

**1.1 REFERENCE MATERIAL FOR DESIGN CALCULATIONS**

- 2009 International Building Code
- American Concrete Institute (ACI) 318-08
- Embedment Properties for Headed Studs, TRW Nelson, Design Data Catalog
- Steel Construction Manual, AISC 360-05
- ASCE 7-05

**1.2 DESIGN CRITERIA USED IN CALCULATIONS**

- Reinforcing Steel Yield Strength =  $f_y = 60$  ksi
- Structural Steel is ASTM A 36/A 36M-05
- Unconfined Compressive Strength of Concrete =  $f'_c = 5000$  psi
- Weight of Concrete = 115 pcf
- Stud Yield Strength = 50 ksi

**1.3 INTERNATIONAL BUILDING CODE REQUIREMENTS**

The following is a summary of the Code requirements applicable to CellXion precast concrete equipment shelters.

**1.3.1 Occupancy Classification**

Occupancy is Group H-2 per section 307.1 and Table 307.1(1).

**1.3.2 Construction Type**

Type V-B per section 602.5 and Table 601.

**1.3.3 Building Limitations**

Occupancy H-2

Relative to the location of the nearest structure or property line:

Walls must be rated one hour if less than 10 feet. ( Table 602 )

Maximum size of H-2 building (Table 503) is 21,000 SF, UL stories. ( Table 503 )

**NOTE: STANDARD SHELTERS MAY BE RATED UP TO 2-HOURS.**

REF: Table 720.1(2), Item number 4-1.1, Sand-lightweight concrete 4 inches thick.

**IF PROTECTED OPENINGS ARE REQUIRED:**

**3/4 HOUR RATED OPENINGS ARE REQUIRED IN ONE HOUR ASSEMBLIES.**

**1.5 HOUR RATED OPENINGS ARE REQUIRED IN TWO HOUR ASSEMBLIES.**

<u>Unprotected Openings Allowed</u>	<u>Protected Openings Allowed</u>	Table 705.8
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Not permitted up to 5 feet.	Not permitted up to 3 feet.
10% permitted > 5 feet to 10 feet.	15% permitted > 3 feet to 5 feet.
15% permitted > 10 feet to 15 feet.	25% permitted > 5 feet to 10 feet.
25% permitted > 15 feet to 20 feet.	45% permitted > 10 feet to 15 feet.
45% permitted > 20 feet to 25 feet.	75% permitted > 15 feet to 20 feet.
70% permitted > 25 feet to 30 feet.	No restriction > 20 feet.
No restriction > 30 feet.	

**1.4 FLOOR LOADS**

Floor live load required (Table 1607.1) for light storage is; 125 psf

The summary loading chart in Section 2.0.1 indicates allowable loads of:

251 psf 10.000 ft wide **OK**

For a 2 sq ft area per sec 2.3.6, a concentrated load of 2020 lbs can be placed anywhere.

If the concentrated load is next to the wall, 4522 lbs can be used.

For a 3 sq ft area per sec 2.3.6, a concentrated load of 4041 lbs can be placed anywhere.

**1.5 ROOF LOADS** Minimum roof live load required (2009 IBC 1607.11.2.1) is:

$$L_r = L_o R_1 R_2 \quad [\text{sec 1607.11.2.1, Eq 16-25}]$$

$$L_o = 20 \quad [\text{sec 1607.11.2.1}]$$

$$R_1 = 1.0 \quad (\text{worst case for smaller shelters}) \quad [\text{sec 1607.11.2.1, Eq 16-26}]$$

$$F = .167 \text{ in per ft slope} \quad R_2 = 1.0 \quad (\text{for } F < 4) \quad [\text{sec 1607.11.2.1, Eq 16-29}]$$

$$L_r = 20 \text{ psf}$$

The summary loading chart in Section 2.0.1 indicates allowable loads of:  
135 psf      10.00 ft wide **OK**

**Snow Loads** Section 1608.2 requires use of section 7 of ASCE 7-05

$$p_f = 0.7 C_e C_t I p_g \quad [\text{ASCE 7-05, Equation 7-1, Sec 7.3}]$$

$p_f =$  (Min. design load for roofs from section 2 of these calcs)  
 $= 135 \text{ psf} \quad 10.00 \text{ ft wide}$

$C_e = 1.2$  (worst case-ASCE 7-05, Table 7-2, lesser factors may be used as appropriate)  
 $C_t = 1.0$  (From ASCE 7-05, Table 7-3, heated structure)  
 $I = 1.0$  (Category II, ASCE 7-05 Table 7-4)

Using the design load from section 2 for  $p_f$  and solving for  $p_g$ :

$$p_g = p_f / (0.7 C_e C_t I)$$

**= (Allowable ground snow load)**  
 $= 161 \text{ psf} \quad 10.00 \text{ ft wide}$

**1.6 WIND LOADS**

Sect. 1609.1.1 allows ASCE 7-05, Chapter 6; use sec 6.4, Method 1 - Simplified Procedure:

$V = 160 \text{ mph}$  [ASCE 7-05, Section 6.5.4 and Figure 6-1]  
 $I = 1.0$  [ASCE 7-05, Category II, Table 6-1 >> Table 1-1]  
 Exposure Classification: **C** [ASCE 7-05, section 6.5.6.3]  
 Exposure C category:  $\lambda = 1.21$  [ASCE 7-07, section 6.4.2 & Figure 6-2]  
 Enclosure Classification: **enclosed** [ASCE 7-05, section 6.2]  
 Roof angle: **0 to 5 degrees**  $K_{zt} = 1.0$  [ASCE 7-05, sec 6.5.7.2]  
 MWFRS Design Wind Pressures: [from ASCE 7-05, Figure 6-2]  
 $p_s = \lambda K_{zt} I p_{s30}$  [ASCE 7-05, sec 6.4.2.1, Eq 6-1]

**WALLS: 48.4 psf [ zone A ]**  
 -25.4 psf [ zone B, negligible--> only 1 inch tall ]  
 32.5 psf [ zone C ]  
 -15.1 psf [ zone D, negligible--> only 1 inch tall ]

Zone A controls, use it for analysis

Allowable load on walls: 87.3 psf (Calcs sec 2.0.1)      9.25 ft tall      **OK**

**ROOF: -59.0 psf [ zone E ]**  
 -33.6 psf [ zone F ]  
 -40.9 psf [ zone G ]  
 -25.9 psf [ zone H ]

Zone E controls, use it for analysis

Allowable negative load on roof: -53.1 psf (Calcs, sec 2)      10.00 ft wide  
 Plus .6 x DL ( 45.7 psf = 27.4 psf + Allow Neg Ld = -80.5 psf      **OK**

**1.6.1 Check structural connections for carrying wind loads to the foundation.**

The worst case for the windward forces are when they are projected onto the long walls. Half of the load is carried to the floor connections and half is carried to the roof connections. The walls are assumed to be 9.25 ft tall the worst case scenario. The connections which connect the long walls to the end walls are neglected for the purposes of this particular analysis. Analysis with Calculations from section 3

**1.6.1.1 Check connections for transfer of windward loads from wall to the floor and roof.**

The connections along the top and bottom of the walls are at a standard spacing of 56 inches. This will be the tributary width of wind load for each connection at the floor and roof. The load for this tributary area on the windward wall is then:

$$P'(w) = P(\text{windward wall}) \times \text{tributary area} \quad (\text{for } 9.25 \text{ ft tall wall})$$
$$\text{Where tributary area} = (9.25 \text{ ft} / 2) \times 4 \text{ ft } 8 \text{ in} = 21.58 \text{ sq. ft.}$$
$$= 48.4 \text{ psf} \times 21.58 \text{ sq. ft.}$$
$$P'(w) = 1,045 \text{ lbs}$$

This load is resisted by three main components of the connection at the floor:

- 5.95 kips Capacity of P/N 223100 in tension per Clacs Section 3.3.1
- 22.87 kips Capacity of the Floor Lifting Insert in shear per Clacs Section 3.7
- 8.35 kips Capacity of the weld which connects the plates per Clacs Section 3.8

**The capacity of all 3 components exceed the wind load OK**

This load is resisted by three main components of the connection at the roof:

- 3.52 kips Capacity of P/N 223000 in Y-shear per Clacs Section 3.4.3
- 5.95 kips Capacity of P/N 222000 in tension per Clacs Section 3.5.1
- 8.35 kips Capacity of the weld which connects the plates per Clacs Section 3.8

**The capacity of all 3 components exceed the wind load OK**

**1.6.1.2 Check connections for transfer of leeward loads from wall to the floor and roof.**

The leeward wall has similar construction, but the loads are less and are outward.

$$P'(l) = P(\text{leeward wall}) \times \text{tributary area}$$
$$\text{Where tributary area} = (9.25 \text{ ft} / 2) \times 4 \text{ ft } 8 \text{ in} = 21.58 \text{ sq. ft.}$$
$$= 48.4 \text{ psf} \times 21.58 \text{ sq. ft.}$$
$$P'(l) = 1,045 \text{ lbs} \quad (\text{negative indicating an outward direction})$$

This load is resisted by three main components of the connection at the floor:

- 5.95 kips Capacity of P/N 223100 in tension per Section 3.3.1
- 22.87 kips Capacity of Floor Lifting Insert in shear per Section 3.7
- 8.35 kips Capacity of the weld which connects the plates per Section 3.8

**The capacity of all 3 components exceed the wind load OK**

This load is resisted by three main components of the connection at the roof:

- 3.52 kips Capacity of P/N 223000 in Y-shear per Section 3.4.3
- 5.95 kips Capacity of P/N 222000 in tension per Section 3.5.1
- 8.35 kips Capacity of the weld which connects the plates per Section 3.8

**The capacity of all 3 components exceed the wind load OK**

**1.6.1.3 Windward and leeward loading transfer to endwalls:**

The loads on the top half of the shelter must be transferred to the ground through the connections on the endwalls. There are three connections from the roof to the endwall and three connec-

tions from the endwall to the floor. The load on the projected area of the top half of the long side of the shelter is resisted by these connections and is assumed to distribute half of the load to each endwall.

A shelter which is 14.00 feet long has a tributary area of:

$$\text{Area} = ( 9.667 \text{ feet} / 2 ) \times ( 14.0 \text{ feet} / 2 )$$

$$= 33.835 \text{ sq. ft.}$$

$$P(\text{proj.}) = 33.835 \text{ sq ft} \times 48.4 \text{ psf}$$

$$= 1,638 \text{ lbs.}$$

The roof connection consist of the same three components as were indicated in the sidewalls, except that they are loaded in a different direction. Their capacities are shown below.

- 7.04 kips Capacity of P/N 223000 in X-shear per Section 3.4.2
- 22.87 kips Capacity of the Wall Corner Insert per Section 3.6.1
- 8.35 kips Capacity of the weld which connects the plates per Section 3.8

Since there are three of these connections, the total capacity is: 21.12 kips **OK**

**1.6.1.4 Windward and Leeward loading transfer to floor:**

The same loads that are transferred to the endwalls from the roof need to be transferred to the floor panel. This is accomplished through the three connections at the base of the endwall. The floor connections consist of the same three components as were indicated in the sidewalls, except that they are loaded in a different direction. Their capacities are shown below.

- 14.54 kips Capacity of P/N 223100 in X-shear per Section 3.3.2
- 22.87 kips Capacity of Floor Lifting Insert in shear per Section 3.7
- 8.35 kips Capacity of the weld which connects the plates per Section 3.8

Since there are three of these connections, the total capacity is: 25.05 kips **OK**

**1.6.1.5 Find horizontal forces and overturning moments.**

This is used in the tie-down anchor analysis in 1.8 below.

Shelter Dims (feet)			Shelter Weight lbs	Hor. Wind (PxA-hor) lbs	Vert. Wind (PxA-vert.) lbs	Overturn Moment ft-lbs
Width	Length	Height				
10.00	14.00	10.083	28,791	6,832	8,267	75,781

**1.6.1.6 Components and Cladding:**

$$p_{net} = \lambda K_{zt} I p_{net30} \quad [ \text{ASCE 7-05, sec 6.4.2.2, Eq 6-2} ]$$

POS      NEG      [ from ASCE 7-05, Figure 6-3 ]

- ROOF ZONE 1: 18.0    -51.1 (100 sf effective wind area) use for analysis
- ROOF ZONE 2: 21.5    -84.1 (20 sf effective wind area)
- ROOF ZONE 3: 22.7    -141.3 (10 sf effective wind area)

Allowable positive load on roof: (From section 2)  
135 psf      10.00 ft wide shelter

Allowable negative load on roof: (From section 2, neglecting DL)  
-53.1 psf      10.00 ft wide shelter

Allowable negative load on roof: (From section 2, including .6 x DL)

Roof Dead Load: 45.7 psf    X .6 = 27.4 psf  
-80.5 psf      10.00 ft wide shelter      **OK**

- WALL ZONE 4: 45.0    -49.6 (200 sf effective wind area) use for analysis
- WALL ZONE 5: 52.4    -67.8 (30 sf effective wind area)

Allowable load on walls: (From section 2)

87 psf                      9.25 ft tall wall                      **OK**

The larger load at the corners does not produce a significant bending stress, and the shear strength of the roof panel will be more than adequate to resist this uplift load. In addition, extra connections between the roof and endwalls anchor the roof at these end zones.

**1.7 SEISMIC LOADS**                      Section 1613.1, requires ASCE 7-05 for analysis.

Site Class is E                      [ Section 1613.5.2 ]

Occupancy Category: II                      [ Table 1604.5 ]

Seismic Design Category: D                      [ sec 1613.5.6 ]

Seismic Importance Factor, I is: 1.50                      [ ASCE 7-05, sec 11.5, Table 11.5-1 ]

$V = C_s W$                       [ ASCE 7-05, sec 12.8.1, Eq. 12.8-1 ]

$W = D$                       [ ASCE 7-05, sec 12.7.2 ]

$C_s = S_{DS} / (R / I)$                       [ ASCE 7-05, sec 12.8.1.1, Eq. 12.8-2 ]

$V = (S_{DS} / (R / I)) D$

$R = 4$                       [ ASCE 7-05, Table 12.2-1, A.2 ]

$S_{DS} = 2/3 S_{MS}$                       [ Per 1613.5.4, Eq. 16-39 ]

$S_{MS} = F_a S_s$                       [ Per 1613.5.3, Eq. 16-37 ]

$F_a = 1.0$  [ Table 1613.5.3(1) ]

$S_s = 3.00$  [ Fig 1613.5(1), meets all US areas ]

$S_{MS} = 3.00$

$S_{DS} = 2.00$

$V = 0.750 D$                       [ Use for base shear ]

Determine E for use in load combinations on individual panel design.

$E = E_h + E_v$                       [ ASCE 7-05, sec 12.4.2, Eq. 12.4-1 ]

$E_h = \rho Q_E$                       [ ASCE 7-05, sec 12.4.2.1, Eq. 12.4-3 ]

$E_v = 0.2 S_{DS} D$                       [ ASCE 7-05, sec 12.4.2.2, Eq. 12.4-4 ]

$E = \rho Q_E + 0.2 S_{DS} D$                       [ ASCE 7-05, sec 12.4.2.1, Eq. 12.4-3 plus sec 12.4.2.2, Eq. 12.4-4 ]

$Q_E = V$                       [ ASCE 7-05, sec 12.4.2.1 ]                       $\rho = 1.0$                       [ ASCE 7-05, sec 12.3.4.2 ]

$E = \rho V + 0.2 S_{DS} D = 1.150 D$                       [ Use in load comb 4 & 6 ]

$E_m = E_{mh} - E_v$                       [ ASCE 7-05, sec 12.4.3, Eq. 12.4-6 ]

$E_{mh} = \Omega_0 Q_E$                       [ ASCE 7-05, sec 12.4.3.1 Eq. 12.4-7 ]

$E_m = \Omega_0 Q_E - 0.2 S_{DS} D$                        $\Omega_0 = 2.5$                       [ ASCE 7-05, Table 12.2-1, A.2 ]

$E_m = 1.475 D$                       [ Use in load comb 7 ]

$D_{wall} = 35.6 \text{ psf}$                        $D_{roof} = 45.7 \text{ psf}$                        $D_{floor} = 46.4 \text{ psf}$                       (calcs sec 4)

**Load combinations:**                      Section 1605.3.1 & ASCE 7-05 12.4.3.2

Comb 1 D                      [ Notes 1, 2, 3 ]

Comb 2 D + L                      [ Notes 1, 2, 3 ]

Comb 3 D + L + (Lr or S or R)                      [ Notes 1, 2, 3 ]

Comb 4 D + (W or 0.7E) + L + (Lr or S or R)                      [ Notes 1, 2, 3, 4 ]

Comb 5 0.6 D + W                      [ Notes 1, 2, 3 ]

Comb 6 0.6D + 0.7E                      [ Notes 1, 2, 3, 4 ]

Comb 7 (0.9-2S<sub>DS</sub>)D +  $\Omega_0 Q_E$                       See analysis below:

Note 1: Roof and floor panels are designed using 1.4D and 1.7L, exceeds req'd factors.

Note 2: Wall panels are designed using 1.4D and 1.7W, exceeds req'd factors.

Note 3: S, R, and Lr are used as L in panel calculations, see section 2 of these calcs.

Note 4: Wind loads control over Seismic.

			psf	Min. Design Loads	
Comb 7 check					
Walls:	$(0.9 \cdot 2S_{DS})D + \Omega_0 Q_E =$	$2.375 D_{wall} =$	84	87 psf	<b>OK</b>
Roof:	$(0.9 \cdot 2S_{DS})D + \Omega_0 Q_E =$	$2.375 D_{roof} =$	108	135 psf	<b>OK</b>
Floor:	$(0.9 \cdot 2S_{DS})D + \Omega_0 Q_E =$	$2.375 D_{floor} =$	110	251 psf	<b>OK</b>

**1.7.1 Seismic loads from top half of the wall panel are transferred to the roof.**

Equipment permanently installed in the building is estimated at 12,000 pounds. For a 14.00 ft long shelter, this is an average of 857 pounds per linear foot. If this equipment is mounted to the floor and braced at the top, then half the seismic load from the equipment should be added to the top of the walls. Analysis uses sec 3 of these calculations.

The weight of a wall section transferred to the connections at 56" on center is:

$$W(\text{wall}) = (56/12 \text{ ft width}) \times (9.25 \text{ ft high}) \times (4/12 \text{ ft thick}) \times (115 \text{ pcf})$$

$$= 827 \text{ lbs}$$

$$W(\text{equipment}) = (56/12 \text{ ft width}) \times (429 \text{ plf}) = 2000 \text{ lbs}$$

$$W(\text{top of wall}) = W(\text{wall}) + W(\text{equipment}) = 2,827 \text{ lbs}$$

For the wall panel, the seismic shear is:

$$V = 2,121 \text{ lbs} \quad \text{Seismic shear per connection plate at top of walls}$$

This load is resisted by three main components of the connection at the floor:

5.95 kips Capacity of P/N 223100 in tension per Section 3.3.1

22.87 kips Capacity of Floor Lifting Insert in shear per Section 3.7

8.35 kips Capacity of the weld which connects the plates per Section 3.8

**The capacity of all 3 components exceed the seismic load OK**

This load is resisted by three main components of the connection at the roof:

3.52 kips Capacity of P/N 223000 in Y-shear per Section 3.4.3

5.95 kips Capacity of P/N 222000 in tension per Section 3.5.1

8.35 kips Capacity of the weld which connects the plates per Section 3.8

**The capacity of all 3 components exceed the seismic load OK**

**1.7.2 Seismic loads from roof are transferred to the top of the endwall.**

The seismic load at the top connection plates of the endwalls includes the seismic loads from the top quarter of two sidewalls, one half of the roof, and one half of the total equipment.

Use a 9.25 ft tall x 13.33 ft long wall & use a 10.33 ft wide x 14.33 ft long roof.

$$W(\text{quarter wall}) = 9.25 \text{ ft} / 2 \times 13.33 \text{ ft} / 2 \times 4.00 / 12 \text{ ft} \times 115 \text{ pcf} = 1,182 \text{ lbs.} \times 2 = 2,364 \text{ lbs.}$$

$$W(\text{half roof}) = 10.33 \text{ ft} \times 14.33 \text{ ft} / 2 \times 4.50 / 12 \text{ ft} \times 115 \text{ pcf} = 3,193 \text{ lbs.}$$

$$W(\text{equipment}) = 7 \text{ ft} \times 429 \text{ plf} = 3,000 \text{ lbs}$$

$$\text{TOTAL: } W(\text{top of endwall}) = 8,557 \text{ lbs.}$$

$$\text{The seismic load is then: } V(\text{top of endwall}) = 6,418 \text{ lbs.}$$

The roof connection consist of the same three components as were indicated in the sidewalls, except that they are loaded in a different direction. Their capacities are shown below.

- 7.04 kips Capacity of P/N 223000 in X-shear per Section 3.4.2
- 22.87 kips Capacity of the Wall Corner Insert per Section 3.6.1
- 8.35 kips Capacity of the weld which connects the plates per Section 3.8

Since there are three of these connections, the total capacity is:

21.12 kips **This capacity exceeds the seismic load** **OK**

**1.7.3 Seismic loads from endwall are transferred to the floor.**

The connections at the bottom of the endwalls have the same seismic load as the connections at the top, except that the seismic load from the endwall itself is added.

The weight of the endwall is:

$$W(\text{endwall}) = 10.00 \text{ ft} \times 4.00 / 12 \text{ ft} \times 115 \text{ pcf} \times 9.25 \text{ ft} = 3546 \text{ lbs}$$

$$V(\text{endwall}) = 2,659 \text{ lbs}$$

$$V(\text{bottom}) = V(\text{top of endwall}) + V(\text{endwall}) = 9,077 \text{ lbs}$$

The same loads that are transferred to the endwalls from the roof need to be transferred to the floor panel. This is accomplished through the three connections at the base of the endwall.

The floor connections consist of the same three components as were indicated in the sidewalls, except that they are loaded in a different direction. Their capacities are shown below.

- 14.54 kips Capacity of P/N 223100 in X-shear per Section 3.3.2
- 22.87 kips Capacity of Floor Lifting Insert in shear per Section 3.7
- 8.35 kips Capacity of the weld which connects the plates per Section 3.8

Since there are three of these connections, the total capacity is:

25.05 kips **This capacity exceeds the seismic load** **OK**

**1.8 Check shelter tie-downs to foundation**

For tie-down anchor capacity see Section 3.9 of these calcs:

Horizontal: 10472 lbs Per connection  
Vertical: 6615 lbs Per connection

Horizontal forces due to seismic/wind loads:

Shelter Dims (feet)			Shelter Weight	Contents Weight	Seis.Load (W x Cs)	Wind load 1.6.1.5	Control'g Load	Tie-down Capacity	CHECK	Safety Factor
Width	Length	Height								
10.00	14.00	10.083	28,791	12,000	30,593	6,832	SEISMIC	41,887	OK	1.37

Friction against sliding is ignored.

shelters under 24 ft in length have 4 tie-downs; lengths 24 ft and over have 8 tie-downs

Overturning forces due to seismic/wind loads:

Shelter Dims (feet)			Seis.load (W x Cs) lbs.	Overturn Force lbs.	Wind Over See 1.6.1.5 ft-lbs.	Control'g Load	Overturn Resist. ft-lbs.	Tie-down Capacity lbs	CHECK	Safety Factor 1.5 req'd
Width	Length	Height								
10.00	14.00	10.083	30,593	154241	75,781	SEISMIC	129560	41,887	OK	2.20

Overturning resistance uses 0.9 x DL of shelter (no contents)

Weight of shelter and contents are the same as in the horizontal force chart above.



**2.0 DESIGN CRITERIA**

NOTE: These calculations represent the panels of a  
10.000 ft wide x 14.000 ft long x 9.250 ft tall shelter.

<u>STRUCTURAL PROPERTY</u>	<u>UNITS</u>	<u>LABEL</u>
Concrete Compressive Strength	5000 psi	f <sub>c</sub> (sand-lightweight)
Reinforcing bar Yield Stress	60000 psi	f <sub>y</sub> [REBAR]
Concrete Density	115 pcf	DENSITY
Maximum Building Width	10 feet	BLDGW
Maximum Building Length	14 feet	BLDGL
Maximum Wall Panel Height	9.25 feet	WALLH
Max. Est. weight of Shelter	28,791 LBS.	BLDGWT
Concrete volume req'd.	8.65 YDS.	CONCYDS
Roof thickness at peak	5 inches	H[ROOF]
Roof thickness at edge	4 inches	
Rebar size used in roof #	4 Rebar	REBARROOF
Steel mesh used in roof:	W4 Wire	
Steel spacing in roof (12"max.)	4 inches	
Lateral rebar spacing: roof	12 inches	ROOFSPACING12
Longitudinal rebar spacing-roof:	18 inches	
Steel mesh used in wall:	W4 Wire	REBARWALL
Add vert steel used in wall #	4 Rebar	REBARWALL2
Steel spacing in wall (12"max.)	4 inches	WALLSPACING
Vertical Rebar spacing in wall	36 inches	WALLSPACING2
Horizontal rebar spacing in wall	48 inches	
Wall panel thickness	4 inches	WALLTHICKNESS
Rebar size used in floor #	6 Rebar	REBARFLR
Number of rebar per floor rib	2 each	REBARFLRQTY
Spacing of ribs in floor	28 inches	FLOORSPACING
Floor thickness	5.75 inches	H[FLOOR]
Floor deck thickness	2.75 inches	H[DECK]
Floor rib width	4 inches	B[RIB]
Floor deck steel size	W4 Wire	
Floor deck steel spacing	4 inches	
Area per roof rebar	<b>0.200</b> sq. in.	A[REBARROOF]
Diameter of roof rebar	<b>0.500</b> inches	DIA[REBARROOF]
Area per roof wire	<b>0.040</b> sq. in.	
Area per wall wire	<b>0.040</b> sq. in.	A[REBARWALL]
Area per extra vert wall rebar	<b>0.200</b> sq. in.	A[REBARWALL2]
Diameter of wall wire	<b>0.225</b> inches	DIA[REBARWALL]
Diameter of wall rebar	<b>0.500</b> inches	
Area of floor rib rebar	<b>0.880</b> sq. in.	A[REBARFLR]
Diameter of floor rebar	<b>0.750</b> inches	DIA[REBARFLR]
Area of deck rebar/wire	<b>0.040</b> sq. in.	A[REBARDECK]
Diameter of deck rebar/wire	<b>0.225</b> inches	DIA[REBARDECK]
Area of deck steel per foot	<b>0.120</b> sq.in./ft.	A[DECKSTEEL]
Minimum req'd deck steel/foot	<b>0.059</b> sq.in./ft.	A[DECKSTEEL-MIN]



**2.0.1 STRUCTURAL LOADING SUMMARY FOR PANELS, AS DESIGNED.**

PANEL	ALLOWABLE LOAD	TYPE
	10.000 ft wide	
roof	<b>135</b> psf	LIVE
floor	<b>251</b> psf	LIVE
	9.250 ft tall	
wall	<b>87.3</b> psf	WIND

**2.0.2 CHECK STEEL RATIOS ( ACI 318-08, sec. 21.9.2.3 )**

	$\rho_t$	$\rho_v$	
$B_1 = 0.80$	ROOF: 0.0083	0.0069	<b>OK</b>
$\rho_b$ $\rho_{max}$ $\rho_{min}$	FLOOR: 0.0068		<b>OK</b>
0.0335    0.0252    0.0033	WALL: 0.0066	0.0062	<b>OK</b>
Min reqd. per ACI 318-08, sec 21.9.2.1	0.0025		

**2.0.3 CHECK DEVELOPMENT LENGTH ( ACI 318-08, sec. 21.7.5.1 )**

	Wall	Roof	Floor
Largest of:	10 $d_b = 2.3$ in	5.0 in	7.5 in
	7.5 in	7.5 in	7.5 in
$l_{dh} = 1.25 f_y d_b / ( 65 \times f'_c^{1/2} )$	3.7 in	8.2 in	12.2 in
All rebar development lengths are	18 in		<b>OK</b>

**2.1 ROOF PANEL CALCULATIONS**

Temperature steel required: A<sub>ts</sub>  
 Panels are 4 in thick, minimum.  
 Maximum thickness of roof panel is 5 inches at center peak.

$$A_{ts} = A_{conc} \times 0.0018$$

$$= 5 \text{ in.} \times 12 \text{ in.} \times 0.0018$$

$$= 0.1080 \text{ sq. in. per foot of width of roof panel.}$$

Use #4 rebar at 18 inches, longitudinal: A<sub>ts(actual)</sub> = 0.2533 sq. in. **OK**

**2.1.1 Determine shear strength: Vu[ROOF]**

$$b[\text{ROOF}] = 12.0 \text{ inches}$$

$$d[\text{ROOFSHEAR}] = 3 \text{ in.} - \text{DIA}[\text{REBARROOF}] / 2$$

$$= 2.75 \text{ inches}$$

$$V_u[\text{ROOF}] = .85 \times .85 \times 2 \times (f_c)^{.5} \times b[\text{ROOF}] \times d[\text{ROOFSHEAR}]$$

$$= 3372 \text{ lbs.}$$

**2.1.2 Determine allowable live load due to shear: w[ROOFSHEARLL]**

$$\text{ROOFSPANSHEAR} = \text{bldgw} - ( d[\text{ROOFSHEAR}] + 4 ) \times 2 / 12$$

$$= 8.875 \text{ feet} \quad 10.00 \text{ ft wide shelter}$$

$$w[\text{ROOFDL}] = \text{density} \times \text{thickness} \quad ( 4.5 \text{ in avg} ) = 43.1 \text{ psf (concrete only)}$$

$$w[\text{ROOFSHEARLL}] = ( V_u[\text{ROOF}] / \text{ROOFSPANSHEAR} - 1.4 \times w[\text{ROOFDL}] ) / 1.7$$

$$= 188 \text{ psf allowable roof live load due to shear strength} \quad 10.00 \text{ ft wide}$$

**2.1.3 Determine allowable live load due to moment:  $w[\text{ROOFMOMENTLL}]$** 

$$\begin{aligned}
 A[\text{ROOFSTEEL12}] &= A[\text{REBARROOF}] \times 12 \text{ inches} / \text{ROOFSPACING} \\
 &= \mathbf{0.20} \text{ sq. inches per foot of roof panel} \quad 10.00 \text{ ft wide shelter} \\
 d[\text{ROOFMOMENT}] &= (H[\text{ROOF}]) - (1 + \text{DIA}[\text{REBARROOF}] / 2) \\
 &= \mathbf{3.75} \text{ inches} \\
 a[\text{ROOF12}] &= (A[\text{ROOFSTEEL12}] \times f_y[\text{REBAR}]) / (.85 \times f_c \times b[\text{ROOF}]) \\
 &= \mathbf{0.235} \text{ inches} \\
 \text{Mu}[\text{ROOF12}] &= (.9/12) \times A[\text{ROOFSTEEL12}] \times f_y[\text{REBAR}] \times (d[\text{ROOFMOMENT}] - a[\text{ROOF12}] / 2) \\
 &= \mathbf{3269} \text{ ft-lbs} \\
 l[\text{ROOFSPAN}] &= \text{BLDGW} - .5 = \mathbf{9.50} \text{ feet} \quad 10.00 \text{ ft wide shelter} \\
 w[\text{ROOFMOMENTLL}] &= [ (8 \times \text{Mu}[\text{ROOF}] / l[\text{ROOFSPAN}]^2) - (1.4 \times w[\text{ROOFDL}]) ] / 1.7 \\
 &= \mathbf{135} \text{ psf allowable roof live load due to bending strength.} \quad 10.00 \text{ ft wide}
 \end{aligned}$$

**2.1.4 Determine allowable negative live load due to moment:  $w[\text{ROOFNEG MOMENTLL}]$** 

$$\begin{aligned}
 d[\text{RFNEGMOMENT}] &= 1 + \text{DIA}[\text{REBARROOF}] / 2) \\
 &= \mathbf{1.25} \text{ inches} \\
 a[\text{RFNEG12}] &= (A[\text{ROOFSTEEL12}] \times f_y[\text{REBAR}]) / (.85 \times f_c \times b[\text{ROOF}]) \\
 &= \mathbf{0.235} \text{ inches} \\
 \text{Mu}[\text{RFNEG12}] &= (.9/12) \times A[\text{ROOFSTEEL12}] \times f_y[\text{REBAR}] \times (d[\text{RFNEGMOMENT}] - a[\text{RFNEG12}] / 2) \\
 &= \mathbf{1019} \text{ ft-lbs} \\
 l[\text{ROOFSPAN}] &= \text{BLDGW} - .5 = \mathbf{9.50} \text{ feet} \quad 10.00 \text{ ft wide shelter} \\
 w[\text{ROOFNEG MOMLL}] &= [ (8 \times \text{Mu}[\text{ROOF}]) / (l[\text{ROOFSPAN}]^2) ] / 1.7 \\
 &= \text{Allowable negative roof live load due to bending strength (neglecting dead load)} \\
 &= \mathbf{-53.1} \text{ psf} \quad 10.00 \text{ ft wide shelter}
 \end{aligned}$$

**2.1.5 CHECK SHEAR ALLOWED PARALLEL TO PLANE OF ROOF****2.1.5.1 CHECK SHEAR ALLOWED FOR ONE CURTAIN OF REINFORCEMENT**

Use a 4 inch panel, 4 foot length, for minimum  $A_{CV}$ . (ACI 318-08, 21.9.2.2)

$$2 A_{CV} \times \lambda \times f_c^{1/2} = 23080 \text{ lbs} \quad [\text{CONTROLS}]$$

**2.1.5.2 NOMINAL SHEAR FOR ROOF SECTION (per ACI 318-08, sec. 21.9.4.1, eq. 21-7)**

Use a 4 inch panel, 4 foot length, for minimum  $A_{CV}$ .

$$\begin{aligned}
 V_n &= A_{CV} (\alpha_c \times \lambda \times f_c^{1/2} + \rho_t \times f_y) & \alpha_c &= 2.0 \text{ (for } h_w / l_w > 2) \\
 A_{CV} &= 192 \text{ in}^2 & \lambda &= 0.85 \text{ (per ACI 318-08 sec. 8.6.1)} \\
 \rho_t &= A_s / A_{CV} = 0.0083
 \end{aligned}$$

$$= 118708 \text{ lbs} \quad [\text{DOES NOT CONTROL}]$$

**2.1.5.3 NOMINAL SHEAR FOR ROOF DIAPHRAGM (per ACI 318-08, sec 21.11.9.1, eq. 21-10)**

Use a 4 inch panel, 4 foot length, for minimum  $A_{CV}$ .

$$\begin{aligned}
 V_n &= A_{CV} (2 \times \lambda \times f_c^{1/2} + \rho_t \times f_y) \\
 &= 118708 \text{ lbs} \quad [\text{DOES NOT CONTROL}]
 \end{aligned}$$

**2.2 WALL PANEL CALCULATIONS**Temperature steel required:  $A_{ts}$ 

Panel thickness is: 4 inches

$$A_{ts} = A_{conc} \times 0.0018$$

$$= 4 \text{ in.} \times 12 \text{ in.} \times 0.0018$$

$$= 0.0864 \text{ sq. in. per foot of width of wall panel.}$$

(ACI 318-08, sec. 14.3.5; 18" MAX) use 4x4-W4xW4 mesh:

Use #4 rebar at 48 inches, longitudinal:  $A_{ts}(\text{actual}) = 0.1700 \text{ sq. in. per foot OK}$ **2.2.1 Determine allowable loads perpendicular to plane of wall****2.2.1.1 Determine shear strength perpendicular to plane of wall: ( $V_u$ )**

$$b[\text{WALL}] = 12 \text{ inches}$$

$$d[\text{WALL}] = 2 \text{ inches (Distance from outside face of panel to center of rebar)}$$

$$V_u[\text{WALL}] = .85 \times .85 \times 2 \times (f_c)^{.5} \times b[\text{WALL}] \times d[\text{WALL}]$$

$$= 2452 \text{ lbs.}$$

**2.2.1.2 Determine allowable live load due to shear:  $w[\text{WALLSHEARLL}]$** 

$$\text{WALLSPANSHEAR} = \text{WALLH} - (d[\text{WALL}] \times 2 / 12)$$

$$= 8.92 \text{ feet} \quad 9.25 \text{ ft tall wall}$$

$$w[\text{WALLDL}] = 38.33 \text{ psf (does not add to horizontal force)}$$

NOTE: WALL DEAD LOAD DOES NOT ACT PERPENDICULAR TO PLANE OF PANEL.

