KUBRICKY CONSTRUCTION CORP.
269 BALLARD ROAD

WILTON, NY 12831
518 792-5864

KUBRICKY CONSTRUCTION CORP.
A PROUD MEMBER OF THE D.A. COLLINS™ COMPANIES
An Equal Opportunity Employer

Rutland City BRF 3000 (2014036)
SUBMITTAL 59.1

**Issued 10/30/15**
Respond by 11/06/15

*To*

**Timothy Pockette, PE**

| | |
|---|---|
| Topic | 900.640 Ductile Iron Pipe on Bridge 6" & 10" |
| Status | Revision For Approval |

Message

Tim,
Please see attached revision to the previously approved Submittal 59 - Ductile Iron Pipe on Bridge 6" & 10" hanger Design. KCC has revised this design to address any possible movement of the back to back angle supports Prior to filling and testing the water line.

Thanks,
Mike

*Courtesy Copy*

**Volker H.D. Burkowski**

*From*

**Mike Martin**

Signed by ______________________ Date 10/30/15

Proceed as Indicated ______________________ Date ______________
Owner Authorized Representative

# Design Submittal

# Utility Brackets

## River Street over Otter Creek
## Rutland, VT

## State of Vermont Agency of Transportation

## Proposed Improvement Bridge Project
## Project No.: BRF 3000 (16)

Prepared for:

Kubricky Construction Corp.
295 Ballard Road
Wilton, NY 12831

Prepared by:

William J. Frank Engineering, P.C.
4 Old Route 6
Brewster, NY 10509
845-490-1393

April 24, 2015
Revised May 20, 2015
Revised October 29, 2015

Job No. 14-049.03

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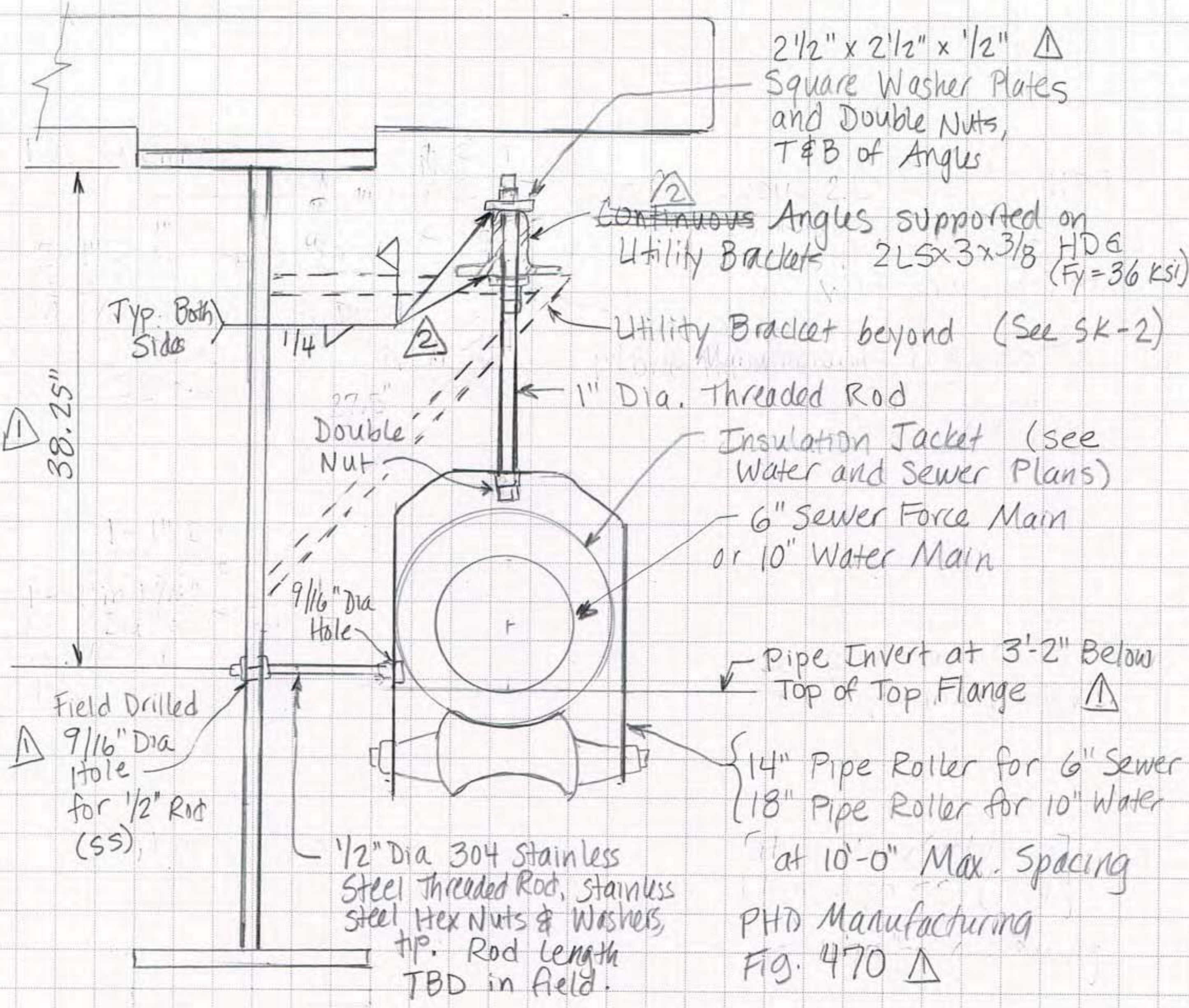
JOB 14-049.03
SHEET NO. SK-1 OF 2
CALCULATED BY EMC DATE 4-23-2015
CHECKED BY WJF DATE 4/23/15
SCALE 1" = 1'-0"   △1 Rev: EMC 5-19-15
Chk: WJF 5-19-15
△2 Rev: EMC 10-29-15
Chk: WJF 10/29/15

△2 Sheet Revised 10/29/15

River Street Over Otter Creek
Rutland, VT




Section at Pipe Hangers

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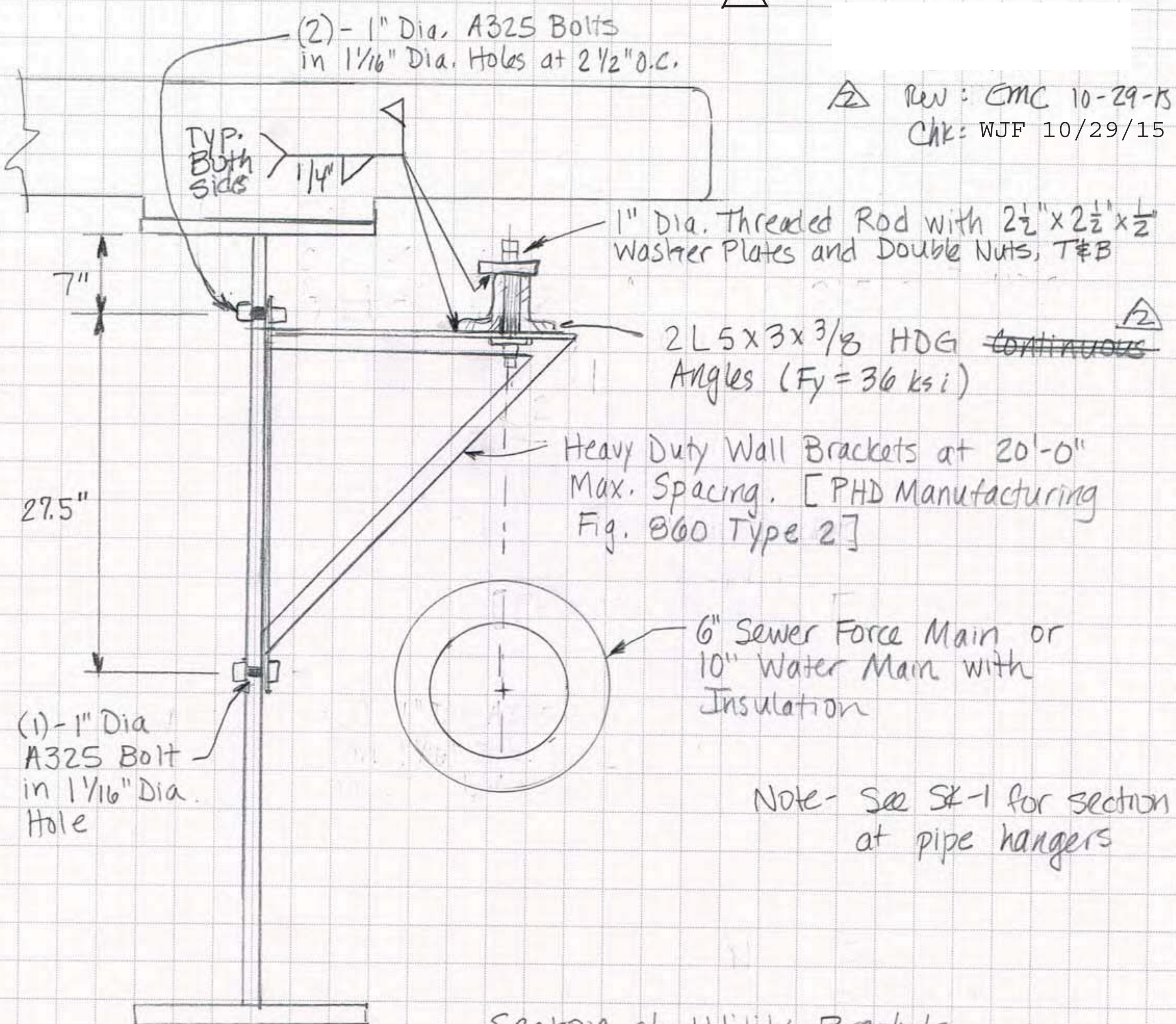
JOB 14-049.03
SHEET NO. SK-2 OF 2
CALCULATED BY EMC DATE 5-19-2015
CHECKED BY WJF DATE 5/19/15
SCALE 1" = 1'-0"

1 SHEET ADDED 5-19-15

River Street over Otter Creek, Rutland, VT

2 SHEET REVISED 5-20-15

2 Rev: EMC 10-29-15
Chk: WJF 10/29/15




Note - See SK-1 for section at pipe hangers

Section at Utility Brackets

PRODUCT 204-1 (Single Sheets) 205-1 (Padded)

# SUPPORTING DESIGN CALCULATIONS

**REFERENCES**

1. Contract Drawings for Vermont Agency of Transportation (VTrans) Project No. BRF 3000(16), Rutland City TH 8 Bridge 2
2. Shop Drawings for VTrans Project No. BRF 3000 (16), TH-8 (River Street) over Otter Creek, Bridge No. 2, Rutland City Bridge Replacement, by Casco Bay Steel Structures, Inc.
3. Water and Sewer Plans for VTrans Project No. BRF 3000 (16), Rutland City, by CLD Consulting Engineers
4. ASCE 07-10, Minimum Design Loads for Buildings and Other Structures
5. AASHTO LRFD Bridge Design Specifications, 5th Edition
6. AISC Steel Construction Manual, Fourteenth Edition

**INTRODUCTION**

These design calculations are for utility supports to be attached to the fascia girders for the replacement bridge carrying River Street over Otter Creek in Rutland, Vermont. A 10-inch diameter water main and a 6-inch diameter sewer force main will be supported on opposite sides of the bridge.

