid & Reliable Installation

Because CanusaTube™ consists of a unique tubular configuration that has been factory constructed, quick and reliable field installation is easy to accomplish. CanusaTube™ is available with a specially formulated adhesive to accommodate demanding operating temperatures and soil stress conditions. To further optimize installation, CanusaTube™ is available in yellow which includes a thermochromic indicator to visually confirm proper installation.

Long Term Corrosion Protection

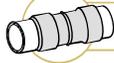
CanusaTube™ provides excellent resistance to cathodic disbondment resulting in effective long term corrosion protection. The high performance crosslinked backing in combination with the specially formulated adhesive is engineered to have excellent resistance against temperature cycling, and chemical and environmental attack.



Saves Time & Money

With CanusaTube's™ unique construction, less time is required handling, positioning and installing separate closures. With the application of heat, this feature allows for fast, simple and complete installation of the sleeve. No additional costly primers are required. This minimizes installation time and labour costs while promoting high production rates. CanusaTube™ is also available in a high shrink ratio for high profile joint protection. Consult the High Shrink data sheet for additional information.

Applications

-  Oil & Gas
-  Girth-Weld Joints
-  Water Pipelines
-  Pre-Insulated Pipes

Configurations

-  CanusaTube™
-  2-Layer
-  Standard Shrink

Pipe Sizes

-  55 - 315 (2" - 12")

Temperature Range

-  up to 55°C (131°F)

Approvals

-  DIN 30672

Product Selection Guide Choose your sleeve based on your Pipe Diameter

| Shrink Range | Nominal Pipe Diameter DN (inches) | Outside Pipe Diameter mm (inches) | Tubular Sleeve PLA XXX-YYY ZZ | Tubular Sleeve Diameter | |
|--------------|--------------------------------------|--------------------------------------|----------------------------------|-------------------------|----------------------------|
| | | | | As Supplied mm (in) | Fully Recovered mm (in) |
| | 50 (2) | 61 (2.4) | PLA 55-YYY ZZ | 90 (3.5) | 55 (2.3) |
| | 65 (2.5) | 76 (3) | PLA 63-YYY ZZ | 90 (3.5) | 63 (2.5) |
| | 80 (3) | 89 (3.5) | PLA 90-YYY ZZ | 120 (4.8) | 81 (3.3) |
| | 90 (3.5) | 102 (4) | PLA 100-YYY ZZ | 130 (5) | 90 (3.5) |
| | 100 (4) | 114 (4.5) | PLA 115-YYY ZZ | 145 (5.5) | 98 (3.8) |
| | 125 (5) | 141 (5.5) | PLA 125-YYY ZZ | 160 (6.3) | 110 (4.3) |
| | 150 (6) | 168 (6.6) | PLA 170-YYY ZZ | 205 (8) | 140 (5.5) |
| | 200 (8) | 219 (8.6) | PLA 230-YYY ZZ | 260 (10) | 180 (7) |
| | 250 (10) | 273 (10.7) | PLA 280-YYY ZZ | 315 (12.3) | 211 (8.3) |
| | 300 (12) | 324 (12.8) | PLA 315-YYY ZZ | 360 (14) | 245 (9.5) |

For pipe diameters > DN300 (12"), consult your Canusa representative.

Operating Characteristics

| Sleeve Operating Characteristics | Celsius | | Fahrenheit | | Hot Melt |
|--------------------------------------|------------|------|---------------------------------------|--|----------|
| | PLA | | | | PLA |
| Pipeline Operating Temperature | 70° | 158° | [Bar chart showing temperature range] | | |
| | 60° | 140° | | | |
| | 50° | 120° | | | |
| | 40° | 104° | | | |
| | 30° | 85° | | | |
| Minimum Installation Temp. | 60 °C (°F) | | 140 (140) | | |
| Resistance to Circumferential Forces | | | very good | | |
| Resistance to Soil Stress | | | very good | | |
| Resistance to Axial Pipe Movement | | | very good | | |
| Main Line Coating Compatibility | | | PU, PE, FBE, PP | | |

Typical Product Properties

| | Test Standard | Unit | PLA |
|----------|---------------------------|--------------|-------------------------|
| Adhesive | Softening Point | ASTM E28 | °C (°F) |
| | Lap Shear | DIN 30 672 | N/cm ² (psi) |
| Backing | Specific Gravity | ASTM D792 | |
| | Tensile Strength | ASTM D638 | MPa (psi) |
| | Elongation | ASTM D638 | % |
| | Hardness | ASTM D2240 | Shore D |
| | Abrasion Resistance | ASTM D1044 | mg |
| | Volume Resistivity | ASTM D257 | ohm-cm |
| | Dielectric Voltage Brkdw. | ASTM D149 | kV/mm |
| Sleeve | Impact | DIN 30 672 | class B |
| | Indentation | DIN 30 672 | class B |
| | Peel | ASTM D1000 | N/cm (pli) |
| | Peel | DIN 30 672 | N/cm (pli) |
| | Cathodic Disbondment | ASTM G8 | mm rad |
| | Water Absorption | ASTM D570 | % |
| | Low Temp. Flexibility | ASTM D2671-C | °C (°F) |
| | DIN Approval | DIN 30 672 | class |
| | Fully Recovered Thickness | | mm (mils) |

How To Order:

Dimensions & Ordering Info

PLA 115-450 YE

Colour → YE - Yellow, BK - Black

Sleeve Width → 300mm, 450mm, 600mm, 900mm (12", 18", 24", 36")

Pipe Size → 55mm - 315mm (2" - 12")

Adhesive (thickness as supplied) → A - 0.75 mm (30 mils)

Backing (thickness as supplied) → L - 0.80 mm (31 mils)

Configuration → P - Tubular

Standard Ordering Options

YE - Yellow, BK - Black

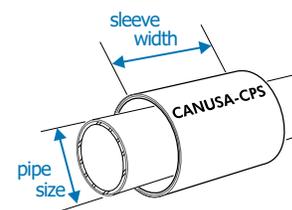
300mm, 450mm, 600mm, 900mm
(12", 18", 24", 36")

55mm - 315mm (2" - 12")

A - 0.75 mm (30 mils)

L - 0.80 mm (31 mils)

P - Tubular



Min. Sleeve Width =
Bare Steel Dimension + 50 mm (2") min.
on each side of the pipe joint.

The above represent standard ordering options. Consult your Canusa representative for any unique project requirements.



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