$$w[\text{WALLSHEARLL}] = V_u[\text{WALL}] / (\text{WALLSPANSHEAR}) \times 1.7$$

$$= \text{Allowable wall load due to shear strength}$$

$$= 162 \text{ psf} \quad 9.25 \text{ ft tall wall}$$

**2.2.1.3 Determine allowable live load due to WINDWARD moment:  $w[\text{WALLMOMENTLL}]$** 

$$A[\text{WALLSTEEL}] = A[\text{REBARWALL}] \times (12 / \text{WALLSPACING}) + A[\text{REBARWALL2}] \times 12 / \text{WALLSPACING2}$$

$$= 0.19 \text{ sq. inches per foot of wall panel}$$

$$a[\text{WALL}] = (A[\text{WALLSTEEL}] \times f_y[\text{REBAR}]) / (.85 \times f_c \times b[\text{WALL}])$$

$$= 0.220 \text{ inches}$$

$$M_u[\text{WALL}] = (.9/12) \times A[\text{WALLSTEEL}] \times f_y[\text{REBAR}] \times (d[\text{WALL}] - a[\text{WALL}] / 2)$$

$$= 1588 \text{ ft-lbs}$$

$$w[\text{WALLMOMENTLL}] = [ (8 \times M_u[\text{WALL}] / l[\text{WALLH}]^2) - (1.4 \times w[\text{WALLDL}]) ] / 1.7$$

$$= \text{Allowable wall live load due to bending strength.}$$

$$= 87.3 \text{ psf} \quad 9.25 \text{ ft tall wall}$$

**2.2.1.4 Determine allowable live load due to LEEWARD moment:  $w[\text{WALLMOMENTLL}]$** 

$$d[\text{LEEWARD}] = 2 \text{ inches (Distance from inside face of panel to center of rebar)}$$

$$a[\text{LEEWARD}] = (A[\text{WALLSTEEL}] \times f_y[\text{REBAR}]) / (.85 \times f_c \times b[\text{WALL}])$$

$$= 0.220 \text{ inches}$$

$$M_u[\text{LEEWARD}] = (.9/12) \times A[\text{WALLSTEEL}] \times f_y[\text{REBAR}] \times (d[\text{WALL}] - a[\text{WALL}] / 2)$$

$$= 1588 \text{ ft-lbs}$$

$$w[\text{LEEWARDMOMENTLL}] = [ (8 \times M_u[\text{WALL}] / l[\text{WALLH}]^2) - (1.4 \times w[\text{WALLDL}]) ] / 1.7$$

$$= \text{Allowable wall live load due to bending strength.}$$

$$= 87.3 \text{ psf} \quad 9.25 \text{ ft tall wall}$$

**2.2.2 CHECK SHEAR ALLOWED PARALLEL TO PLANE OF WALL**

**2.2.2.1 CHECK SHEAR ALLOWED FOR ONE CURTAIN OF REINFORCEMENT**

Use a 4 inch panel, 4 foot length, for minimum ( ACI 318-08, 21.9.2.2 )  
 $2 A_{CV} \lambda x \lambda x f'_c{}^{1/2} = 23080 \text{ lbs} \quad [\text{CONTROLS}]$

**2.2.2.2 NOMINAL SHEAR FOR WALL SECTION ( per ACI 318-08, sec. 21.9.4.1, eq. 21-7 )**

Use a 4 inch panel, 4 foot length, for minimum  $A_{CV}$ .  
 $V_n = A_{CV} ( \alpha_c x \lambda x f'_c{}^{1/2} + \rho_t x f_y ) \quad A_{CV} = 192 \text{ in}^2$   
 $\alpha_c = 2.0 \text{ ( for } h_w / l_w > 2 ) \quad \lambda = 0.85 \text{ ( per ACI sec. 8.6.1 )}$   
 $\rho_t = A_s / A_{CV} = 0.0066$   
 $= 99264 \text{ lbs} \quad [\text{DOES NOT CONTROL}]$

**2.2.2.3 NOMINAL SHEAR FOR WALL DIAPHRAGM ( per ACI 318-08, sec. 21.11.9.1, eq. 21-10 )**

Use a 4 inch panel, 4 foot length, for minimum  $A_{CV}$ .  
 $V_n = A_{CV} ( 2 x \lambda x f'_c{}^{1/2} + \rho_t x f_y )$   
 $= 99264 \text{ lbs} \quad [\text{DOES NOT CONTROL}]$

**2.3 FLOOR PANEL CALCULATIONS****2.3.1 Determine temperature steel required for the deck:**

Deck temperature steel required is:

$$\begin{aligned} \text{ATS}[\text{DECK}] &= \text{H}[\text{DECK}] \times 12 \text{ in.} \times .0018 \\ &= 2.75 \text{ in.} \times 12 \text{ in.} \times 0.0018 \\ &= 0.0594 \text{ sq. in. per foot of width of floor panel.} \end{aligned}$$

$$\text{A}[\text{DECKSTEEL}] = 0.1200 \text{ sq. in per foot of panel.}$$

OK

**2.3.2 Determine floor deck strength:**

$$\begin{aligned} \text{DECKSPAN} &= \text{FLOORSPACING} - \text{B}[\text{RIB}] \\ &= 24.0 \text{ inches} \\ \text{d}[\text{DECK}] &= \text{H}[\text{DECK}] - 1 \quad (\text{Assumes mesh is 1" clear from bottom of deck}) \\ &= 1.75 \text{ inches} \\ \text{a}[\text{DECK}] &= (\text{A}[\text{DECKSTEEL}] \times \text{FY}[\text{REBAR}]) / (.85 \times \text{fc} \times 12 \text{ in.}) \\ &= 0.1412 \text{ inches} \\ \text{Mu}[\text{DECK}] &= 0.9/12 \times \text{A}[\text{DECKSTEEL}] \times \text{fy}[\text{REBAR}] \times (\text{d}[\text{DECK}] - (\text{a}[\text{DECK}] / 2)) \\ &= 907 \text{ ft-lbs} \\ \text{w}[\text{DECKTOTALMOM}] &= (\text{Mu}[\text{DECK}] \times 8) / (\text{DECKSPAN} \times 12 \text{ in. per ft.})^2 \\ &= 1814 \text{ psf} \\ \text{w}[\text{DECKDL}] &= (\text{H}[\text{DECK}] / 12 \text{ in. per ft.} \times 1 \text{ ft.}^2 \times \text{DENSITY}) \\ &= 26.4 \text{ psf} \\ \text{w}[\text{DECKLLMOM}] &= (\text{w}[\text{DECKTOTAL}] - 1.4 \times \text{w}[\text{DECKDL}]) / 1.7 \\ &= 1045 \text{ psf} \\ \text{Vu}[\text{DECK}] &= .85 \times .85 \times 2 \times (\text{fc}^{\wedge}.5) \times \text{d}[\text{DECK}] \times 12 \text{ in.} \\ &= 2146 \text{ lbs.} \\ \text{w}[\text{DECKTOTSHEAR}] &= 2 \times (\text{Vu}[\text{DECK}] / \text{L}) \\ &= 2146 \text{ psf} \\ \text{w}[\text{DECKLLSHEAR}] &= (\text{w}[\text{DECKTOTSHEAR}] - 1.4 \times \text{w}[\text{DECKDL}]) / 1.7 \\ &= 1240 \text{ psf} \end{aligned}$$

Allowable live load for the floor deck is: **1045 psf** (FLOOR DECK MOMENT CONTROLS)

**2.3.3 Determine floor rib strength:**

Effective width of flange: ACI 318-08, sec. 8.12.2 flange width  
 1/4 span: = **28.5** inches

Effective width of overhang: ACI 318-08, sec. 8.12.2 (a) & (b)  
 (a) 8 times H[DECK] = **22** inches **48.0** inches  
 OR (b) 1/2 clear dist. = **12.0** inches **28.0** inches <controls>

bf= **28.0** inches  
 $d[FLOOR] = H[FLOOR] - (.75" + DIA[REBARFLR] / 2)$   
 = **4.625** inches  
 $a[FLOOR] = (A[REBARFLR] \times fy[REBAR]) / (.85 \times fc \times bf)$   
 = **0.444** inches  
 $Mu[FLOOR] = (.9/12) \times A[REBARFLR] \times fy[REBAR] \times (d[FLOOR] - a[FLOOR] / 2)$   
 = **17436** ft-lbs  
 FLOORSPANMOM= BLDGW - .5 ft. = **9.50** feet 10.00 ft wide shelter  
 $w[FLOORMOMTOT] = 8 \times Mu[FLOOR] / (FLOORSPANMOM)^2$   
 = **1546** plf 10.00 ft wide shelter  
 $w[FLOORDL] = ((H[DECK] \times bf / 144) + b[RIB] \times (H[FLOOR] - H[DECK]) / 144) \times 1 \text{ ft.} \times \text{DENSITY}$   
 = **71.1** plf (PER RIB) = **30.5** psf  
 $w[FLOORMOMLL] = [W[FLOORMOMTOT] - (1.4 \times w[FLOORDL])] / (1.7 \times \text{trib})$   
 = **365** psf 10.00 ft wide shelter

**2.3.4 Determine rib shear strength: Vu[FLOOR]**

b[RIB] = **4.00** inches  
 $A[RIBSHEAR] = (H[FLOOR] - (.75" + DIA[REBARFLR]/2)) \times B[RIB]$   
 = **18.50** sq. in.  
 ACI 318-08, sec. 11.2.2.1 Eq. 11-5  $\lambda = 0.85$   
 $Vc[FLOOR] = (1.9 \times \lambda \times (fc)^{.5} + (2500 \times \rho_w \times A[REBARFLR] / (b[RIB] \times d[FLOOR]))) \times b[RIB] \times d[FLOOR]$   
 = **4313** lbs.  
 But not greater than:  $3.5 \times \lambda \times fc^{.5} \times b[RIB] \times d[FLOOR]$   
 = **3892** lbs.  
 USE **3892** lbs.  
 ACI 318-08, 8.13.8  $Vc[FLOORALLOW] = 1.1 \times Vc[FLOOR] =$  **4281** lbs.

**2.3.5 Determine allowable live load due to shear: w[FLOORSHEARLL]**

$$\begin{aligned} \text{FLOORSPANSHEAR} &= \text{bldgw} - (d[\text{FLOOR} + 8.5] \times 2 / 12) \\ &= \mathbf{7.81} \text{ feet} \quad 10.00 \text{ ft wide shelter} \\ w[\text{FLOORSHEARLL}] &= (V_c[\text{FLOORALLOW}] / (.5 \times \text{FLOORSPANSHEAR}) - 1.4 \times w[\text{FLOORDL}]) / (1.7 \times \text{FLOORSPACING} / 12) \\ &= \text{Allowable floor live load due to shear strength} \\ &= \mathbf{251} \text{ psf} \quad 10.00 \text{ ft wide shelter} \\ \text{Allowable LL for the } &10.00 \text{ ft wide floor rib is: } \mathbf{251} \text{ psf} \quad (\text{FLOOR RIB SHEAR CONTROLS}) \\ \text{Gross allowable floor load; LL + } &46 \text{ psf DL} = \mathbf{298} \text{ psf} \quad 10.00 \text{ ft wide} \end{aligned}$$

**2.3.6 Determine allowable concentrated load over 2 sq ft and 3 sq ft.**

2 square foot area is equivalent to approximately 17 inch x 17 inch, or 1.41 feet x 1.41 feet.

Assume one rib takes the entire concentrated load.

Allowable load based on shear is: 251 psf

For a 10.00 foot wide shelter with a 9.00 ft span, the equivalent concentrated load is:

$$\begin{aligned} P[\text{shear}] &= 9.00 \text{ ft} \times 251 \text{ lbs.} \times 2 \\ &= \mathbf{4522} \text{ lbs} \quad \text{Maximum concentrated load (shear).} \end{aligned}$$

Maximum live load for bending on one rib is:

$$w[\text{FLOORRIBLL}] = w[\text{FLOORMOMLL}] \times \text{BF} / 12 = 851 \text{ plf}$$

Make uniform load moment equal to concentrated load moment and solve for P.

$$w[\text{FLOORRIBLL}] \times (\text{FLOORSPANMOM}^2) / 8 = P \times \text{FLOORSPANMOM} / 2$$

$$P(\text{moment}) = w[\text{FLOORRIBLL}] \times (\text{FLOORSPANMOM}) / 4$$

$$= \mathbf{2020} \text{ LBS} \quad \text{Max concentrated load in center of floor (bending).}$$

If the load is next to the wall (as is usually the case with batteries) :

$$w[\text{FLOORRIBLL}] \times (\text{FLOORSPANMOM}^2) / 8 = P \times 1.5$$

$$P(\text{moment}) = w[\text{FLOORRIBLL}] \times (\text{FLOORSPANMOM}^2) * (2 \times 8)$$

$$= \mathbf{6398} \text{ LBS} \quad \text{Max concentrated load next to wall (bending).}$$

Shear controls

**Shear controls when load is next to wall.**

For a 3 square foot area the concentrated load will be supported by two ribs.

Maximum live load for bending on two ribs is:

$$w[\text{FLOORRIBLL}] = w[\text{FLOORMOMLL}] \times \text{BF} / 12 = 1701 \text{ plf}$$

Make uniform load moment equal to concentrated load moment and solve for P.

$$w[\text{FLOORRIBLL}] \times (\text{FLOORSPANMOM}^2) / 8 = P \times \text{FLOORSPANMOM} / 2$$

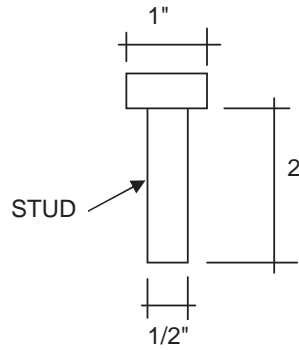
$$P(\text{moment}) = w[\text{FLOORRIBLL}] \times (\text{FLOORSPANMOM}) / 4$$

$$= \mathbf{4041} \text{ LBS} \quad \text{Max concentrated load in center of floor (bending).}$$

**3.0 INSERT PLATE ANALYSIS**  
(Analysis per ACI 318-08, Appendix D)

**3.1 Material Properties**

- $f'_c =$  5000 psi (sand-lightweight)
- $f_{uta} =$  61 ksi
- $A_{se} =$  0.196 in<sup>2</sup>
- $A_{brg} =$  0.589 in<sup>2</sup>
- $h_{ef} =$  2 in
- $d_a =$  0.5 in



**3.2 Stud Analysis**

**3.2.1** Per D.5.3.4, Eq D-15, Pullout strength in tension shall not exceed:

$$N_p = 8 A_{brg} f'_c = 23,562 \text{ lbs/stud}$$

(due to crushing strength of concrete at the head of the stud.)

**3.2.2** Basic tension breakout strength of stud shall not exceed:

$$N_b = k_c \lambda (f'_c)^{1/2} h_{ef}^{1.5} \quad [\text{Eq D-7}] \text{ Sec D.5.2.2}$$

$$\lambda = 0.85 \text{ Sec 8.6.1 (sand-lightweight)} \quad k_c = 24 \text{ (for cast-in anchors)}$$

$$N_b = 4080 \text{ lbs/stud}$$

**3.2.3** Check ductile strength of stud.

$$N_{sa} = A_{se} f_{uta} = 11.98 \text{ kips/stud}$$

$$\phi = 0.75 \quad [\text{See D.4.4 a) i)}]$$

$$\phi N_{sa} = 8.98 \text{ kips/stud}$$

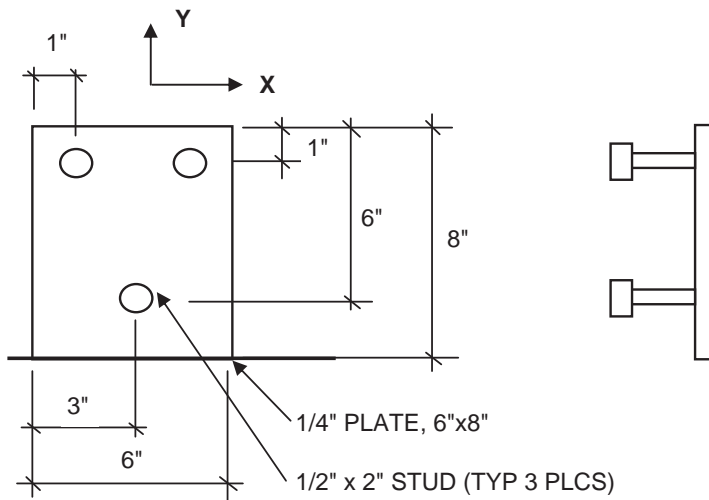
**3.2.3** Check shear strength of stud.

$$V_{sa} = A_{se} f_{uta} = 11.98 \text{ kips/stud}$$

$$\phi = 0.65 \quad [\text{See D.4.4 a) ii)}]$$

$$\phi N_{sa} = 7.79 \text{ kips/stud}$$

**3.3 INSERT PLATE "P/N 223100" ANALYSIS**





**3.3.1 Tension Capacity of "P/N 223100" plate:**

$$N_{cbg} = (A_{nc}/A_{nco}) \psi_{ec,N} \psi_{ed,N} \psi_{c,N} \psi_{cp,N} N_b$$

$$A_{Nco} = 9h_{ef}^2 =$$

Find  $A_{Nc}$  for just the two upper studs.

$$A_{Nc} = A_{Nco} + 4(3)(h_{ef}) =$$

$$\psi_{ec,N} = 1.0 \text{ assume no eccentricity}$$

$$\psi_{ed,N} = 1.0 \text{ (} c_a \text{ min} > 1.5 h_{ef} \text{ for 2 studs)}$$

$$\psi_{c,N} = 1.25 \text{ (for cast-in anchors)}$$

$$\psi_{cp,N} = 1.0 \text{ (for cast-in anchors)}$$

$$N_{cbg} = 8500 \text{ lbs} \quad \phi = 0.70 \text{ [Sec D.4.4 (c) condition B]}$$

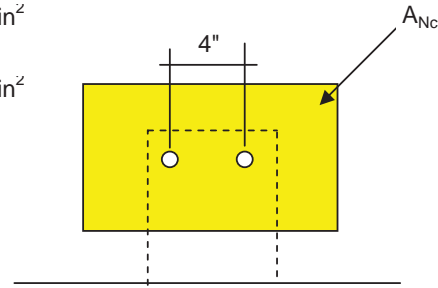
$$\phi N_{cbg} = 5950 \text{ lbs}$$

**TENSION CAPACITY OF "P/N 223100" PLATE**

[Eq D-5] Sec D.5.2.1

$$36 \text{ in}^2$$

$$60 \text{ in}^2$$



**3.3.2 Shear Capacity of "P/N 223100" plate in the X-direction:**

This shear force is parallel to the edge of the panel. (equals two times perpendicular)

$$V_{cbg} = 2(A_{vc}/A_{vco}) \psi_{ec,V} \psi_{ed,V} \psi_{c,V} \psi_{h,V} V_b \quad \text{[Eq D-22 x 2] Sec D.6.2.1 (c)}$$

$$V_b = 7(l_e/d_a)^{0.2} (d_a)^{1/2} \lambda (f'_c)^{1/2} (c_{a1})^{1.5} \quad \text{[Eq D-24] Sec D.6.2.2}$$

$$l_e = h_{ef} = 2 \text{ inches} \quad \lambda = 0.85 \text{ Sec 8.6.1}$$

$$d_a = 0.5 \text{ inches} \quad c_{a1} = 7 \text{ inches}$$

$$V_b = 7270 \text{ lbs/stud} \quad \psi_{h,V} = 1.0 \text{ [D.6.2.8]}$$

$$\psi_{ec,V} = 1.0 \text{ assume no eccentricity} \quad \psi_{ed,V} = 1.0$$

$$\psi_{c,V} = 1.2 \text{ (for #4 bar between anchor and edge)}$$

$$h_a = 4 \text{ inches} \quad s_1 = 4 \text{ inches}$$

$$A_{vco} = 2(1.5 c_{a1}) h_a = 84 \text{ in}^2$$

$$A_{vc} = (2(1.5 c_{a1}) + s_1) h_a = 100 \text{ in}^2$$

$$V_{cbg} = 20772 \text{ lbs} \quad \phi = 0.70 \text{ [D.4.4 (c) condition B]}$$

$$\phi V_{cbg} = 14540 \text{ lbs}$$

**SHEAR CAPACITY OF "P/N 223100" PLATE IN X-DIRECTION**

**3.3.3 Shear Capacity of "P/N 223100" plate in the (negative) Y-direction:**

This shear force is perpendicular to the edge of the panel.

NOTE: The lower stud is ignored since it is close to the free edge.

$$V_{cbg} = (A_{vc}/A_{vco}) \psi_{ec,V} \psi_{ed,V} \psi_{c,V} \psi_{h,V} V_b \quad \text{[Eq D-22] Sec D.6.2.1 (b)}$$

$$V_b = 7270 \text{ lbs/stud} \quad \text{from 3.3.2 above}$$

$$\psi_{ec,V} = 1.0 \text{ assume no eccentricity}$$

$$\psi_{ed,V} = 1.0 \text{ } c_{a2} > 1.5 c_{a1} \quad \psi_{h,V} = 1.0 \text{ [D.6.2.8]}$$

$$\psi_{c,V} = 1.2 \text{ (for #4 bar between anchor and edge)}$$

$$h_a = 4 \text{ inches} \quad s_1 = 4 \text{ inches}$$

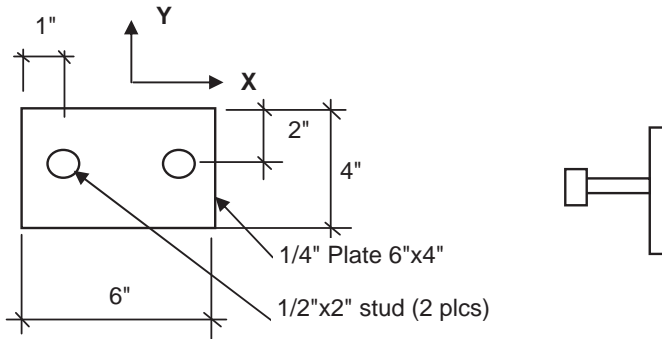
$$A_{vco} = 84 \text{ in}^2 \quad A_{vc} = 100 \text{ in}^2 \quad \text{from 3.3.2 above}$$

$$V_{cbg} = 10386 \text{ lbs} \quad \phi = 0.70 \text{ [D.4.4 (c) condition B]}$$

$$\phi V_{cbg} = 7270 \text{ lbs}$$

**SHEAR CAPACITY OF "P/N 223100" PLATE IN Y-DIRECTION**

**3.4 INSERT PLATE "P/N 223000" ANALYSIS**



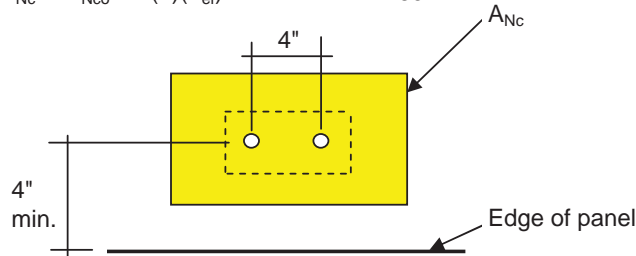
**3.4.1 Tension Capacity of "P/N 223000" plate:**

$$N_{cbg} = (A_{nc}/A_{nco}) \psi_{ec,N} \psi_{ed,N} \psi_{c,N} \psi_{cp,N} N_b \quad [\text{Eq D-5}] \text{ Sec D.5.2.1 (b)}$$

$$A_{Nco} = 9h_{ef}^2 = 36 \text{ in}^2$$

Find  $A_{Nc}$  for just the two upper studs.

$$A_{Nc} = A_{Nco} + 4(3)(h_{ef}) = 60 \text{ in}^2$$



- $\psi_{ec,N} = 1.0$  assume no eccentricity
- $\psi_{ed,N} = 1.0$  ( $c_a \text{ min} > 1.5 h_{ef}$  for 2 studs considered)
- $\psi_{c,N} = 1.25$  (for cast-in anchors)
- $\psi_{cp,N} = 1.0$  (for cast-in anchors)
- $N_{cbg} = 8500 \text{ lbs}$
- $\phi = 0.70$  [Use condition B, D.4.4]

$\phi N_{cbg} = 5950 \text{ lbs}$
-----------------------------------

**TENSION CAPACITY OF "P/N 223000" PLATE**

**3.4.2 Shear Capacity of "P/N 223000" plate in the X-direction:**

This shear force is parallel to the edge of the panel. (equals two times perpendicular)

$$V_{cbg} = 2(A_{vc}/A_{vco}) \psi_{ec,V} \psi_{ed,V} \psi_{c,V} \psi_{h,V} V_b \quad [\text{Eq D-22 x 2}] \text{ Sec D.6.2.1 (c)}$$

where:  $V_b = 7(l_e/d_a)^{0.2} (d_a)^{1/2} \lambda (f'_c)^{1/2} (c_{a1})^{1.5}$  [Eq D-24] Sec D.6.2.2

- $l_e = h_{ef} = 2 \text{ inches}$        $\lambda = 0.85$  Sec 8.6.1
- $d_a = 0.5 \text{ inches}$        $c_{a1} = 4 \text{ inches}$

$$\begin{aligned}
 V_b &= 3140 \text{ lbs/stud} & \psi_{h,V} &= 1.0 \text{ [D.6.2.8]} \\
 \psi_{ec,V} &= 1.0 \text{ assume no eccentricity} & \psi_{ed,V} &= 1.0 \\
 \psi_{c,V} &= 1.2 \text{ (for \#4 bar between anchor and edge)} \\
 h_a &= 3.5 \text{ inches [at step-joint]} & s_1 &= 4 \text{ inches} \\
 A_{vco} &= 2(1.5 c_{a1}) h_a = 42 \text{ in}^2 \\
 A_{vc} &= (2 (1.5 c_{a1}) + s_1) h_a = 56 \text{ in}^2 \\
 V_{cbg} &= 10049 \text{ lbs} \\
 \phi &= 0.70 \text{ [Use condition B, D.4.4]}
 \end{aligned}$$

$\phi V_{cbg} = 7035 \text{ lbs}$   
**SHEAR CAPACITY OF "P/N 223000" PLATE IN X-DIRECTION**

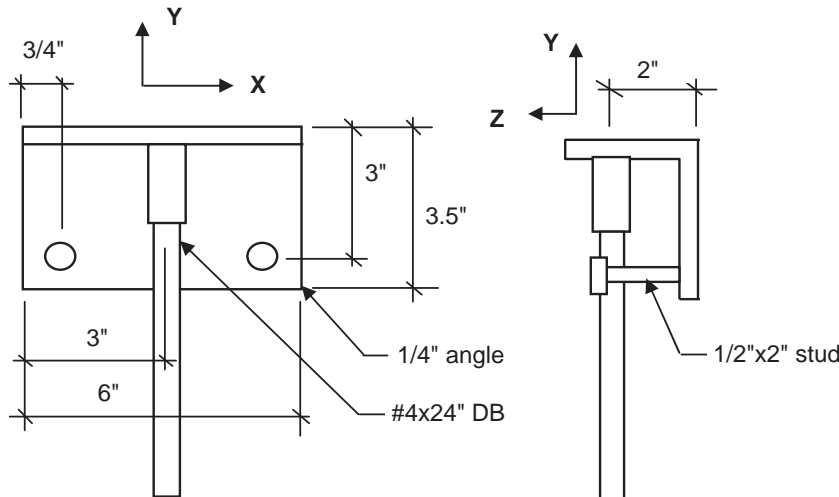
**3.4.3 Shear Capacity "P/N 223000" in the neg Y-direction (toward free edge):**

This shear force is perpendicular to the edge of the panel.

$$\begin{aligned}
 V_{cbg} &= (A_{vc}/A_{vco}) \psi_{ec,V} \psi_{ed,V} \psi_{c,V} \psi_{h,V} V_b & \text{[Eq D-22] Sec D.6.2.1 (b)} \\
 V_b &= 3140 \text{ lbs/stud} & \text{from 3.4.2 above} \\
 \psi_{ec,V} &= 1.0 \text{ assume no eccentricity} \\
 \psi_{ed,V} &= 1.0 \text{ } c_{a2} > 1.5 c_{a1} & \psi_{h,V} &= 1.0 \text{ [D.6.2.8]} \\
 \psi_{c,V} &= 1.2 \text{ (for \#4 bar between anchor and edge)} \\
 A_{vco} &= 42 \text{ in}^2 & A_{vc} &= 56 \text{ in}^2 \text{ from 3.4.2 above} \\
 V_{cbg} &= 5025 \text{ lbs} & \phi &= 0.70 \text{ [Use condition B, D.4.4]}
 \end{aligned}$$

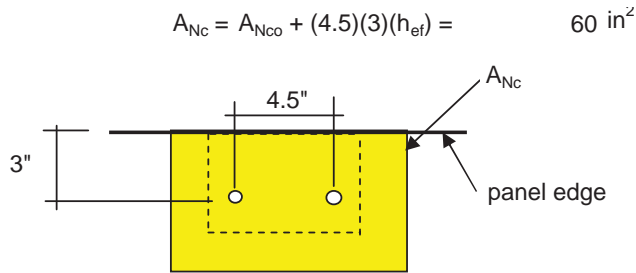
$\phi V_{cbg} = 3517 \text{ lbs}$   
**SHEAR CAPACITY OF "P/N 223000" PLATE IN Y-DIRECTION**

**3.5 INSERT ANGLE "P/N 222000" ANALYSIS**



**3.5.1 Tension Capacity of "P/N 222000" Insert Angle: (negative Z)**

$$\begin{aligned}
 N_{cbg} &= (A_{nc}/A_{nco}) \psi_{ec,N} \psi_{ed,N} \psi_{c,N} \psi_{cp,N} N_b & \text{[Eq D-5] Sec D.5.2.1 (b)} \\
 A_{Nco} &= 9h_{ef}^2 = 36 \text{ in}^2 \\
 \text{Find } A_{Nc} &\text{ for just the two studs.}
 \end{aligned}$$



$\psi_{ec,N} = 1.0$  assume no eccentricity  
 $\psi_{ed,N} = 1.0$  ( $c_a \text{ min} > 1.5 h_{ef}$  for 2 studs considered)  
 $\psi_{c,N} = 1.25$  (for cast-in anchors)  
 $\psi_{cp,N} = 1.0$  (for cast-in anchors)  
 $N_{cbg} = 8500 \text{ lbs}$        $\phi = 0.70$  [Use condition B, D.4.4]

$\phi N_{cbg} = 5950 \text{ lbs}$   
**TENSION CAPACITY OF "P/N 222000" INSERT**

**3.5.2 Shear Capacity of "P/N 222000" Insert Angle in X direction:**

This shear force is parallel to the edge of the panel. (equals two times perpendicular)

$V_{cbg} = 2(A_{vc}/A_{vco}) \psi_{ec,V} \psi_{ed,V} \psi_{c,V} \psi_{h,V} V_b$  [Eq D-22 x 2] Sec D.6.2.1 (c)

where:

$V_b = 7(l_e/d_a)^{0.2} (d_a)^{1/2} \lambda (f'_c)^{1/2} (c_{a1})^{1.5}$  [Eq D-24] Sec D.6.2.2

$l_e = h_{ef} = 2 \text{ inches}$        $\lambda = 0.85$  Sec 8.6.1

$d_a = 0.5 \text{ inches}$        $c_{a1} = 3 \text{ inches}$

$V_b = 2040 \text{ lbs/stud}$        $\psi_{h,V} = 1.0$  [D.6.2.8]

$\psi_{ec,V} = 1.0$  assume no eccentricity       $\psi_{ed,V} = 1.0$

$\psi_{c,V} = 1.2$  (for #4 bar between anchor and edge)

$h_a = 4 \text{ inches}$  [at step-joint]

$s_1 = 4.5 \text{ inches}$

$A_{vco} = 2(1.5 c_{a1}) h_a = 36 \text{ in}^2$

$A_{vc} = (2(1.5 c_{a1}) + s_1) h_a = 54 \text{ in}^2$

$V_{cbg} = 7343 \text{ lbs}$        $\phi = 0.70$  [Use condition B, D.4.4]

$\phi V_{cbg} = 5140 \text{ lbs}$   
**SHEAR CAPACITY OF "P/N 222000" INSERT, X-DIRECTION**

**3.5.3 Shear Capacity of "P/N 222000" Insert Angle in Y direction:**

This is for uplift forces from the roof panel.

$V_{cbg} = (A_{vc}/A_{vco}) \psi_{ec,V} \psi_{ed,V} \psi_{c,V} \psi_{h,V} V_b$  [Eq D-22] Sec D.6.2.1 (b)

$V_b = 2040 \text{ lbs/stud}$  from 3.5.2 above

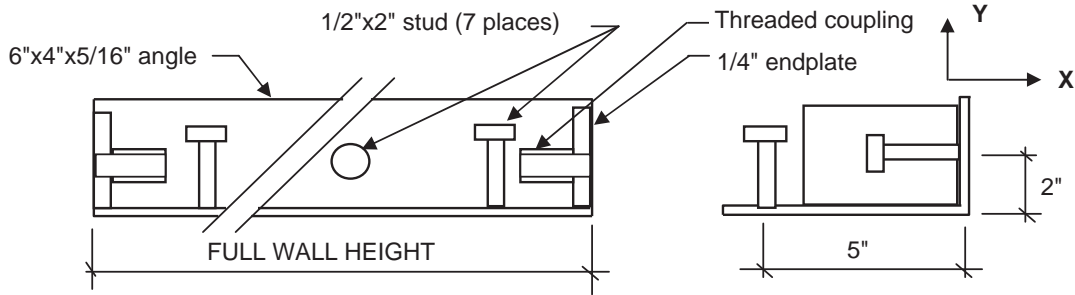
$\psi_{ec,V} = 1.0$  assume no eccentricity

$\psi_{ed,V} = 1.0$   $c_{a2} > 1.5 c_{a1}$        $\psi_{h,V} = 1.0$  [D.6.2.8]

$$\begin{aligned} \psi_{c,V} &= 1.2 \text{ (for \#4 bar between anchor and edge)} \\ A_{vco} &= 36 \text{ in}^2 \text{ from 3.5.2 above} \\ A_{vc} &= 54 \text{ in}^2 \text{ from 3.5.2 above} \\ V_{cbg} &= 3672 \text{ lbs} \\ \phi &= 0.70 \text{ [Use condition B, D.4.4]} \end{aligned}$$

$\phi V_{cbg} = 2570 \text{ lbs}$
<b>SHEAR CAPACITY OF "P/N 222000" INSERT, Y-DIRECTION</b>

**3.6 WALL CORNER INSERT ANALYSIS**



This insert is used on the vertical sides of the endwalls. The 4" leg forms the outside edge of the endwalls, and the 6" leg is abutted to the side walls and is used for the welded connection to the side wall, the roof, and the floor.

The primary loads on this insert are those from wind and seismic forces as they are transferred to/from the floor/roof panel by using the endwall as a shearwall against the forces as they are applied to the side walls.

The shearwall forces are applied in the X-direction as applied to the end view on the right side of the picture above. Of the 7 studs (minimum) that are on the insert, three of them would be analyzed for tension and the other four would be in shear. Depending on the direction of shear, (+X or -X direction), the free edge will come into play. This analysis will only consider the free edge allowable loads with the assumption that the insert will exceed that capacity when loaded in the opposite direction.

**3.6.1 Capacity of Wall Corner Inserts in X-direction**

Check capacity of individual studs on the 6" leg of the angle.

These studs would be in shear toward the free edge.

$$V_{cb} = (A_{vc}/A_{vco}) \psi_{ed,V} \psi_{c,V} \psi_{h,V} V_b \quad \text{[Eq D-21 Sec D.6.2.1 (a)]}$$

where:

$$V_b = 7(l_e/d_a)^{0.2} (d_a)^{1/2} \lambda (f'_c)^{1/2} (c_{a1})^{1.5} \quad \text{[Eq D-24] Sec D.6.2.2}$$

$$l_e = h_{ef} = 2 \text{ inches} \quad \lambda = 0.85 \text{ Sec 8.6.1}$$

$$d_a = 0.5 \text{ inches} \quad c_{a1} = 5 \text{ inches}$$

$$V_b = 4389 \text{ lbs/stud}$$

$$\psi_{ed,V} = 1.0 \quad \psi_{h,V} = 1.0 \text{ [D.6.2.8]}$$

$$\psi_{c,V} = 1.2 \text{ (for \#4 bar between anchor and edge)}$$

$$h_a = 4 \text{ inches [at step-joint]} \quad s_1 = 24 \text{ inches}$$

$$A_{vco} = 4.5 c_{a1}^2 = 112.5 \text{ in}^2$$

$$A_{vc} = 2(1.5 c_{a1}) h_a = 60 \text{ in}^2$$

$$V_{cb} = 5618 \text{ lbs} \quad \phi = 0.70 \text{ [Use condition B, D.4.4]}$$

$$\phi V_{cb} = 3932 \text{ lbs}$$

Shear capacity of studs on 6" leg, X direction.

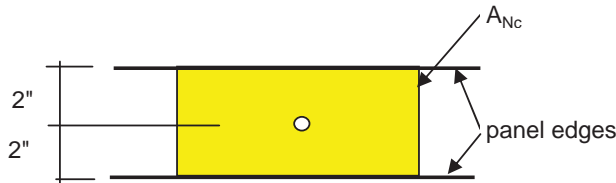
To this, add the tension load from the studs on the 4" leg.

$$N_{cb} = (A_{nc}/A_{nco}) \psi_{ed,N} \psi_{c,N} \psi_{cp,N} N_b \quad \text{[Eq D-4] Sec D.5.2.1 (a)}$$

$$A_{Nco} = 9h_{ef}^2 = 36 \text{ in}^2$$

Find  $A_{Nc}$        $c_{a1} = 2 \text{ inches}$        $h_{ef} = 2 \text{ inches}$

$$A_{Nc} = 2(c_{a1}) \times 2(1.5 h_{ef}) = 24 \text{ in}^2$$



$$\psi_{ed,N} = 1.0 \text{ (} c_a \text{ min} > 1.5 h_{ef} \text{ for 2 studs considered)}$$

$$\psi_{c,N} = 1.25 \text{ (for cast-in anchors)}$$

$$\psi_{cp,N} = 1.0 \text{ (for cast-in anchors)}$$

$$N_{cb} = 3400 \text{ lbs} \quad \phi = 0.70 \text{ [Use condition B, D.4.4]}$$

$$\phi N_{cb} = 2380 \text{ lbs}$$

Shear capacity of studs on 6" leg, X direction.

These two were analyzed as individual studs since they are spaced 12 inches apart, far enough to act alone, not as a group. In this direction, there would be a minimum of 4 studs in shear, and three studs in tension. The total allowable load is:

$$P_x = 4(\phi V_{cb}) + 3(\phi N_{cb}) = 22870 \text{ lbs}$$

SHEAR CAPACITY OF WALL INSERT, +/- X-direction

### 3.7 FLOOR LIFTING INSERT ANALYSIS

The floor lifting inserts are made from 5"x5"x5/16" angle with a 5"x5/16" plate welded on the open top, to form a channel, and extend across the entire width of the floor panel at each end of the shelter. The inserts are similar to the wall corner inserts in design as they have no less than 6 studs, 1/2"x4" long, on 12" centers and two studs, 1/2"x2" long. These inserts provide three connection points for the endwall, and the two outer connections also double as side wall connections. The floor panel side inserts are made from a 5"x5"x5/16" angle with one side up and one side out, and extend the entire length of the shelter. They are also similar to the wall corner inserts in design by having a minimum of 6 studs, 1/2"x4" long, on 12" centers and four # 6 x 30" rebar splices. These inserts provide three or more connection points for the sidewall. By inspection these inserts are highly integrated into the floor structure. A failure would require much more than the shear cone failures as provided by the stud design manual. Therefore, the connections will be considered as equivalent to the analysis of the wall corner insert (sec 3.6.1).