The utilities will be supported by Fig. 470SS (304) Pipe Roller Supports with 1-inch diameter threaded rods by PHD Manufacturing, Inc. at a 10 foot spacing. The rods will be supported by back-to-back 5"x3"x3/8" angles (Fy=36 ksi) with the 5" legs vertical. Each hanger will have a ½-inch diameter threaded rod sway brace attached to the fascia girder. The angles will be supported by Fig. 860 Type No. 2 Heavy Duty Wall Brackets by PHD Manufacturing, Inc. at a 20 foot spacing. 2

Utility Dead Loads – assume 20-foot segments

6-inch sewer force main with insulation

6" pipe – Thickness Class 52 t = 0.31"
Wt = 413 lb / 20' = 21 lb/f
(App. A)
Insulation with aluminum jacket – assume 10 lb/f

Total = 31 lb/f

10-inch water main with insulation

10" pipe – Thickness Class 52. t = 0.31"
Wt = 760 lb / 20' = 38 lb/f
(App. A)
Insulation with aluminum jacket – assume 10 lb/f

Total = 48 lb/f

Snow Loads

Ignore snow loading since the utilities will be under the bridge deck overhang.

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JOB 14-049.03
SHEET NO. 2A OF 11
CALCULATED BY EMC DATE 5-19-2015
CHECKED BY WJF DATE 5/20/15
~~SCALE~~ ⚠1 SHEET ADDED 5-19-15

## Utility Live Loads (contents of pipes)

### 6-inch sewer force main

O.D. = 6.90 t = 0.31 I.D. = 6.28"

Interior volume = $\frac{\pi}{4}(6.28/12)^2 = 0.215\ ft^3/f$

Water weight = $0.215\ ft^3/f \times 62.4\ pcf =$ 14. lb/f

### 10-inch water main

O.D. = 11.10 t = 0.35 I.D. = 10.4"

Interior volume = $\frac{\pi}{4}(10.4/12)^2 = 0.590\ ft^3/f$

Water weight = $0.590\ ft^3/f \times 62.4\ pcf =$ 37 lb/f

## Ice Loads Due to Freezing Rain (ASCE 07-10, Section 10.4)

For Vermont, nominal ice thickness $t = 1"$ (Fig. 10-2)

Topographic factor $K_{zt} = 1.0$ for level terrain. (10.4.5)

Risk Category III or IV: $I_i = 1.25$ (Table 1.5-2)

Vertical clearance of bridge = 19' min above stream bed.
Height of utilities ≈ 22' above stream bed.

Height factor $f_z = \left(\frac{z}{33}\right)^{0.10} = \left(\frac{22}{33}\right)^{0.10} = 0.96$

Design ice thickness $t_d = 2.0\, t\, I_i\, f_z\, (K_{zt})^{0.35}$ (Eq. 10-5)

$= 2.0 \times 1" \times 1.25 \times 0.96 \times (1)^{0.35} = 2.4$ inches

Ice density = 56 pcf

For 6" sewer force main: $D_c = 13"$
For 10" water main: $D_c = 17.5"$
} Including insulation. See Contract Dwg. Sh. 9

6" sewer: $A_i = \pi\, t_d (D_c + t_d)$ (Eq. 10-1)

$= \pi \times 2.4\,(13 + 2.4) = 116\ in^2$

$D_i = 56\,pcf \times \frac{116}{144} = \underline{45\ lb/f}$

10" water: $A_i = \pi \times 2.4\,(17.5 + 2.4) = 150\ in^2$

$D_i = 56\,pcf \times \frac{150}{144} = \underline{58\ lb/f}$

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## Load Combinations

Refer to ASCE 7-10 Sections 2.4.1 and 2.4.3

Load Case #2: $D + L + 0.7\,Di$ ⚠1

6" sewer: $D + L + 0.7\,Di = 31\ lb/f + 14\ lb/f + 0.7(45\ lb/f) = \underline{77\ lb/f}$

10" water: $D + L + 0.7\,Di = 48\ lb/f + 37\ lb/f + 0.7(58\ lb/f) = \underline{126\ lb/f}$

## Pipe Roller Hangers

Use PHD Fig 470 Pipe Roller Supports. (App. B)

Use 14" Pipe Roller for 6" sewer. Wt = 36 lb each

Max. recommended load = 1200 lb

$$\text{Max spacing} = \frac{1200 \text{ lb}}{77 \text{ lb/f}} = 15.6 \text{ feet for 6" sewer}$$

Use 2 hangers per 20' segment

Spacing = 20'/2 = 10' < 15.6' ok

Use 18" Pipe Roller for 10" water Wt = 54 lb each

Max. recommended load = 1400 lb

$$\text{Max. spacing} = \frac{1400 \text{ lb}}{126 \text{ lb/f}} = 11.1 \text{ feet for 10" water}$$

Use 2 hangers per 20' segment

Spacing = 20'/2 = 10' < 11.1' ok

## Utility Brackets

Use PHD Fig. 860 Heavy Duty Wall Brackets, Type 2 (App. C)

Capacity = 3000 lb per bracket

For 6" sewer and pipe rollers and continuous angles:

$$w = \underset{\text{sewer}}{77\ \text{lb/f}} + \underset{\text{rollers}}{\frac{2 \times 36\ \text{lb}}{20'}} + \underset{\text{angles}}{20\ \text{lb/f}}\ (\leftarrow \text{Assumed}) = 101\ \text{lb/f}$$

$$\text{Max. bracket spacing} = \frac{3000\ \text{lb}}{101\ \text{lb/f}} = 29.7'$$

Try brackets at 20' max spacing for 6" sewer

For 10" water and pipe rollers and continuous angles:

$$w = \underset{\text{water}}{126\ \text{lb/f}} + \underset{\text{rollers}}{\frac{2 \times 54\ \text{lb}}{20'}} + \underset{\text{angles}}{20\ \text{lb/f}}\ (\leftarrow \text{Assumed}) = 151\ \text{lb/f}$$

$$\text{Max. bracket spacing} = \frac{3000\ \text{lb}}{151\ \text{lb/f}} = 19.9',\ \text{say } 20'$$

Try brackets at 20' max spacing for 10" water

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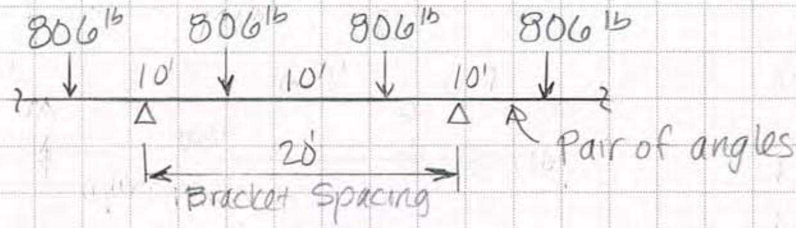
JOB 14-049.03
SHEET NO. 7 OF 11
CALCULATED BY EMC DATE 4-21-2015
CHECKED BY WJF DATE 4/23/15
△1 ~~SCALE~~ Rev= EMC 5-19-15
Chk= WJF 5/20/15

## Angles to Support Hangers

### For 6" sewer:

Hanger spacing = 10'
Hanger load = (77 lb/f × 10') + 36 lb = 806 lb
Bracket spacing = 20' max



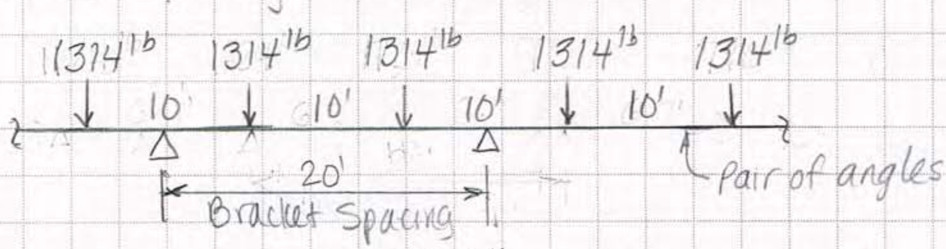

$$\text{Bracket reaction} = \frac{806\ lb}{10'} \times 20' = 1612\ lb$$

$$V_{max} = 1612\ lb / 2 = 806\ lb$$

$$M_{max} = 806\ lb \times 5' = 4{,}030\ lb\text{-}f$$

### For 10" water:

Hanger spacing = 10'
Hanger load = (126 lb/f × 10') + 54 lb = 1314 lb
Bracket spacing = 20' max




$$\text{Bracket reaction} = \frac{1314\ lb}{10'} \times 20' = \underline{2628\ lb} \text{ controls}$$

$$V_{max} = 2628\ lb / 2 = \underline{1314\ lb} \text{ (controls)}$$

$$M_{max} = 1314\ lb \times 5' = \underline{6{,}570\ lb\text{-}f} \text{ (controls)}$$

△2 SHEET REVISED 10-29-15

Angles to Support Hangers (typ)

$V_{max} = 1314^{lb} = 1.3k$

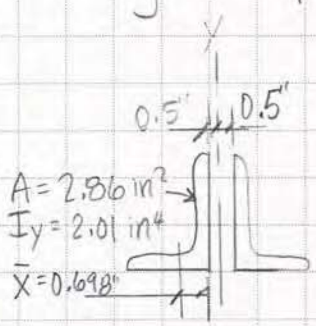
Try ⅃L 5 x 3 x 3/8 back to back angles, long leg vertical, $F_y = 36$ ksi

$I_x = 2 \times 7.35 = 14.7 in^4$
$S_x = 2 \times 2.22 = 4.44 in^3$
$r_x = 1.60 in$
$Z_x = 2 \times 3.93 = 7.86 in^3$

$J = 2 \times 0.141 = 0.282 in^4$
$C_w = 2 \times 0.196 = 0.392 in^6$
$G = 0.385E = 11,165$ ksi
$d = 5$ in

Hanger rod diameter = 1 inch (Sh. B1)

Say 1" separation between angles




$I_y = 2 \times 2.01 = 4.02 in^4$ (conservative)
$A = 2 \times 2.86 = 5.72 in^2$

$r_y = \sqrt{I_y/A} = \sqrt{4.02/5.72} = 0.83"$

Unbraced length = bracket spacing: $L_b = 20' = 240"$ △2

Yielding (AASHTO 6.12.2.2.4)
Since the angles are continuous, the angle stems will be in both tension and compression.
∴ $M_n = M_y = F_y S_x = 36 \times 4.44 = 160$ k-in ← controls

Lateral Torsional Buckling

$B = -2.3 \frac{d}{L_b} \sqrt{\frac{I_y}{J}} = -2.3 \times \frac{5}{240} \sqrt{\frac{4.02}{0.282}} = -0.18$

$M_n = \frac{\pi \sqrt{E I_y G J}}{L_b} \left[B + \sqrt{1+B^2}\right] \le M_p$ △1

$= \frac{\pi \sqrt{29000 \times 4.02 \times 11165 \times 0.282}}{240} \left[-0.18 + \sqrt{1+(-0.18)^2}\right] = 210$ k-in

Chk: WJF 5/20/15
Rev: EMC 10-29-2015
Chk: WJF 10/29/15
△2 SHEET REVISED 5-29-15

## Angles to Support Hangers (cont.)

$M_p = F_y Z_x = 36 \times 7.86 = 283$ k-in

### Flange Local Buckling

$\lambda_f = \frac{b_f}{2t_f} = \frac{2 \times 3}{2 \times 0.375} = 8.0$

$\lambda_{pf} = 0.38\sqrt{E/F_y} = 0.38\sqrt{29000/36} = 10.8 > 8.0$

∴ Flange is compact

No need to check for flange local buckling.

Yielding controls. $M_n = 160$ k-in

$\phi_f = 1.0$ (AASHTO 6.5.4.2)

$M_{max} = 6570^{lb\text{-}f} \times \frac{12}{1000} = 78.8$ k-in

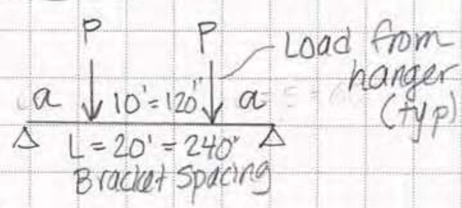
Use load factor for DC (dead load of components)

$\gamma_p = 1.25$ (AASHTO Table 3.4.1.2)

Use strength I: $M_u = 1.25 \times 78.8 = 98.5$ k-in $< \phi_f M_n = 160$ k-in (ok)

Use 2L 5x3x3/8 LLBB $F_y = 36$ ksi

△1 Deflections at 10" water supports




$\Delta = \frac{Pa}{24EI}(3L^2 - 4a^2)$ $a = 5' = 60"$

$= \frac{P \times 60}{24 \times 29000 \times 14.7}(3 \times 240^2 - 4 \times 60^2) = 0.93P$

Hanger weight = 54 lb

For Pipe DL: $P = (0.048 \times 10) + 0.054 = 0.53^k$ $\Delta = 0.93 \times 0.53 = 0.49"$

For Pipe DL plus contents: $P = 0.53 + (0.037 \times 10) = 0.90^k$ $\Delta = 0.93 \times 0.90 = 0.84"$

For Pipe DL plus contents plus 0.7 × Ice Load:-
$P = 0.90 + (0.7 \times 0.058 \times 10) = 1.31^k$ $\Delta = 0.93 \times 1.31 = 1.22"$

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JOB 14-049.03
SHEET NO. 9A OF 11
CALCULATED BY DJF DATE 10-27-15
CHECKED BY EMG DATE 10-29-15
SCALE

Rev 2 Sheet Added 10/29/15

## CHECK SINGLE ANGLE FOR BENDING

$M_u = 98.5^{k\text{-}in}$ $L_b = 10' = 120''$ (between welded plates)

per AISC F10

$M_n = 1.5M_y = 1.5(S_x \times F_y) = 1.5(2.22\ in^3)(36^{ksi}) = 120^{k\text{-}in}$ ($M_y = 79.9^{k\text{-}in}$)

$$M_e = \frac{4.9EI_zC_b}{L_b^2}\left[\sqrt{\left(\beta_w^2 + 0.052\left(\frac{L_bt}{r_z}\right)^2\right)} + \beta_w\right]$$

$\beta_w = 2.99''$ (C-F10.1)

$$M_e = \frac{4.9(29000)(1.2)(1)}{120^2}\left[\sqrt{2.99^2 + 0.52\left(\frac{120(3/8)}{0.646}\right)^2} + 2.99\right] = 631^{k\text{-}in} \gg M_y$$

$$M_n = \left(1.92 - 1.17\sqrt{M_y/M_e}\right)M_y = \left(1.92 - 1.17\sqrt{79.9/631}\right)79.9$$

$M_n = 120^{k\text{-}in} \approx 1.5M_y$

$\phi M_n = 1.0(120^{k\text{-}in}) = 120^{k\text{-}in} > 98.5^{k\text{-}in}$ ∴ OK

$b/t = 5''/3/8 = 13.3$

$\lambda_p = 0.54\sqrt{E/F_y} = 0.54\sqrt{29000/36} = 15.3 > 13.3$ ∴ LLB doesn't control

PRODUCT 204-1 (Single Sheets) 205-1 (Padded)

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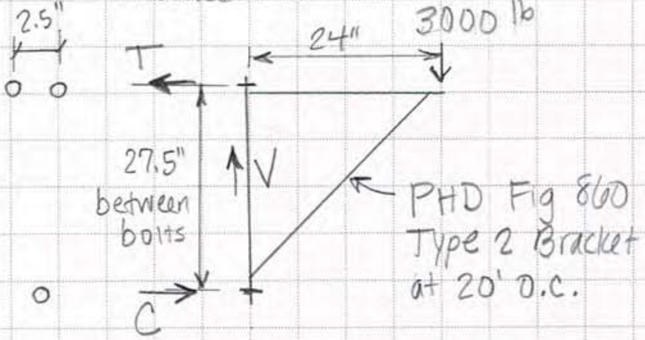
## Connection of Brackets to Fascia Girder Webs

Reaction from hanger loads: 2628 lb
⅃L Angle weight: 2 × 9.8 lb/f × 20' = 392 lb

$\Sigma$ = 3020 lb per bracket
(≈ 3000 lb ok)

Conservatively assume the load acts at the edge of the bracket.




$V = 3{,}000$ lb

$T = C = \frac{3000\text{ lb} \times 24"}{27.5"} = 2618$ lb

There are two 1 1/16" $\phi$ holes at the top, and one 1 1/16" $\phi$ hole at the bottom.
Try (3) 1-inch dia A325 bolts.

$T_{bolt} = \frac{2618\text{ lb}}{2} = 1309$ lb / bolt

$V_{bolt} = \frac{3000\text{ lb}}{3} = 1000$ lb / bolt

Use $\gamma_p = 1.25$ Load Factor for DC (dead load of components) (AASHTO Table 3.4.1.2)

$T_u = 1.25 \times 1309 = 1636$ lb $= 1.64$ k (tension)
$P_u = 1.25 \times 1000 = 1250$ lb $= 1.25$ k (shear)

$A_b = 0.79\text{ in}^2$
$F_{ub} = 120$ ksi (AASHTO 6.4.3)
$\phi_t = 0.80$ $\phi_s = 0.80$ $\phi_{bb} = 0.80$ (AASHTO 6.5.4.2)

Shear: $R_n = 0.38\, A_b\, F_{ub}\, N_s = 0.38 \times 0.79 \times 120 \times 1 = 36.0^k$ (AASHTO 6.13.2.7-2)
$\phi_s R_n = 0.80 \times 36.0 = 28.8^k > P_u = 1.25^k$ (OK)
$\frac{P_u}{R_n} = \frac{1.10}{36.0} = 0.03 < 0.33$ ∴ $T_n = 0.76\, A_b\, F_{ub}$ (AASHTO 6.13.2.11-1)
Tension: $T_n = 0.76 \times 0.79 \times 120 = 72.0^k$ $\phi_t T_n = 0.8 \times 72 = 57.6^k > T_u = 1.64^k$ (OK)

Connection of Brackets to Fascia Girder Webs (cont)

Ref: Shop Dwgs. Web is 3/4" x 60" (App. E)

$t = 0.75"$

Bearing on bolts:

Clear distance between holes: $L_c = 2.5" - 1.0625" = 1.44"$

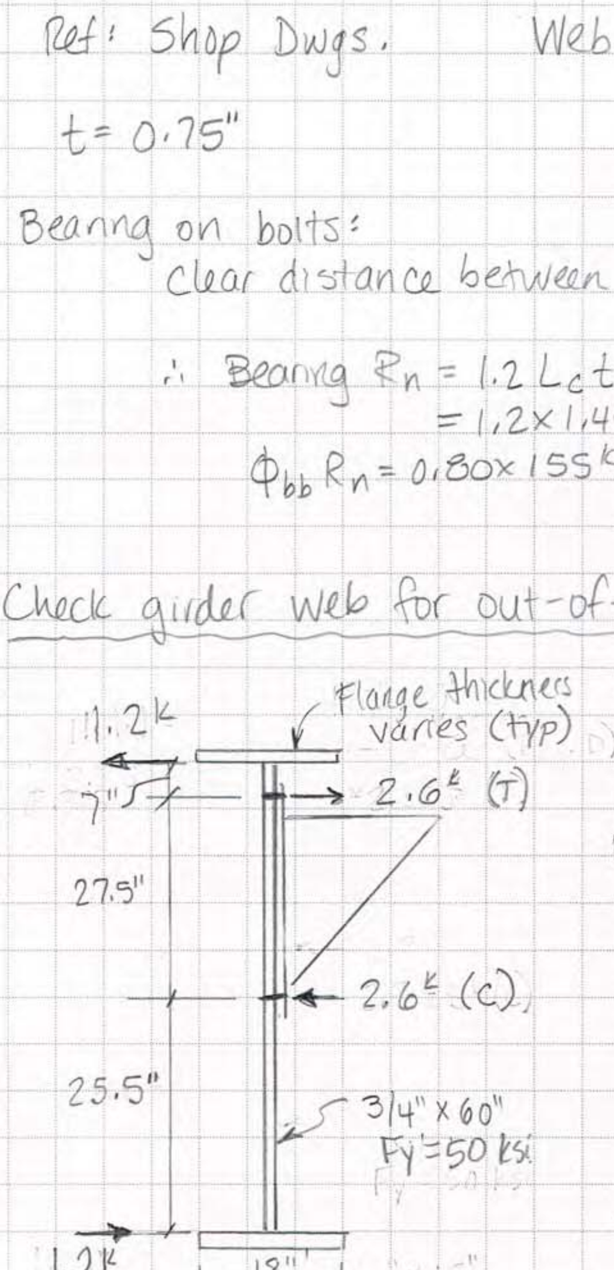
$L_c < 2.0d = 2.0 \times 1 = 2.0"$

$\therefore$ Bearing $R_n = 1.2 L_c t F_u$ (AASHTO 6.13.2.9-2)