**3.8 CAPACITY OF WELDS AT CONNECTION PLATES**

Welds to be made with SMAW, E70XX electrodes.  
All standard connection plates will have a 3/16" weld, 3 inches long.  
E70XX welds are good for .928 kips per inch per sixteenth inch of weld.  
Weld capacity is then:

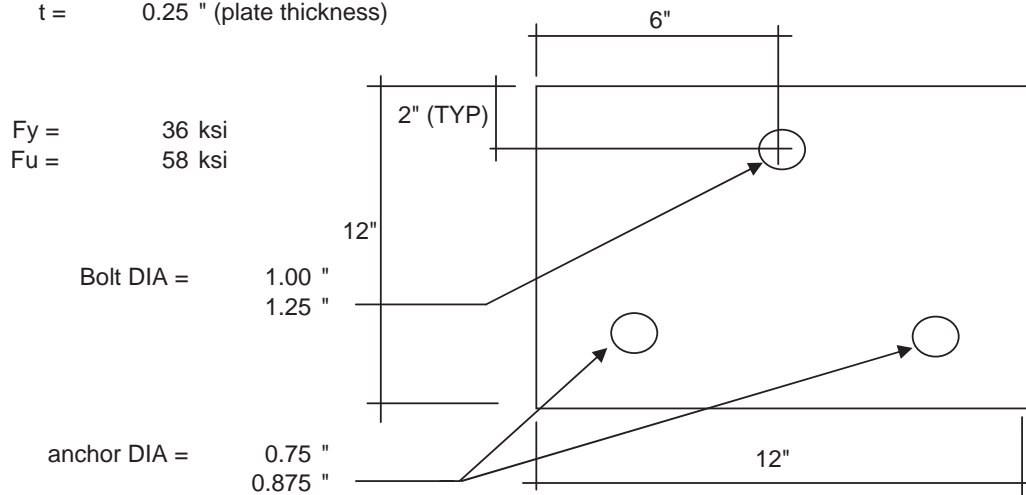
$$P_w = (0.928 \text{ k/inch/sixteenth}) \times (3 \text{ inches}) \times (3 \text{ sixteenths})$$

$P_w = 8.352 \text{ kips}$ <b>CAPACITY OF ALL STANDARD CONNECTION PLATE WELDS</b>
--

**3.9 CAPACITY OF TIE-DOWN CONNECTION PLATES**

Three failure modes are noted:

- A: Failure of the connection plate.
  - B: Failure of the bolts connecting the plate to the shelter.
  - C: Failure of the expansion anchor connecting the plate to the foundation.
- t = 0.25 " (plate thickness)



**A: Shear through edge of plate at one hole is:**

HoleArea(bolt)= D(top) x t	=	0.3125 in <sup>2</sup>	
HoleArea(anchor)= D(bot) x t	=	0.21875 in <sup>2</sup>	
PL-Area = t x ( 2" - (.5 x 1.25" ) )	=	0.34375 in <sup>2</sup>	
cannot exceed t x 4t	=	0.25 in <sup>2</sup>	<b>CONTROLS</b>
OK [exceeds 2/3 hole area, AISC, LRFD (1999), D3.2]			



Bearing on hole area:            Apl(bolt)=            0.25 in<sup>2</sup>  
    Apl(anchor)=        0.1875 in<sup>2</sup>  
    Fp(hole) = 1.0 Fu    =                    58 ksi  
    PL-bearing =        14.50 kips/ bolt hole  
    PL-bearing =        10.88 kips/ anchor hole  
    Transient load factor:    1.333  
 Capacity of connection plate is:    19.33 kips            (using 1 bolt and 2 anchors)  
    19333 lbs per connection

**B: 1" bolt capacity:**        Use A307 bolts or better  
    Fv =            10.0 ksi  
    A(bolt) =        0.785 in<sup>2</sup>  
    Transient load factor:    1.333  
    P(bolt) =        10.47 kips / bolt        =            10472 lbs per connection

**C: Expansion anchor capacity from Hilti charts:**

**Reference ICC report #ESR-1385 & Tables 2 & 5**

Anchor is Hilti Stainless Steel Kwik Bolt 3, 3/4" x 6.5"

Shear in horizontal direction (due to sliding of shelter):

See Table 5, 3000 psi normal weight concrete, in ICC report.

Embedment depth:        4.75 in    OK

Allowable load:            4225 lbs per anchor

See Table 2, 3000 psi normal weight concrete, in ICC report.

Edge distance for max load:    9.75 in    OK    (in direction of load)

Spacing req'd for full load:    10.75 in

Min. spacing allowed:        4.75 in    (10% reduction per note 4, table 2)

Actual spacing:            8 in

Interpolated reduction for spacing:    4.6 %

Transient load factor:        1.333

Modified allowable horizontal shear load:    5375 lbs per anchor

   times 2 =        10750 lbs per connection

Shear in vertical direction (due to uplift of shelter):

Hilti Kwik Bolt 3 requirements

4.75" embedment

4.875" min. edge dist. allowed => use 50% of chart loads (note 6, table 2)

   9.75" required for full load strength

6" edge distance =>        38.46% Interpolated reduction

Allowable vertical load in 3000 psi concrete:

61.54%            x        4225 lbs        =            2600 lbs per anchor

Reduction for spacing (same as above):        4.6 %

   Transient load factor:        1.333

Modified allowable vertical shear load:        3308 lbs per anchor

   times 2 =        6615 lbs per connection

<b>Controlling loads for tie-down connections:</b>	
Horizontal (sliding):	10472 lbs
Vertical (uplift):	6615 lbs

**4 CONCRETE BUILDING WEIGHT CALCULATOR**

Concrete Density = 115 pcf  
Concrete Required = 8.7 yards

**4.1 Shelter Dimensions:**

Width:	10.000	ft
Length:	14.000	ft
Height:	9.250	ft,(wall height)
		Weight, lbs

**4.2 ROOF**

Material	Weight, lbs
CONCRETE	6566
2.25" INSULATION	49
7/16" OSB PANELING	183
3/8" OSB W/FINISH	156
<hr/>	
<b>Total Roof Wt.</b>	<b>6953</b>
<b>Avg. Dead Load, psf</b>	<b>45.7</b>

**4.3 WALLS**

CONCRETE	14495
1.75" INSULATION	118
7/16" OSB PANELING	395
3/8" OSB W/FINISH	339
<hr/>	
<b>Total Wall Wt.</b>	<b>15347</b>
<b>Avg. Dead Load, psf</b>	<b>35.6</b>

**4.4 FLOOR**

CONCRETE	5798
L5x5x5/16 PERIMETER BEAM	494
STYROFOAM (2 PCF DENSITY)	33
TILE, 1/8"	166
<hr/>	
<b>Total Floor Wt.</b>	<b>6491</b>
<b>Avg. Dead Load, psf</b>	<b>46.4</b>

**4.5 WEIGHT SUMMARY:**

<b>Total Overall : lbs</b>	<b>28791</b>	<b>Width x</b>	<b>Building Length x</b>	<b>Height</b>
		<b>10.000</b>	<b>14.000</b>	<b>9.250</b>

**CODE SUMMARY**

1996 UNIFORM BUILDING CODE  
 1996 BOCA NATIONAL BUILDING CODE  
 1997 INTERNATIONAL BUILDING CODE  
 1997 STANDARD BUILDING CODE  
 1997 UNIFORM BUILDING CODE  
 2000 INTERNATIONAL BUILDING CODE  
 2000 STANDARD BUILDING CODE  
 2003 INTERNATIONAL BUILDING CODE  
 2006 INTERNATIONAL BUILDING CODE  
 2009 INTERNATIONAL BUILDING CODE  
 1994 UNIFORM MECHANICAL CODE  
 1996 BOCA MECHANICAL CODE  
 1997 INTERNATIONAL MECHANICAL CODE  
 1997 STANDARD MECHANICAL CODE  
 1997 UNIFORM MECHANICAL CODE  
 2000 INTERNATIONAL MECHANICAL CODE  
 2000 STANDARD MECHANICAL CODE  
 2003 INTERNATIONAL MECHANICAL CODE  
 2006 INTERNATIONAL MECHANICAL CODE  
 2009 INTERNATIONAL MECHANICAL CODE  
 2010 CALIFORNIA BUILDING CODE  
 2010 CALIFORNIA GREEN BUILDING STANDARDS  
 2010 CALIFORNIA ENERGY CODE  
 2010 BUILDING CODE OF NEW YORK STATE  
 2010 ELECTRICAL CODE OF NEW YORK STATE  
 2010 MECHANICAL CODE OF NEW YORK STATE  
 2010 CALIFORNIA BUILDING CODE  
 2009 NORTH CAROLINA BUILDING CODE  
 2008 NORTH CAROLINA ELECTRICAL CODE  
 2009 NORTH CAROLINA MECHANICAL CODE  
 2009 NORTH CAROLINA ENERGY CONSERVATION CODE  
 2009 NORTH DAKOTA ELECTRICAL WIRING STANDARDS  
 2009 MICHIGAN BUILDING CODE  
 2009 MICHIGAN MECHANICAL CODE  
 2000 MINNESOTA STATE ENERGY CODE (CH. 1323)  
 2007 MINNESOTA STATE MECHANICAL CODE (CH. 1346-2000 IMC & 2000 IFGC W/ AMEND.)  
 2007 MINNESOTA STATE BUILDING CODE  
 2009 NEW MEXICO COMMERCIAL BUILDING CODE  
 2008 NEW MEXICO ELECTRICAL CODE  
 2009 NEW MEXICO MECHANICAL CODE  
 2004 CHICAGO BUILDING CODE  
 2007 FLORIDA BUILDING CODE WITH 2009 SUPPLEMENTS 1 & 2  
 2011 MASSACHUSETTS ELECTRICAL CODE  
 8TH MASSACHUSETTS STATE BUILDING CODE  
 2010 OHIO BUILDING CODE  
 2010 OHIO MECHANICAL CODE  
 2010 CALIFORNIA TITLE 25  
 2010 OREGON STRUCTURAL SPECIALITY CODE  
 2010 OREGON MECHANICAL SPECIALITY CODE  
 2010 OREGON ENERGY EFFICIENCY SPECIALITY CODE  
 2007 KENTUCKY BUILDING CODE  
 1996-2011 NATIONAL ELECTRICAL CODE  
 1989,1999,2001,2004,2007 ASHRAE 90.1  
 2000,2003,2006,2009 INTERNATIONAL ENERGY CONSERVATION CODE  
 2000,2003,2005,2006,2009 NFPA 101 LIFE SAFETY CODE  
 2002 ARKANSAS FIRE PREVENTION CODE  
 2009 NORTH CAROLINA FIRE PREVENTION CODE

**NOTES**

- LISTED CODES INCLUDE LATEST STATE ADOPTED AMENDMENTS.
- THIS SHELTER NOT INTENDED FOR HUMAN HABITATION.
- APPROVED MODEL MAY BE MIRROR IMAGE.
- OCCUPANT LOAD = 0, OHIO = 2
- SPECIAL CONDITIONS AND PERMISSIBLE TYPES OF GASES: N/A
- SHELTER HAS NO COUNTY PLACEMENT RESTRICTION IN THE STATE OF MARYLAND.
- STATE INSIGNIA LABEL/DECAL IS LOCATED NEAR MAIN ELECTRICAL SERVICE PANEL.
- DOOR MUST BE MINIMUM 90 MINUTE FIRE RATED IF USED IN 2 HOUR FIRE RATED SHELTER AND MINIMUM 45 MINUTE FIRE RATED IF USED IN 1 HOUR FIRE RATED SHELTER.
- ENERGY CODE EVALUATION BASED ON COMCHECK-EZ AND ENERGY GAUGE FLACOM SOFTWARE.
- NOT SUBJECT TO FLORIDA FIRE SAFETY CODE, COMPLIANCE IS THE RESPONSIBILITY OF THE LOCAL JURISDICTION CODE OFFICIAL.
- ACCESS TO SHELTER SHALL COMPLY WITH MARYLAND ACCESSIBILITY CODE COMAR .05.02.02.07/ADAAG SECTION 4.1.2.
- ALL WELDS SHALL BE VERIFIED BY SPECIAL INSPECTION SHOWING CONFORMANCE TO THE DESIGN DRAWINGS AND SPECIFICATIONS.
- BUILDING CATEGORY II. 1609.1.1 ALLOWS CHAPTER 6 OF ASCE 7; PER SEC 6.5.5, USE TABLE 1-1.
- APPLICABLE INTERNAL PRESSURE COEFFICIENT (NOT APPLICABLE) - THESE SHELTERS CONFORM TO THE REQUIREMENTS OF SECTION 1609.1.1 WHICH ALLOWS CHAPTER 6 OF ASCE 7; USE SEC 6.4; METHOD I SIMPLIFIED PROCEDURE.
- WIND IMPORTANCE FACTOR - IW = 1.000
- THIS SHELTER IS AN "ENCLOSED STRUCTURE".
- THESE PLANS ARE DESIGNED TO BE USED FOR THE CONSTRUCTION OF COMMERCIAL MODULAR UNITS, IN ACCORDANCE WITH CA HEALTH AND SAFETY CODE SECTION 18028, 1991 UBC, 1993 NEC, ANSI A117.1-1986.
- THE 2005 NEC IS MORE STRINGENT THAN THE 2002 NEC, 2012 NEC.
- EXTERNAL GROUNDING BY OTHERS.
- SHELTER CONSTRUCTED IN ACCORDANCE WITH 9N-3 FAC.
- SHELTERS AND VENTS ARE DESIGNED FOR AND DO MEET THE HVHZ REQUIREMENTS.
- THIS BUILDING DOES NOT CONTAIN PLUMBING FACILITIES.

ZONE	EXTERIOR COMPONENTS AND CLADDING POSITIVE AND NEGATIVE PRESSURES IN TERMS OF PSF			
	2000 IBC, 120 MPH WIND SPEED	2003 IBC, 2006 IBC, 120 MPH WIND SPEED	2000,2003,2006 IBC, 2004 FBC, 156 MPH WIND SPEED	2000,2003,2006,2009,2007,IBC FBC 156 MPH WIND SPEED
ROOF ZONE 1 (100 SF EFFECTIVE WIND AREA)	+12.1/-28.7	+10.0/-28.7	+15.7/-44.8	+17.2/-48.4
ROOF ZONE 2 (20 SF EFFECTIVE WIND AREA)	+12.1/-46.9	+12.0/-46.9	+18.6/-73.4	+20.4/-79.7
ROOF ZONE 3 (10 SF EFFECTIVE WIND AREA)	+12.7/-79.1	+12.7/-79.1	+20.0/-123.7	+21.5/-135.6
WALL ZONE 4 (200 SF EFFECTIVE WIND AREA)	+25.8/-28.4	+25.8/-28.4	+39.6/-43.4	+42.7/-47.2
WALL ZONE 5 (30 SF EFFECTIVE WIND AREA)	+29.3/-38.0	+29.3/-38.0	+45.9/-59.2	+49/-64.4

**INDEX OF SHEETS**

**LAYOUT DRAWINGS**

- 0-0 COVER SHEET
- 0-1 PARTS LIST
- 0-2 PARTS LIST CONT'D./CUT LIST
- \*1-0 EXTERIOR ELEVATION "A"
- \*1-1 EXTERIOR ELEVATION "C"
- \*1-2 EXTERIOR ELEVATION "B"
- \*1-3 EXTERIOR ELEVATION "D"
- 2-0 FLOOR PLAN
- 2-1 GENERATOR BASE BRACKET DETAIL
- 3-0 REFLECTED CEILING PLAN - ELECTRICAL
- 3-1 REFLECTED CEILING PLAN - UNISTRUT LAYOUT
- 4-0 INTERIOR ELEVATION "A"
- 4-1 INTERIOR ELEVATION "C"
- 4-2 INTERIOR ELEVATION "B"
- 4-3 INTERIOR ELEVATION "D"
- 4-4 INTERIOR ELEVATION "A" - UNISTRUT LAYOUT
- 4-5 INTERIOR ELEVATION "C" - UNISTRUT LAYOUT
- 4-6 INTERIOR ELEVATION "B" - UNISTRUT LAYOUT
- 4-7 INTERIOR ELEVATION "D" - UNISTRUT LAYOUT
- \*5-0 ELECTRICAL SCHEMATIC
- 5-1 GENERATOR DUPLEX WIRING SCHEMATIC
- 5-2 SMOKE/HEAT WIRING SCHEMATIC
- 5-3 LOW VOLTAGE SCHEMATIC
- 5-4 ELECTRICAL PANEL CALC (PRE HEMP)
- 5-5 ELECTRICAL PANEL CALC (POST HEMP)
- 5-6 DEC 3000 WIRING SCHEMATIC
- 5-7 FUEL MONITORING WIRING SCHEMATIC
- 5-8 HEATER STRIP ELECTRICAL CONNECTION DETAIL
- 5-9 SAUK PANEL CONNECTION DETAIL
- 6-0 GROUND BAR DETAILS
- 6-1 GROUND STRAP TO DOOR FRAME DETAIL
- 6-2 GROUND BAR THRU WALL DETAIL
- 6-2A THRU WALL PENETRATION DETAIL
- 6-3 MUFFLER HANGER DETAILS
- 7-0 INTERIOR PANELING R/U CALCULATIONS
- 7-1 FUEL FILL & RETURN RISER
- 7-2 FUEL VENT RISER
- 7-3 HEMP PROTECTION W/G & DOOR SECTION
- 7-4 6" SLAB FOUNDATION FLAT TIEDOWN DETAILS
- 7-5 CONCRETE SHELTER PANEL CONNECTION DETAILS
- 7-6 GENERAL ELECTRICAL NOTES & LEGEND
- 7-7 THRU WALL PENETRATION DETAIL
- 7-8 GENERATOR THIMBLE DETAIL
- 7-9 UMBILICAL CORD PENETRATION DETAIL
- 7-10 COMPRESSOR BRACKET SUPPORT DETAIL
- 7-10A DOOR STOP BRACKET INSTALLATION DETAILS

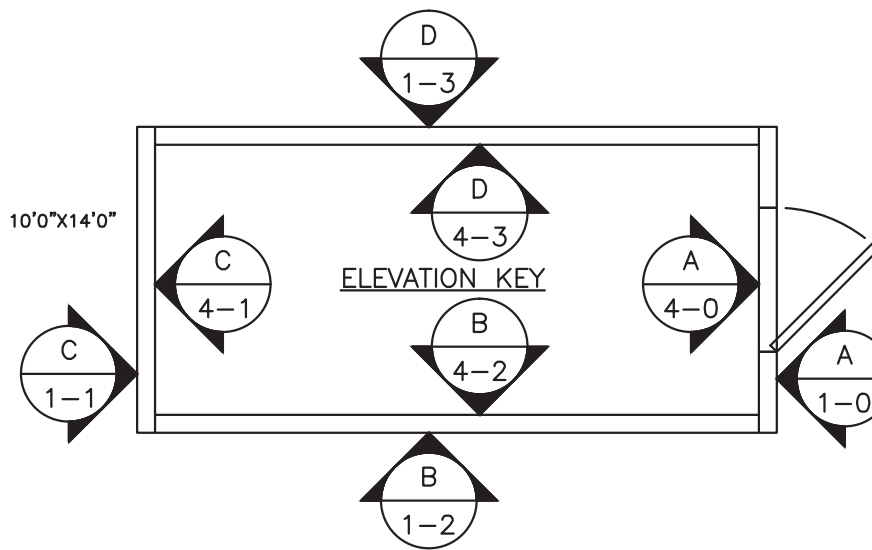
\* = DENOTES SHEETS WHICH MAY CONTAIN FIELDWORK

**REFERENCE DRAWINGS**

- 108-007 ABBREVIATIONS AND SYMBOLS
- 108-016 GENERAL CASTING SPECIFICATIONS (4 SHEETS)
- 108-088 SHELTER LIFTING DETAILS (3 SHEETS)

**STRUCTURAL DRAWINGS (MANUFACTURE ONLY)**

- S0-0 STRUCTURAL SPECIFICATIONS
- S1-0 STRUCTURAL LAYOUT - WALL "A"
- S1-1 STRUCTURAL LAYOUT - WALL "C"
- S1-2 STRUCTURAL LAYOUT - WALL "B"
- S1-3 STRUCTURAL LAYOUT - WALL "D"
- S2-0 STRUCTURAL LAYOUT - ROOF
- 221-1000X1400-03 CONCRETE FLOOR ASSY KIT 10'0"x14'0"



**DESIGN PARAMETERS**

USE GROUP: B (BOCA, MASBC)  
 S-2 (FBC, IBC, SBC, UBC)  
 U (OBC)  
 CONSTRUCTION TYPE: 5B (BOCA, MASBC)  
 IV-UNP (SBC)  
 V-B (IBC, FBC)  
 V-N (UBC)  
 ROOF LIVE LOAD: 135 PSF  
 FLOOR LIVE LOAD: 251 PSF  
 GROUND SNOW LOAD: 161 PSF (N/A FOR FBC 2007)  
 WIND SPEED: 156 MPH/EXPOSURE C  
 SEISMIC ZONE FOR SBC & UBC: 4  
 SEISMIC DESIGN CATEGORY FOR IBC: E (IBC)  
 Ss = 3.00  
 Si = 2.00  
 Ip = 1.5  
 SDC = D  
 USE GROUP-III (OBC)  
 SITE CLASS-D (OBC)

CONCRETE f'c: 5000 PSI AT 28 DAYS  
 CONCRETE UNIT WEIGHT: 115 PCF  
 FIRE RATING: 2 HOUR WALL AND ROOF (LIMITATIONS MAY APPLY DUE TO OPENINGS AND PROXIMITY ON SITE)

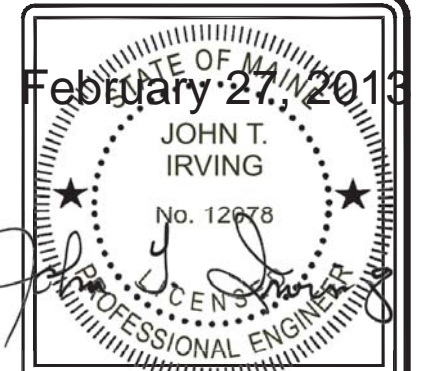
**PHYSICAL PROPERTIES**

SHELTER DIMENSIONS: 10'-0"W X 14'-0"L  
 SHIPPING DIMENSIONS: 11'-10 1/8"W X 16'-6 1/2"L X 10'-1"H  
 SHELTER WEIGHT: 33,000 # (SHELTER ONLY)

**GENERAL NOTE:**

- DIMENSIONS MARKED WITH A "D" ARE DESIGN DIMENSIONS THAT NEED TO BE CHECKED. THEY TYPICALLY DICTATE A POSITION OF A SERVICE TERMINATION OR DIMENSION THAT NEEDS TO MATCH A POSITION OR DIMENSION AT THE INSTALLATION SITE.
- PAINT UNGALVANIZED OR UNPAINTED CARBON STEEL COMPONENTS WITH A. TWO(2) COATS OF DEVOE 201H UNIVERSAL EPOXY PRIMER 2-3 MIL DFT OR TWO(2) COATS OF DEVOE BAR-RUST 235 MULTIPURPOSE PIMER 4-8 MIL DFT, THEN B. ONE(1) COAT OF DEVTHANE 389 POLYURETRANE TWO PART SYSTEM 4-8 MIL DFT.
- ALL EXPOSED UNFINISHED SHEET METAL TO BE OF ALUMINUM.
- ALL EXTERNAL FASTENERS TO BE OF STAINLESS STEEL UNLESS OTHERWISE NOTED.
- PAINT INTERIOR WITH ONE COAT OF DEVTHANE 309 POLYURETHANE TWO PART SYSTEM 2-8 MIL DFT.
- PLUG SCREW HOLES USED TO HOLD SHIPPING COVERS OVER LOUVERS WITH ALUMINUM SCREWS OR ALL-ALUMINUM POP-RIVETS.

REV	BY	DATE	DESCRIPTION	APP. BY	DATE
N	RRG	6/8/12	CHANGES PER 12KBR002-3	LJL	6/8/12
M	JJ	7/25/11	UPDATED SHEET INDEX & CODE COMPLIANCES	LJL	7/25/11
L	RRG	04/28/11	ADDED SHT 2-1 & 5-10	LJL	04/28/11
F	MDF	08/03/10	PER MARKUPS	DB	08/05/10



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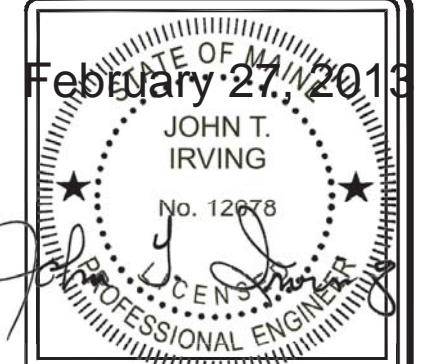
CUSTOMER:  
**KELLOGG  
 BROWN & ROOT  
 FEMA (PEP)  
 EXPANSION PROGRAM**

PROJECT:  
**10'-0" X 14'-0"  
 CONCRETE SHELTER  
 COVER SHEET**

FILENAME: KBR/SKBR01	
SCALE: N.T.S.	TOLERANCE:
DRWN. BY: D. CHRISTOPHE	DATE: 03/22/10
CHK. BY: G. BRINKMAN	DATE: 03/22/10
ENG. BY: A. DUMAS	DATE:
APP. BY: JI	DATE:
SHEET NO. 0-0	
DRAWING NO.:	REV.:
SKBR01	P



PARTS LIST												
ITEM	QTY	U/M	P/N	DESCRIPTION	ITEM	QTY	U/M	P/N	DESCRIPTION			
4	0.0950	EA.	146545	SHEET ALUM.,.090",48"x120",5052,COAT	88	2.0000	EA.	420202	LABEL, BLK, ELECT, "208V 3-PHASE"			
5	1.0000	EA.	146565-001	SHELF,3105 SERIES UPS,15",ALUM	89	1.0000	EA.	420203	LABEL, BLK, ELECT, "CIRCUIT BREAKER BOX"			
6	49.0000	EA.	163750	WASHER,2"x2"x1/8",SQ,7/16" H,GALV	90	1.0000	EA.	420204	LABEL, BLK, ELECT, "GENERATOR/SHORE POWER SWITCH"			
7	4.0000	EA.	168090	SCREW,TEK,#BX1/2",PH,MOD TRUSS	91	1.0000	EA.	420226	LABEL,BLK,ELECT,"HOME"			
8	1.0000	EA.	168283	BUSHING,PLASTIC,1/2",SNAP-IN,HEYCO	92	1.0000	EA.	420227	LABEL,BLK,ELECT,"RELEASE"			
9	3.0000	EA.	170112	PIPE CAP,PLASTIC,NPT,NIAGARA #249	93	1.0000	EA.	420311	LABEL,BLK,ELECT,"L1"			
10	1.0000	EA.	400666	CARD HOUSING W/AC DC 48V ADAPT	94	1.0000	EA.	420312	LABEL,BLK,ELECT,"L2"			
11	2.0000	EA.	410000	CONDULET,BODY COVER,1" ALUM	95	1.0000	EA.	420313	LABEL,BLK,ELECT,"L3"			
12	2.0000	EA.	410006	CONDULET,BODY AL LB,1",LB100D	96	1.0000	EA.	420314	LABEL,BLK,ELECT,"N"			
13	4.0000	EA.	410041	CONDULET,GASKET 1",GASKO35N	97	1.0000	EA.	420321	LABEL,BLK,ELECT,"NORMAL"			
14	1.0000	EA.	410049	LOCKNUT,EMT,1 1/2"	98	1.0000	EA.	420322	LABEL,BLK,ELECT,"BYPASS"			
15	1.0000	EA.	410050	LOCKNUT,EMT,2"	99	1.0000	EA.	420328	LABEL,BLK,ELECT,"TORQUE REQUIREMENT"			
16	3.0000	EA.	410077	BUSHING,1",PLASTIC	100	2.0000	EA.	420329	LABEL,YEL,"OSHA CLEARANCE REQUIRE"			
17	11.0000	EA.	410102	CONDUIT,PVC,1",CONNECTOR,MALE	101	8.0000	EA.	430034	RECEPTACLE,DUPLX,125V,20A,IVORY			
18	1.0000	EA.	410147	CONDULET,PVC LL,1",W/GASKET & CVR	102	1.0000	EA.	430084	SWITCH,SPST,20A,120V,IVORY			
19	21.0000	EA.	410177	CONDUIT HANGER,3/4" EMT/RIGID	103	1.0000	EA.	430170	GEN RECPT,DECONTACTOR,MALE,MELTRIC			
20	1.0000	EA.	410203	CONDUIT,PVC,2",MALE ADAPTER	104	1.0000	EA.	430171	RECEPT,DECONTACTOR,FEMALE,MELTRIC			
21	2.0000	EA.	410341	CONDUIT,PVC,2",90 DEGREE SWEEP BEND	105	1.0000	EA.	430247	GEN RECPT,PROTECTIVE CAP,MALE,MELTR			
22	1.0000	EA.	410405	NIPPLE,RIGID,2"x5"	106	1.0000	EA.	430354	PANELBOARD,SQD,225A,30P,3PH,NQ430L2			
23	11.0000	EA.	410416	LOCKNUT,RNC,1",LT9LF	107	1.0000	EA.	430503	COVER,RECPT PLATE,4X4,QUAD,PLASTIC			
24	24.0000	EA.	410421	CONDUIT,PVC,1/2",CONNECTOR,MALE	108	9.0000	EA.	430569	COVER,BLANK PLATE, 4X4X2,PVC,NEMA 6			
25	5.0000	EA.	410422	ELBOW,SCH.40 RNC,1",90 DEGREE	109	1.0000	EA.	430721	PANELBOARD,SQD,COVER,NC32S			
26	12.0000	EA.	410423	ELBOW,SCH.40 RNC,1/2",90 DEGREE	110	6.0000	EA.	430928	COVER,RECPT PLATE,4X2,2R,SS			
27	3.0000	EA.	410424	CONDUIT,PVC,1,CONNECTOR,FEMALE	111	1.0000	EA.	430929	COVER,SWITCH PLATE,4X2,1 SWITCH,SS			
28	1.0000	EA.	410425	CONDUIT,PVC,2",CONNECTOR,FEMALE	112	1.0000	EA.	431201	GEN RECEPT,HANDLE,METAL,MELTRIC			
29	24.0000	EA.	410426	LOCKNUT,RNC,1/2",LT9LD	113	1.0000	EA.	431202	GRIP,CORD,NO MESH,AL,1.438-1.562			
30	1.0000	EA.	410429	CONNECTOR,1 1/2",CGB5913	114	1.0000	EA.	440071	SURGE ARRESTOR,SQ-D,3PHASE,SDSA3650			
31	1.0000	EA.	410434	CONDULET,PVC LB,1",W/GASKET & CVR	115	4.0000	EA.	470047	LIGHT FIXTURE,LENS,2-BULB T-8			
32	1.0000	EA.	410435	CONDULET,PVC LL,2" (OR EQUAL)	116	8.0000	EA.	470058	LIGHT BULB,F32 T-8 MED BIPIN			
33	1.0000	EA.	410445	CONNECTOR,1 1/4",CG1144A	117	1.0000	EA.	540211	G-BAR KIT,SQUARE D,PK23GTAL			
34	10.0000	EA.	410461	1IN CONDUIT VIBRACLAMP BVP100	118	1.0000	EA.	168029	BOLT,3/8"x2",STAINLESS STEEL			
35	1.0000	EA.	430161	BOX,BACK,GEN RECPT 100A,MELTRIC	119	2.0000	EA.	168030	WASHER,3/8" LOCK,STAINLESS STEEL			
36	2.0000	EA.	430244	BOX,JUNCTION,ROUND,1/2"KO, E970CD	120	2.0000	EA.	168031	WASHER,3/8" FLAT,STAINLESS STEEL			
37	1.0000	EA.	430286	BOX,ENCLOSURE,16X16X6,HINGED,NEMA3	121	1.0000	EA.	168032	NUT,3/8"-UNC,HEX,STAINLESS STEEL			
38	3.0000	EA.	430566	BOX,JUNCTION,2X4,1/2"KO,E981DFN	122	1.0000	EA.	168120	WASHER,3/8" DRAGON TOOTH,DTW38			
39	2.0000	EA.	430567	WBOX,JUNCTION, 2X4,1/2" KO,E980DFN	123	50.0000	FT.	400030	WIRE,#6 THHN,STRAND,GRN			
40	9.0000	EA.	430659	BOX,JUNCTION, 4X4X2,PVC,NEMA 6P	127	80.0000	FT.	400050	WIRE,#2 THHN,STRAND,GRN			
41	1.0000	EA.	430720	LOADCENTER,SQD,BOX,MH32	128	1.0000	EA.	400051	C-TAP,ORANGE,54740			
42	1.0000	EA.	430813	SWITCH,MTS,4P200A,SQD,82454,NEMA1	129	1.0000	EA.	400174	C-TAP,PINK,54730			
43	4.0000	EA.	430936	BOX,JUNCT,2"x4",1 7/8"D,NONMETALIC	130	1.0000	EA.	400371	LUG,2H,#6,BLU,1/4"BOLT,3/4"C/C,LBFW			
44	1.0000	EA.	440115	UPS,SYSTEM,3105 SERIES,EATON	131	2.0000	EA.	400390	LUG,2H,#2,BRN,1/4"BOLT,3/4"C/C,LBFW			
45	4.0000	EA.	470057	LIGHT FIXTURE,32W,2 BULB,4FT,WR,T-8	132	43.0000	EA.	410430	CABLE TIE MOUNT TM3S25-C			
46	1.0000	EA.	470423	LOUVER,8"x9 1/2",HOFFMAN,AVK86	133	1.0000	EA.	480005	CELLXION GREEN SERIAL NO.PLAT			
47	45.5417	FT.	510017	UNISTRUT,1 5/8"CHANNEL,GOLDGALV,RAW	134	19.2500	FT.	510017	UNISTRUT,1 5/8"CHANNEL,GOLDGALV,RAW			
48	38.0000	EA.	P410127-00	KIT,CONDUIT HANGER,3/8" & 1/2"	135	1.0000	EA.	510017-001	UNISTRUT,WELDED ASSEMBLY,-001			
49	4.0000	EA.	P410190-00	KIT,CONDUIT HANGER,2"	136	1.0000	EA.	510017-002	UNISTRUT,WELDED ASSEMBLY,-002			
50	16.0000	EA.	P510020-00	KIT,HARDWARE,ISOLATING,1/4"	137	1.0000	EA.	510017-003	UNISTRUT,WELDED ASSEMBLY,-003			
51	1.0000	EA.	390009	DETECTOR,SMOKE,120V,ION,KIDDE/FYRN	138	1.0000	EA.	510017-004	UNISTRUT,WELDED ASSEMBLY,-004			
52	1.0000	EA.	390020	RELAY,SMOKE DETECTOR,RM3	139	1.0000	EA.	510017-005	UNISTRUT,WELDED ASSEMBLY,-005			
53	1.0000	EA.	390032	DETECTOR,HEAT,120V,9V BU,KIDDE/FYR	140	1.0000	EA.	510017-007	UNISTRUT,WELDED ASSEMBLY,-007			
54	5.0000	EA.	400272	BREAKER,SQD,1P 20A,BOLT ON,QOB120	141	1.0000	EA.	510017-008	UNISTRUT,WELDED ASSEMBLY,-008			
55	1.0000	EA.	400273	BREAKER,SQD,1P 15A,BOLT ON,QOB115	142	1.0000	EA.	510017-009	UNISTRUT,WELDED ASSEMBLY,-009			
56	1.0000	EA.	400273	BREAKER,SQD,1P 15A,BOLT ON,QOB115	143	1.0000	EA.	510017-010	UNISTRUT,WELDED ASSEMBLY,-010			
57	10.0000	FT.	400274	WIRE,#4/5,TYPE W MULTICONDUCTOR CAB	144	1.0000	EA.	510017-011	UNISTRUT,WELDED ASSEMBLY,-011			
58	1.0000	EA.	400295	BREAKER,SQD,2P 20A,BOLT ON,QOB220	145	1.0000	EA.	510017-012	UNISTRUT,WELDED ASSEMBLY,-012			
59	1.0000	EA.	400315	BREAKER,SQD,3P 30A,BOLT ON,QOB330								
60	1.0000	EA.	400324	BREAKER,SQD,3P 150A,B,QOB3150								
61	1.0000	EA.	400438	BREAKER,SQD,3P,90A,BOLT ON,QOB390								
62	1.0000	EA.	400664	CONTACT CLOSURE TRANSMITTER CARD								
63	8.0000	FT.	410165	CONDUIT,LFMC,1 1/2",SEALTITE								
64	1.0000	EA.	410171	CONNECTOR,LFMC,1",STRAIGHT,ST (OR EQUAL)								
65	1.0000	EA.	420009	LABEL,BLK,ELECT,"INTERIOR LIGHT"								
66	80.0000	EA.	420033	LABEL, SELF TRANSFER, PANDUIT TTSL2								
67	1.0000	EA.	420037	LABEL,BLK,ELECT,"TVSS"								
68	2.0000	EA.	420041	LABEL,"ARC FLASH AND SHOCK WARNING"								
69	5.0000	EA.	420047	LABEL,BLK,ELECT,"120V RECEPT"								
70	4.0000	EA.	420082	LABEL, BLK, ELECT, "CKT 14"								
71	1.0000	EA.	420143	LABEL,RED, ELECT,BONDING TAG								
72	2.0000	EA.	420174	LABEL,BLK,ELECT,"CKT 18"								
73	1.0000	EA.	420193	LABEL, BLK, ELECT, "CKT 21"								
74	2.0000	EA.	420196	LABEL, BLK, ELECT, "CKT 24"								
75	1.0000	EA.	420198	LABEL,BLK,ELECT,"CKT 26&28&30"								
76	1.0000	EA.	420199	LABEL, BLK, ELECT, "DRYER/FILTER"								
77	1.0000	EA.	420200	LABEL, BLK, ELECT, "REGULATOR 30-35 PSI"								
78	1.0000	EA.	420201	LABEL, BLK, ELECT, "OPTICAL CONNECTOR"								



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CUSTOMER:  
**KELLOGG  
 BROWN & ROOT  
 FEMA (PEP)  
 EXPANSION PROGRAM**

PROJECT:  
**10'-0" X 14'-0"  
 CONCRETE SHELTER  
 PARTS LIST/CUT LIST**

FILENAME: KBR/SKBRO1	
SCALE: N.T.S.	TOLERANCE:
DRWN. BY: D. CHRISTOPHE	DATE: 03/22/10
CHK. BY: G. BRINKMAN	DATE: 03/22/10
ENG. BY: A. DUMAS	DATE:
APP. BY: JI	DATE:
SHEET NO. 0-1	
DRAWING NO.: SKBR01	REV.: P

P	RRG	10/31/12	UPDATED PARTS LIST	LJL	10/31/12
N	RRG	6/8/12	UPDATED PARTS LIST	LJL	6/8/12
M	JJ	7/25/11	UPDATED PARTS LIST	LJL	7/25/11
L	RRG	04/25/11	UPDATED PARTS LIST	LJL	04/25/11
REV	BY	DATE	DESCRIPTION	APP.BY	DATE

PARTS LIST (CONTINUED)

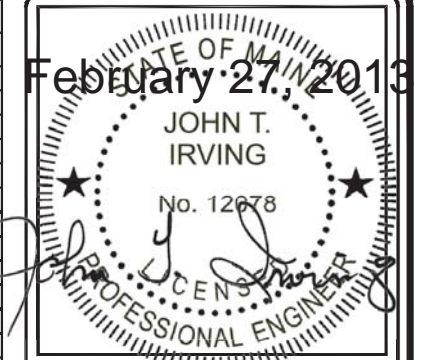
ITEM	QTY	U/M	P/N	DESCRIPTION
146	1.0000	EA.	540104	G-BAR KIT,SQUARE D,PTOGTA-6
147	1.0000	EA.	540115	G-BAR,CU,1/8"x1"x12",2 HOLE,DR FRM
148	1.0000	EA.	P540299-01	G-BAR,KIT,CU,540299-01
149	4.0000	EA.	100065	SEAL,EMSEAL,COLORSEAL,COS-60-40-02
150	1.0000	EA.	141104-001	FLATBAR DOOR PULL,1/4"x4"x9",A304,S
151	0.0042	EA.	146545	SHEET ALUM.,.090",48"x120",5052,COAT
152	1.0000	EA.	500004	DOOR,4068,CURRIES,LH/RH,18G
153	3.0000	EA.	504007	DOOR,HINGES,SPRING,NEWSH140
154	2.0000	EA.	504102	DOOR,BUMPER,SS RUBBER STOP,BLACK
155	1.0000	EA.	504113	DOOR,HOLD OPEN,T-LATCH,6" SS
156	1.0000	EA.	504140	DOOR STOP BRACKET ASSY
157	4.0000	EA.	504203	DOOR,SWEEP WEATHERSTRIPPING,48"
158	1.0000	EA.	504300	DOOR,LOCKGUARD,10" 32D
159	1.0000	EA.	504405	DOOR,DRIP CAP,NGF16A-54"
160	1.0000	EA.	504501	CORE, LOCKSET, BEST, CONSTRUCT, GREEN
161	1.0000	EA.	504503	LOCKSET,DEAD BOLT,CYLINDRICAL,BEST (OR EQUAL)
162	2.0000	EA.	504504	DOOR,PULL HANDLE KASON,CAST,382
163	1.0000	EA.	540216	GROUND STRAP ASSY,1/2 BRAIDED,18"
164	10.0000	EA.	560026	FLOOR, MATTING, NOTRAX #556
165	1.0000	EA.	146545-001	RETAINING STRAP,ALUM
166	1.0000	EA.	170104	PIPE,DRAIN COCK,1/4"
167	1.0000	EA.	170123	PIPE CAP,PLASTIC,NPT,NIAGARA #2046
168	1.0000	EA.	170125	PIPE CAP,PLASTIC,NPT,NIAGARA #257
169	30.0000	FT.	170142	PIPE,BLK,SCH40,1",STEEL,USA
170	10.0000	FT.	170143	PIPE,BLK,SCH40,2",STEEL,USA
	8.0000	FT.	170144	PIPE,GALV,SCH40,2",MAL,USA
173	2.0000	EA.	170146	PIPE,BLK,150#,2",90ELBOW,MAL,USA
174	2.0000	EA.	170148	PIPE,BLK,150#,2" UNION,MAL,USA
175	2.0000	EA.	170149	COUPLING,RIGID,1",BLK,MAL,USA
176	1.0000	EA.	170150	COUPLING,RIGID,2",BLK,MAL,USA
177	8.0000	EA.	170151	PIPE,BLK,150#,1",90ELBOW,MAL,USA
178	2.0000	EA.	170152	PIPE,SS,DIELECTRIC,1",UNION
179	4.0000	EA.	170158	CLAMP,HOSE,WORM DR,SS,13/16"-1 1/2"
180	1.0000	EA.	170160	PIPE,GALV,SCH 40,2",TEE,USA MADE
181	1.0000	EA.	170162	PIPE,GALV,SCH 40,2",CAP,USA MADE
182	4.0000	EA.	400667	STEEL SPRING ISOLATER/RESTRAINT
183	1.0000	EA.	400893	CORD,POWERSUPPLY,12/3,PIGTAIL,8FT
184	1.0000	EA.	410080	BUSHING,2",PLASTIC
185	10.0000	FT.	410112	CONDUIT,LFMC,1/2",SEALTITE
186	10.0000	FT.	410119	CONDUIT,LFMC,1",SEALTITE
187	1.0000	EA.	410146	CONNECTOR,LFMC,1/2",45D,SEALTITE
188	1.0000	EA.	410155	CONNECTOR,LFMC,1",45D,SEALTITE (OR EQUAL)
189	1.0000	EA.	410160	BUSHING,3",PLASTIC
190	10.0000	FT.	410232	CONDUIT,LFMC,2",SEALTIGHT
191	1.0000	EA.	410252	CONNECTOR,LFMC,2",45
192	2.0000	EA.	410404	COUPLING,PVC,1/2"
193	2.0000	EA.	410438	COUPLING,PVC,1"
194	1.0000	EA.	410439	COUPLING,PVC,2"
195	4.0000	FT.	410442	CONDUIT,LFNC,1",SEALTITE
196	2.0000	EA.	410468	COUPLING,REDUCING,1"x1/2",BLK,USA
197	1.0000	EA.	410519	CONNECTOR,FLEX CORD,1/2"-3/4"
198	1.0000	EA.	430034	RECEPTACLE,DUPLX,125V,20A,IVORY (OR EQUAL)
199	1.0000	EA.	430168	COVER,RECPT PLATE,4 11/16,1 REC (OR EQUAL)
200	2.0000	EA.	430651	SWITCH,FLOAT,GRAINGER,ASSY
201	1.0000	EA.	431181	BOX,JUNCT,4-11/16" SQ,D-2 1/8",1"KO (OR EQUAL)
202	1.0000	EA.	470497	LOUVER,RUSKIN,36"x72",INTAKE,6625D
203	1.0000	EA.	470498	LOUVER,RUSKIN,6625D,48"x48"
204	1.0000	EA.	471000	COWLING ASSEMBLY,4'0" X 4'0"
205	1.0000	EA.	471001	COWLING ASSEMBLY,3'0" X 6'0"
206	2.0000	EA.	510114	UNISTRUT,1 5/8"CHANNEL,GOLDGALV,18"
207	1.0000	EA.	550042-011	GENERATOR,EXHAUST TL PIPE ASSM,USA
208	1.0000	EA.	550124	EXHAUST THIMBLE,8"OD,ASSEMBLY
209	4.0000	EA.	550125	CLAMP,IRON BEAM, T&B #502
210	1.0000	EA.	550219	GENERATOR OILER STAND (PROVIDED TO KBR FOR KOHLER)
211	4.0000	EA.	550220	MOUNT,GENSET INSTALL ASSY,6"x12"
212	2.0000	EA.	550222	GENERATOR,KBR FUEL LINE
213	1.0000	EA.	900001	GENERATOR,45KW,3PHASE (SUPPLIED BY KBR)
214	1.0000	EA.	420048	LABEL,DATA,STANDARD SHELTER
215	1.0000	EA.	480001	PLATE,DATA,ALUM,8"x12",GRAY
216	8.0000	EA.	168042	NUT,1/4"-20,HEX,PLATED
217	12.0000	EA.	168043	WASHER,1/4" LOCK,PLATED
218	8.0000	EA.	168109	WASHER,1/4" FLAT Z/P
219	4.0000	EA.	168401	SCREW,CAP,1/4"x1 1/2",GLASS-NYLON
220	2.0000	EA.	410134	NIPPLE,RIGID,1/2",CLOSE
221	7.0000	EA.	410465	BUSHING,BUMPER,7/8",9305K28

ITEM	QTY	U/M	P/N	DESCRIPTION
222	1.0000	EA.	420374	SIGN,CAUTION-THRESHOLD,SELF-ADHESIE
223	1.0000	EA.	420375	SIGN,BLK,"CLEAN INNER DOOR..."
224	1.0000	EA.	480203	SIGN,PPE WARNING,88571
225	1.0000	EA.	480205	SIGN,EMERGENCY BACK-UP EXIT
226	1.0000	EA.	480229	SIGN,"ELECT PANEL KEEP CLEAR 36"
227	3.0000	EA.	480232	SIGN,FUEL FILL,SELF-ADHESIVE
228	3.0000	EA.	480233	SIGN,FUEL RETURN,SELF-ADHESIVE
229	1.0000	EA.	560536	VALVE,CONTROL,3WAY,H11-30-66
230	1.0000	EA.	561057	ALUMINUM SHELF,18"x12"
231	1.0000	EA.	900102	HEMP FILTER 30AMP AND CABINET (PROVIDED BY OTHERS)
232	1.0000	EA.	900109	COMPRESSOR,115V,4.3A,1/6 HP,1HAB-8X (SUPPLIED & INSTALL/SUB CONT'R.
233	4.0000	EA.	168078	SCREW,CONCRETE,1/4"x1 3/4",PH,SS (PACKING LIST ITEM)
234	8.0000	EA.	168111	WASHER,1/4" FLAT,STAINLESS STEEL (PACKING LIST ITEM)
235	1.0000	EA.	170300	PIPE,STRAP,2",GALV,2 HOLE (PACKING LIST ITEM)
236	1.0000	EA.	170301	PIPE,STRAP,3",GALV,2 HOLE (PACKING LIST ITEM)
237	4.0000	EA.	470005	LIGHT FIXTURE,70W,EXTERIOR,WALL W/PHOTOCELL (PACKING LIST ITEM)
238	1.0000	KIT	480087-01	PACKING KIT,TYPICAL EVERY SHELTER (PACKING LIST ITEM)
239	1.0000	KIT	480147	PACKING KIT,GENERATOR ROOM PARTS (PACKING LIST ITEM)
240	1.0000	EA.	480181	TRUCK,STEEL PLATFORM,#9925T31 (PACKING LIST ITEM)
241	2.0000	EA.	520294	HVAC,WINDOW,1.5T,4KW,FREDRH,EM18M34 (PACKING LIST ITEM)

CUT LIST

ITEM	P/N	DESCRIPTION	CUT	LENGTH (INCH)	WIDTH (INCH)	PCS
1	146545	SHEET ALUM.,.090",48"x120",5052,COAT	4 1/16" X 5 7/8"	4.0625	5.8750	1
2	146545	SHEET ALUM.,.090",48"x120",5052,COAT	4 3/4" X 37"	4.7500	37.0000	1
3	146545	SHEET ALUM.,.090",48"x120",5052,COAT	5 7/8" X 5 7/8"	5.8750	5.8750	10
46	510017	UNISTRUT,1 5/8"CHANNEL,GOLDGALV,RAW	6"	6.0000		2
47	510017	UNISTRUT,1 5/8"CHANNEL,GOLDGALV,RAW	18"	18.0000		1
48	510017	UNISTRUT,1 5/8"CHANNEL,GOLDGALV,RAW	20"	20.0000		1
49	510017	UNISTRUT,1 5/8"CHANNEL,GOLDGALV,RAW	20 3/4"	20.7500		2
50	510017	UNISTRUT,1 5/8"CHANNEL,GOLDGALV,RAW	22"	22.0000		1
51	510017	UNISTRUT,1 5/8"CHANNEL,GOLDGALV,RAW	24"	24.0000		1
52	510017	UNISTRUT,1 5/8"CHANNEL,GOLDGALV,RAW	34"	34.0000		1
53	510017	UNISTRUT,1 5/8"CHANNEL,GOLDGALV,RAW	42"	42.0000		1
54	510017	UNISTRUT,1 5/8"CHANNEL,GOLDGALV,RAW	51"	51.0000		3
55	510017	UNISTRUT,1 5/8"CHANNEL,GOLDGALV,RAW	84"	84.0000		1
56	510017	UNISTRUT,1 5/8"CHANNEL,GOLDGALV,RAW	96"	96.0000		1
66	400274	WIRE,#4/5,TYPE W MULTICONDUCTOR CAB	120"	120.0000		1
72	410165	CONDUIT,LFMC,1 1/2",SEALTITE	96"	96.0000		1
123	400030	WIRE,#6 THHN,STRAND,GRN	600"	600.0000		1
124	400050	WIRE,#2 THHN,STRAND,GRN	48"	48.0000		1
125	400050	WIRE,#2 THHN,STRAND,GRN	192"	192.0000		1
126	400050	WIRE,#2 THHN,STRAND,GRN	720"	720.0000		1
133	510017	UNISTRUT,1 5/8"CHANNEL,GOLDGALV,RAW	77"	77.0000		3
151	146545	SHEET ALUM.,.090",48"x120",5052,COAT	6" X 4"	6.0000	4.0000	1
157	504203	DOOR,SWEEP WEATHERSTRIPPING,48"	48"	48.0000		1
159	504405	DOOR,DRIP CAP,NGF16A-54"	52"	52.0000		1
169	170142	PIPE,BLK,SCH40,1",STEEL,USA	360"	360.0000		1
170	170143	PIPE,BLK,SCH40,2",STEEL,USA	120"	120.0000		1
171	170144	PIPE,GALV,SCH40,2",MAL,USA	36"	36.0000		1
172	170144	PIPE,GALV,SCH40,2",MAL,USA	60"	60.0000		1
185	410112	CONDUIT,LFMC,1/2",SEALTITE	120"	120.0000		1
186	410119	CONDUIT,LFMC,1",SEALTITE	120"	120.0000		1
190	410232	CONDUIT,LFMC,2",SEALTIGHT	120"	120.0000		1
195	410442	CONDUIT,LFNC,1",SEALTITE	48"	48.0000		1

REV	BY	DATE	DESCRIPTION	APP.BY	DATE
P	RRG	10/31/12	UPDATED PARTS LIST	LJL	10/31/12
N	RRG	6/8/12	UPDATED PARTS LIST	LJL	6/8/12
M	JJ	7/25/11	UPDATED PARTS & CUT LIST	LJL	7/25/11
L	RRG	04/25/11	UPDATED PARTS LIST	LJL	04/25/11
K	AMM	02/03/11	UPDATED CUT LIST AND PARTS LIST	LJL	02/03/11
F	MDF	08/03/10	PER MARKUPS	DB	08/05/10
E	JFA	5/7/10	ADDED FLORIDA OPTIONS	GAB	5/7/10



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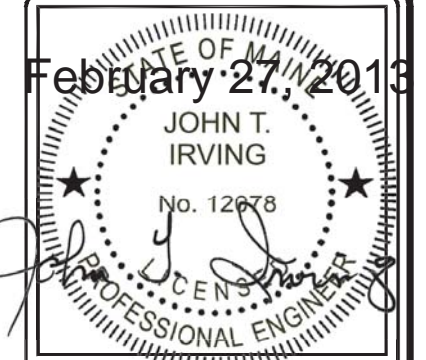
CUSTOMER:  
**KELLOGG  
 BROWN & ROOT  
 FEMA (PEP)  
 EXPANSION PROGRAM**

PROJECT:  
**10'-0" X 14'-0"  
 CONCRETE SHELTER  
 PARTS LIST CONT'D./  
 CUT LIST**

FILENAME: KBR/SKBR01	TOLERANCE:
SCALE: N.T.S.	DATE: 03/22/10
DRWN. BY: D. CHRISTOPHE	DATE: 03/22/10
CHK. BY: G. BRINKMAN	DATE:
ENG. BY: A. DUMAS	DATE:
APP. BY: JI	DATE:
SHEET NO. 0-2	
DRAWING NO.: SKBR01	REV.: P



SUB-PARTS LIST			
ITEM	P/N	DESCRIPTION	CUT
52	510017	UNISTRUT, 1 5/8" CHANNEL, GOLD GALV, RAW	34"
157	504203	DOOR, SWEEP WEATHERSTRIPPING, 48"	48"
159	504405	DOOR, DRIP CAP, NGF16A-54"	52"



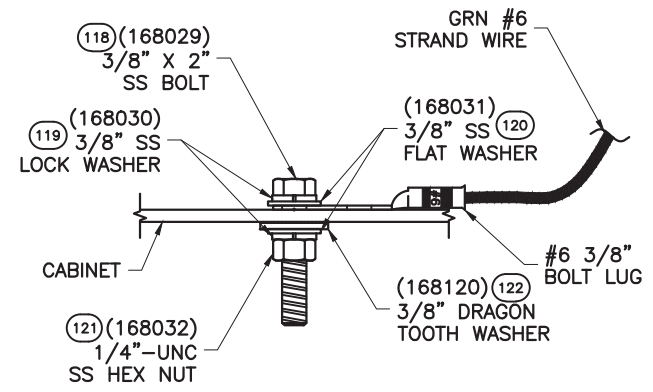
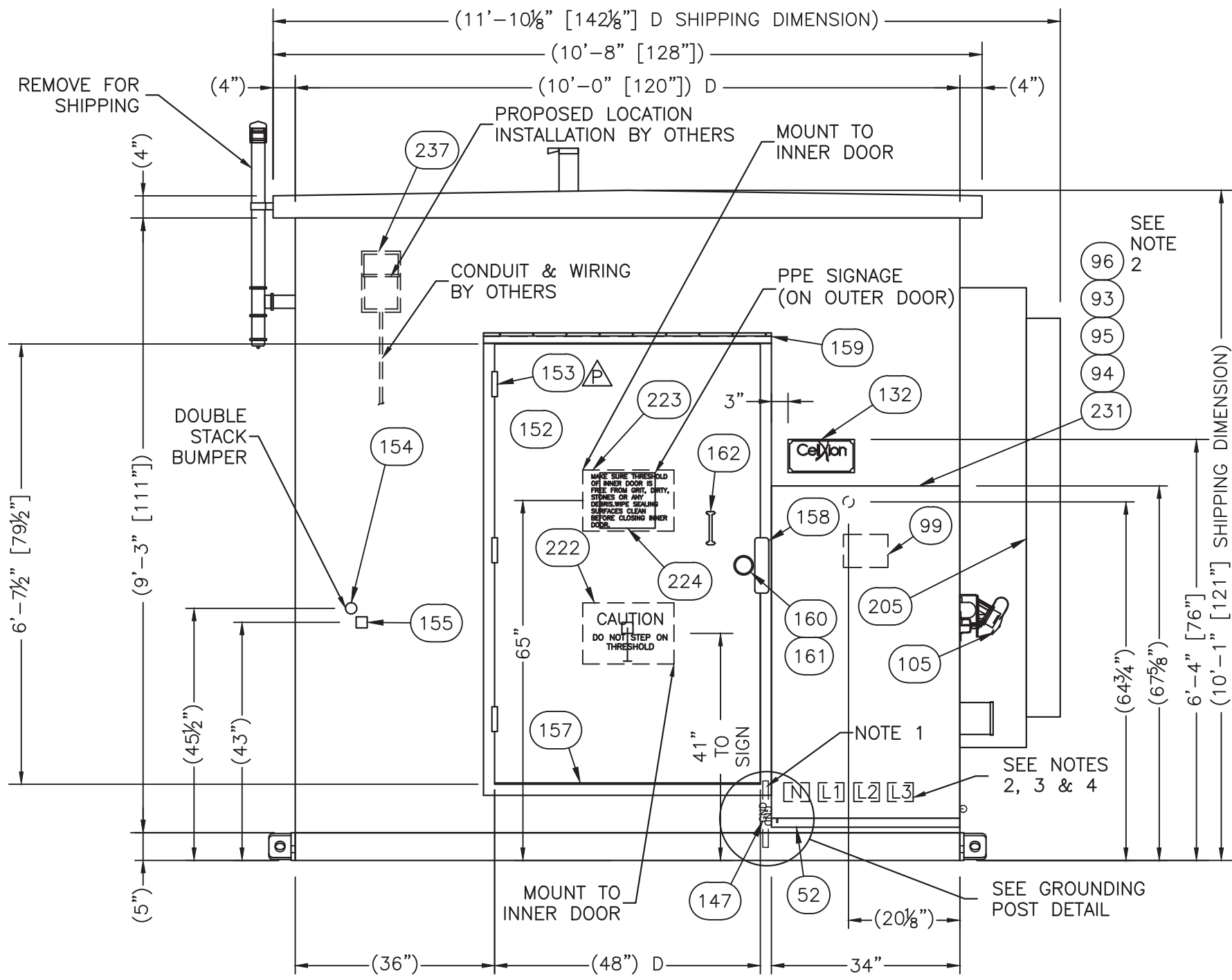
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CUSTOMER:  
**KELLOGG  
 BROWN & ROOT  
 FEMA (PEP)  
 EXPANSION PROGRAM**

PROJECT:  
**10'-0" X 14'-0"  
 CONCRETE SHELTER  
 EXTERIOR, ELEVATION  
 "A"**

FILENAME: KBR/SKBR01	
SCALE: 1/2" = 1'-0"	TOLERANCE:
DRWN. BY: D. CHRISTOPHE	DATE: 03/22/10
CHK. BY: G. BRINKMAN	DATE: 03/22/10
ENG. BY: A. DUMAS	DATE:
APP. BY: JI	DATE:
SHEET NO. 1-0	
DRAWING NO.:	REV.:
SKBR01	P

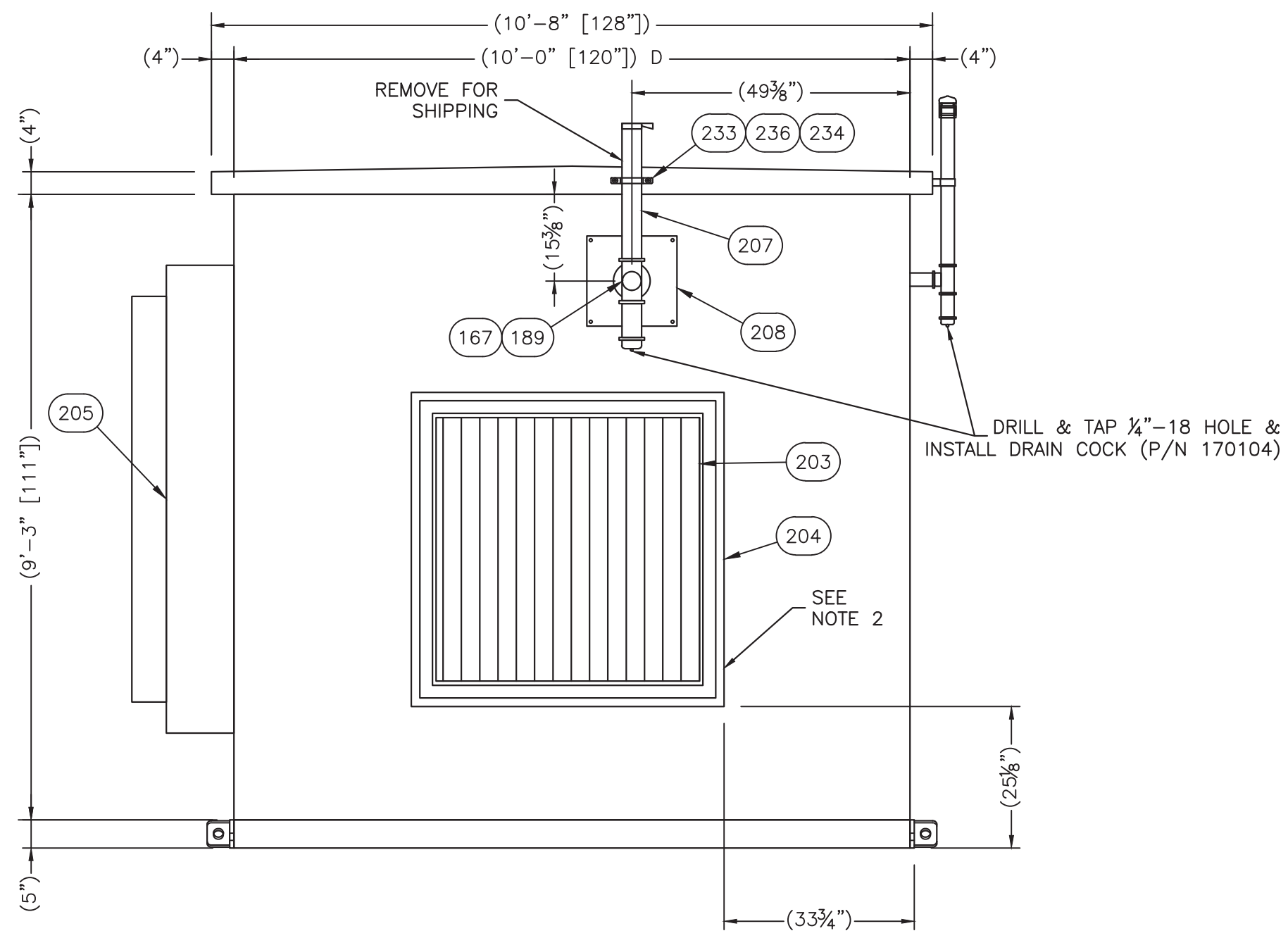
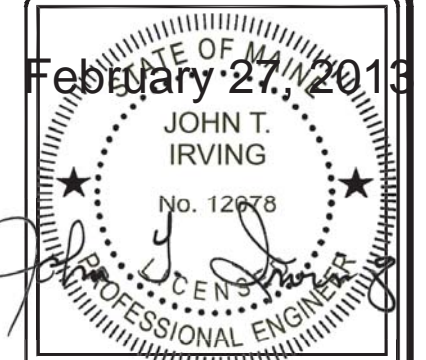


**GROUNDING POST DETAIL  
 (INSTALLED BY CELLXION)**

NOTE:  
 ROUTE AN INSULATED #6 AWG GROUND CONDUCTOR TO A LUG TO BE INSTALLED ON THE INTERIOR OF EXTERIOR FILTER BOX AT THE LOWER LEFT SIDE. USE LUG TERMINATIONS TO FIT MOUNTED TO FIL-COIL MOUNTING STUD AND MIN 3/8\"/>

- NOTES:
1. ATTACH TO DOOR FRAME WITH SELF TAPPING S.S. FASTENER.
  2. EACH FILTER TO BE LABELED WITH PHASE DESIGNATION STARTING WITH NEUTRAL, THEN "L1", "L2", "L3".
  3. PHASE CONNECTION TO BE LABELED WITH TORQUE REQUIREMENT FOR THE UPPER FILTER COVER INSIDE OF CABINET DOOR.

REV	BY	DATE	DESCRIPTION	APP. BY	DATE
P	RRG	10/31/12	CHANGED DOOR HINGES	LJL	10/31/12
N	RRG	6/8/12	ADDED UNISTRUT & GROUNDING STUD DETAIL	LJL	6/8/12
M	JJ	7/25/11	ADDED SIGNS&LABELS, CHANGED DOOR SPONGE TO SWEEP	LJL	7/25/11



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CUSTOMER:  
**KELLOGG  
 BROWN & ROOT  
 FEMA (PEP)  
 EXPANSION PROGRAM**

PROJECT:  
**10'-0" X 14'-0"  
 CONCRETE SHELTER  
 EXTERIOR "C" ELEVATION**

FILENAME: KBR/SKBRO1	
SCALE: 1/2" = 1'-0"	TOLERANCE:
DRWN. BY: D. CHRISTOPHE	DATE: 03/22/10
CHK. BY: G. BRINKMAN	DATE: 03/22/10
ENG. BY: A. DUMAS	DATE:
APP. BY: JI	DATE:
SHEET NO. 1-1	
DRAWING NO.:	REV.:
SKBR01	P

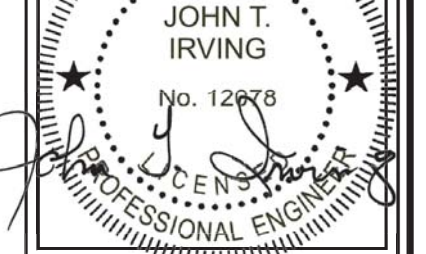
NOTE:  
 1. FILL ALL SHIPPING SCREWS HOLES IN COWLING, PART NUMBERS 471000 & 471001 IN FIELD. WIRE ALL ALUMINUM RIVETS DURING FINAL INSTALLATION, CAULK ALL TOP & SIDE.  
 2. DRILL 2 WEEP HOLES IN THE BOTTOM OF COWLINGS

**EXTERIOR ELEVATION "C"**

REV	BY	DATE	DESCRIPTION	APP. BY	DATE
N	RRG	6/8/12	ADDED NOTE	LJL	6/8/12
M	JJ	7/25/11	ADDED NOTE, CHANGED PIPE STRAP, UPDATED COWLING	LJL	7/25/11
L	RRG	04/25/11	PER MARKUPS	LJL	04/25/11
F	MDF	08/03/10	PER MARKUPS	DB	08/03/10



February 27, 2013



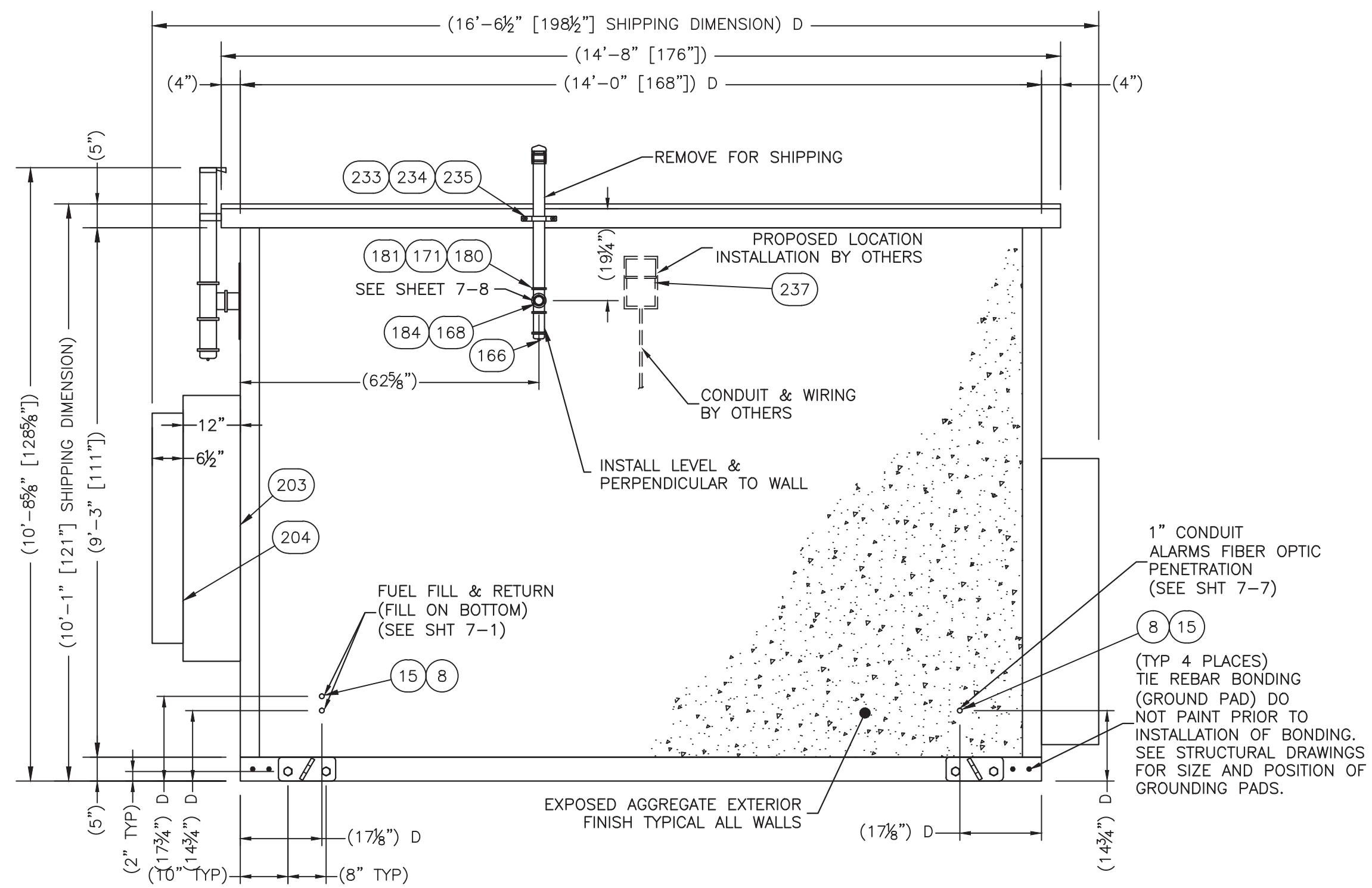
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CUSTOMER:  
**KELLOGG  
 BROWN & ROOT  
 FEMA (PEP)  
 EXPANSION PROGRAM**

PROJECT:  
**10'-0" X 14'-0"  
 CONCRETE SHELTER  
 EXTERIOR "B"**

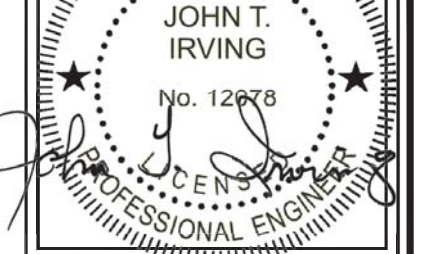
FILENAME: KBR/SKBR01	
SCALE: 1/2" = 1'-0"	TOLERANCE:
DRWN. BY: D. CHRISTOPHE	DATE: 03/22/10
CHK. BY: G. BRINKMAN	DATE: 03/22/10
ENG. BY: A. DUMAS	DATE:
APP. BY: JI	DATE:
SHEET NO. 1-2	
DRAWING NO.:	REV.:
SKBR01	P



EXTERIOR ELEVATION "B"

M	LJL	1/16/12	UPDATED GROUND PAD NOTE	LJL	1/16/12
L	RRG	04/25/11	UPDATED VENT PER CUSTOMER & REPLACED VENT STRAP	LJL	04/25/11
F	MDF	08/03/10	PER MARKUPS	DB	08/03/10
REV	BY	DATE	DESCRIPTION	APP. BY	DATE

February 27, 2013



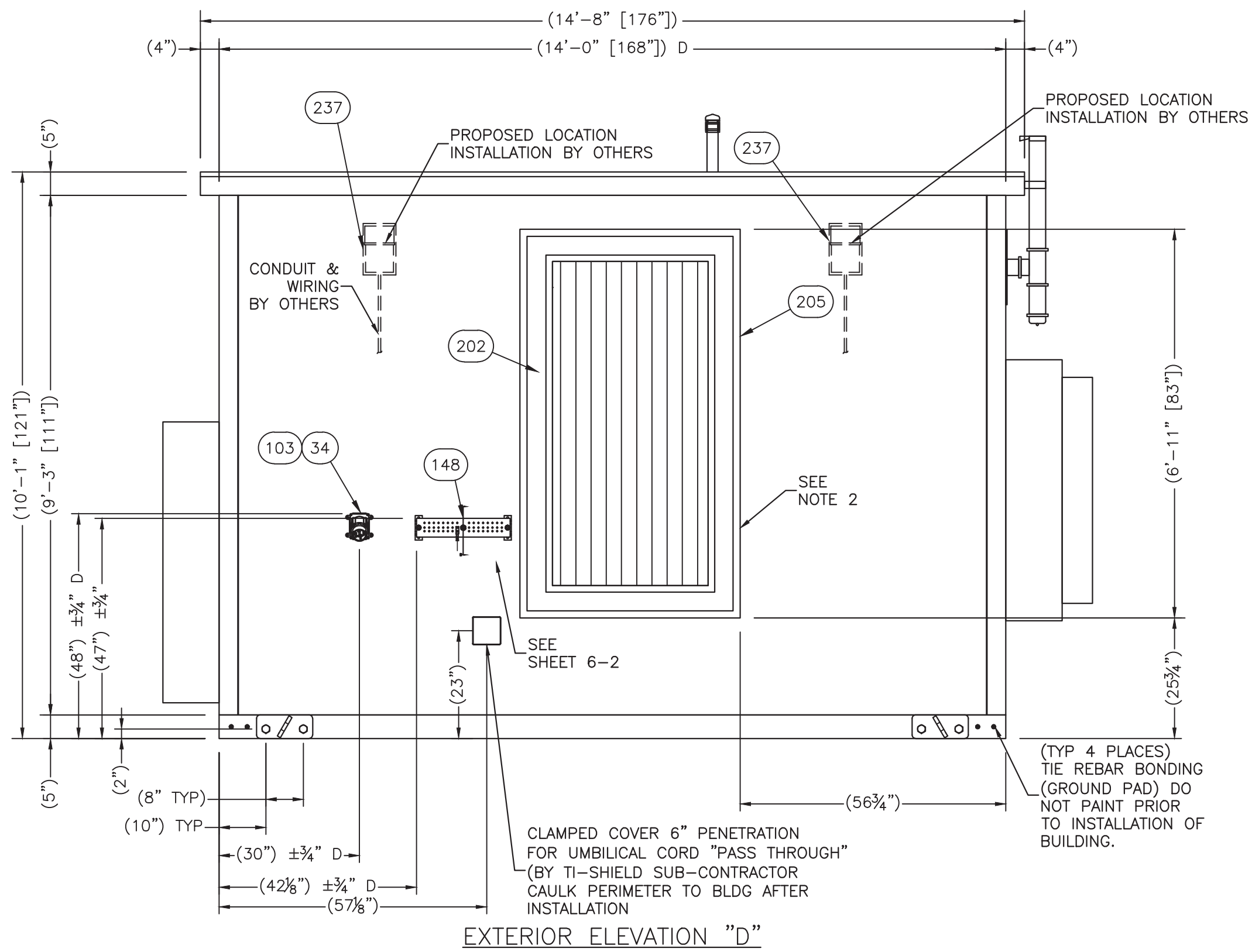
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CUSTOMER:  
**KELLOGG  
 BROWN & ROOT  
 FEMA (PEP)  
 EXPANSION PROGRAM**