$= 1.2 \times 1.44" \times 0.75" \times 120\ ksi = 155^k$

$\phi_{bb} R_n = 0.80 \times 155^k = 124^k > P_u = 1.25^k$ (OK)

Check girder web for out-of-plane bending




$T = C = 2618^{lb} = 2.6^k$

Reaction at top flange:

$R_T = \frac{1}{60}[2.6(60-7) - 2.6(25.5)]$

$R_T = \frac{1}{60}[137.8 - 66.3] = 1.2^k \leftarrow$

Reaction at bottom flange:

$R_B = \frac{1}{60}[2.6(7+27.5) - 2.6(7)]$

$= \frac{1}{60}[89.7 - 18.2] = 1.2^k \rightarrow$

$V = 0$ at bottom bolts

$M_{max} = 1.2^k \times 25.5" = 30.6\ k\text{-}in$

Consider a 9" length of web to resist the out-of-plane bending.

$S = \frac{bd^2}{6} = \frac{9 \times 0.75^2}{6} = 0.84\ in^3$

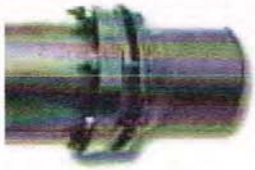
$f_b = \frac{M}{S} = \frac{30.6\ k\text{-}in}{0.84\ in^3} = 36.4\ ksi < 0.75 F_y = 37.5\ ksi$ (OK)

# APPENDIX 'A'

## MECH-LOK Rigid Restrained Joint Pipe

△1 Revised 5-19-15

Sh. A1 of 4



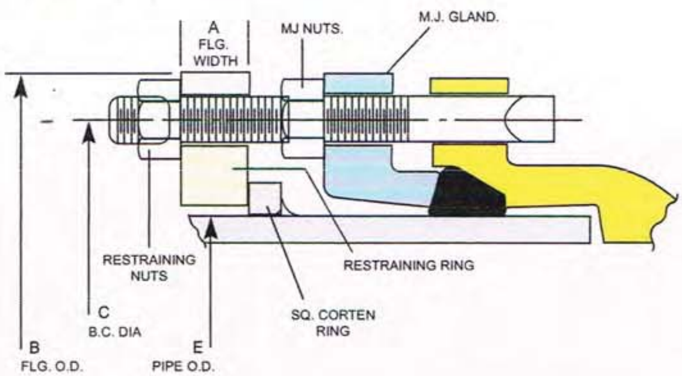
Griffin Pipe Products Co.



## Griffin MECH-LOK™ Rigid Restrained Joint

Certain pipeline construction projects require rigid restrained joint pipe for use on bridges or other elevated structures. The ***MECH-LOK*** joint combines the proven mechanical joint with a rigid restraining system. This product can be used on long-span piers at 40 ft. spacings.

The ***MECH-LOK*** assembly consists of a mechanical joint pipe, a ductile iron or A588 alloy steel ***MECH-LOK*** ring, and a factory-welded alloy steel ring on the plain end (spigot) of the pipe. The ***MECH-LOK*** joint is available in sizes 6" through 36" with working pressure ratings of 250 psi. It can be ordered with any standard or custom pipe laying length. ***MECH-LOK*** joints are supplied with the gland and fasteners. Note: **Although mechanical joint pipe is produced in 3" - 24" sizes only, *MECH-LOK* joints can be specified on any spigot up to 36" diameter.**




The double-nut design of the ***MECH-LOK*** joint allows the first nut to tighten the mechanical joint gland and compress the gasket. The second nut provides the necessary joint restraint and determines the flexibility of the finished joint. If the restraining nut is fully torqued, it will create a rigid pipeline with the capability of spanning 40-foot long span support spacings. The supports can be piers giving support from below or pipe hangers giving support from above the pipeline. Hangers can be as close as the bridge architecture demands or as distant as 40-feet on-center. The hangers are only responsible for supporting the dead weight of the pipe and its contained fluid - the rigid joint handles the thrust force. Isolated expansion is addressed by using readily available expansion joints as necessary.

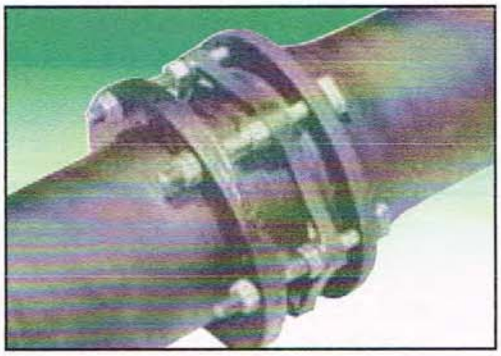
### 6" - 36" MECH-LOK™ JOINT

| Pipe Size | "A" Flange Width | "B" Flange O.D. | "C" B.C. Dia. | "E" Pipe Dia. | Bolt Length | Number of Bolts | Deflection Angle |
|---|---|---|---|---|---|---|---|
| 6" | 0.75 | 11.13 | 9.50 | 6.90 | 8 | 6 | 2 1/2° |
| 8" | 1.00 | 13.38 | 11.75 | 9.05 | 8 | 6 | 2 1/2° |
| 10" | 1.00 | 15.63 | 14.00 | 11.10 | 8 | 8 | 2 1/2° |
| 12" | 1.00 | 17.88 | 16.25 | 13.20 | 8 | 8 | 2° |
| 14" | 1.25 | 20.25 | 18.75 | 15.30 | 8 | 10 | 2° |
| 16" | 1.50 | 22.50 | 21.00 | 17.40 | 8 | 12 | 2° |
| 18" | 1.63 | 25.75 | 23.25 | 19.50 | 8 | 12 | 2° |
| 20" | 1.75 | 28.32 | 25.50 | 21.60 | 8 | 14 | 2° |
| 24" | 2.00 | 32.44 | 30.00 | 25.80 | 8 | 16 | 2° |
| 30" | 2.50 | 39.25 | 36.88 | 32.00 | 10.5 | 20 | 1/2° |
| 36" | 3.00 | 46.00 | 43.75 | 38.30 | 11 | 24 | 1/2° |

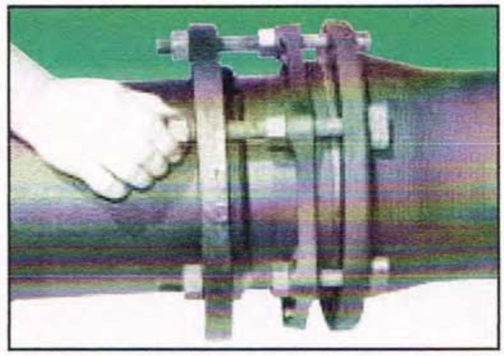


## MECH-LOK™ Rigid Restrained Joint
### Assembly Instructions

1. Assemble the mechanical joint as per the standard recommended procedure. Use reasonably straight alignment of the two pipe sections during assembly. Keep the MJ gland square with the MJ flange. Hand-tighten the nuts on the MJ gland.



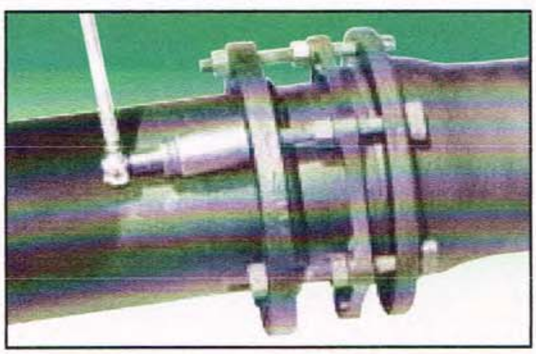
2. Slide the ***MECH-LOK*** restraining ring over the bolts and hand tighten the nuts.



3. For non-rigid pipelines, tighten the nuts on the MJ gland using an open-end adjustable wrench. Uniformly tighten the nuts to the 120-150 ft.-lb torque range.

   For applications that require subsequent joint deflection, the restraining nuts should be finger tightened.

   For applications that require rigid joints, such as long span or bridge crossings, the restraining nuts should be tightened to the 120-150 ft-lb torque range, prior to final tightening of the MJ nuts. This will ensure that the spigot is tight against the socket. After tightening the MJ bolts, retighten and torque the restraining nuts.

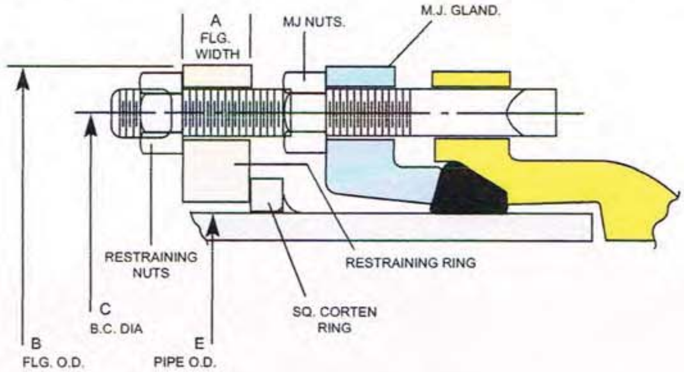


A typical ***MECH-LOK*** rigid restrained (long span) pipe design.

## Griffin MECH-LOK™ Rigid Restrained Joint

Certain pipeline construction projects require rigid restrained joint pipe for use on bridges or other elevated structures. The ***MECH-LOK*** joint combines the proven mechanical joint with a rigid restraining system. This product can be used on long-span piers at 40 ft. spacings.