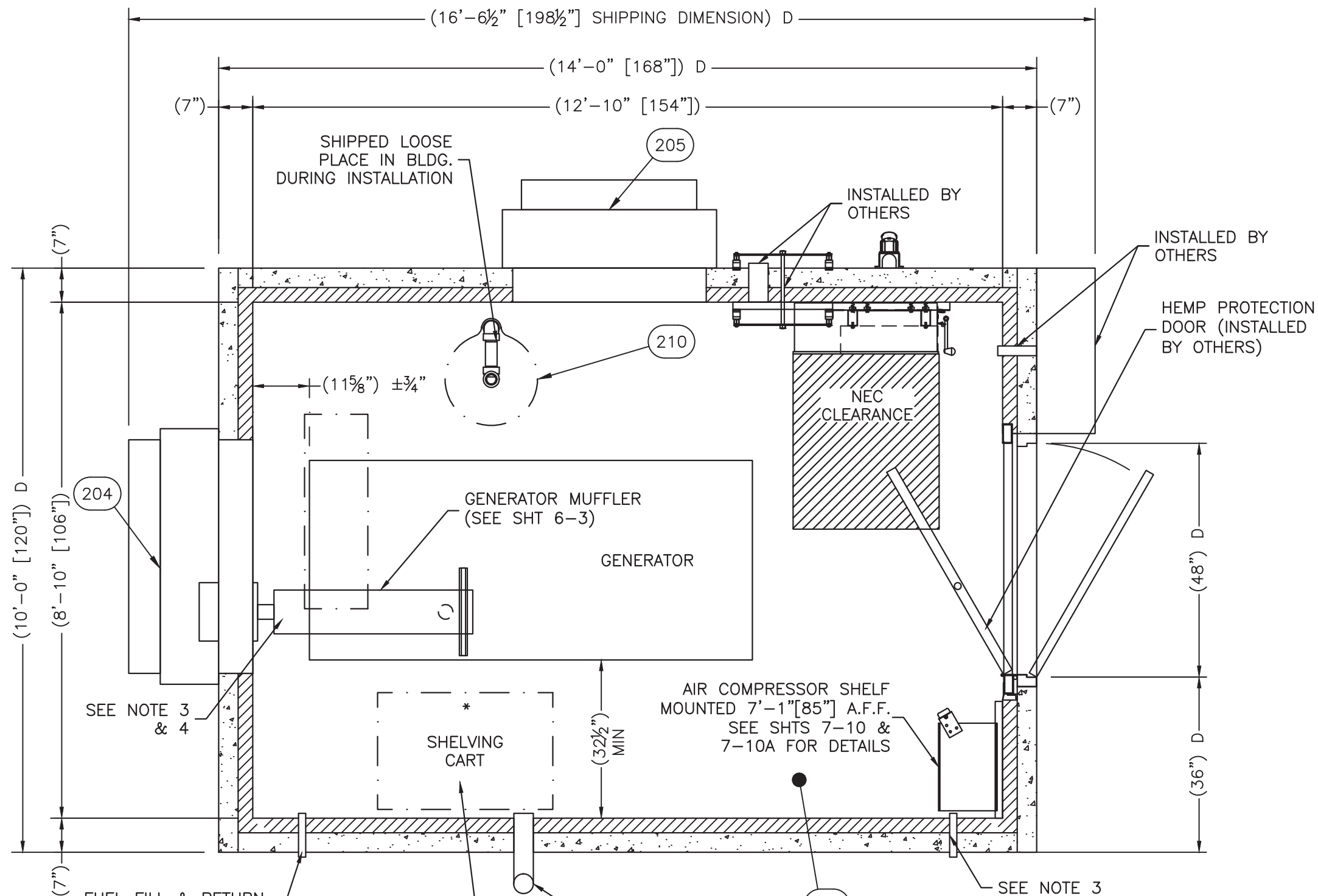
PROJECT:  
**10'-0" X 14'-0"  
 CONCRETE SHELTER  
 EXTERIOR "D" ELEVATION**

FILENAME: KBR/SKBR01	
SCALE: 1/2" = 1'-0"	TOLERANCE:
DRWN. BY: D. CHRISTOPHE	DATE: 03/22/10
CHK. BY: G. BRINKMAN	DATE: 03/22/10
ENG. BY: A. DUMAS	DATE:
APP. BY: JI	DATE:
SHEET NO. 1-3	
DRAWING NO.:	REV.:
SKBR01	P



NOTE:  
 1. AT FINAL INSTALLATION IN FIELD, FILL ALL OPEN SHIPPING SCREW HOLES WITH ALUMINUM POP RIVETS AND CAULK TOP & SIDE AT CONNECTION TO BUILDING.  
 2. DRILL 2 WEEP HOLES IN THE BOTTOM OF COWLINGS.

REV	BY	DATE	DESCRIPTION	APP. BY	DATE
N	RRG	6/8/12	ADDED NOTE	LJL	6/8/12
M	JJ	7/25/11	UPDATED PER COWLING & GROUND BAR	LJL	7/25/11
L	RRG	04/25/11	UPDATED DIMENSIONS PER CUSTOMER	LJL	04/25/11
F	MDF	08/03/10	PER MARKUPS	DB	08/03/10



**NOTE:**

1. ITEM 1 0.188 TI-SHIELD TO BE INSTALLED MDFB DOWN ON FLOOR.
2. FLOOR MATTING TO BE CUT OUT AROUND GENERATOR
3. SEE SHEET 6-2, 7-1 & 7-7, 7-8 FOR PENETRATION DETAILS.
4. SEE SHEET 7-8 FOR DETAILS.
5. "D" DIMENSIONS AND TOLERANCES PER SHT (UNLESS OTHERWISE NOTED, AND TO BE CHECKED).
6. OTHER TOLERANCES  $\pm 1"$  OR LESS (UNLESS OTHERWISE NOTED.)

FUEL FILL & RETURN (FILL ON BOTTOM) SEE NOTE 3

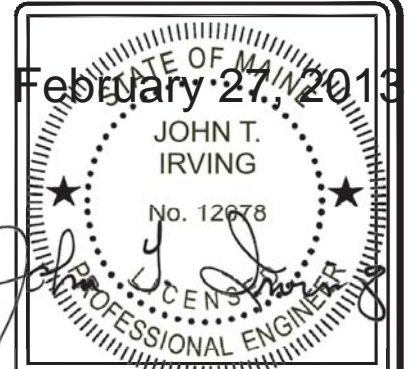
CART IS PROVIDED BY CELLXION AND SHIPPED LOOSE PLACE IN BUILDING DURING FIELD INSTALLATION & STORE BACK-UP PORTABLE AC UNITS ON IT

FUEL TANK VENT SEE NOTE 3 & 4

**FLOOR PLAN**

140.00 SQ.FT. EXTERIOR AREA  
113.36 SQ.FT. INTERIOR AREA

REV	BY	DATE	DESCRIPTION	APP. BY	DATE
P	LJL	12/11/12	CHANGED WINDOW HVAC TO PORTABLE AC	LJL	12/11/12
N	RRG	6/8/12	UPDATED LOCATION OF GEN. MUFFLER/REMOVED BATT. CHARGER/CORRECTED NEC CLEARANCE	LJL	6/8/12
M	JJ	7/25/11	ADDED NOTES PER MARKUPS	LJL	7/25/11
L	RRG	04/25/11	ADDED TOLERANCE NOTES	LJL	04/25/11
F	MDF	08/03/10	PER MARKUPS	DB	08/03/10



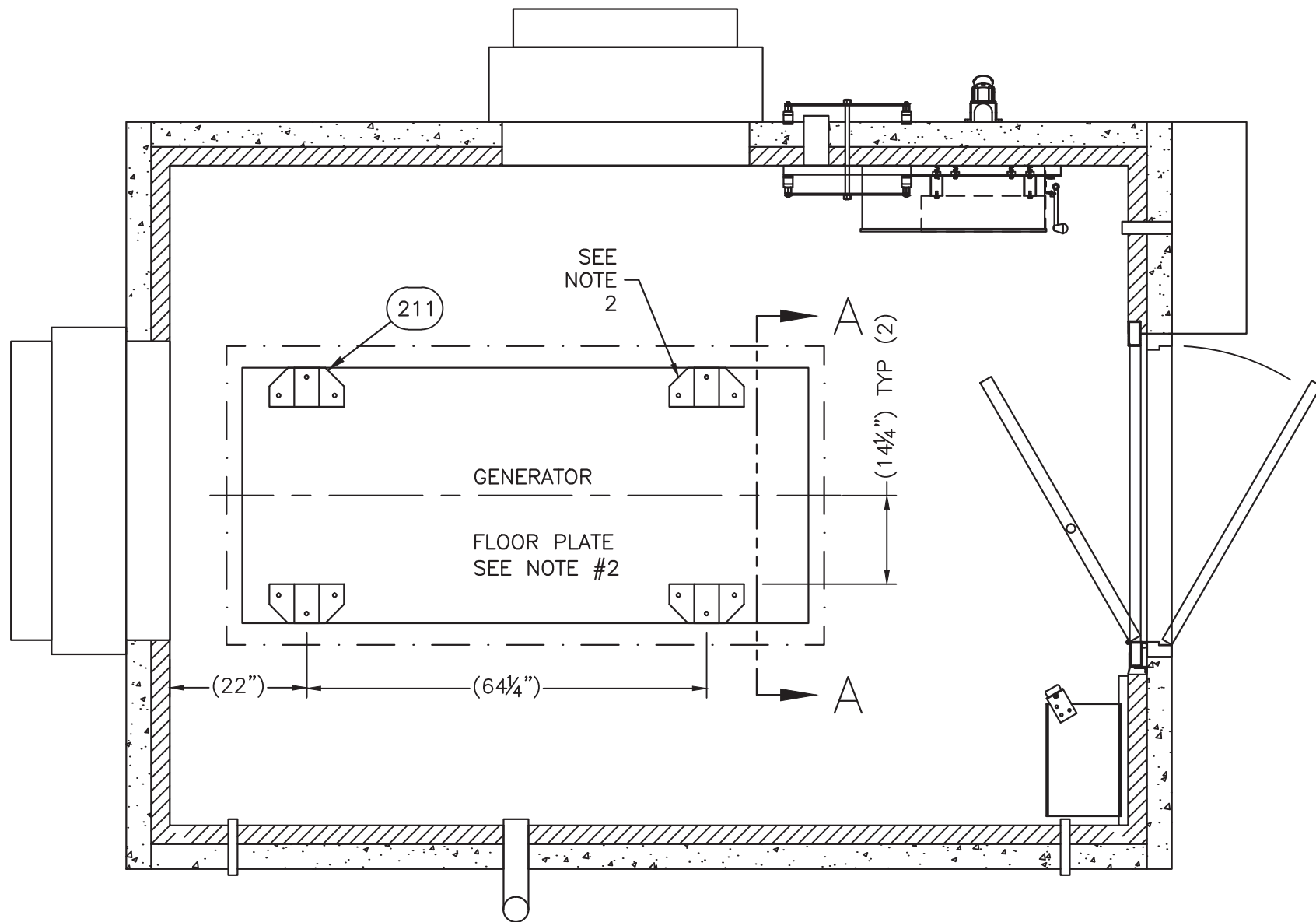
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fax: (318) 213-2919  
www.cellxion.com

CUSTOMER:  
**KELLOGG  
BROWN & ROOT  
FEMA (PEP)  
EXPANSION PROGRAM**

PROJECT:  
**10'-0" X 14'-0"  
CONCRETE SHELTER  
FLOOR PLAN**

FILENAME: KBR/SKBRO1	TOLERANCE: 1/2" = 1'-0"
DRWN. BY: D. CHRISTOPHE	DATE: 03/22/10
CHK. BY: G. BRINKMAN	DATE: 03/22/10
ENG. BY: A. DUMAS	DATE:
APP. BY: JL	DATE:
SHEET NO. 2-0	
DRAWING NO.: SKBR01	REV.: P

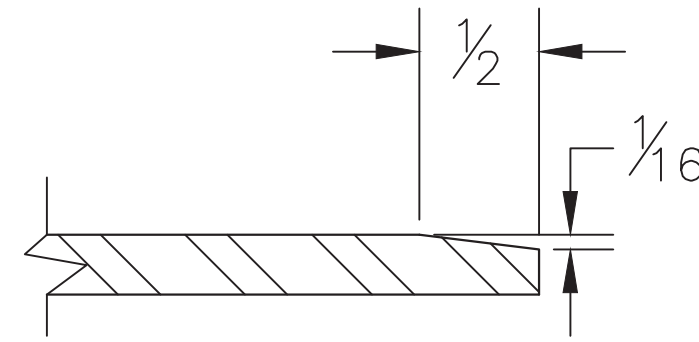


GENERATOR BASE BRACKET DETAIL

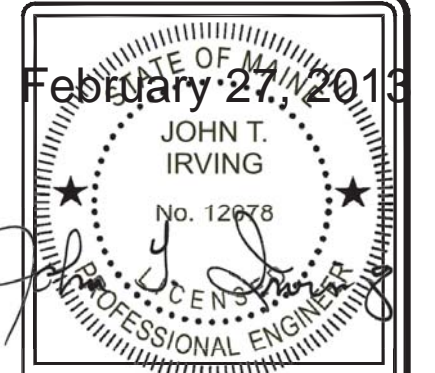
NOTE:

1. FLOOR PROVIDED & INSTALLED BY SUBCONTRACTOR PRIOR TO INSTALLATION OF GENERATOR FOOT & RF SHIELDING 304 STAINLESS 48" X 96" X 1/4" THICK, DRILLED & TINNED & BEVELED BY SUBCONTRACTOR PRIOR TO INSTALLATION.

2. SEE 550220 PART DRAWING: (4) REQUIRED



SECTION A-A



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CUSTOMER:  
**KELLOGG  
 BROWN & ROOT  
 FEMA (PEP)  
 EXPANSION PROGRAM**

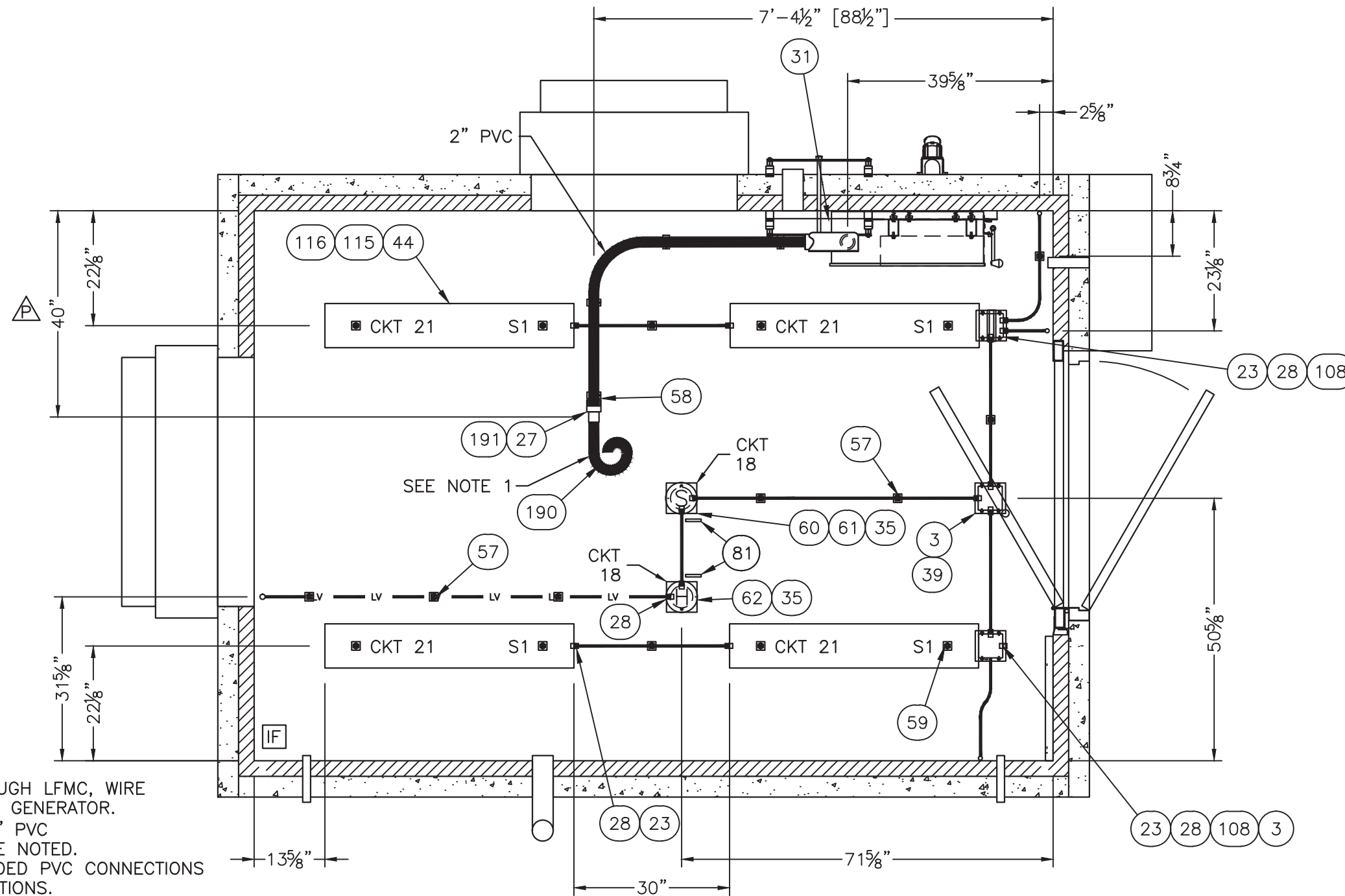
PROJECT:  
**10'-0" X 14'-0"  
 CONCRETE SHELTER  
 GENERATOR BASE  
 BRACKET DETAIL**

FILENAME: KBR/SKBRO1	
SCALE: 1/2" = 1'-0"	TOLERANCE:
DRWN. BY: D. CHRISTOPHE	DATE: 03/22/10
CHK. BY: G. BRINKMAN	DATE: 03/22/10
ENG. BY: A. DUMAS	DATE:
APP. BY: JI	DATE:
SHEET NO. 2-1	
DRAWING NO.: SKBR01	REV.: P

M	JJ	11/16/11	UPDATED NOTES, ADDED BUBBLE	LJL	11/16/11
REV	BY	DATE	DESCRIPTION	APP. BY	DATE



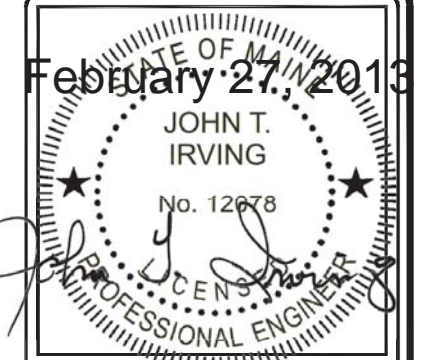
SUB-PARTS LIST			
ITEM	P/N	DESCRIPTION	CUT
190	410232	CONDUIT,LFMC,2",SEALTIGHT	120"



- NOTE:
1. PULL WIRES THROUGH LFMC, WIRE WILL TERMINATE IN GENERATOR.
  2. ALL CONDUIT 1/2" PVC UNLESS OTHERWISE NOTED. GLUE ALL UNTHREADED PVC CONNECTIONS PER WORK INSTRUCTIONS.
  3. ITEMS (57) & (58) CONDUIT HANGERS ARE TO BE PLACED MAXIMUM OF 24" O.C.
  4. THE LAYOUT FOR UNISTRUT IS ON SHEET 3-1
  5. TOLERANCES THIS SHT ±1" (UNLESS OTHERWISE NOTED)

**REFLECTED CEILING PLAN  
ELECTRICAL**

REV	BY	DATE	DESCRIPTION	APP. BY	DATE
P	RRG	10/31/12	EXTENDED CONDUIT	LJL	10/31/12
M	LJL	1/16/12	SWAPPED HEAT & SMOKE DETECTOR LOCATIONS	LJL	1/16/12
L	RRG	04/25/11	RELOCATED SMOKE, UPDATED NOTES	LJL	04/25/11
F	MDF	08/03/10	PER MARKUPS	DB	08/03/10



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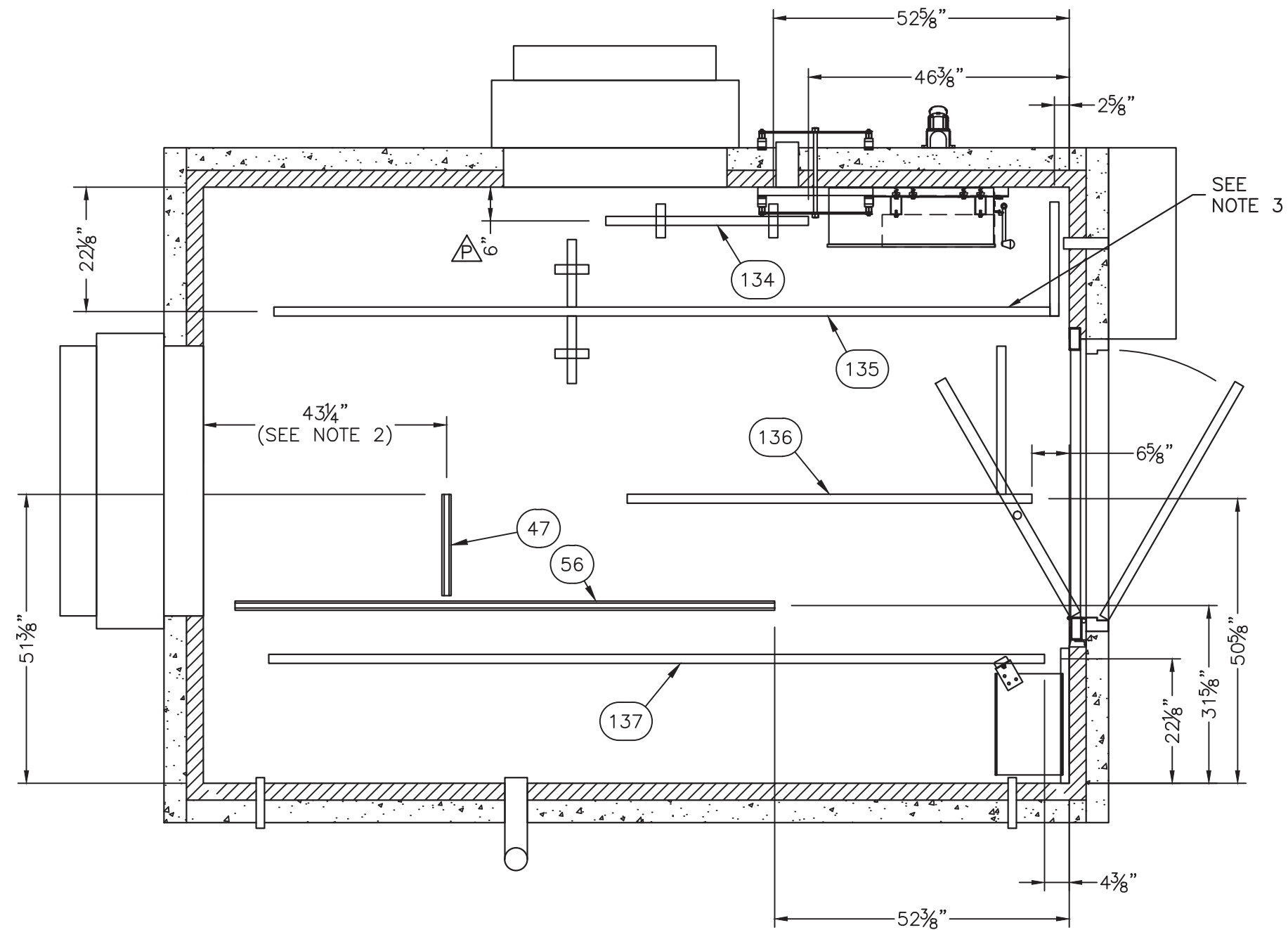
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CUSTOMER:  
**KELLOGG  
 BROWN & ROOT  
 FEMA (PEP)  
 EXPANSION PROGRAM**

PROJECT:  
**10'-0" X 14'-0"  
 CONCRETE SHELTER  
 REFLECTED CEILING  
 PLAN - ELECTRICAL**

FILENAME: KBR/SKBR01	
SCALE: 1/2" = 1'-0"	TOLERANCE:
DRWN. BY: D. CHRISTOPHE	DATE: 03/22/10
CHK. BY: G. BRINKMAN	DATE: 03/22/10
ENG. BY: A. DUMAS	DATE:
APP. BY: JI	DATE:
SHEET NO. 3-0	
DRAWING NO.:	REV.:
SKBR01	P

SUB-PARTS LIST			
ITEM	P/N	DESCRIPTION	CUT
47	510017	UNISTRUT,1 5/8"CHANNEL,GOLDGALV,RAW	18"
56	510017	UNISTRUT,1 5/8"CHANNEL,GOLDGALV,RAW	96"

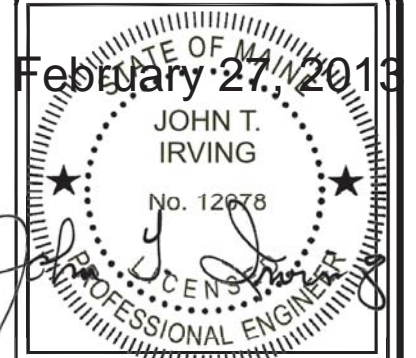


NOTE:

1. TOLERANCES THIS SHT ±1" (UNLESS OTHERWISE NOTED)
2. ADJUST AS REQUIRED TO AVOID SOLDER SEAM.
3. INSTALL UNISTRUTS USING 3/8" STUDS 1" FROM ENDS AND EVERY 24" ON CENTER. 2 STUDS MIN. EACH UNISTRUT(TYP.).

REFLECTED CEILING PLAN  
UNISTRUT LAYOUT

REV	BY	DATE	DESCRIPTION	APP. BY	DATE
P	RRG	10/31/12	MOVED UNISTRUT	LJL	10/31/12
N	RRG	6/8/12	ADDED NOTE	LJL	6/8/12
M	JJ	7/25/11	CHANGED UNISTRUT ASSEMBLY	LJL	7/25/11



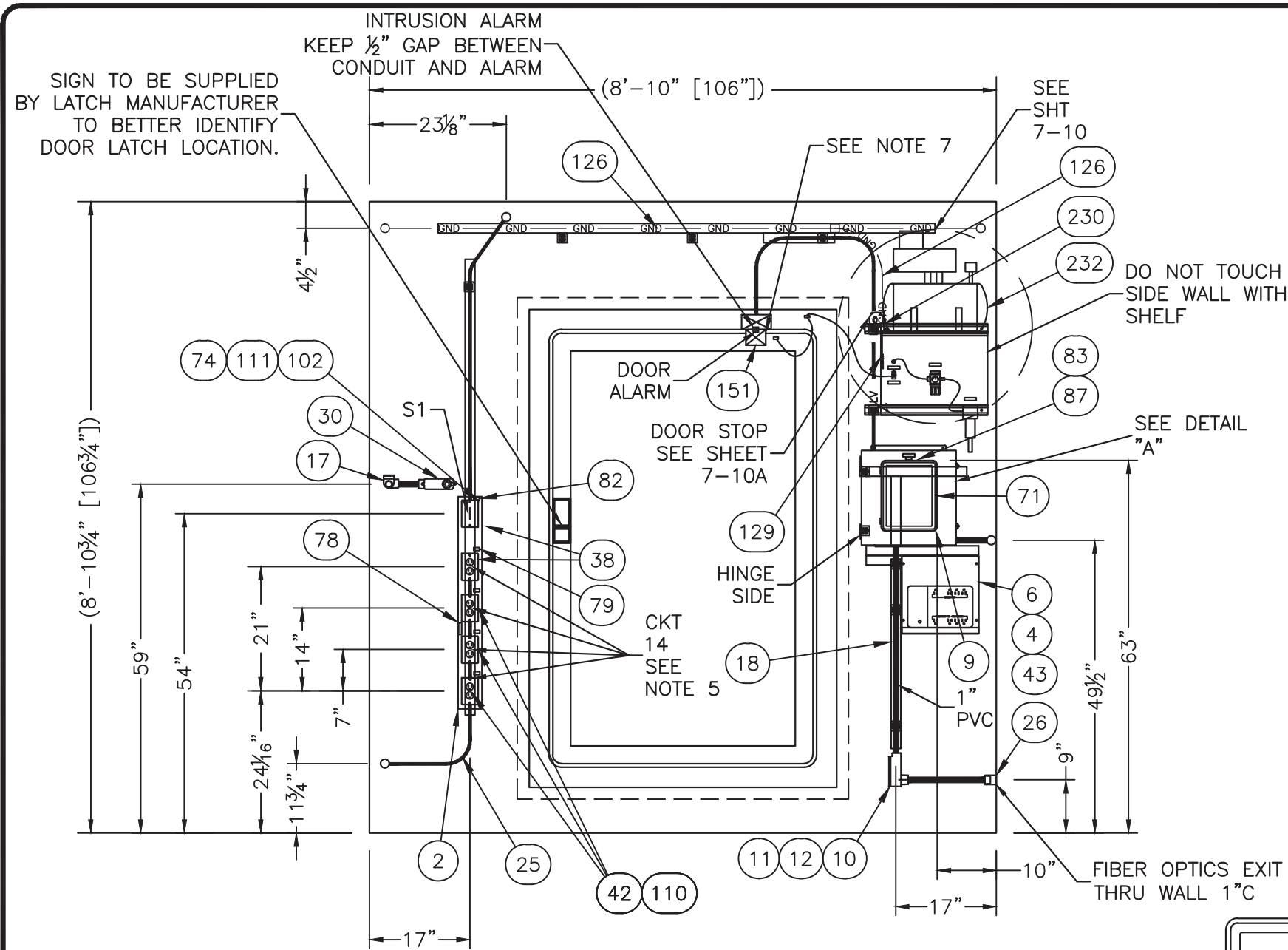
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 BROWN & ROOT  
 FEMA (PEP)  
 EXPANSION PROGRAM**

PROJECT:  
**10'-0" X 14'-0"  
 CONCRETE SHELTER  
 REFLECTED CEILING PLAN  
 UNISTRUT LAYOUT**

FILENAME: KBR/SKBRO1	
SCALE: 1/2" = 1'-0"	TOLERANCE:
DRWN. BY: D. CHRISTOPHE	DATE: 03/22/10
CHK. BY: G. BRINKMAN	DATE: 03/22/10
ENG. BY: A. DUMAS	DATE:
APP. BY: JI	DATE:
SHEET NO. 3-1	
DRAWING NO.:	REV.:
SKBR01	P



INTERIOR ELEVATION "A"

NOTES:

1. ALL CONDUIT 1/2" PVC UNLESS OTHERWISE NOTED
2. ITEMS (57) & (58) CONDUIT HANGERS ARE TO BE PLACED MAXIMUM OF 24" O.C.
3. THE LAYOUT FOR UNISTRUT IS ON SHEET 4-4
4. SEE SHT 7-10 & 7-10A FOR SHELF DETAILS.
5. DO NOT DRILL HOLES IN UL BOXES.
6. TOLERANCES THIS SHT ±1" (UNLESS OTHERWISE NOTED)
7. REMOVE COVER SUPPLIED WITH DOOR AND REPLACE WITH ALUMINUM COVER, (151) FOR MOUNTING ALARM CONTACT. DRILL HOLES TO MATCH HOLE PATTERN ON DOOR FRAME.

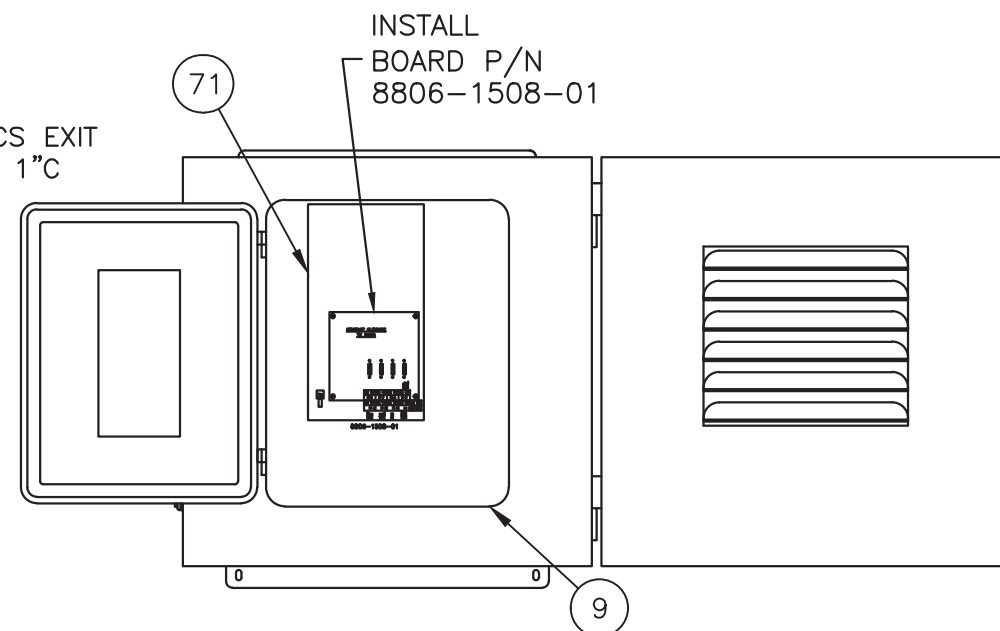
CUT 8" X 7" OPENING AS SHOWN AND REMOVE SHARP EDGES

PLACE, MARK HOLES, DRILL OUT 1/4", TYP. 6 PLACES  
168075(NUT)  
168111(WASHER)  
168123(BOLT)

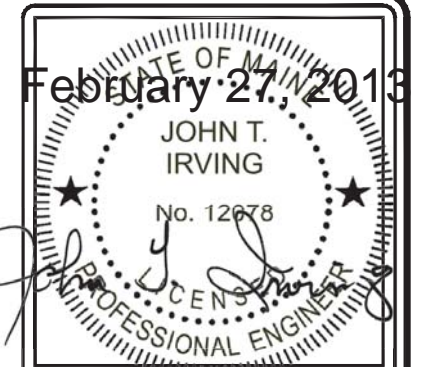
HINGE SIDE

DETAIL "A" (EXTERIOR VIEW)  $\Delta$   
SEE ALSO INTERIOR VIEW BELOW

\* VENT NOT SHOWN IN ELEVATION VIEW FOR CLARITY.



DETAIL "A" (INTERIOR VIEW)  $\Delta$   
SEE SHEET 5-3 FOR WIRING SCHEMATIC



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CUSTOMER:  
**KELLOGG  
BROWN & ROOT  
FEMA (PEP)  
EXPANSION PROGRAM**

PROJECT:  
**10'-0" X 14'-0"  
CONCRETE SHELTER  
INTERIOR ELEVATION  
"A"**

FILENAME: KBR/SKBRO1	
SCALE: 1/2" = 1'-0"	TOLERANCE:
DRWN. BY: D. CHRISTOPHE	DATE: 03/22/10
CHK. BY: G. BRINKMAN	DATE: 03/22/10
ENG. BY: A. DUMAS	DATE:
APP. BY: JI	DATE:

SHEET NO.  
4-0

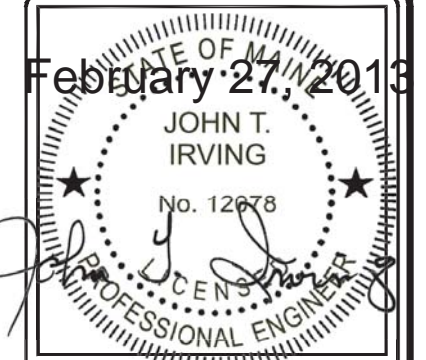
DRAWING NO.:  
SKBR01

REV.:  
P

REV	BY	DATE	DESCRIPTION	APP. BY	DATE
P	RRG	10/31/12	ROTATED BOX	LJL	10/31/12
N	RRG	6/8/12	REMOVED CONDUIT RUN/CORRECTED CONDUIT HEIGHT CHANGED 15 1/2" TO 17"/ADDED UPS AND SHELF	LJL	6/8/12
M	JJ	7/25/11	UPDATED DOOR PLATE, NOTES, BALLOONS, & BOX	LJL	7/25/11



SUB-PARTS LIST			
ITEM	P/N	DESCRIPTION	CUT
125	400050	WIRE,#2 THHN,STRAND,GRN	192"
185	410112	CONDUIT,LFMC,1/2",SEALTITE	120"
186	410119	CONDUIT,LFMC,1",SEALTITE	120"



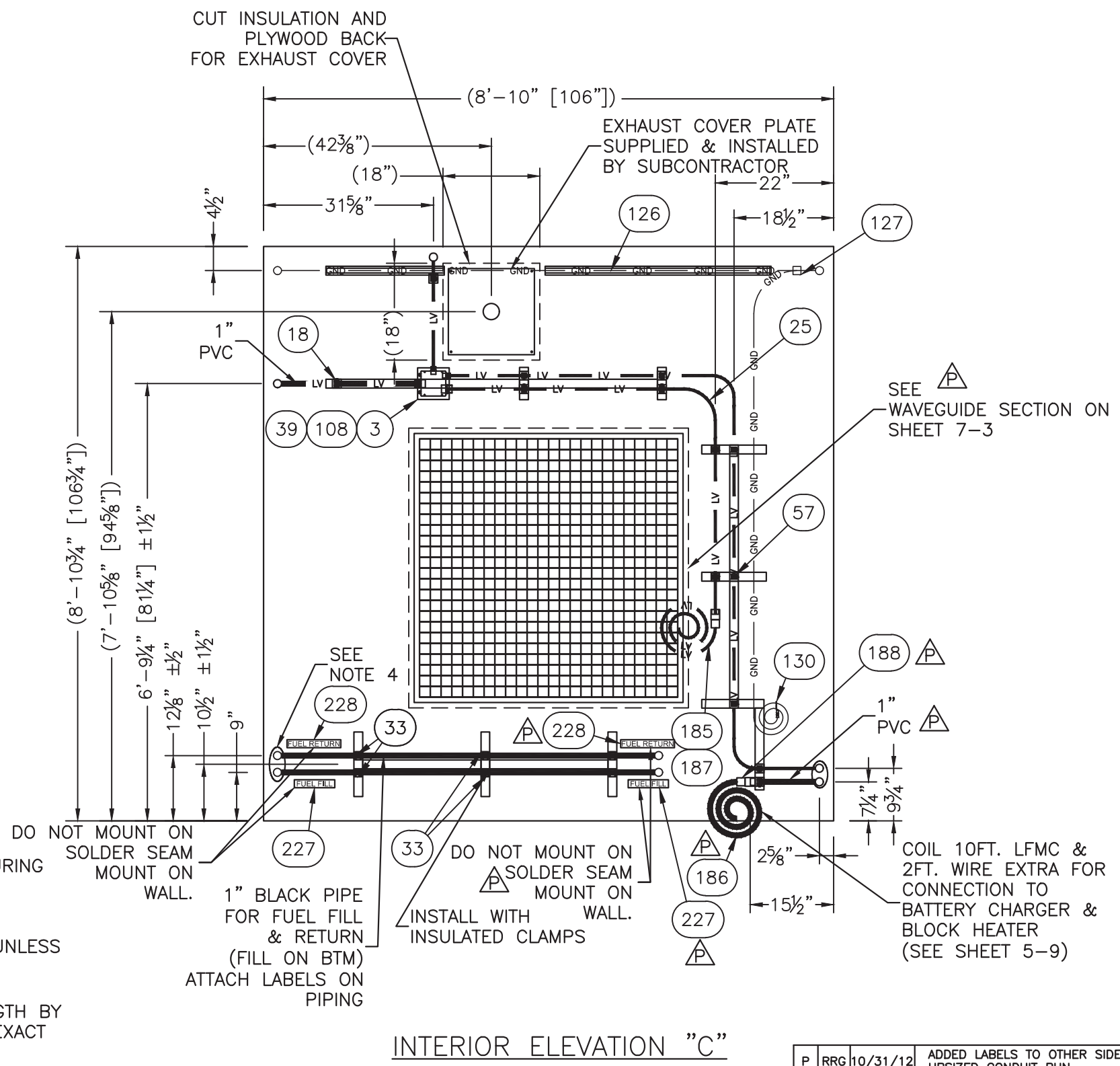
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CUSTOMER:  
**KELLOGG  
 BROWN & ROOT  
 FEMA (PEP)  
 EXPANSION PROGRAM**

PROJECT:  
**10'-0" X 14'-0"  
 CONCRETE SHELTER  
 INTERIOR "C"**

FILENAME: KBR/SKBRO1	
SCALE: 1/2" = 1'-0"	TOLERANCE:
DRWN. BY: D. CHRISTOPHE	DATE: 03/22/10
CHK. BY: G. BRINKMAN	DATE: 03/22/10
ENG. BY: A. DUMAS	DATE:
APP. BY: JI	DATE:
SHEET NO. 4-1	
DRAWING NO.:	REV.:
SKBR01	P



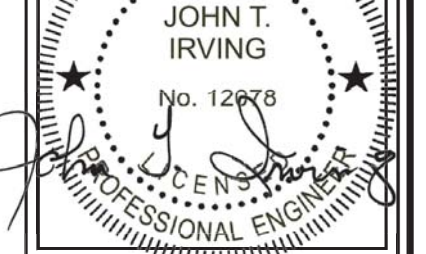
- NOTE:
1. ALL CONDUIT 1/2" PVC UNLESS OTHERWISE NOTED
  2. ITEMS (57) & (58) CONDUIT HANGERS ARE TO BE PLACED MAXIMUM OF 24" O.C.
  3. THE LAYOUT FOR UNISTRUT IS ON SHEET 4-5
  4. MAKE UP ALL PIPE JOINTS DURING MANUFACTURING PER WORK INSTRUCTIONS.
  5. TOLERANCES THIS SHT ±1" (UNLESS OTHERWISE NOTED)
  6. 12" MAX NIPPLE & PIPE LENGTH BY PIPE FILTER TO SUIT ACTUAL EXACT PLACEMENT OF GENERATOR.
  7. TO RECEPTACLE BOX ON GENERATOR SEE SHT 5-0, 5-1 & 5-8

INTERIOR ELEVATION "C"

REV	BY	DATE	DESCRIPTION	APP. BY	DATE
P	RRG	10/31/12	ADDED LABELS TO OTHER SIDE OF GENERATOR & UPSIZED CONDUIT RUN	LJL	10/31/12
N	RRG	6/8/12	REMOVED CONDUIT/RAISED LFMC CONNECTION	LJL	6/8/12
M	JJ	7/25/11	ADDED SIGNAGE & UPDATED WAVEGUIDE NOTE	LJL	7/25/11
L	RRG	04/25/11	CHANGED CONDUIT SIZES	LJL	04/25/11
F	MDF	08/03/10	PER MARKUPS	DB	08/03/10



February 27, 2013



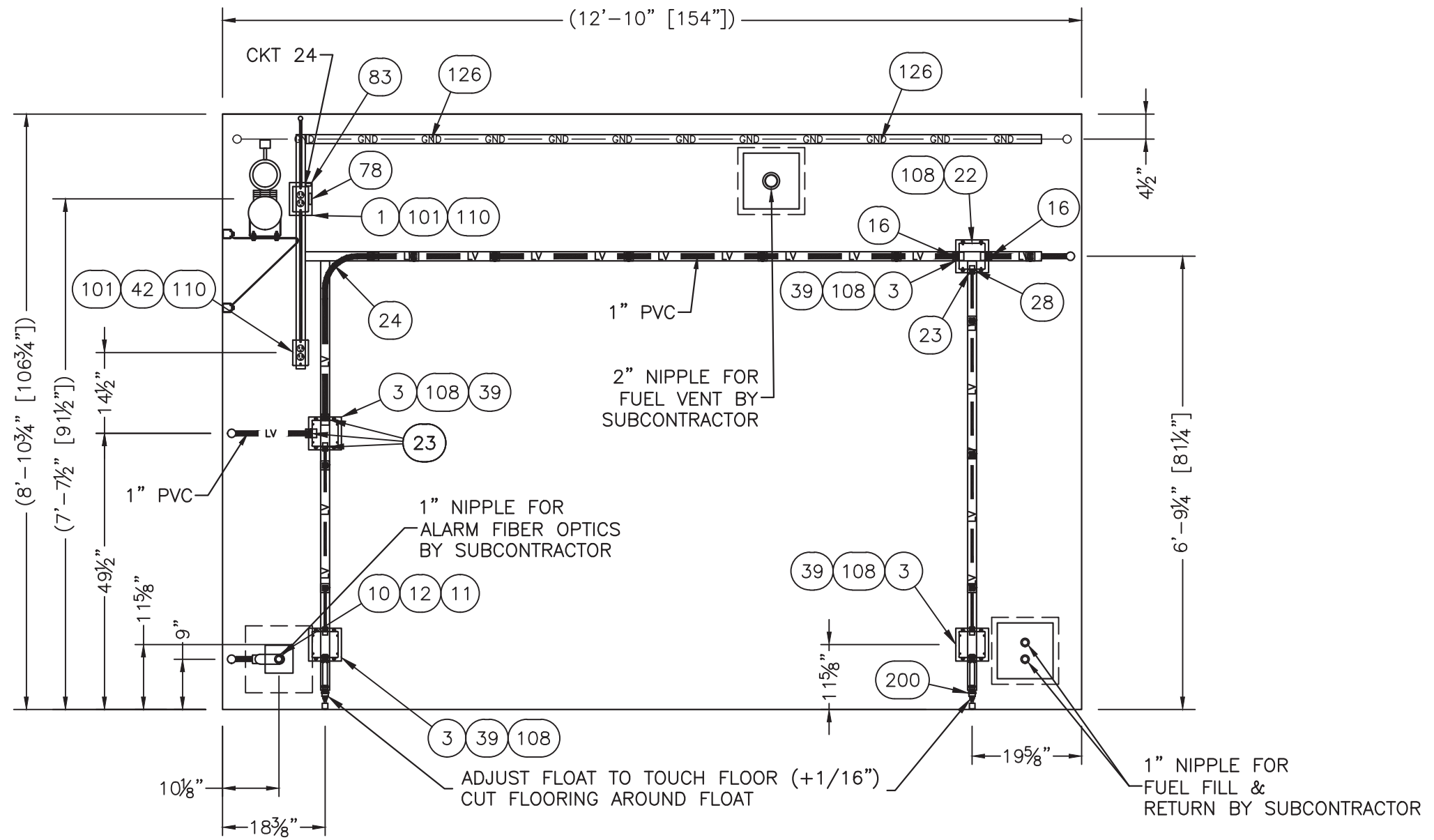
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CUSTOMER:  
**KELLOGG  
 BROWN & ROOT  
 FEMA (PEP)  
 EXPANSION PROGRAM**

PROJECT:  
**10'-0" X 14'-0"  
 CONCRETE SHELTER  
 INTERIOR "B" ELEVATION**

FILENAME: KBR/SKBRO1	
SCALE: 1/2" = 1'-0"	TOLERANCE:
DRWN. BY: D. CHRISTOPHE	DATE: 03/22/10
CHK. BY: G. BRINKMAN	DATE: 03/22/10
ENG. BY: A. DUMAS	DATE:
APP. BY: JI	DATE:
SHEET NO. 4-2	
DRAWING NO.:	REV.:
SKBR01	P



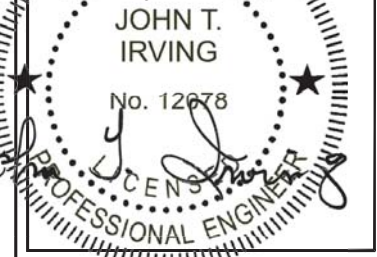
INTERIOR ELEVATION "B"

NOTE:

1. ALL CONDUIT 1/2" PVC UNLESS OTHERWISE NOTED
2. ITEMS (57) & (58) CONDUIT HANGERS ARE TO BE PLACED MAXIMUM OF 24" O.C.
3. THE LAYOUT FOR UNISTRUT IS ON SHEET 4-6
4. TOLERANCES THIS SHT ±1" (UNLESS OTHERWISE NOTED)

REV	BY	DATE	DESCRIPTION	APP. BY	DATE
N	RRG	6/8/12	REPLACED CONDUIT RUN TO "A" WALL WITH RECEPTACLE	LJL	6/8/12
M	JJ	7/25/11	UPDATED PER MARKUP	LJL	7/25/11
L	RRG	04/25/11	UPDATED NOTES	LJL	04/25/11
K	AMM	2/3/11	ADDED LABELS & BACK PLATES	LJL	2/3/11
F	MDF	08/03/10	PER MARKUPS	DB	08/03/10

February 27, 2013



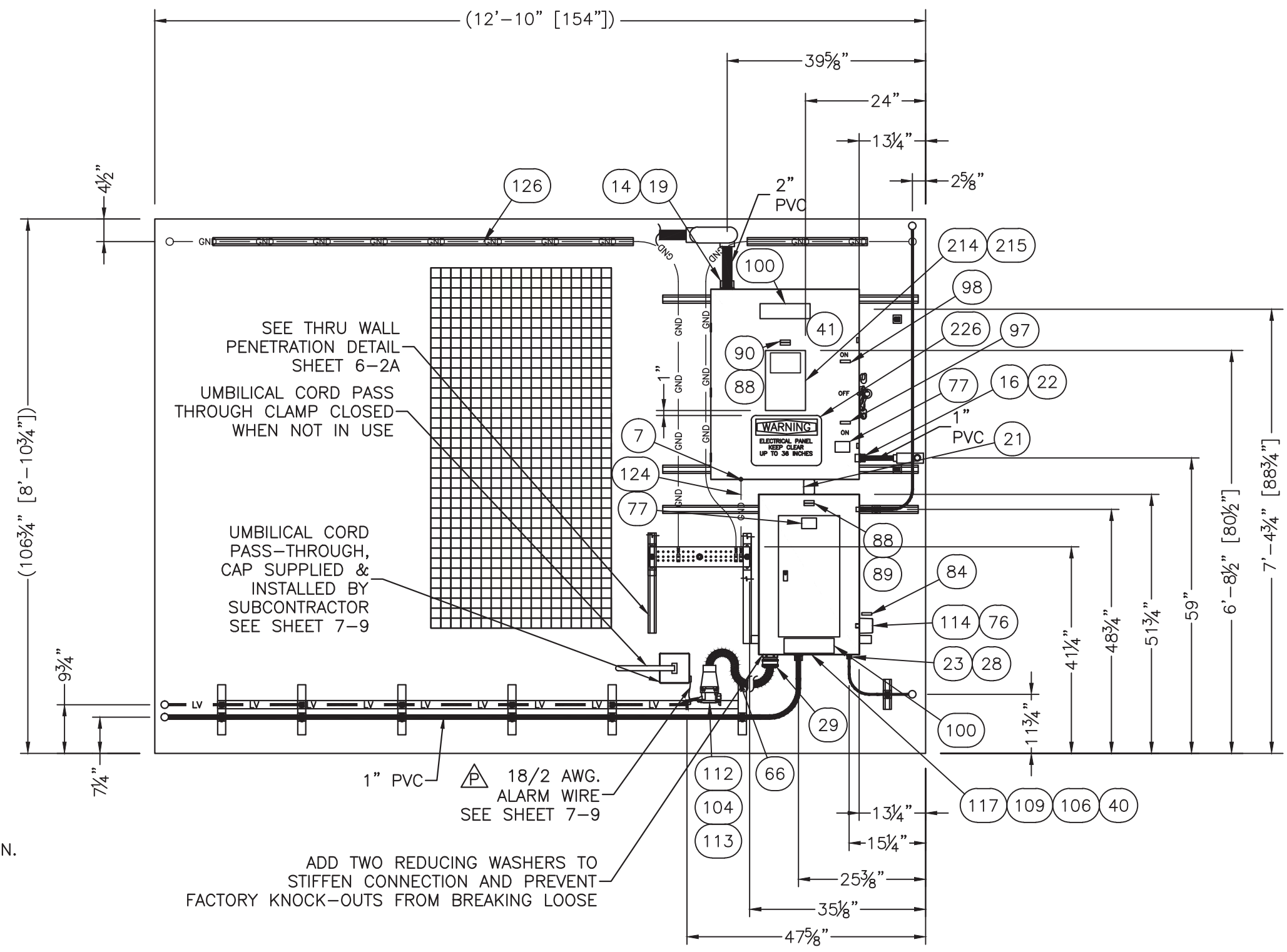
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CUSTOMER:  
**KELLOGG  
 BROWN & ROOT  
 FEMA (PEP)  
 EXPANSION PROGRAM**

PROJECT:  
**10'-0" X 14'-0"  
 CONCRETE SHELTER  
 INTERIOR "D"**

FILENAME: KBR/SKBR01	
SCALE: 1/2" = 1'-0"	TOLERANCE:
DRWN. BY: D. CHRISTOPHE	DATE: 03/22/10
CHK. BY: G. BRINKMAN	DATE: 03/22/10
ENG. BY: A. DUMAS	DATE:
APP. BY: JI	DATE:
SHEET NO. 4-3	
DRAWING NO.:	REV.:
SKBR01	P

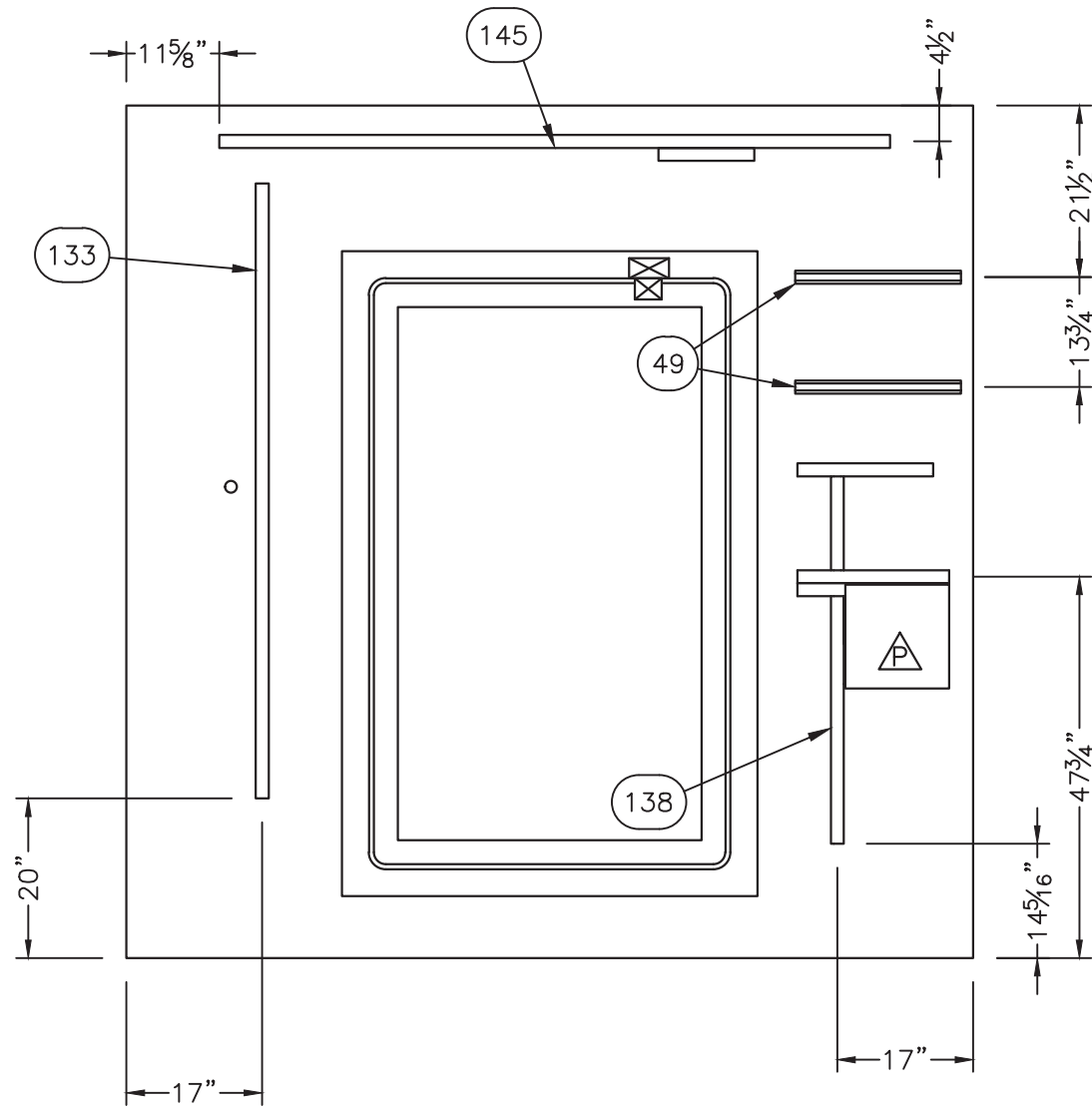


- NOTE:
- ALL CONDUIT 1/2" PVC UNLESS OTHERWISE NOTED. GLUE ALL PVC UNTHREADED JOINTS PER WORK INSTRUCTION.
  - ITEMS (57) & (58) CONDUIT HANGERS ARE TO BE PLACED MAXIMUM OF 24" O.C.
  - THE LAYOUT FOR UNISTRUT IS ON SHEET 4-7
  - TOLERANCES THIS SHT ±1" (UNLESS OTHERWISE NOTED)
  - REDUCING WASHERS ARE REQUIRED WITH ITEM (29).

INTERIOR ELEVATION "D"

REV	BY	DATE	DESCRIPTION	APP. BY	DATE
P	RRG	11/12/12	CHANGED WIRE SIZE FROM 22 TO 18AWG	LJL	11/12/12
N	RRG	6/8/12	REMOVED BATT. CHARGER, STORAGE HOOK, & CONDUIT/ ADJUSTED CONDUIT HEIGHT / ADDED NOTE	LJL	6/8/12
M	JJ	7/25/11	MOVE GROUND BAR, ADDED LABELS, UPDATED GEN RECEPTACLE HANDLE & STRAIN RELIEF PARTS	LJL	7/25/11
L	RRG	04/25/11	ADDED NOTE 4	LJL	04/25/11
K	AMM	2/8/11	RE-ADDED BATT CHARGER TO WALL & SHIFTED LOCATION	LJL	2/8/11
F	MDF	08/03/10	PER MARKUPS	DB	08/03/10
REV	BY	DATE	DESCRIPTION	APP. BY	DATE

SUB-PARTS LIST			
ITEM	P/N	DESCRIPTION	CUT
49	510017	UNISTRUT, 1 5/8" CHANNEL, GOLD GALV, RAW	20 3/4"

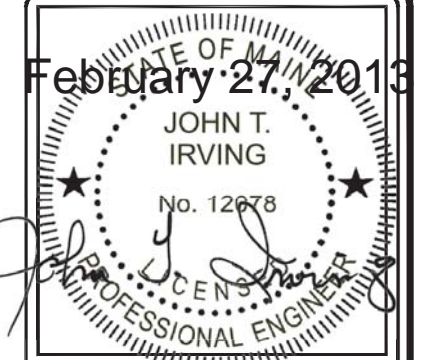


INTERIOR ELEVATION  
"A" - UNISTRUT LAYOUT

NOTE:

1. TOLERANCES THIS SHT ±1" (UNLESS OTHERWISE NOTED).
2. INSTALL UNISTRUTS USING 3/8" STUDS 1" FROM ENDS AND EVERY 24" ON CENTER. 2 STUDS MIN. EACH UNISTRUT(TYP.).

REV	BY	DATE	DESCRIPTION	APP. BY	DATE
P	RRG	10/31/12	MODIFIED UNISTRUT ASSEMBLY	LJL	10/31/12
N	RRG	6/8/12	MODIFIED UNISTRUT ASSEMBLY/CHANGED 15 1/2" TO 17" & 13 1/4" TO 13 3/4"	LJL	6/8/12
M	JJ	7/25/11	RELOCATED UNISTRUT TO "D" WALL & ADDED PENETRATION	LJL	7/25/11



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**cellxion**

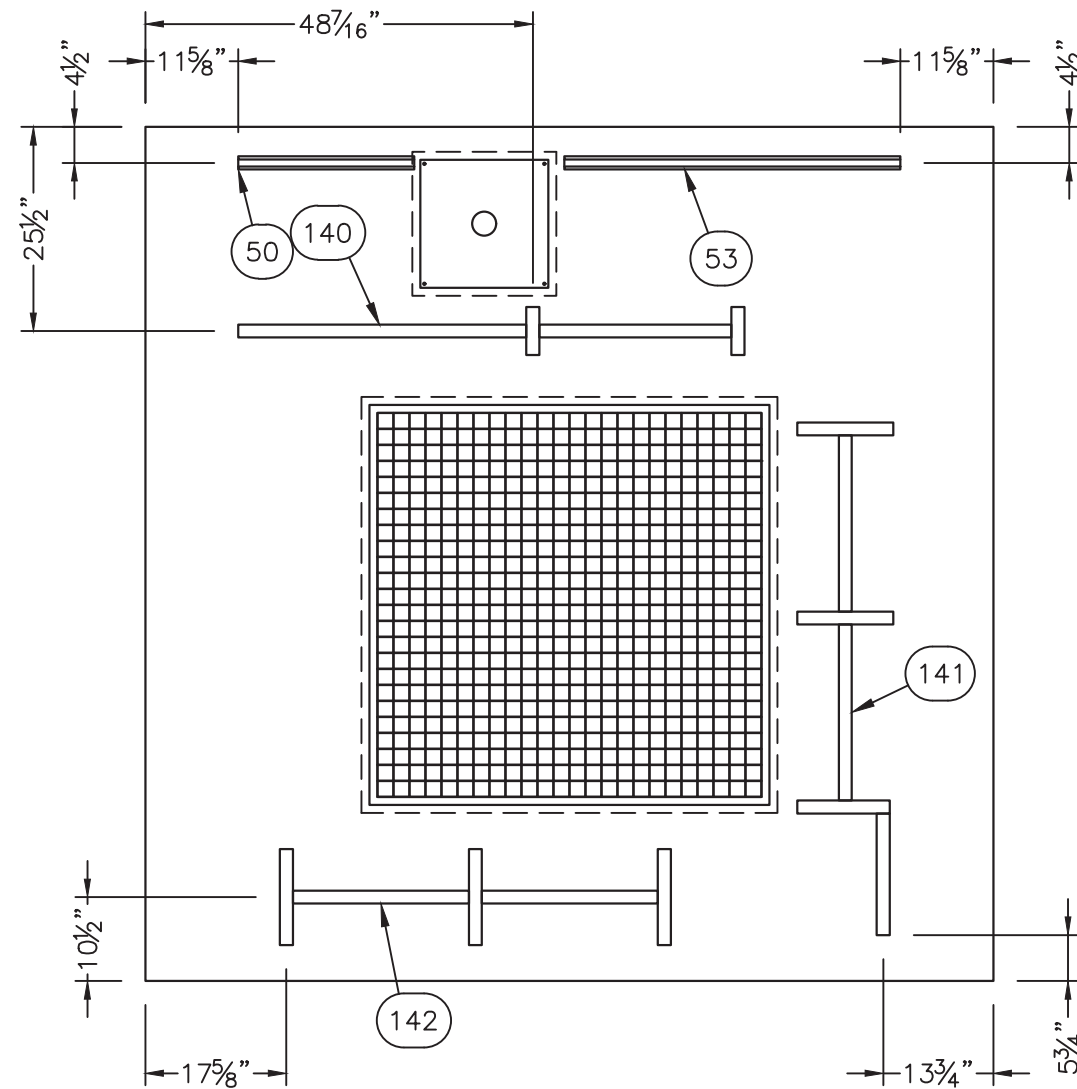
5031 Hazel Jones Road  
Bossier City, Louisiana 71111  
voice: (318) 213-2900  
fax: (318) 213-2919  
www.cellxion.com

CUSTOMER:  
**KELLOGG  
BROWN & ROOT  
FEMA (PEP)  
EXPANSION PROGRAM**

PROJECT:  
**10'-0" X 14'-0"  
CONCRETE SHELTER  
INTERIOR ELEVATION  
"A" UNISTRUT LAYOUT**

FILENAME: KBR/SKBRO1	
SCALE: 1/2" = 1'-0"	TOLERANCE:
DRWN. BY: D. CHRISTOPHE	DATE: 03/22/10
CHK. BY: G. BRINKMAN	DATE: 03/22/10
ENG. BY: A. DUMAS	DATE:
APP. BY: JI	DATE:
SHEET NO. 4-4	
DRAWING NO.:	REV.:
SKBR01	P

SUB-PARTS LIST			
ITEM	P/N	DESCRIPTION	CUT
50	510017	UNISTRUT,1 5/8"CHANNEL,GOLDGALV,RAW	22"
53	510017	UNISTRUT,1 5/8"CHANNEL,GOLDGALV,RAW	42"

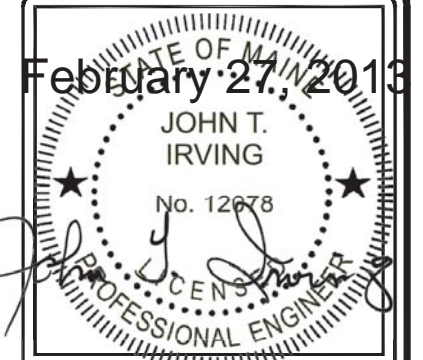


INTERIOR ELEVATION  
"C" - UNISTRUT LAYOUT

NOTE:

1. TOLERANCES THIS SHT  $\pm 1"$  (UNLESS OTHERWISE NOTED).
2. INSTALL UNISTRUTS USING  $\frac{3}{8}"$  STUDS 1" FROM ENDS AND EVERY 24" ON CENTER. 2 STUDS MIN. EACH UNISTRUT(TYP.).

L	RRG	04/25/11	ADDED TOLERANCE NOTE	LJL	04/25/11
F	MDF	08/03/10	CREATED UNISTRUT ASSEMBLIES	DB	08/05/10
REV	BY	DATE	DESCRIPTION	APP. BY	DATE



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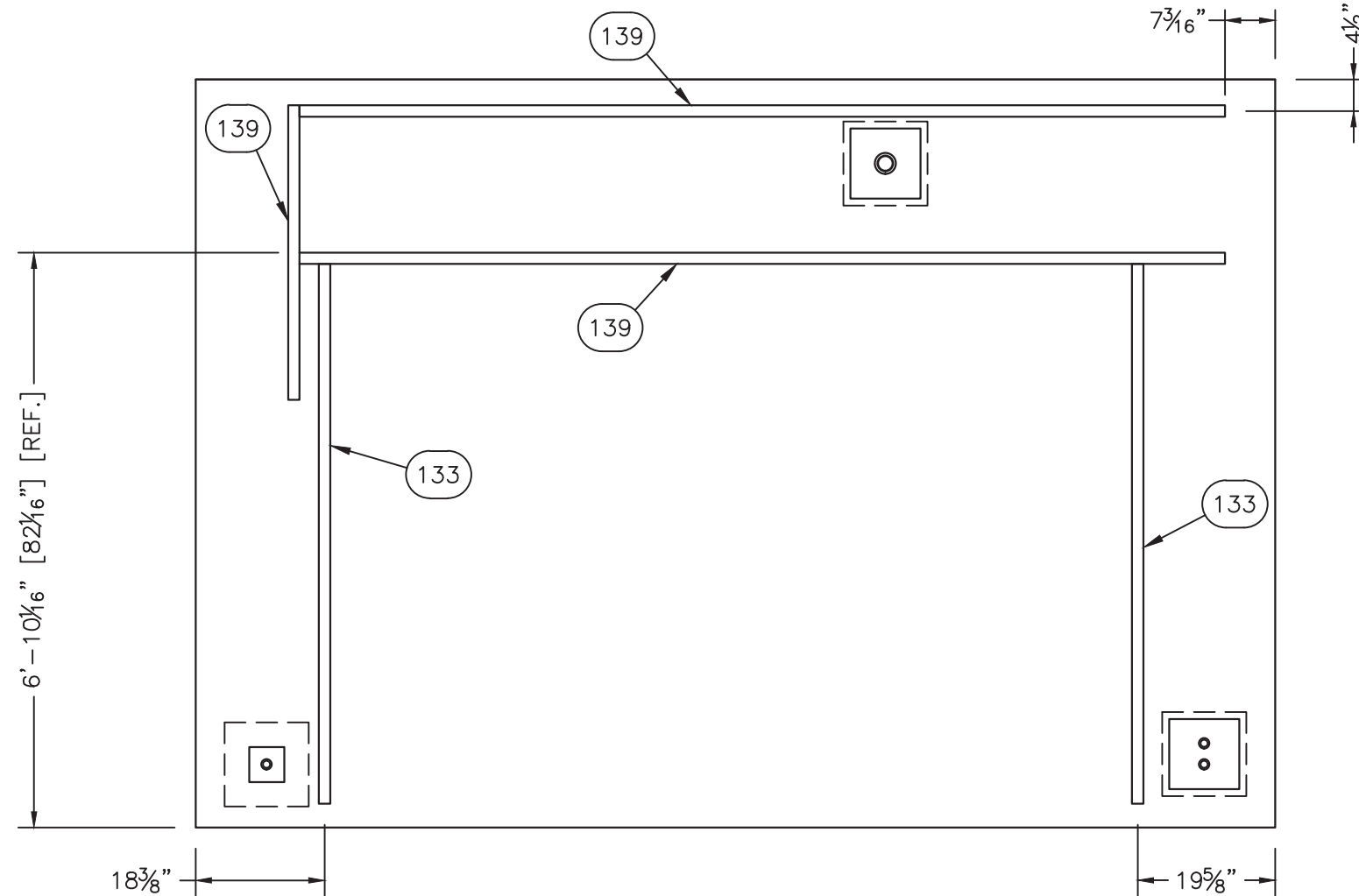
**cellxion**  
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 Bossier City, Louisiana 71111  
 voice: (318) 213-2900  
 fax: (318) 213-2919  
 www.cellxion.com

CUSTOMER:  
**KELLOGG  
 BROWN & ROOT  
 FEMA (PEP)  
 EXPANSION PROGRAM**

PROJECT:  
**10'-0" X 14'-0"  
 CONCRETE SHELTER  
 INTERIOR ELEVATION  
 "C" - UNISTRUT LAYOUT**

FILENAME: KBR/SKBRO1	
SCALE: 1/2" = 1'-0"	TOLERANCE:
DRWN. BY: D. CHRISTOPHE	DATE: 03/22/10
CHK. BY: G. BRINKMAN	DATE: 03/22/10
ENG. BY: A. DUMAS	DATE:
APP. BY: JI	DATE:
SHEET NO. 4-5	
DRAWING NO.:	REV.:
SKBR01	P

SUB-PARTS LIST			
ITEM	P/N	DESCRIPTION	CUT
133	510017	UNISTRUT, 1 5/8" CHANNEL, GOLD GALV, RAW	77"

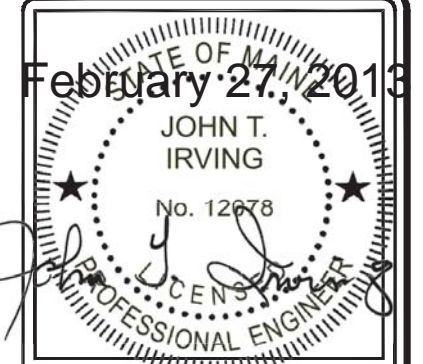


NOTE:

1. TOLERANCES THIS SHT  $\pm 1"$  (UNLESS OTHERWISE NOTED).
2. INSTALL UNISTRUTS USING  $\frac{3}{8}"$  STUDS 1" FROM ENDS AND EVERY 24" ON CENTER. 2 STUDS MIN. EACH UNISTRUT(TYP.).