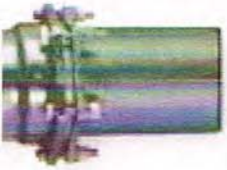
The ***MECH-LOK*** assembly consists of a mechanical joint pipe, a ductile iron or A588 alloy steel ***MECH-LOK*** ring, and a factory-welded alloy steel ring on the plain end (spigot) of the pipe. The ***MECH-LOK*** joint is available in sizes 6" through 36" with working pressure ratings of 250 psi. It can be ordered with any standard or custom pipe laying length. ***MECH-LOK*** joints are supplied with the gland and fasteners. Note: **Although mechanical joint pipe is produced in 3" - 24" sizes only, *MECH-LOK* joints can be specified on any spigot up to 36" diameter.**




The double-nut design of the ***MECH-LOK*** joint allows the first nut to tighten the mechanical joint gland and compress the gasket. The second nut provides the necessary joint restraint and determines the flexibility of the finished joint. If the restraining nut is fully torqued, it will create a rigid pipeline with the capability of spanning 40-foot long span support spacings. The supports can be piers giving support from below or pipe hangers giving support from above the pipeline. Hangers can be as close as the bridge architecture demands or as distant as 40-feet on-center. The hangers are only responsible for supporting the dead weight of the pipe and its contained fluid - the rigid joint handles the thrust force. Isolated expansion is addressed by using readily available expansion joints as necessary.

### 6" - 36" MECH-LOK™ JOINT

| Pipe Size | "A" Flange Width | "B" Flange O.D. | "C" B.C. Dia. | "E" Pipe Dia. | Bolt Length | Number of Bolts | Deflection Angle |
|---|---|---|---|---|---|---|---|
| 6" | 0.75 | 11.13 | 9.50 | 6.90 | 8 | 6 | 2 1/2° |
| 8" | 1.00 | 13.38 | 11.75 | 9.05 | 8 | 6 | 2 1/2° |
| 10" | 1.00 | 15.63 | 14.00 | 11.10 | 8 | 8 | 2 1/2° |
| 12" | 1.00 | 17.88 | 16.25 | 13.20 | 8 | 8 | 2° |
| 14" | 1.25 | 20.25 | 18.75 | 15.30 | 8 | 10 | 2° |
| 16" | 1.50 | 22.50 | 21.00 | 17.40 | 8 | 12 | 2° |
| 18" | 1.63 | 25.75 | 23.25 | 19.50 | 8 | 12 | 2° |
| 20" | 1.75 | 28.32 | 25.50 | 21.60 | 8 | 14 | 2° |
| 24" | 2.00 | 32.44 | 30.00 | 25.80 | 8 | 16 | 2° |
| 30" | 2.50 | 39.25 | 36.88 | 32.00 | 10.5 | 20 | 1/2° |
| 36" | 3.00 | 46.00 | 43.75 | 38.30 | 11 | 24 | 1/2° |



Sh. A4 of 4

Griffin Pipe Products Co.



## Mechanical Joint Pipe

### Pressure & Special Thickness Classes

Similar to Mech-Lok Pipe.

| Pipe Dimensions | | | | | Pipe Weights | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | 18-foot Laying Lengths | | 20-foot Laying Lengths | |
| Nominal Pipe Size *(in.)* | Pressure Class | Thickness Class | Pipe Thickness *(in.)* | Pipe O.D. *(in.)* | Weight of pipe barrel per foot *(lbs.)* | Weight per length *(lbs.)* | Average weight per foot** *(lbs.)* | Weight per length *(lbs.)* | Average weight per foot** *(lbs.)* |
| | 350 | 51 | 0.25 | | 8.9 | 171 | 9.5 | | |
| | | 52 | 0.28 | | 9.9 | 189 | 10.5 | | |
| 3 | | 53 | 0.31 | 3.96 | 10.9 | 207 | 11.5 | | |
| | | 54 | 0.34 | | 11.8 | 224 | 12.4 | | |
| | | 55 | 0.37 | | 12.8 | 242 | 13.4 | | |
| | | 56 | 0.40 | | 13.7 | 258 | 14.3 | | |
| | 350 | | 0.25 | | 10.9 | 211 | 11.7 | | |
| | | 51 | 0.26 | | 11.3 | 218 | 12.1 | | |
| | | 52 | 0.29 | | 12.6 | 241 | 13.4 | | |
| 4 | | 53 | 0.32 | 4.80 | 13.8 | 263 | 14.6 | | |
| | | 54 | 0.35 | | 15.0 | 284 | 15.8 | | |
| | | 55 | 0.38 | | 16.1 | 304 | 16.9 | | |
| | | 56 | 0.41 | | 17.3 | 326 | 18.1 | | |
| | 350 | 50 | 0.25 | | 16.0 | 309 | 17.2 | 341 | 17.1 |
| | | 51 | 0.28 | | 17.8 | 342 | 19.0 | 377 | 18.9 |
| 6 | | 52 | 0.31 | 6.90 | 19.6 | 374 | 20.8 | 413 | 20.7 |
| | | 53 | 0.34 | | 21.4 | 406 | 22.6 | 449 | 22.5 |
| | | 54 | 0.37 | | 23.2 | 439 | 24.4 | 485 | 24.2 |
| | | 55 | 0.40 | | 25.0 | 471 | 26.2 | 521 | 26.1 |
| | | 56 | 0.43 | | 26.7 | 502 | 27.9 | 555 | 27.8 |
| | 350 | | 0.25 | | 21.1 | 408 | 22.7 | 451 | 22.6 |
| | | 50 | 0.27 | | 22.8 | 439 | 24.4 | 485 | 24.3 |
| | | 51 | 0.30 | | 25.2 | 482 | 26.8 | 533 | 26.7 |
| 8 | | 52 | 0.33 | 9.05 | 27.7 | 527 | 29.3 | 583 | 29.2 |
| | | 53 | 0.36 | | 30.1 | 570 | 31.7 | 631 | 31.6 |
| | | 54 | 0.39 | | 32.5 | 614 | 34.1 | 679 | 34.0 |
| | | 55 | 0.42 | | 34.8 | 655 | 36.4 | 725 | 36.3 |
| | | 56 | 0.45 | | 37.2 | 698 | 38.8 | 773 | 38.7 |
| | 350 | | 0.26 | | 27.1 | 524 | 29.1 | 578 | 28.9 |
| | | 50 | 0.29 | | 30.1 | 578 | 32.1 | 638 | 31.9 |
| | | 51 | 0.32 | | 33.2 | 634 | 35.2 | 700 | 35.0 |
| 10 | | 52 | 0.35 | 11.10 | 36.2 | 688 | 38.2 | 760 | 38.0 |
| | | 53 | 0.38 | | 39.2 | 742 | 41.2 | 820 | 41.0 |
| | | 54 | 0.41 | | 42.1 | 794 | 44.1 | 878 | 43.9 |
| | | 55 | 0.44 | | 45.1 | 848 | 47.1 | 938 | 46.9 |
| | | 56 | 0.47 | | 48.0 | 900 | 50.0 | 996 | 49.8 |
| | 350 | | 0.28 | | 34.8 | 672 | 37.3 | 741 | 37.1 |
| | | 50 | 0.31 | | 38.4 | 736 | 40.9 | 813 | 40.7 |
| | | 51 | 0.34 | | 42.0 | 801 | 44.5 | 885 | 44.3 |
| 12 | | 52 | 0.37 | 13.20 | 45.6 | 866 | 48.1 | 957 | 47.8 |
| | | 53 | 0.40 | | 49.2 | 931 | 51.7 | 1029 | 51.5 |
| | | 54 | 0.43 | | 52.8 | 996 | 55.3 | 1101 | 55.1 |
| | | 55 | 0.46 | | 56.3 | 1059 | 58.8 | 1171 | 58.6 |
| | | 56 | 0.49 | | 59.9 | 1123 | 62.4 | 1243 | 62.2 |

Standard Dimensions and Weights per ANSI/AWWA C151

** "Average weight per foot" shown in tables includes the weight of the bell

## APPENDIX 'B'

## Catalog Cuts for Pipe Roller Supports

# PIPE ROLLER SUPPORTS

**FUNCTION:** Designed for suspending pipe in applications where horizontal movement, due to expansion and contraction, will occur and vertical adjustment is necessary. The knurled insert provided with Fig. 475 allows easier vertical adjustment.

**APPROVALS:** Complies with Federal Specifications A-A-1192A (Type 43) and Manufacturers' Standardization Society ANSI/SP-69 and SP-58 (Type 43).

**MATERIAL:** Cast iron pipe roller with low carbon steel frame, axle and hex nuts.

**FINISH:** Plain or Electro-galvanized

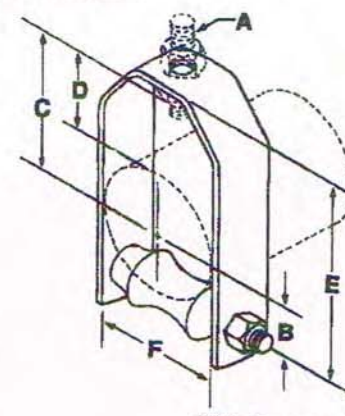
**SIZING:** Pipe roller size is for bare pipe. For proper sizing with insulation, refer to pipe roller selection guide on page 49, which is for use with pipe covering protection saddles.

**ORDERING:** Specify pipe roller size and figure number.

## Fig. 470 & 475 PIPE ROLLER HANGER

**Fig. 470*** WITHOUT SWIVEL
**Fig. 475** WITH ADJUSTING SWIVEL

*Available in stainless steel.
To order, specify 304 or 316 and add suffix SS to figure number.
Price on request.




"B" Center of axle to center of pipe

Fig. 470

Fig. 475
Available up to 8" (200) Pipe Roller Size

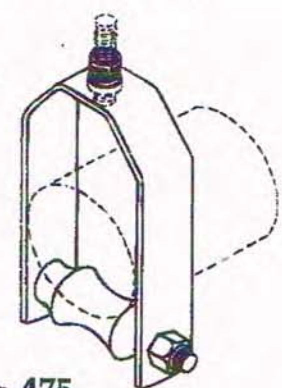


Fig. 475

| Pipe Roller Size | | Rod Size A | B | | C | | Adjustment D | | E | | F | | Max. Rec. Load | | Wt. Each | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | lbs. | kN | lbs. | kg |
| 2 | (50) | $\frac{3}{8}$ | $1\frac{5}{8}$ | (41.28) | $2\frac{5}{8}$ | (66.68) | $1\frac{1}{16}$ | (26.99) | $4\frac{3}{8}$ | (111.13) | 3 | (76.20) | 150 | (0.67) | 1.05 | (.48) |
| $2\frac{1}{2}$ | (65) | $\frac{1}{2}$ | 2 | (50.80) | $2\frac{3}{8}$ | (60.33) | $1\frac{3}{16}$ | (30.16) | 5 | (127.00) | $3\frac{1}{4}$ | (82.55) | 225 | (1.00) | 1.29 | (.59) |
| 3 | (80) | $\frac{1}{2}$ | $2\frac{1}{4}$ | (57.15) | $3\frac{1}{2}$ | (88.90) | $1\frac{3}{4}$ | (44.45) | $6\frac{3}{8}$ | (161.93) | $3\frac{7}{8}$ | (98.43) | 310 | (1.38) | 1.56 | (.71) |
| $3\frac{1}{2}$ | (90) | $\frac{1}{2}$ | $2\frac{5}{8}$ | (66.68) | $3\frac{3}{4}$ | (95.25) | $1\frac{3}{4}$ | (44.45) | 7 | (177.80) | $4\frac{3}{8}$ | (111.13) | 390 | (1.73) | 1.83 | (.83) |
| 4 | (100) | $\frac{5}{8}$ | $2\frac{3}{4}$ | (69.85) | $3\frac{15}{16}$ | (100.01) | $1\frac{11}{16}$ | (42.86) | $7\frac{1}{2}$ | (190.50) | 5 | (127.00) | 475 | (2.11) | 2.81 | (1.27) |
| 5 | (125) | $\frac{5}{8}$ | $3\frac{1}{2}$ | (88.90) | $4\frac{5}{16}$ | (109.54) | $1\frac{9}{16}$ | (39.69) | $8\frac{5}{8}$ | (219.08) | 6 | (152.40) | 685 | (3.05) | 4.42 | (2.00) |
| 6 | (150) | $\frac{3}{4}$ | 4 | (101.60) | $5\frac{3}{8}$ | (136.53) | $2\frac{1}{16}$ | (52.39) | $10\frac{1}{4}$ | (260.35) | $7\frac{1}{8}$ | (180.98) | 780 | (3.47) | 5.98 | (2.71) |
| 8 | (200) | $\frac{3}{4}$ | $5\frac{1}{8}$ | (130.18) | $6\frac{1}{2}$ | (165.10) | $2\frac{3}{16}$ | (55.56) | $12\frac{3}{4}$ | (323.85) | $9\frac{1}{4}$ | (234.95) | 780 | (3.47) | 11.42 | (5.18) |
| 10 | (250) | $\frac{7}{8}$ | $6\frac{3}{8}$ | (161.93) | $7\frac{3}{8}$ | (187.33) | 2 | (50.80) | 15 | (381.00) | $11\frac{1}{4}$ | (285.75) | 965 | (4.29) | 17.36 | (7.87) |
| 12 | (300) | $\frac{7}{8}$ | $7\frac{1}{2}$ | (190.50) | $8\frac{3}{4}$ | (222.25) | $2\frac{3}{8}$ | (60.33) | $17\frac{3}{8}$ | (441.33) | $13\frac{1}{4}$ | (336.55) | 1200 | (5.34) | 24.62 | (11.17) |
| 14 | (350) | 1 | $8\frac{3}{8}$ | (212.73) | 9 | (228.60) | 2 | (50.80) | $18\frac{7}{8}$ | (479.43) | $14\frac{3}{4}$ | (374.65) | 1200 | (5.34) | 36.00 | (16.33) |
| 16 | (400) | 1 | $9\frac{1}{2}$ | (241.30) | $9\frac{3}{4}$ | (247.65) | $1\frac{3}{4}$ | (44.45) | $20\frac{3}{4}$ | (527.05) | $16\frac{7}{8}$ | (428.63) | 1200 | (5.34) | 44.00 | (19.96) |
| 18 | (450) | 1 | $10\frac{1}{2}$ | (266.70) | $11\frac{3}{4}$ | (298.45) | $2\frac{3}{4}$ | (69.85) | $23\frac{3}{4}$ | (603.25) | $18\frac{7}{8}$ | (479.43) | 1400 | (6.23) | 54.00 | (24.49) |
| 20 | (500) | $1\frac{1}{4}$ | $11\frac{5}{8}$ | (295.28) | $12\frac{1}{2}$ | (317.50) | $2\frac{1}{2}$ | (63.50) | 26 | (660.40) | $20\frac{7}{8}$ | (530.23) | 1600 | (7.12) | 74.00 | (33.57) |
| 24 | (600) | $1\frac{1}{2}$ | $13\frac{13}{16}$ | (350.84) | $16\frac{1}{2}$ | (419.10) | $4\frac{1}{2}$ | (114.30) | 31 | (787.40) | 25 | (635.00) | 1600 | (7.12) | 126.00 | (57.15) |

*Note: For Fig. 470 use of an upper locknut ensures proper performance.*

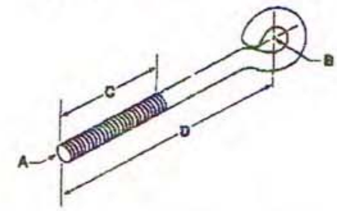
Unless otherwise specified, all dimensions on drawings and in charts are in inches and dimensions shown in parentheses are in millimeters.

# THREADED ACCESSORIES

**FUNCTION:** Designed for use in hanger assemblies. The welded design allows the eye to develop the full strength of the rod.
**MATERIAL:** Low carbon steel
**FINISH:** Plain or electro-galvanized
**ORDERING:** Specify rod size, length and figure number.

## Fig. 50 & 50L
## EYE ROD

**Fig. 50** RIGHT-HAND THREADS
**Fig. 50L** LEFT-HAND THREADS



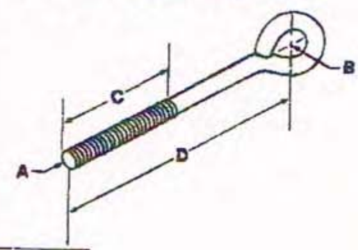

### Fig. 50 & 50L

| Rod Size A | B | | Thread Length C | | Max. Rec. Load 650°F (343°C) lbs. | kN |
|---|---|---|---|---|---|---|
| 3/8 | 5/8 | (15.88) | 2 1/2 | (63.50) | 240 | (1.07) |
| 1/2 | 3/4 | (19.05) | 2 1/2 | (63.50) | 440 | (1.96) |
| 5/8 | 7/8 | (22.23) | 2 1/2 | (63.50) | 705 | (3.14) |
| 3/4 | 1 | (25.40) | 3 | (76.20) | 1050 | (4.67) |
| 7/8 | 1 1/8 | (28.58) | 3 1/2 | (88.90) | 1470 | (6.54) |
| 1 | 1 1/4 | (31.75) | 4 | (101.60) | 1940 | (8.63) |

Available in stainless steel. To order, specify 304 or 316 and add suffix SS to figure number.
Price on request.

## Fig. 55 & 55L
## WELDED EYE ROD

**Fig. 55** RIGHT-HAND THREADS
**Fig. 55L** LEFT-HAND THREADS




### Fig. 55 & 55L

| Rod Size A | B | | Thread Length C | | Max. Rec. Load 650°F (343°C) lbs. | kN | 750°F (399°C) lbs. | kg |
|---|---|---|---|---|---|---|---|---|
| 3/8 | 5/8 | (15.88) | 2 1/2 | (63.50) | 730 | (3.25) | 540 | (2.40) |
| 1/2 | 3/4 | (19.05) | 2 1/2 | (63.50) | 1350 | (6.01) | 1010 | (4.49) |
| 5/8 | 7/8 | (22.23) | 2 1/2 | (63.50) | 1810 | (8.05) | 1610 | (7.16) |
| 3/4 | 1 | (25.40) | 3 | (76.20) | 2710 | (12.05) | 2420 | (10.76) |
| 7/8 | 1 1/8 | (28.58) | 3 1/2 | (88.90) | 3770 | (16.77) | 3360 | (14.95) |
| 1 | 1 1/4 | (31.75) | 4 | (101.60) | 4960 | (22.06) | 4420 | (19.66) |

Available in stainless steel. To order, specify 304 or 316 and add suffix SS to figure number.
Price on request.

| Rod Size A | Wt. Each, Length D: 8 (203.2) lbs. | Kg | 10 (254.0) lbs. | kg | 12 (304.8) lbs. | kg | 14 (355.6) lbs. | kg | 18 (457.2) lbs. | kg | 24 (609.6) lbs | kg | 30 (762.0) lbs. | kg |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3/8 | .32 | (0.15) | .38 | (0.17) | .44 | (0.20) | .50 | (0.23) | .63 | (0.29) | .80 | (0.36) | 1.00 | (0.45) |
| 1/2 | .60 | (0.27) | .70 | (0.32) | .82 | (0.37) | .94 | (0.43) | 1.16 | (0.53) | 1.50 | (0.68) | 1.83 | (0.83) |
| 5/8 | .97 | (0.44) | 1.14 | (0.52) | 1.31 | (0.59) | 1.49 | (0.68) | 1.84 | (0.83) | 2.36 | (1.07) | 2.88 | (1.31) |
| 3/4 | 1.44 | (0.65) | 1.68 | (0.76) | 1.94 | (0.88) | 2.19 | (0.99) | 2.68 | (1.22) | 3.44 | (1.56) | 4.17 | (1.89) |
| 7/8 | 2.04 | (0.93) | 2.32 | (1.05) | 2.68 | (1.22) | 3.02 | (1.37) | 3.73 | (1.69) | 4.72 | (2.14) | 5.74 | (2.60) |
| 1 | 2.67 | (1.21) | 3.11 | (1.41) | 3.56 | (1.61) | 4.00 | (1.81) | 4.89 | (2.22) | 6.78 | (3.08) | 8.18 | (3.71) |

| Rod Size A | Wt. Each, Length D: 36 (914.4) lbs. | kg | 42 (1066.8) lbs. | kg | 48 (1219.2) lbs. | kg | 54 (1371.6) lbs | kg | 60 (1524.0) lbs. | kg | 66 (1676.4) lbs. | kg | 72 (1828.8) lbs. | kg |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3/8 | 1.18 | (0.54) | 1.39 | (0.63) | 1.58 | (0.72) | 1.76 | (0.80) | 1.95 | (0.88) | 2.14 | (0.97) | 2.33 | (1.06) |
| 1/2 | 2.17 | (0.98) | 2.49 | (1.13) | 2.83 | (1.28) | 3.16 | (1.43) | 3.49 | (1.58) | 3.83 | (1.74) | 4.06 | (1.84) |
| 5/8 | 3.40 | (1.54) | 3.92 | (1.78) | 4.44 | (2.01) | 4.96 | (2.25) | 5.48 | (2.49) | 6.00 | (2.72) | 6.52 | (2.96) |
| 3/4 | 4.94 | (2.24) | 5.70 | (2.59) | 6.45 | (2.93) | 7.20 | (3.27) | 7.95 | (3.61) | 8.70 | (3.95) | 9.45 | (4.29) |
| 7/8 | 6.76 | (3.07) | 7.81 | (3.54) | 8.83 | (4.01) | 9.85 | (4.47) | 10.87 | (4.93) | 11.89 | (5.39) | 12.91 | (5.86) |
| 1 | 8.89 | (4.03) | 10.48 | (4.75) | 11.87 | (5.38) | 13.19 | (5.98) | 14.51 | (6.58) | 15.91 | (7.22) | 17.25 | (7.82) |

Unless otherwise specified, all dimensions on drawings and in charts are in inches and dimensions shown in parentheses are in millimeters.