INTERIOR ELEVATION  
"B" - UNISTRUT LAYOUT

REV	BY	DATE	DESCRIPTION	APP. BY	DATE
M	LJL	1/16/12	ADDED PLATES AT PENETRATIONS	LJL	1/16/12
L	RRG	04/25/11	MOVED UNISTRUT, ADDED TOLERANCE NOTE	LJL	04/25/11
F	MDF	08/03/10	CREATED UNISTRUT ASSEMBLIES	DB	08/05/10



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CUSTOMER:  
**KELLOGG  
BROWN & ROOT  
FEMA (PEP)  
EXPANSION PROGRAM**

PROJECT:  
**10'-0" X 14'-0"  
CONCRETE SHELTER  
INTERIOR ELEVATION  
"B" - UNISTRUT LAYOUT**

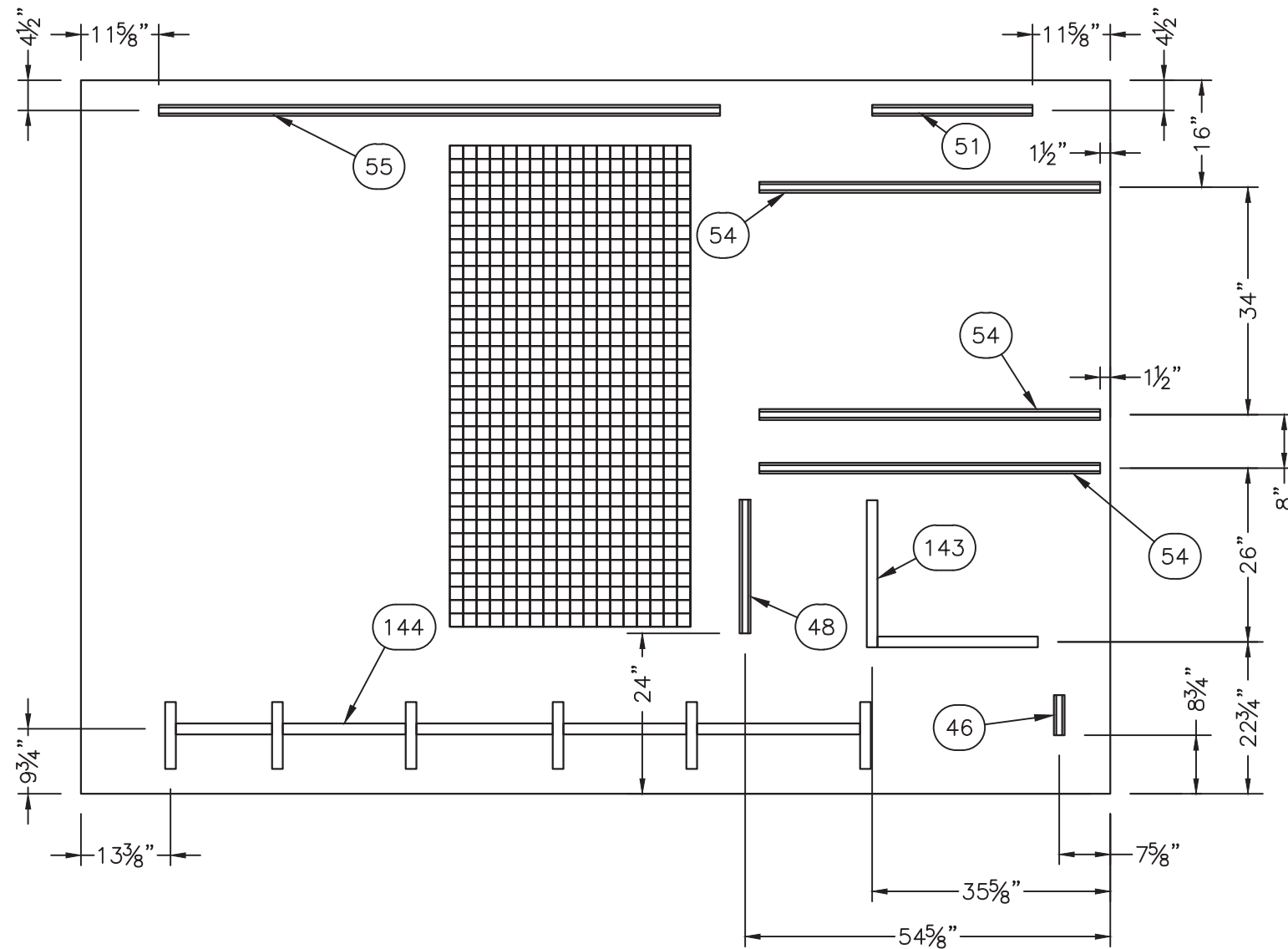
FILENAME: KBR/SKBR01	
SCALE: 1/2" = 1'-0"	TOLERANCE:
DRWN. BY: D. CHRISTOPHE	DATE: 03/22/10
CHK. BY: G. BRINKMAN	DATE: 03/22/10
ENG. BY: A. DUMAS	DATE:
APP. BY: JI	DATE:
SHEET NO. 4-6	
DRAWING NO.:	REV.:
SKBR01	P



SUB-PARTS LIST			
ITEM	P/N	DESCRIPTION	CUT
46	510017	UNISTRUT,1 5/8"CHANNEL,GOLDGALV,RAW	6"
48	510017	UNISTRUT,1 5/8"CHANNEL,GOLDGALV,RAW	20"
51	510017	UNISTRUT,1 5/8"CHANNEL,GOLDGALV,RAW	24"
54	510017	UNISTRUT,1 5/8"CHANNEL,GOLDGALV,RAW	51"
55	510017	UNISTRUT,1 5/8"CHANNEL,GOLDGALV,RAW	84"

NOTES (SHIELDING CONTRACTOR):

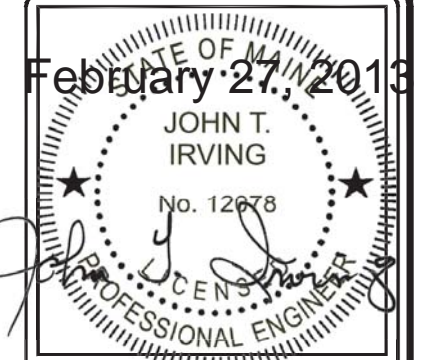
1. SECURE ITEM (54) WITH (3) 3/8" STUDS.



NOTE:

1. TOLERANCES THIS SHT ±1" (UNLESS OTHERWISE NOTED).
2. INSTALL UNISTRUTS USING 3/8" STUDS 1" FROM ENDS AND EVERY 24" ON CENTER. 2 STUDS MIN. EACH UNISTRUT(TYP.).

INTERIOR ELEVATION  
"D" - UNISTRUT LAYOUT



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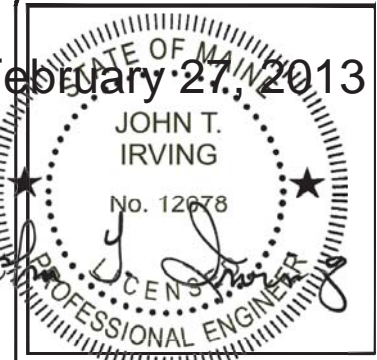
CUSTOMER:  
**KELLOGG  
BROWN & ROOT  
FEMA (PEP)  
EXPANSION PROGRAM**

PROJECT:  
**10'-0" X 14'-0"  
CONCRETE SHELTER  
INTERIOR ELEVATION  
"D" - UNISTRUT LAYOUT**

FILENAME: KBR/SKBRO1	
SCALE: 1/2" = 1'-0"	TOLERANCE:
DRWN. BY: D. CHRISTOPHE	DATE: 03/22/10
CHK. BY: G. BRINKMAN	DATE: 03/22/10
ENG. BY: A. DUMAS	DATE:
APP. BY: JI	DATE:
SHEET NO. 4-7	
DRAWING NO.:	REV.:
SKBR01	P

REV	BY	DATE	DESCRIPTION	APP. BY	DATE
N	RRG	6/8/12	REMOVED UNISTRUT ASSEMBLY & ADDED NOTES	LJL	6/8/12
M	JJ	11/16/11	ADDED UNISTRUT FROM "A" WALL	LJL	11/16/11
L	RRG	04/25/11	ADDED TOLERANCE NOTE	LJL	04/25/11
F	MDF	08/03/10	CREATED UNISTRUT ASSEMBLIES	DB	08/05/10

February 27, 2013



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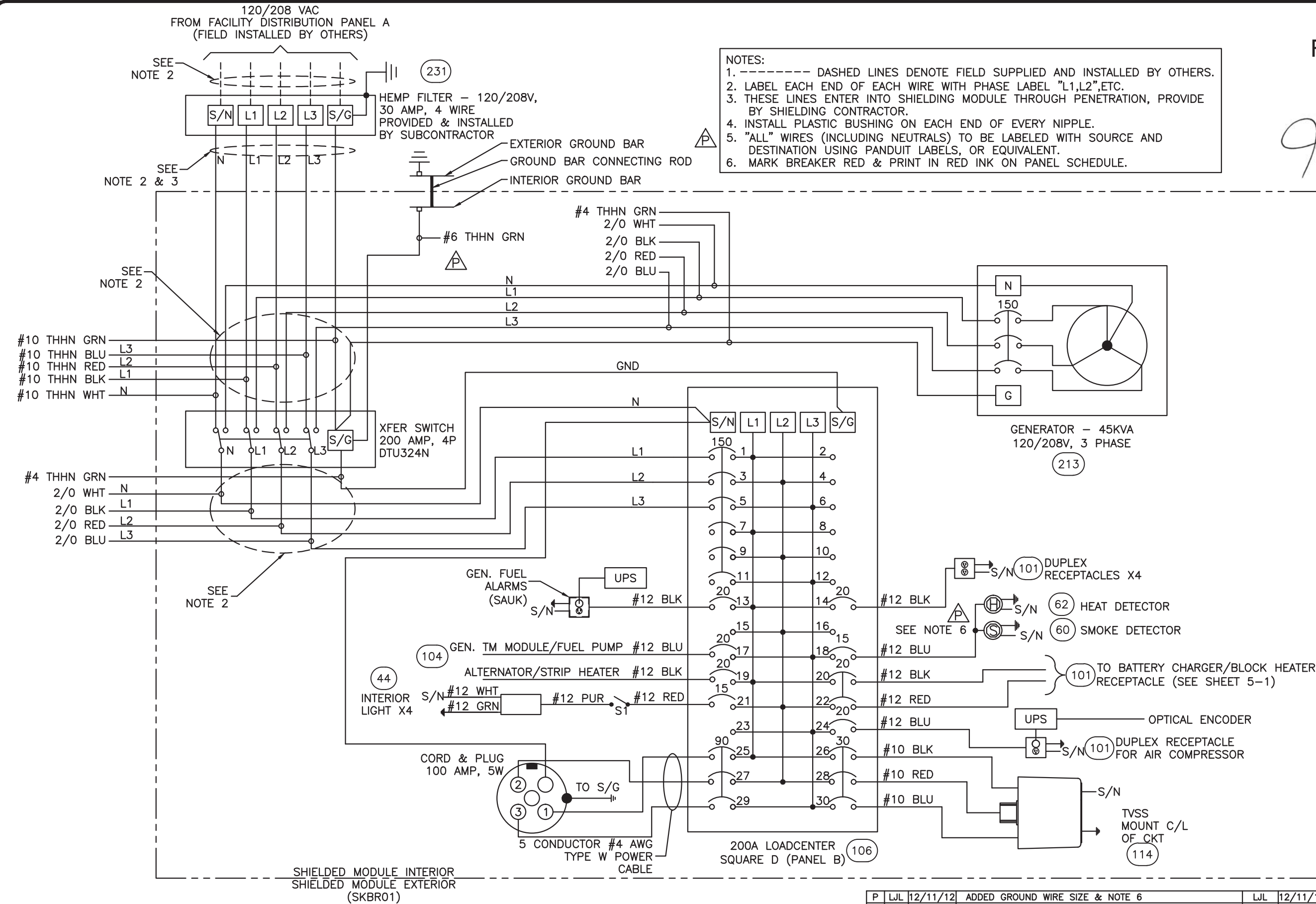
**Cellxion**  
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 www.cellxion.com

CUSTOMER:  
**KELLOGG  
 BROWN & ROOT  
 FEMA (PEP)  
 EXPANSION PROGRAM**

PROJECT:  
**10'-0" X 14'-0"  
 CONCRETE SHELTER  
 ELECTRICAL SCHEMATIC**

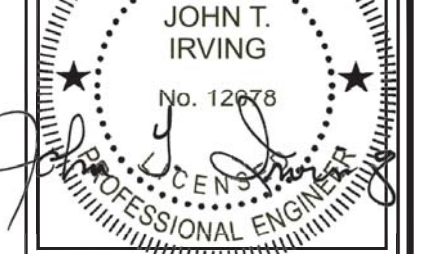
FILENAME: KBR/SKBR01	
SCALE: N.T.S.	TOLERANCE:
DRWN. BY: D. CHRISTOPHE	DATE: 03/22/10
CHK. BY: G. BRINKMAN	DATE: 03/22/10
ENG. BY: A. DUMAS	DATE:
APP. BY: JI	DATE:
SHEET NO. 5-0	
DRAWING NO.:	REV.:
SKBR01	P

- NOTES:
- DASHED LINES DENOTE FIELD SUPPLIED AND INSTALLED BY OTHERS.
  - LABEL EACH END OF EACH WIRE WITH PHASE LABEL "L1,L2",ETC.
  - THESE LINES ENTER INTO SHIELDING MODULE THROUGH PENETRATION, PROVIDE BY SHIELDING CONTRACTOR.
  - INSTALL PLASTIC BUSHING ON EACH END OF EVERY NIPPLE.
  - "ALL" WIRES (INCLUDING NEUTRALS) TO BE LABELED WITH SOURCE AND DESTINATION USING PANDUIT LABELS, OR EQUIVALENT.
  - MARK BREAKER RED & PRINT IN RED INK ON PANEL SCHEDULE.



REV	BY	DATE	DESCRIPTION	APP. BY	DATE
P	LJL	12/11/12	ADDED GROUND WIRE SIZE & NOTE 6	LJL	12/11/12
N	RRG	6/8/12	ADDED UPS/REMOVED GROUND BAR/CHANGED BREAKERS FOR BATT. CHARGER/BLOCK HEATER	LJL	6/8/12
M	JJ	7/25/11	MERGED AND ADDED NOTES	LJL	7/25/11

February 27, 2013



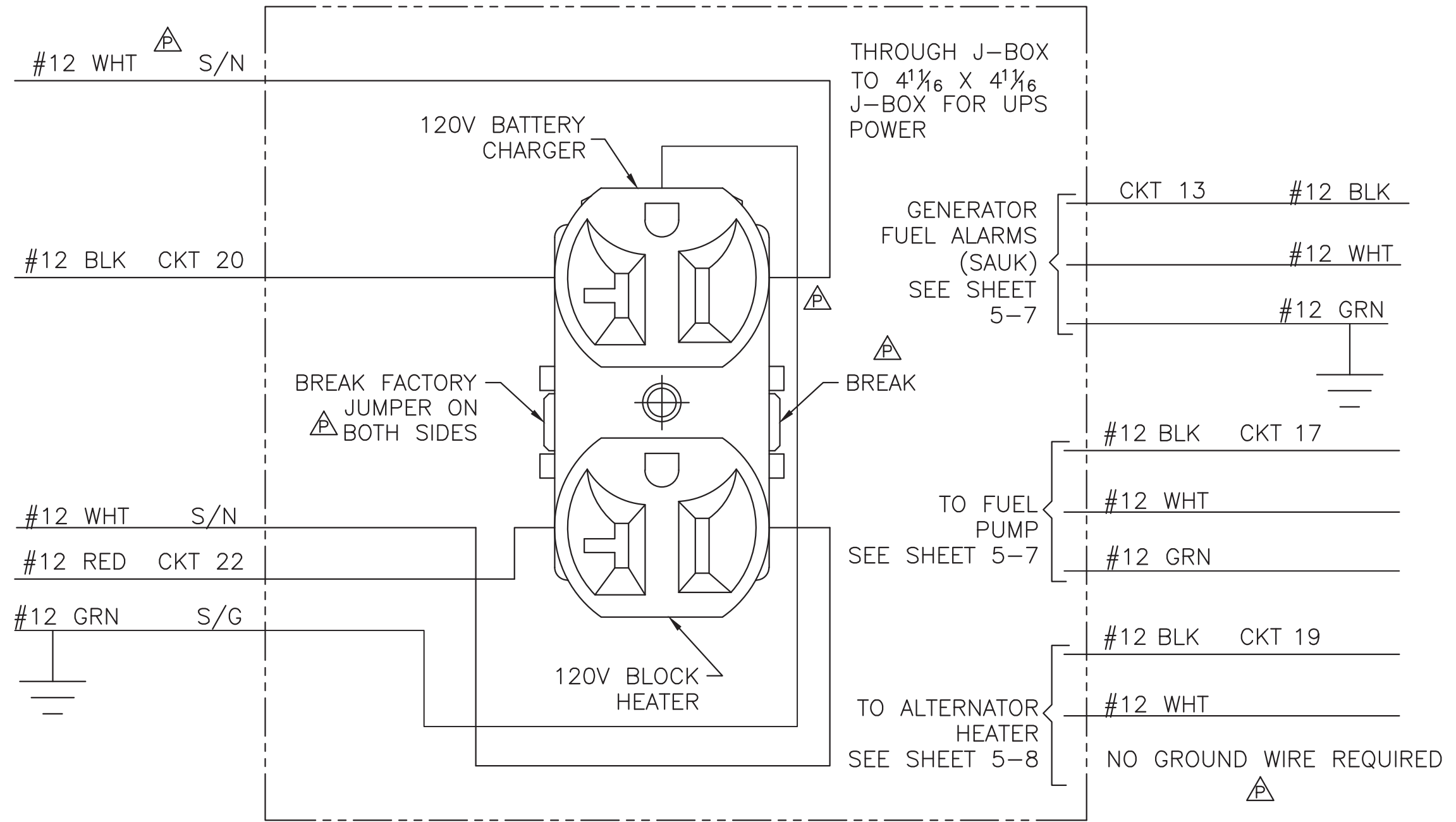
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CUSTOMER:  
**KELLOGG  
 BROWN & ROOT  
 FEMA (PEP)  
 EXPANSION PROGRAM**

PROJECT:  
**10'-0" X 14'-0"  
 CONCRETE SHELTER  
 GENERATOR QUAD  
 WIRING SCHEMATIC**

FILENAME: KBR/SKBR01	
SCALE: N.T.S.	TOLERANCE:
DRWN. BY: D. CHRISTOPHE	DATE: 03/22/10
CHK. BY: G. BRINKMAN	DATE: 03/22/10
ENG. BY: A. DUMAS	DATE:
APP. BY: JI	DATE:
SHEET NO. 5-1	
DRAWING NO.:	REV.:
SKBR01	P

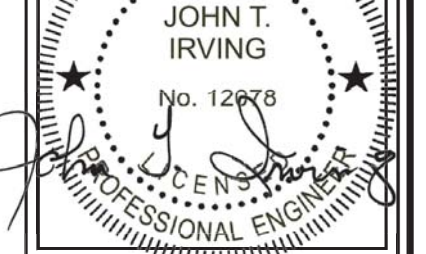


ALTERNATOR HEATER, FUEL PUMP, GENERATOR FUEL ALARMS AND GENERATOR DUPLEX RECEPTACLE WIRING SCHEMATIC (ON GENERATOR) SEE SHEET 5-8

REV	BY	DATE	DESCRIPTION	APP. BY	DATE
P	RRG	10/31/12	ADDED NUETRAL TO RECEPTACLE & REMOVED GROUND	LJL	10/31/12
N	RRG	6/8/12	ADDED CIRCUIT/CHANGED BOX SIZE FOR WIRE FILL	LJL	6/8/12
M	LL	7/25/11	ROTATED RECEPTACLE & UPDATED DETAIL	LJL	7/25/11
L	RRG	04/25/11	ADDED MOUNTING NOTE	LJL	04/25/11



February 27, 2013



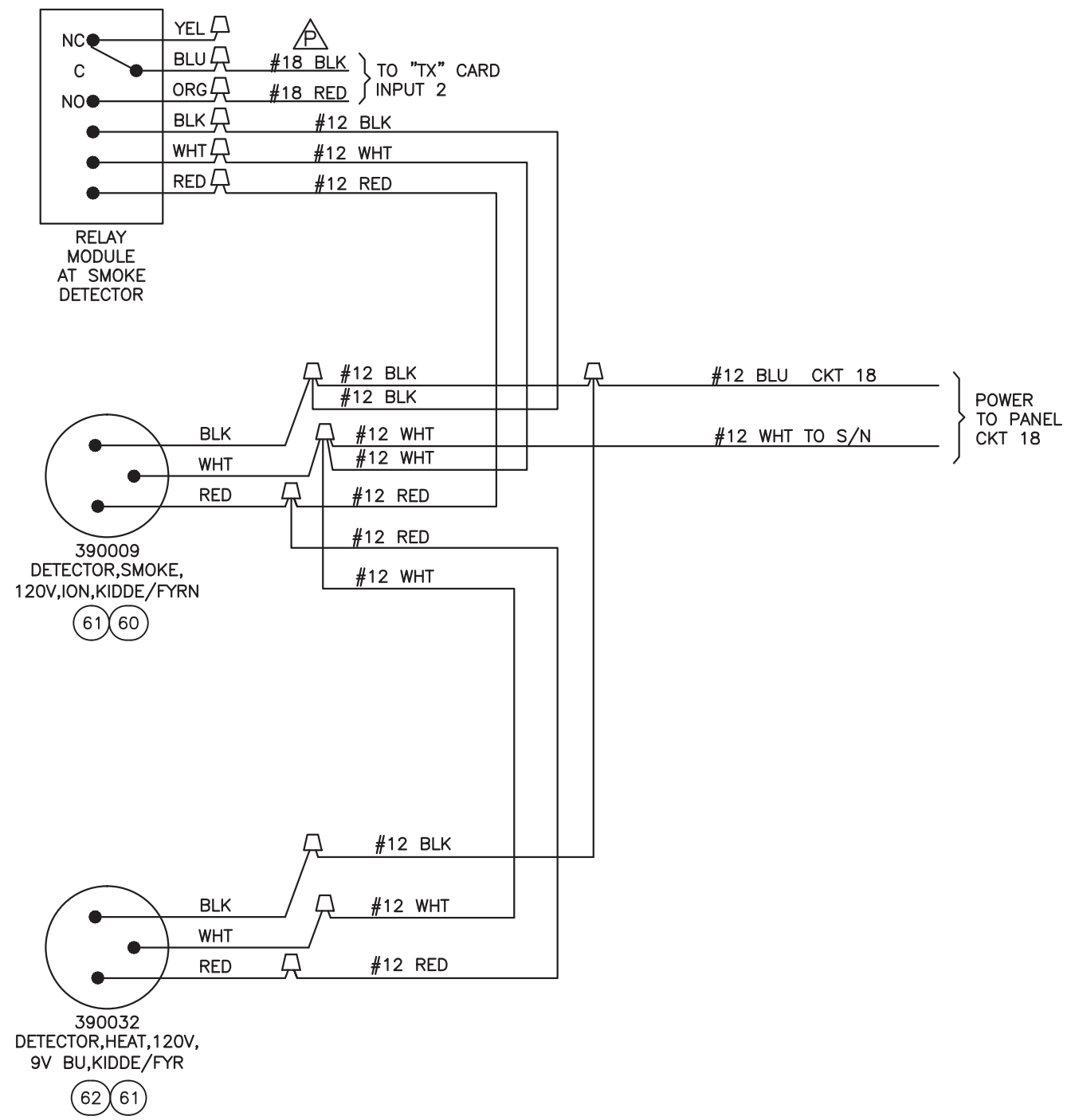
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CUSTOMER:  
**KELLOGG  
 BROWN & ROOT  
 FEMA (PEP)  
 EXPANSION PROGRAM**

PROJECT:  
**10'-0" X 14'-0"  
 CONCRETE SHELTER  
 SMOKE/HEAT DETECTOR  
 WIRING SCHEMATIC**

FILENAME: KBR/SKBRO1	
SCALE: N.T.S.	TOLERANCE:
DRWN. BY: D. CHRISTOPHE	DATE: 03/22/10
CHK. BY: G. BRINKMAN	DATE: 03/22/10
ENG. BY: A. DUMAS	DATE:
APP. BY: JI	DATE:
SHEET NO. 5-2	
DRAWING NO.: SKBR01	REV.: P

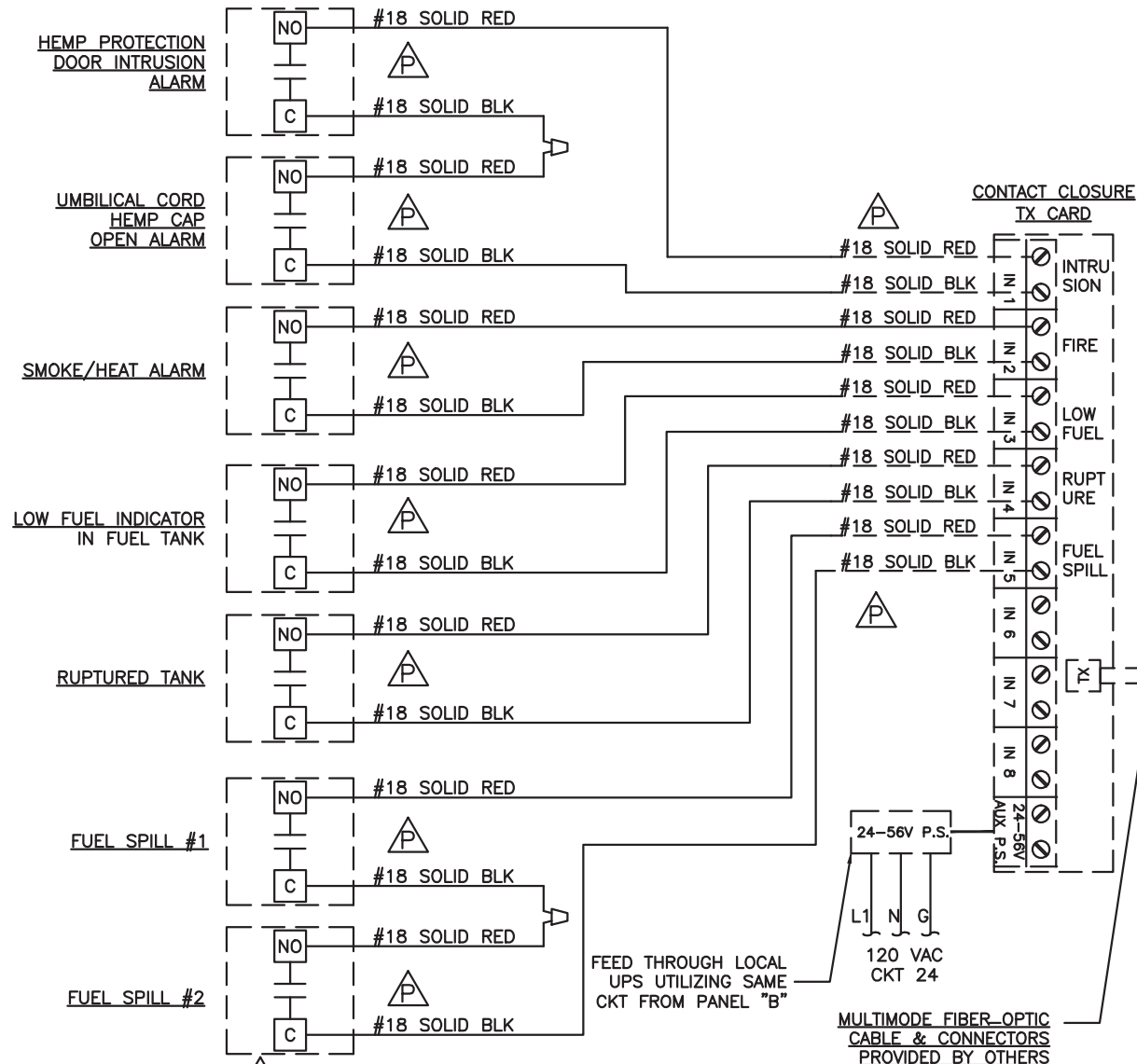


REV	BY	DATE	DESCRIPTION	APP. BY	DATE
P	RRG	10/31/12	CHANGED WIRE FROM #22 TO #18	LJL	10/31/12
L	RRG	04/25/11	MOVED RELAY MOVED TO SMOKE DETECTOR	LJL	04/25/11
K	AMM	2/2/11	CHANGED N/C CONTACT TO N/O PER ELEC ENG	LJL	2/2/11

SKBR01

SKBR02 ALARMS TO RX CONTACTS FOR REFERENCE

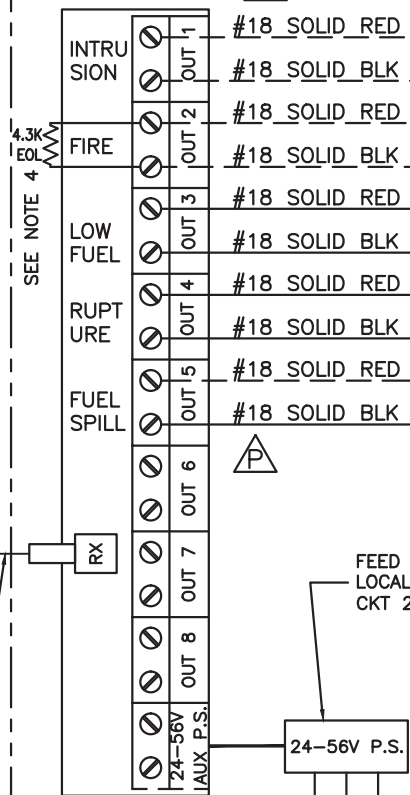
CONTACTS AT VIKING PANEL



SHELTER ALARM NOTES:

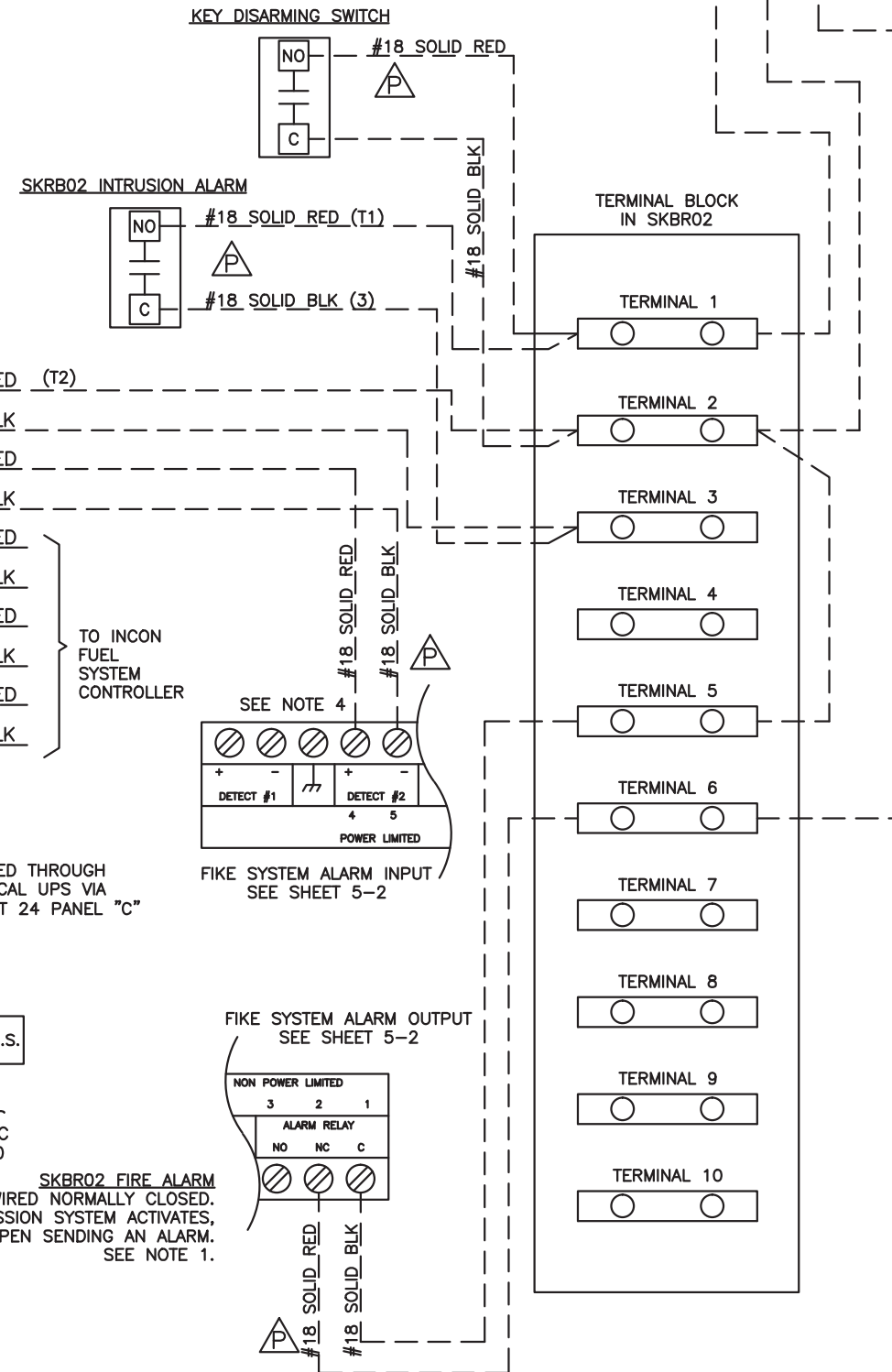
1. WIRES TO BE #18 AWG, 2 CONDUCTOR, SHIELDED ALARM WIRE (P/N 400832).
2. CONTACTS SHOULD BE OPEN IN FAIL SAFE POSITION (SHELF POSITION) WHEN NO POWER IS APPLIED.
3. ALL WIRING SHALL BE TERMINATED TO THE NORMALLY OPEN CONTACT. DURING NORMAL OPERATION THE CONTACT WILL CHANGE STATE TO NC- ALARM CONDITIONS:
  - 1)UPSET CONDITION-DOOR OR CAP OPEN,HEAT ABOVE SET POINT,SMOKE,LOW FUEL,TANK RAPTURE,FUEL SPILL.
  - 2)LOSS OF POWER-TRIPPED OCPD,UTILITY POWER OFF.
  - 3)CUT OR DISCONNECTED WIRE.
4. MOVE 4.3K RESISTOR FIKE ALARM INPUT BOARD TO TERMINALS IN CONTACT CLOSURE CARD AS SHOWN.

CONTACT CLOSURE RX CARD

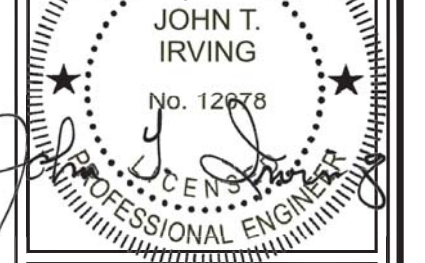


SKBR02 FIRE ALARM CONTACTS ARE WIRED NORMALLY CLOSED. WHEN FIRE SUPPRESSION SYSTEM ACTIVATES, CONTACTS OPEN SENDING AN ALARM. SEE NOTE 1.

SKBR02 INTRUSION ALARM



February 27, 2013



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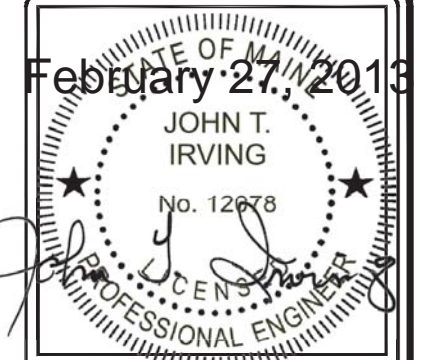
CUSTOMER:  
**KELLOGG BROWN & ROOT FEMA (PEP) EXPANSION PROGRAM**

PROJECT:  
**10'-0" X 14'-0" CONCRETE SHELTER LOW VOLTAGE SCHEMATIC**

FILENAME: KBR/SKBR01	
SCALE: N.T.S.	TOLERANCE:
DRWN. BY: D. CHRISTOPHE	DATE: 03/22/10
CHK. BY: G. BRINKMAN	DATE: 03/22/10
ENG. BY: A. DUMAS	DATE:
APP. BY: JL	DATE:
SHEET NO. 5-3	
DRAWING NO.:	REV.:
SKBR01	P

REV	BY	DATE	DESCRIPTION	APP. BY	DATE
P	RRG	10/31/12	CHANGED WIRE FROM #22 TO #18	LJL	10/31/12
N	RRG	6/8/12	ADDED NOTES	LJL	6/8/12
M	JJ	11/16/11	CORRECTED LINETYPES	LJL	11/16/11
L	RRG	04/25/11	UPDATED SCHEMATICS PER CUSTOMER REQ.	LJL	04/25/11





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CUSTOMER:  
**KELLOGG  
 BROWN & ROOT  
 FEMA (PEP)  
 EXPANSION PROGRAM**

PROJECT:  
**10'-0" X 14'-0"  
 CONCRETE SHELTER  
 ELECTRICAL PANEL CALC  
 PRE HEMP**

FILENAME:  
**KBR/SKBR01**  
 SCALE: N.T.S. TOLERANCE:  
 DRWN. BY: D. CHRISTOPHE DATE: 03/22/10  
 CHK. BY: G. BRINKMAN DATE: 03/22/10  
 ENG. BY: A. DUMAS  
 APP. BY: JI

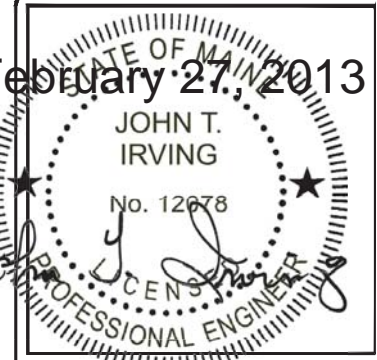
SHEET NO.  
**5-4**  
 DRAWING NO.: **SKBR01** REV.: **P**

PANEL NAME:		PANEL "B"														
PRE HEMP LOADING FED FROM PANEL "A"	VOLTAGE:	208	/	120											MAIN BREAKER:	Y
	PHASE:	3											LUGS ONLY:			
	WIRE:	4											SURFACE:	Y		
	BUS AMPS:	150	150	:MAIN CB AMPS										FLUSH:		
	SUPPLY AMPS:	25											GROUND BUS:	Y		
	MIN. SHORT CIRCUIT RATING:	10000											ISOLATED GROUND BUS:			
INCLUDE SPARE CAP. - Y/N:	N											NEUTRAL BUS:	Y			
SERVES	LTG	RCPT	PWR	MOT	CB *	CKT	PH	CKT	CB *	LTG	RCPT	PWR	MOT	SERVES		
MAIN BREAKER					150	1	A	2						NOT USABLE		
MAIN BREAKER					[	3	B	4						NOT USABLE		
MAIN BREAKER					[	5	C	6						NOT USABLE		
Not Usable					[	7	A	8						NOT USABLE		
Not Usable					[	9	B	10						NOT USABLE		
Not Usable					[	11	C	12						NOT USABLE		
GENERATOR FUEL ALARMS			60		20	13	A	14	20		720			RECEPT		
						15	B	16								
GENERATOR FUEL PUMP			1728		20	17	C	18	15		120			SMOKE / HEAT DETECTORS		
FENERATOR ALTERNATOR HTR.			200		20	19	A	20	20		192			BATTERY CHARGER		
GENERATOR RM LIGHTING	256				15	21	B	22	[		1000			GENERATOR BLOCK HTR (CONVIENCE)		
			64			23	C	24	20		636			RECEPT(AIR COMP, OPTICAL ENCODER)		
1 PANEL C SEE NOTE 1					90	25	A	26	30		60			TVSS		
1 PANEL C SEE NOTE 1					[	27	B	28	[		60			TVSS		
1 PANEL C SEE NOTE 1					[	29	C	30	[		60			TVSS		
CONNECTED VA			A:	1,232	B:	1,316	C:	2,608								
CONNECTED KVA:					D.F.	DEMAND KVA:				AMPS	KVA					
LIGHTING LOAD:	0.3				1.25	0.3			25.0	9.0	DESIGN (BASED ON SUPPLY)					
RECEPT. LOAD - FIRST 10 KVA:	0.7				1.00	0.7			14.3	5.2	CONNECTED					
RECEPT. LOAD - REMAINDER:	0.0				0.50	0.0			10.5	3.8	SPARE					
POWER LOAD:	4.2				1.00	4.2		AVG								
MOTOR LOAD EXCEPT LARGEST:	0.0				1.00	0.0		KVA	AMPS	KVA	CONNECTED					
LARGEST MOTOR:	0.0				1.25	0.0		1.7	10	1.2	PHASE A					
20% SPARE CAPACITY:	0.0				1.00	0.0			11	1.3	PHASE B					
TOTAL CONNECTED LOAD:	5.2			TOTAL DEMAND LOAD:	5.2				22	2.6	PHASE C					
<b>INSTRUCTIONS:</b>										PHASE LOAD						
* - ALL BRANCH CIRCUIT BREAKERS ARE 1P20 UNLESS OTHERWISE SHOWN										72% PHASE A						
[- DENOTES ADDITIONAL POLES OF MULTI-POLE CIRCUIT BREAKERS										77% PHASE B						
<b>NOTES:</b>										87% PHASE C						
1 This circuit will not be connected in the "PRE-HEMP" stage and are shown for information purposes.																
2 The circuit breaker shall have red identification and labeled as "FIRE ALARM CIRCUIT".																