## APPENDIX 'C'

## Catalog Cuts for Utility Brackets

Sh. C1 of 1

# WALL BRACKETS

## Fig. 860 HEAVY DUTY WALL BRACKET

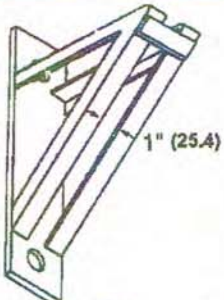
**FUNCTION:** Designed for the support or suspension of loads up to 3000 lbs (13.34kN). from walls or structures. The 1" (25.4) space between the angles allows the rod to be placed anywhere along the length of the brackets.

**APPROVALS:** Complies with Federal Specifications A-A-1192A (Type 33) and Manufacturers' Standardization Society ANSI/SP-69 and SP-58 (Type 33).

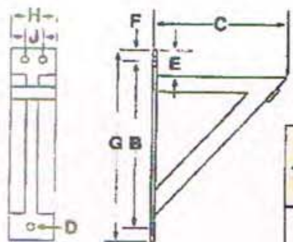
**MATERIAL:** Low carbon steel

**FINISH:** Plain or electro-galvanized

**ORDERING:** Specify type number and figure number.




Available in stainless steel. To order, specify 304 or 316 and add suffix SS to figure number. Price on request.




| Type No. | B | | C | | Hole Size D | | E | | F | |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 15 1/4 | (387.35) | 12 | (304.80) | 13/16 | (20.64) | 2 3/4 | (69.85) | 1 1/2 | (38.10) |
| 1 | 21 3/8 | (542.93) | 18 | (457.20) | 15/16 | (23.81) | 2 3/4 | (69.85) | 1 3/8 | (34.93) |
| 2 | 27 1/2 | (698.50) | 24 | (609.60) | 1 1/16 | (26.99) | 2 3/4 | (69.85) | 1 1/4 | (31.75) |
| 3 | 33 1/4 | (844.55) | 30 | (762.00) | 1 1/16 | (26.99) | 3 | (76.20) | 1 1/2 | (38.10) |
| 4 | 39 | (990.60) | 36 | (914.40) | 1 1/16 | (26.99) | 3 | (76.20) | 1 1/2 | (38.10) |
| 5 | 46 | (1168.40) | 42 | (1066.80) | 1 1/16 | (26.99) | 3 1/2 | (88.90) | 2 | (50.80) |

| Type No. | G | | H | | J | | Angle Iron Size | | Max. Rec. Load | | Wt Each | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | lbs. | kN | lbs. | kg |
| 0 | 18 | (457.2) | 4 | (101.6) | * | | 2 x 1 1/2 x 1/4 | (50.8 x 38.1 x 6.35) | 3000 | (13.34) | 24.33 | (11.04) |
| 1 | 24 | (609.6) | 5 | (127.0) | 2 3/4 | (69.85) | 2 x 2 x 1/4 | (50.8 x 50.8 x 6.35) | 3000 | (13.34) | 51.80 | (23.50) |
| 2 | 30 | (762.0) | 5 | (127.0) | 2 1/2 | (63.50) | 2 1/2 x 2 x 5/16 | (63.5 x 50.8 x 7.94) | 3000 | (13.34) | 65.84 | (29.86) |
| 3 | 36 | (914.4) | 5 | (127.0) | 2 1/2 | (63.50) | 2 1/2 x 2 x 5/16 | (63.5 x 50.8 x 7.94) | 3000 | (13.34) | 82.10 | (37.24) |
| 4 | 42 | (1066.8) | 6 | (152.4) | 3 1/2 | (88.90) | 3 1/2 x 2 1/2 x 3/8 | (88.9 x 63.5 x 9.53) | 3000 | (13.34) | 140.52 | (63.74) |
| 5 | 50 | (1270.0) | 6 | (152.4) | 3 1/2 | (88.90) | 3 1/2 x 2 1/2 x 3/8 | (88.9 x 63.5 x 9.53) | 3000 | (13.34) | 166.40 | (75.48) |

*one hole

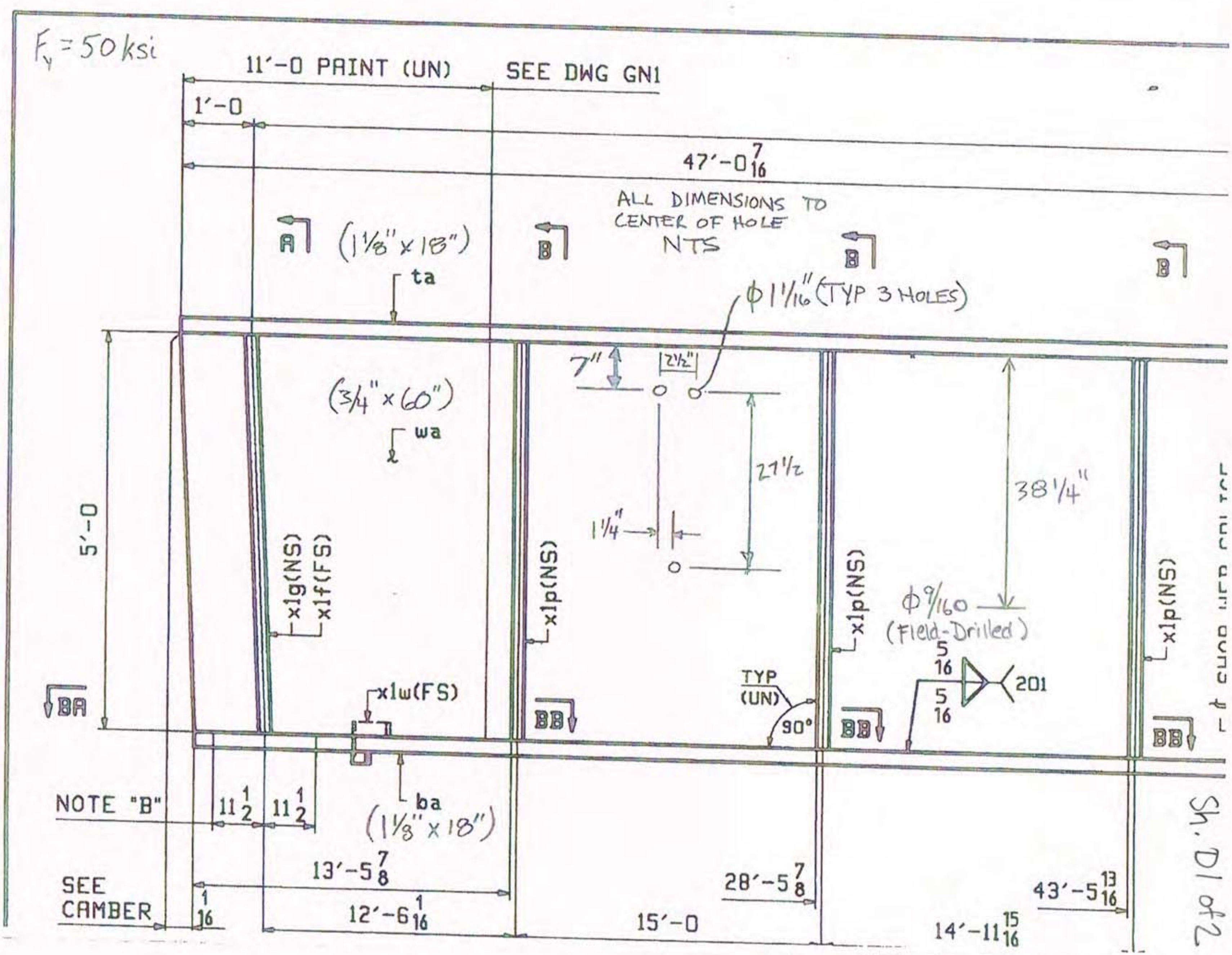
1800-321-2736

Jonathan Covino

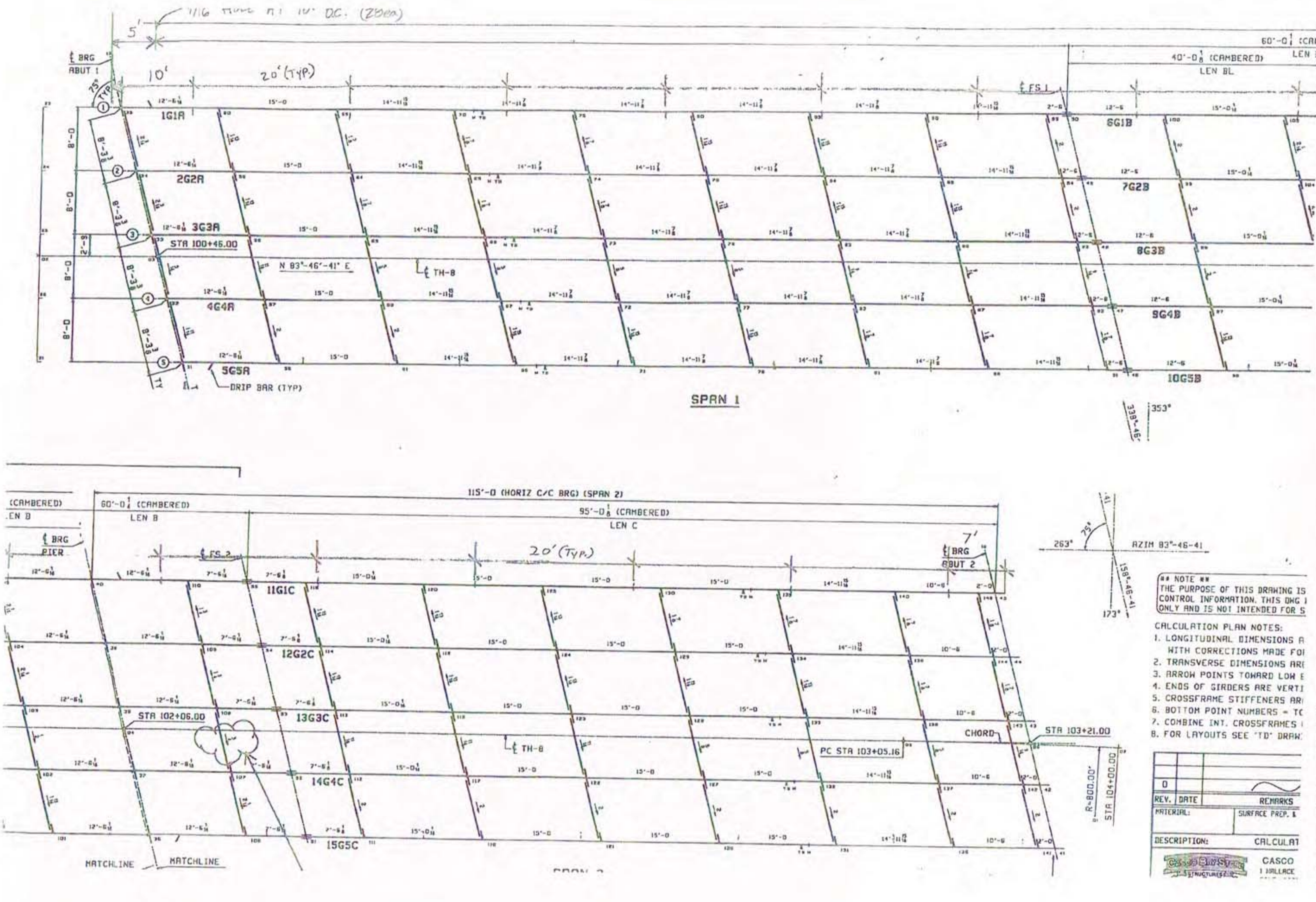
Unless otherwise specified, all dimensions on drawings and in charts are in inches and dimensions shown in parentheses are in millimeters.

## APPENDIX ‘D’

## Proposed Drilled Holes in Fascia Girders



$F_y$ = 50 ksi
11'-0 PAINT (UN)
SEE DWG GN1
1'-0
47'-0 7/16
ALL DIMENSIONS TO CENTER OF HOLE
NTS
A
B
B
B
(1 1/8" x 18")
ta
ϕ 1 1/16" (TYP 3 HOLES)
7"
2 1/2"
(3/4" x 60")
wa
27 1/2
38 1/4"
1 1/4"
5'-0
x1g(NS)
x1f(FS)
x1p(NS)
x1p(NS)
x1p(NS)
ϕ 9/16 O
(Field-Drilled)
5/16
5/16
201
TYP
(UN)
90°
x1w(FS)
BA
BB
BB
BB
NOTE "B"
11 1/2
11 1/2
ba
(1 1/8" x 18")
13'-5 7/8
28'-5 7/8
43'-5 13/16
SEE CAMBER
1/16
12'-6 1/16
15'-0
14'-11 15/16
Sh. D1 of 2



Sh. D2 of 2
7/16 HOLE AT 10' O.C. (28ea)
℄ BRG ABUT 1
20' (TYP.)
60'-0 1/4 (CAMBERED) LEN I
40'-0 1/8 (CAMBERED) LEN BL
℄ FS 1
1G1A
2G2A
3G3A
STA 100+46.00
4G4A
5G5A
DRIP BAR (TYP)
N 83°-46'-41" E
℄ TH-8
6G1B
7G2B
8G3B
9G4B
10G5B
SPAN 1
353°
338°-46'
115'-0 (HORIZ C/C BRG) (SPAN 2)
60'-0 1/4 (CAMBERED) LEN B
95'-0 1/8 (CAMBERED) LEN C
℄ BRG PIER
℄ FS 2
20' (TYP.)
℄ BRG ABUT 2
11G1C
12G2C
13G3C
14G4C
15G5C
STA 102+06.00
PC STA 103+05.16
CHORD
STA 103+21.00
R=800.00'
STA 104+00.00
MATCHLINE
AZIM 83°-46-41
263°
158°-46-41
173°
## NOTE ##
THE PURPOSE OF THIS DRAWING IS
CONTROL INFORMATION. THIS DWG I
ONLY AND IS NOT INTENDED FOR S
CALCULATION PLAN NOTES:
1. LONGITUDINAL DIMENSIONS A
WITH CORRECTIONS MADE FO
2. TRANSVERSE DIMENSIONS ARE
3. ARROW POINTS TOWARD LOW E
4. ENDS OF GIRDERS ARE VERTI
5. CROSSFRAME STIFFENERS AR
6. BOTTOM POINT NUMBERS = TC
7. COMBINE INT. CROSSFRAMES
8. FOR LAYOUTS SEE "TD" DRAW
REV. DATE REMARKS
MATERIAL: SURFACE PREP. &
DESCRIPTION: CALCULAT
CASCO

## APPENDIX 'E'

## Selected Portions of Shop Drawings

**MATERIAL SPECIFICATIONS**

1) UNLESS OTHERWISE NOTED, ALL STEEL TO BE UNPAINTED AASHTO M270 (ASTM A709) GRADE 50W.

2) MATERIAL NOTED "CVN" OR "T2" ON DETAIL DRAWINGS SHALL BE CHARPY V-NOTCH TESTED IN ACCORDANCE WITH THE REQUIREMENTS OF VERMONT STANDARD SPECIFICATIONS SECTION 714.01.

3) HIGH STRENGTH BOLTS:
-ASTM A325 (AASHTO M164) TYPE 3 W/ A563 GRADE C3 NUTS & F436W WASHERS IN NON-PAINTED
-ASTM A325 (AASHTO M164) TYPE 1 (GALV.) W/ A563 GRADE DH NUTS & F436 WASHERS IN PAINTE

BOLTS & NUTS SHALL BE ROTATIONAL CAPACITY TESTED. DO NOT MIX NUTS & BOLTS FROM DIFFERENT CONTAINERS UNLESS ALL BOLTS & NUTS HAVE THE SAME LOT NUMBER.

4) DIRECT TENSION INDICATOR WASHERS CONFORMING TO ASTM F959 SHALL BE INSTALLED WITH ALL HIGH STRENGTH BOLTS.

**FABRICATION**

1) ALL HOLES SHALL BE PUNCHED OR DRILLED FULL SIZE (UN).

Sh. E1 of 3

Sh. E2 of 3

# BILL OF MATERIAL

| ABM INFO | | SHIP | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | JOB NO. | 597-1 | DRAWING NO. | 1 | REV. | | | | |
| PAGE | LINE | MARK | QTY | MARK | MATERIAL | LENGTH FT | LENGTH INCHES | REMARKS | WT | PROCUREMENT NOTES | |
| | | 1G1A | 1 | | GIRDER | | | | 36096 | | |
| | | | | | | | | | | | |
| 1 | Q | | 1 | wa | PL $\frac{3}{4}$×60 (Web) | 46 | 0 $\frac{1}{8}$ | M270-50WT2 | 7045 | | |
| 1 | L | | 1 | wb | PL $\frac{3}{4}$×60 | 75 | 0 $\frac{13}{16}$ | M270-50WT2 | 11495 | | |
| 1 | G | | 1 | ta | PL 1$\frac{1}{8}$×18 (flanges) | 47 | 0 $\frac{7}{16}$ | M270-50WT2 | 3241 | | |
| 1 | C | | 1 | tb | PL 1$\frac{1}{8}$×18 | 73 | 11 $\frac{7}{8}$ | M270-50WT2 | 5098 | | |
| 1 | G | | 1 | ba | PL 1$\frac{1}{8}$×18 | 46 | 11 $\frac{7}{16}$ | M270-50WT2 | 3235 | | |
| 1 | C | | 1 | bb | PL 1$\frac{1}{8}$×18 | 73 | 11 $\frac{7}{8}$ | M270-50WT2 | 5098 | | |
| | | | | | | | | | | | |
| 2 | H | | 1 | x1f | PL 1×8$\frac{7}{8}$ | 5 | 0 | MIE | 151 | | |
| 2 | H | | 1 | x1g | PL 1×8$\frac{7}{8}$ | 5 | 0 | MIE | 151 | | |
| 2 | J | | 8 | x1p | PL $\frac{1}{2}$×8$\frac{1}{2}$ | 5 | 0 | | 72 | | |
| 2 | K | | 1 | x1w | PL $\frac{1}{4}$×3$\frac{3}{16}$ | 1 | 0 $\frac{1}{8}$ | | 3 | | |

G. 1

ON DRAWING X1

Sh. E3 of 3

# BILL OF MATERIAL

JOB NO. 597-1 | DRAWING NO. 5 | REV.

| ABM INFO PAGE | ABM INFO LINE | SHIP MARK | QTY | MARK | MATERIAL | LENGTH FT | LENGTH INCHES | REMARKS | WT | PROCUREMENT NOTES |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 5G5A | 1 | | GIRDER | | | | 36096 | |
| | | | | | (Web) | | | | | |
| 1 | Q | | 1 | wa | PL $\frac{3}{4}\times60$ | 46 | $0\frac{1}{8}$ | M270-50WT2 | 7045 | |
| 1 | L | | 1 | wb | PL $\frac{3}{4}\times60$ | 75 | $0\frac{13}{16}$ | M270-50WT2 | 11495 | |
| 1 | G | | 1 | ta | PL $1\frac{1}{8}\times18$ (Flanges) | 47 | $0\frac{7}{16}$ | M270-50WT2 | 3241 | |
| 1 | C | | 1 | tb | PL $1\frac{1}{8}\times18$ | 73 | $11\frac{7}{8}$ | M270-50WT2 | 5098 | |
| 1 | G | | 1 | ba | PL $1\frac{1}{8}\times18$ | 46 | $11\frac{7}{16}$ | M270-50WT2 | 3235 | |
| 1 | C | | 1 | bb | PL $1\frac{1}{8}\times18$ | 73 | $11\frac{7}{8}$ | M270-50WT2 | 5098 | |
| | | | | | | | | | | |
| 2 | H | | 1 | x1f | PL $1\times8\frac{7}{8}$ | 5 | 0 | MIE | 151 | |
| 2 | H | | 1 | x1k | PL $1\times8\frac{7}{8}$ | 5 | 0 | MIE | 151 | |
| 2 | J | | 8 | x1p | PL $\frac{1}{2}\times8\frac{1}{2}$ | 5 | 0 | | 72 | |

5. 1

DRAWING X1