P	LJL	12/11/12	ADDED NOTE 2, UPDATED SPREADSHEET	LJL	12/11/12
N	RRG	6/8/12	UPDATED TO MATCH SHEET 5-0	LJL	6/8/12
M	JJ	7/25/11	UPDATED LINETYPES	LJL	7/25/11
L	RRG	04/25/11	UPDATED DISPLAY	LJL	04/25/11
REV	BY	DATE	DESCRIPTION	APP. BY	DATE



February 27, 2013



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CUSTOMER:  
**KELLOGG BROWN & ROOT**  
 FEMA (PEP)  
 EXPANSION PROGRAM

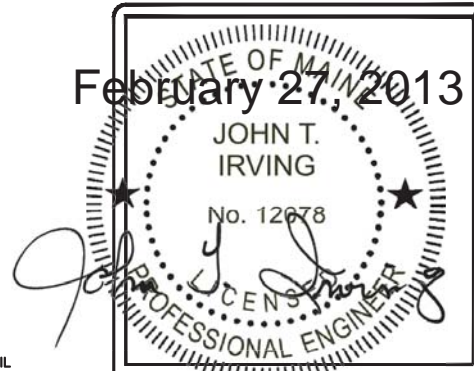
PROJECT:  
 10'-0" X 14'-0"  
 CONCRETE SHELTER  
 ELECTRICAL PANEL CALC  
 POST HEMP

FILENAME: KBR/SKBR01	
SCALE: N.T.S.	TOLERANCE:
DRWN. BY: D. CHRISTOPHE	DATE: 03/22/10
CHK. BY: G. BRINKMAN	DATE: 03/22/10
ENG. BY: A. DUMAS	DATE:
APP. BY: JL	DATE:
SHEET NO. 5-5	
DRAWING NO.:	REV.:
SKBR01	P

PANEL NAME:		PANEL "B"														
NOTES:	POST HEMP LOADING FED FROM GENERATOR	VOLTAGE:	208	/	120	MAIN BREAKER:						Y				
		PHASE:	3	LUGS ONLY:												
		WIRE:	4	SURFACE:						Y						
		BUS AMPS:	150	150	:MAIN CB AMPS						FLUSH:					
		SUPPLY AMPS:	150	GROUND BUS:						Y						
		MIN. SHORT CIRCUIT RATING:	10000	ISOLATED GROUND BUS:												
	INCLUDE SPARE CAP. - Y/N:	N	NEUTRAL BUS:						Y							
	SERVES	LTG	RCPT	PWR	MOT	CB *	CKT	PH	CKT	CB *	LTG	RCPT	PWR	MOT	SERVES	NOTES:
	MAIN BREAKER					150	1	A	2							NOT USABLE
	MAIN BREAKER					[	3	B	4							NOT USABLE
	MAIN BREAKER					[	5	C	6							NOT USABLE
	NOT USABLE					[	7	A	8							NOT USABLE
	NOT USABLE					[	9	B	10							NOT USABLE
	NOT USABLE					[	11	C	12							NOT USABLE
	GENERATOR FUEL ALARMS			60		20	13	A	14	20		720				RECEPT.
							15	B	16							
	GENERATOR FUEL PUMP/ TM MODULE			1728		20	17	C	18	15		120				SMOKE / HEAT DETECTORS
	GENERATOR ALTERNATOR HTR.					20	19	A	20	20						BATTERY CHARGER
	GENERATOR RM LIGHTING	256				15	21	B	22	[						GENERATOR BLOCK HTR (CONVIENCE)
							23	C	24	20		636				RECEPT(AIR COMP & OPTICAL ENCODER)
	PANEL C			7872		90	25	A	26	30		60				TVSS
	PANEL C			7642		[	27	B	28	30		60				TVSS
	PANEL C			7812		[	29	C	30	30		60				TVSS
	CONNECTED VA	A:		8,712	B:	7,958	C:	10,356								
	CONNECTED KVA:				D.F.	DEMAND KVA:					AMPS	KVA				DESIGN (BASED ON SUPPLY)
	LIGHTING LOAD:	0.3			1.25	0.3					150.0	54.0				CONNECTED
	RECEPT. LOAD - FIRST 10 KVA:	0.7			1.00	0.7					75.0	27.0				DEMAND
	RECEPT. LOAD - REMAINDER:	0.0			0.50	0.0					74.8	26.9				SPARE
	POWER LOAD:	26.1			1.00	26.1			AVG							
	MOTOR LOAD EXCEPT LARGEST:	0.0			1.00	0.0			KVA		AMPS	KVA				CONNECTED
	LARGEST MOTOR:	0.0			1.25	0.0		9.0			73	8.7				PHASE A
	20% SPARE CAPACITY:	0.0			1.00	0.0					66	8.0				PHASE B
	TOTAL CONNECTED LOAD:	27.0									86	10.4				PHASE C
	TOTAL DEMAND LOAD:					27.1										
	INSTRUCTIONS:								PHASE							
	* - ALL BRANCH CIRCUIT BREAKERS ARE 1P20 UNLESS OTHERWISE SHOWN								LOAD							PHASE BALANCE
	[ - DENOTES ADDITIONAL POLES OF MULTI-POLE CIRCUIT BREAKERS								48%			97%				PHASE A
	NOTES:								44%			88%				PHASE B
	1 The circuit breaker shall have red identification and labeled as "FIRE ALARM CIRCUIT".								57%			115%				PHASE C

P	LJL	12/11/12	ADDED NOTE 1, UPDATED SPREADSHEET	LJL	12/11/12
N	RRG	6/8/12	UPDATED TO MATCH SHEET 5-0	LJL	6/8/12
L	RRG	04/25/11	UPDATED LINETYPES	LJL	04/25/11
REV	BY	DATE	DESCRIPTION	APP. BY	DATE

February 27, 2013



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CUSTOMER:  
**KELLOGG BROWN & ROOT FEMA (PEP) EXPANSION PROGRAM**

PROJECT:  
**10'-0" X 14'-0" CONCRETE SHELTER DEC 3000 WIRING SCHEMATIC**

FILENAME: KBR/SKBR01	
SCALE: N.T.S.	TOLERANCE:
DRWN. BY: D. CHRISTOPHE	DATE: 03/22/10
CHK. BY: G. BRINKMAN	DATE: 03/22/10
ENG. BY: A. DUMAS	DATE:
APP. BY: JL	DATE:
SHEET NO. 5-6	
DRAWING NO.:	REV.:
SKBR01	P

**P29 2 AMP RELAY OUTPUT (2.1) CONNECTIONS**  
 P29-NC 2.1 RELAY NORMALLY CLOSED  
 P29-COM 2.1 RELAY COMMON  
 P29-NO 2.1 RELAY NORMALLY OPEN

**P30 2 AMP RELAY OUTPUT (2.2) CONNECTIONS**  
 P30-NC 2.2 RELAY NORMALLY CLOSED  
 P30-COM 2.2 RELAY COMMON  
 P30-NO 2.2 RELAY NORMALLY OPEN

**P31 2 AMP RELAY OUTPUT (2.3) CONNECTIONS**  
 P31-NC 2.3 RELAY NORMALLY CLOSED  
 P31-COM 2.3 RELAY COMMON  
 P31-NO 2.3 RELAY NORMALLY OPEN

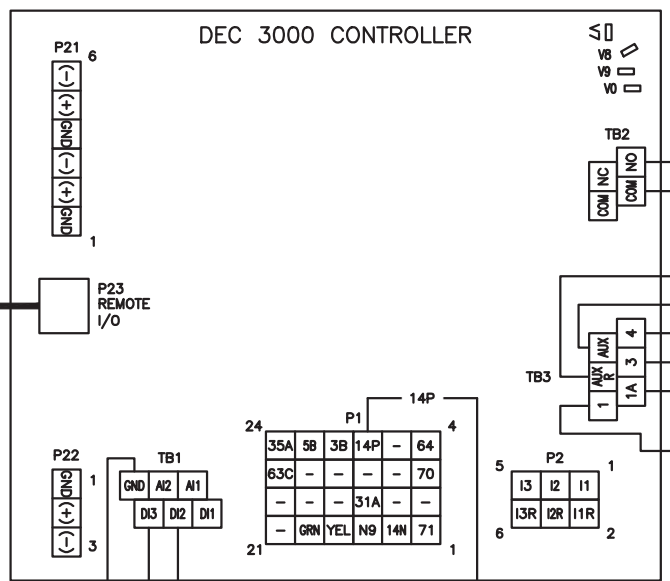
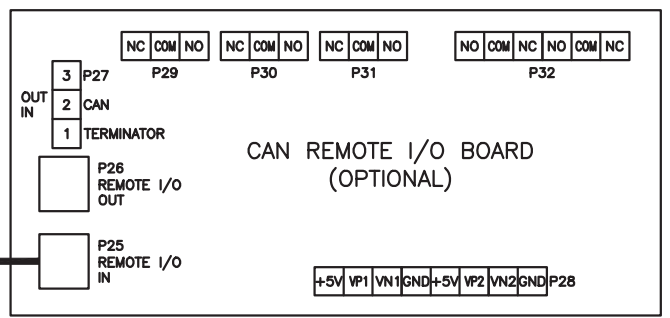
**P32 10 AMP RELAY OUTPUT (2.4 & 2.5) CONNECTIONS**  
 P32-NO 2.4 RELAY NORMALLY OPEN  
 P32-COM 2.4 RELAY COMMON  
 P32-NC 2.4 RELAY NORMALLY CLOSED  
 P32-NO 2.5 RELAY NORMALLY OPEN  
 P32-COM 2.5 RELAY COMMON  
 P32-NC 2.5 RELAY NORMALLY CLOSED

**P27 CAN TERMINATOR CONNECTIONS**  
 PLACE THE P27 JUMPER ON THE "IN" PINS

**P28 SINGLE-ENDED (0-5V) ANALOG INPUT CONNECTIONS**  
 P28-GND AGND ANALOG RETURN  
 P28-VN2 NO CONNECTION  
 P28-VP2 ACH2 SIGNAL  
 P28-+5V SUPPLY (0.05 AMP MAX)  
 P28-GND AGND ANALOG RETURN  
 P28-VN1 NO CONNECTION  
 P28-VP1 ACH1 SIGNAL  
 P28-+5V SUPPLY (0.05 AMP MAX)

**P28 DIFFERENTIAL (+/-3V) ANALOG INPUT CONNECTIONS**  
 P28-GND AGND ANALOG REFERENCE  
 P28-VN2 ACH2 NEGATIVE DIFFERENTIAL SIGNAL  
 P28-VP2 ACH2 POSITIVE DIFFERENTIAL SIGNAL  
 P28-+5V SUPPLY (0.05 AMP MAX)  
 P28-GND AGND ANALOG RETURN  
 P28-VN1 ACH1 NEGATIVE DIFFERENTIAL SIGNAL  
 P28-VP1 ACH1 POSITIVE DIFFERENTIAL SIGNAL  
 P28-+5V SUPPLY (0.05 AMP MAX)

NOTE: CONTACT AUTHORIZED DISTRIBUTOR TO DEFINE P28 A/D INPUTS.



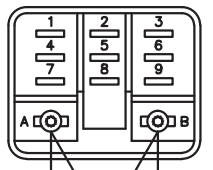
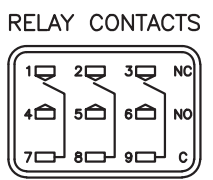
**P21 RS485 NON-ISOLATED CONNECTIONS**  
 P21-1 GND  
 P21-2 +  
 P21-3 -  
 P21-4 GND  
 P21-5 +  
 P21-6 -

**TB1 ANALOG/DIGITAL INPUT FACTORY SETTINGS**  
 TB1-DI1 DCH1 NO FUNCTION  
 TB1-DI2 DCH2 AUX WARNING  
 TB1-DI3 DCH3 BATTERY CHARGER FAULT WARNING  
 TB1-A11 ACH1 NO FUNCTION  
 TB1-A12 ACH2 NO FUNCTION  
 TB1-GND A/DGND ANALOG/DIGITAL RETURN

NOTE: TB1 A/D INPUTS MAY BE REDEFINED - FACTORY DEFAULTS LISTED. CONTACT AUTHORIZED DISTRIBUTOR FOR DETAILS.

**TB2 RELAY OUTPUT**  
 TB2-COM (RELAY COMMON) COMMON FAULT  
 TB2-COM (RELAY COMMON) COMMON FAULT  
 TB2-NO (RELAY NORMALLY OPEN) COMMON FAULT  
 TB2-NC (RELAY NORMALLY CLOSED) COMMON FAULT

NOTE: TB2 RELAY OUTPUT MAY BE REDEFINED - FACTORY DEFAULT LISTED. CONTACT AUTHORIZED DISTRIBUTOR FOR DETAILS. CUSTOMER TO CONNECT TO TB2 UNLESS SHUNT TRIP IS USED. IF SHUNT TRIP IS USED, CUSTOMER TO CONNECT TO DCB2 FOR COMMON FAULT.



TB10-8 (70): BATTERY VOLTAGE PRESENT ONLY WHEN GENERATOR IS OPERATING

NOTE: IF SHUNT TRIP OR FAILURE RELAY IS NOT USED, DISCONNECT & TAPE LEADS 2 & 32A.

NOTE: TRANSFER SWITCH TERMINAL DESIGNATIONS MAY VARY FROM THOSE SHOWN HERE. VERIFY THE CORRECT DESIGNATIONS USING THE APPROPRIATE TRANSFER SWITCH WIRING DIAGRAM.

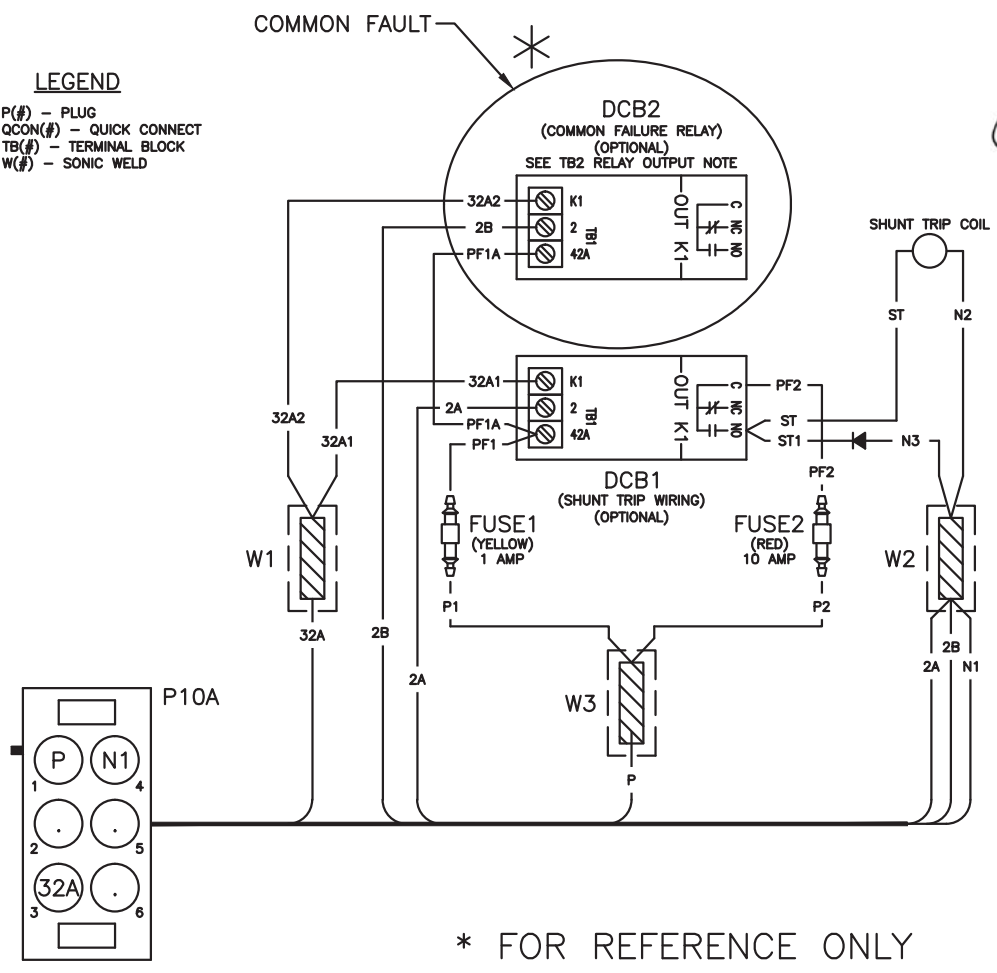
(TERMINALS 3 AND 4: REMOTE START SWITCH OR ENGINE START CONTACTS ON TRANSFER SWITCH)

INSTALLATION NOTE:  
 FOR FIELD INSTALLATION A MAXIMUM OF TWO WIRE TERMINALS PER TERMINAL STRIP SCREW IS RECOMMENDED UNLESS OTHERWISE NOTED ON THE WIRING DIAGRAM. DO NOT EXTEND ABOVE THE TERMINAL STRIP BARRIER.

ANY SIGNAL CABLE SUPPLIED BY CELLXION SHALL BE 18 AWG MINIMUM.

**LEGEND**

P(#)- PLUG  
 QCON(#)- QUICK CONNECT  
 TB(#)- TERMINAL BLOCK  
 W(#)- SONIC WELD

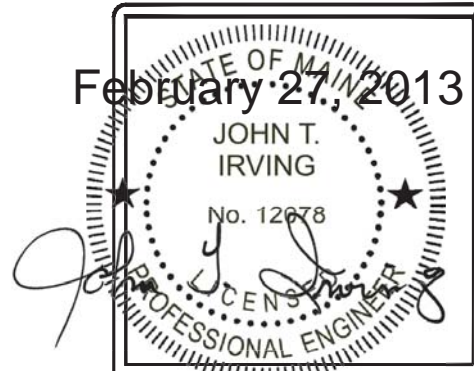


\* FOR REFERENCE ONLY

P	RRG	11/12/12	ADDED #18 AWG SIZE NOTE	LJL	11/12/12
N	RRG	6/8/12	CORRECTED SHEET TITLE	LJL	6/8/12
REV	BY	DATE	DESCRIPTION	APP. BY	DATE



February 27, 2013



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CUSTOMER:  
**KELLOGG  
 BROWN & ROOT  
 FEMA (PEP)  
 EXPANSION PROGRAM**

PROJECT:  
**10'-0" X 14'-0"  
 CONCRETE SHELTER  
 FUEL MONITORING  
 WIRING SCHEMATIC**

FILENAME: KBR/SKBR01	
SCALE: N.T.S.	TOLERANCE:
DRWN. BY: D. CHRISTOPHE	DATE: 03/22/10
CHK. BY: G. BRINKMAN	DATE: 03/22/10
ENG. BY: A. DUMAS	DATE:
APP. BY: JI	DATE:
SHEET NO. 5-7	
DRAWING NO.:	REV.:
SKBR01	P

CAUTION:  
 SUPPLY CURRENT  
 CAN BE SUM OF  
 PUMP 1 & PUMP 2  
 OUTPUT IF BOTH ARE  
 CONFIGURED TO RUN  
 AT THE SAME TIME.

NOTE:  
 SUPPLY VOLTAGE  
 WIRE SIZE SHOULD  
 BE BASED ON  
 PUMP MOTOR(S)  
 TOTAL LOAD.  
 SHOWN AS 120VAC  
 CONFIGURATION.  
 CKT 17

FUEL SUPPLY DEVICES

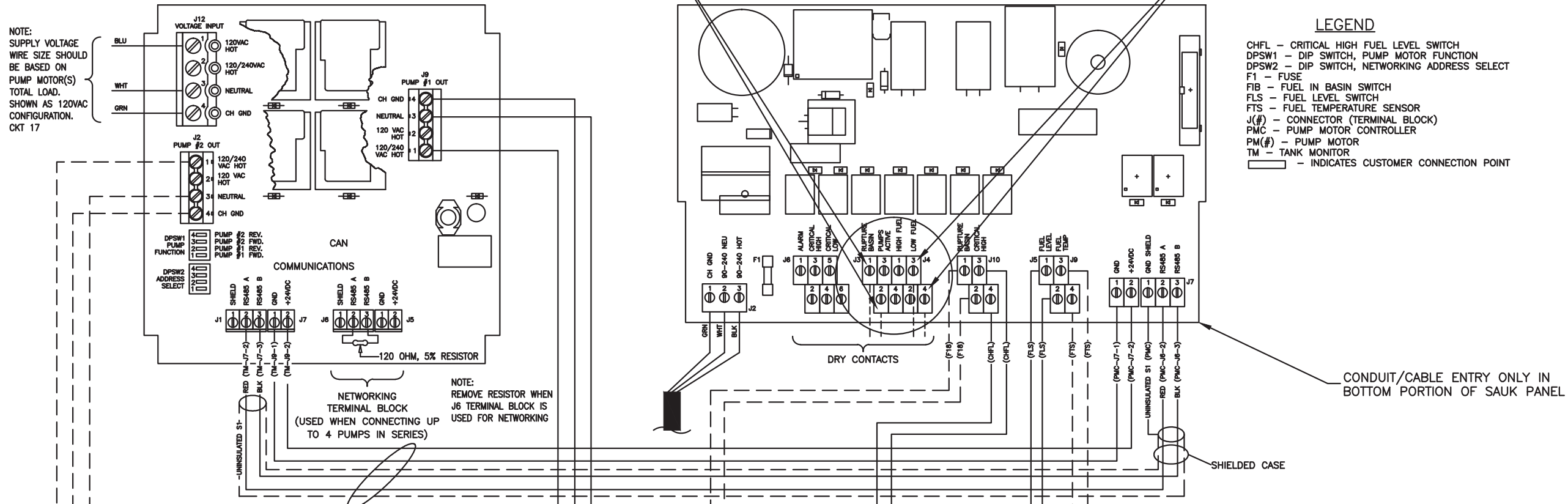
RUPTURE BASIN

FUEL MONITORING DEVICES

LOW FUEL

LEGEND

- CHFL - CRITICAL HIGH FUEL LEVEL SWITCH
- DPSW1 - DIP SWITCH, PUMP MOTOR FUNCTION
- DPSW2 - DIP SWITCH, NETWORKING ADDRESS SELECT
- F1 - FUSE
- FIB - FUEL IN BASIN SWITCH
- FLS - FUEL LEVEL SWITCH
- FTS - FUEL TEMPERATURE SENSOR
- J(#)- CONNECTOR (TERMINAL BLOCK)
- PMC - PUMP MOTOR CONTROLLER
- PM(#)- PUMP MOTOR
- TM - TANK MONITOR
- - INDICATES CUSTOMER CONNECTION POINT



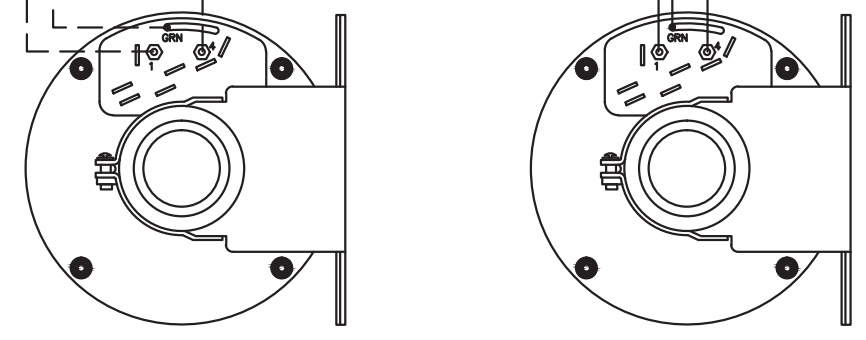
CONDUIT/CABLE ENTRY ONLY IN BOTTOM PORTION OF SAUK PANEL

FUEL DAYTANK

NOTE:  
 ALL WIRING TO BE SUPPLIED & CONNECTED (PER NEC) BY CUSTOMER. 18 GA. AWG IS RECOMMENDED FOR ALL WIRING EXCEPT SHIELDED COMMUNICATION CABLE & PUMP MOTOR/PUMP MOTOR CONTROLLER WIRING. BELDEN 87760 IS RECOMMENDED FOR COMMUNICATION WIRING. PUMP MOTOR TO PUMP MOTOR CONTROLLER WIRING AND PUMP MOTOR CONTROLLER. SUPPLY WIRING IS PENDANT ON MOTOR AMPS, DISTANCE, ETC. AND IS TO BE DETERMINED BY CUSTOMER.

FOR REFERENCE ONLY

WIRING INSTALLED BY CELLXION



PM2 (OPTIONAL)

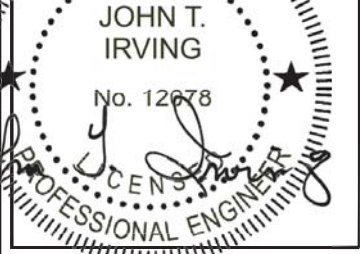
PM1

CORD PLUGS INTO UPS ON CKT 13

NOTE:  
 FIB & CHFL ARE SHOWN IN THE NORMALLY CLOSED (N.C.) POSITION ALARM WILL OCCUR WHEN FUEL FORCES CONTACTS OPEN (N.O.)

REV	BY	DATE	DESCRIPTION	APP. BY	DATE
P	LJL	12/11/12	ADDED BELDEN WIRE PART NUMBER	LJL	12/11/12
N	RRG	6/8/12	ADDED CUSTOMER SUPPLIED CORD & ADDED BELDEN #	LJL	6/8/12
M	JJ	7/25/11	ADD NOTES PER MARKUPS	LJL	7/25/11
K	AMM	2/3/11	CORRECTED J3 & J4 LOCATIONS	LJL	2/3/11

February 27, 2013



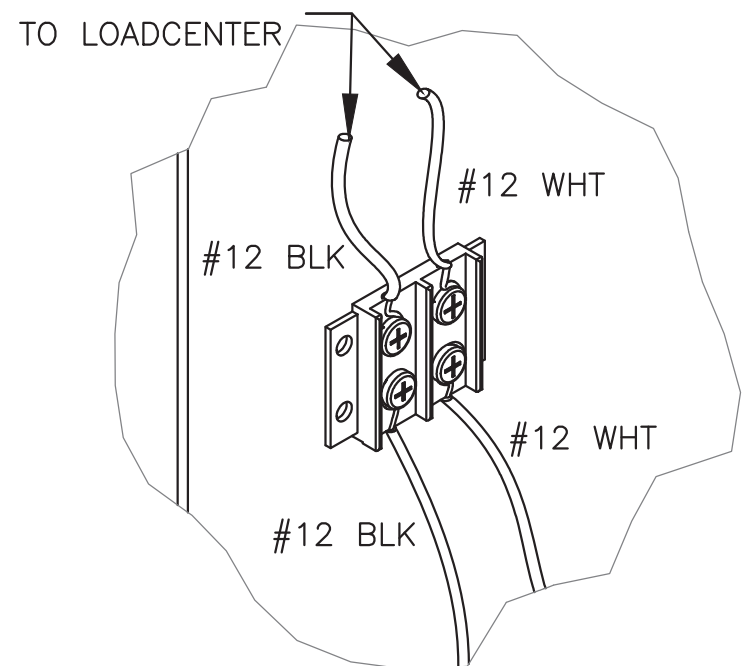
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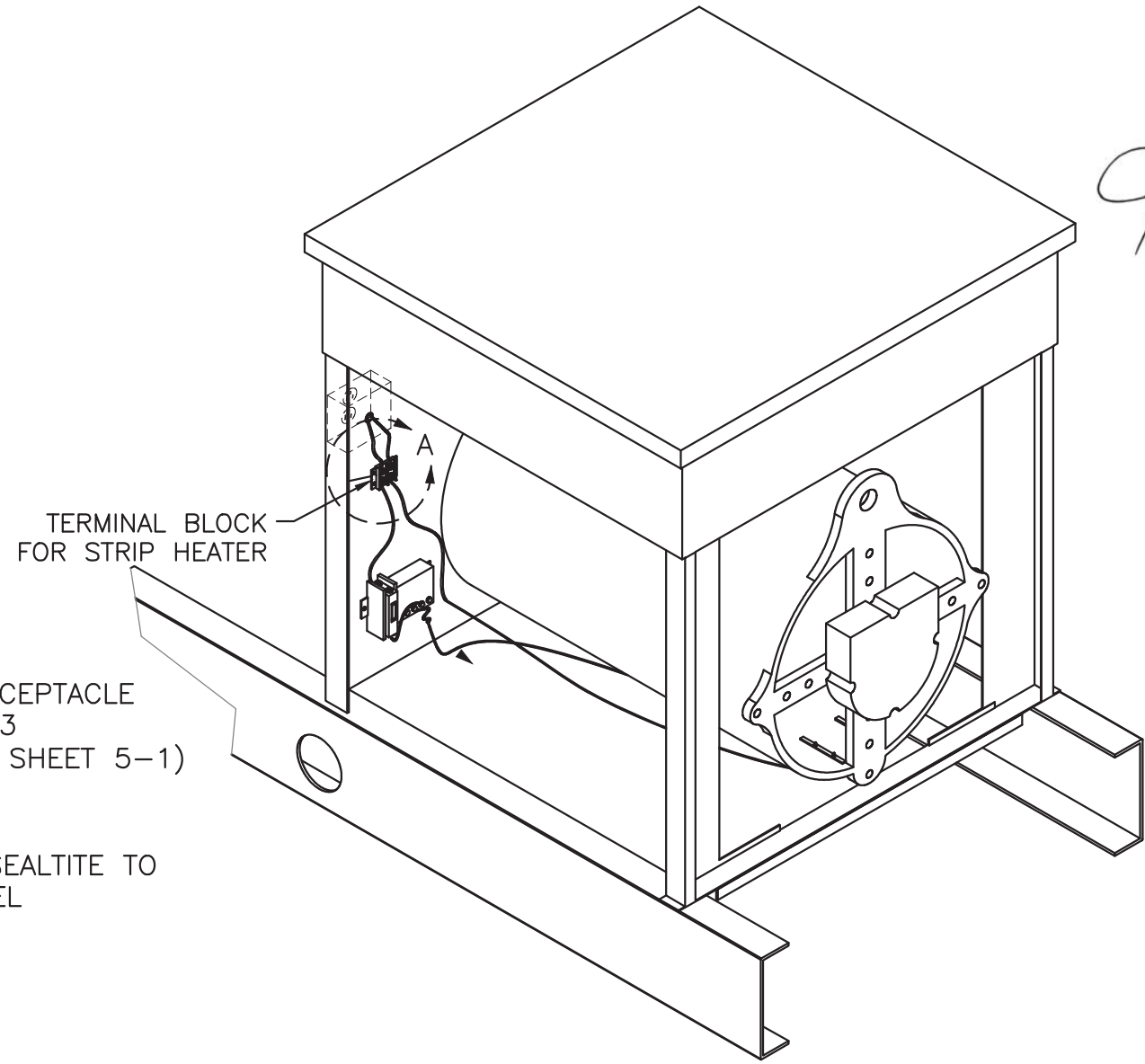
CUSTOMER:  
**KELLOGG  
 BROWN & ROOT  
 FEMA (PEP)  
 EXPANSION PROGRAM**

PROJECT:  
**10'-0" X 14'-0"  
 CONCRETE SHELTER  
 HEATER STRIP ELECT'L.  
 CONNECTION DETAIL**

FILENAME: KBR/SKBR01	
SCALE: N.T.S.	TOLERANCE:
DRWN. BY: D. CHRISTOPHE	DATE: 03/22/10
CHK. BY: G. BRINKMAN	DATE: 03/22/10
ENG. BY: A. DUMAS	DATE:
APP. BY: JI	DATE:
SHEET NO. 5-8	
DRAWING NO.:	REV.:
SKBR01	P

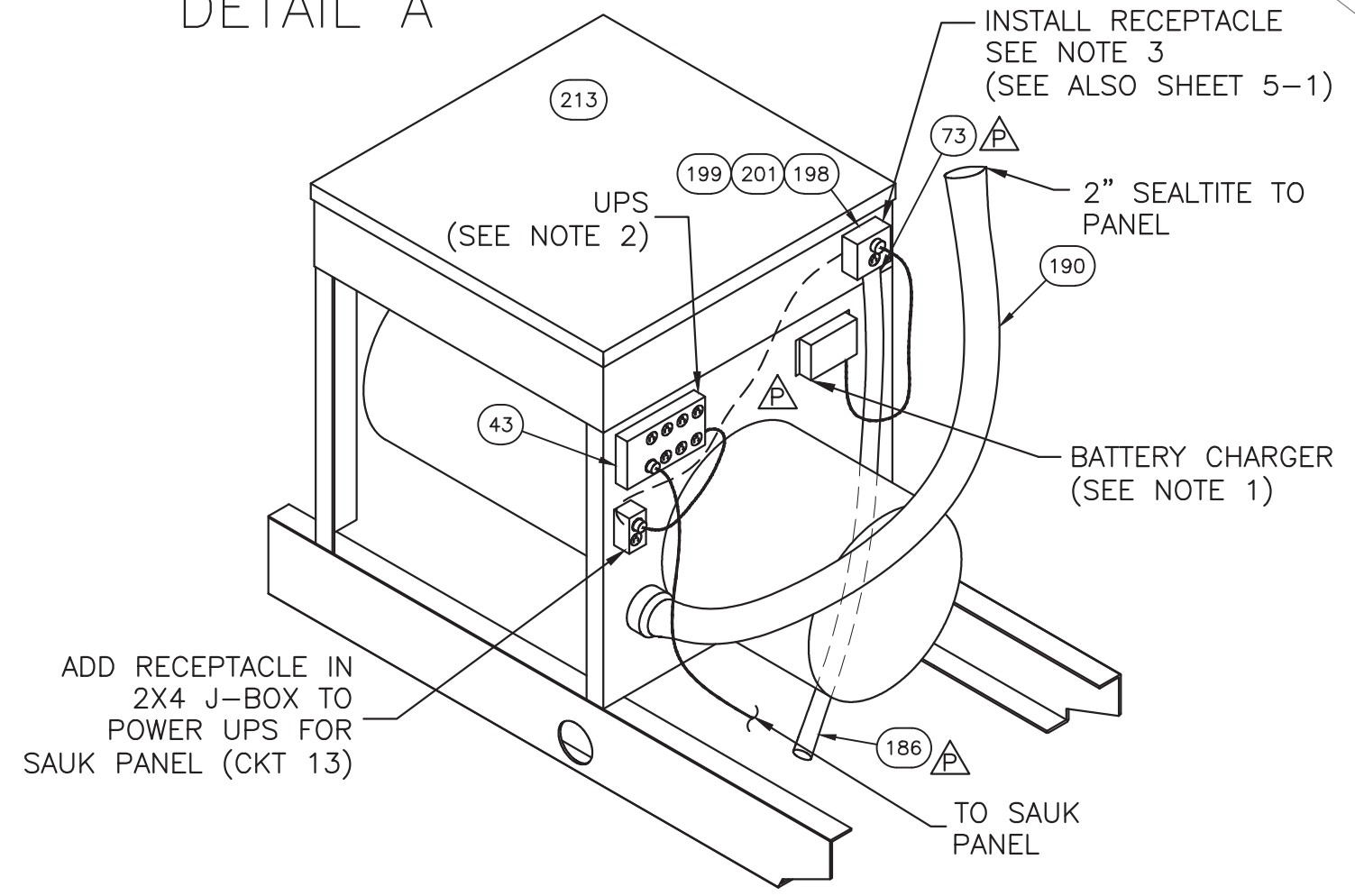


DETAIL A



HEATER STRIP DETAIL

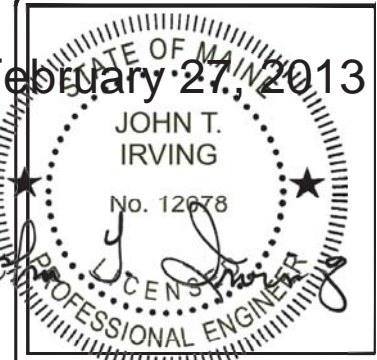
- NOTES:
1. RELOCATE FACTORY INSTALLED BATTERY CHARGER TO BE 8 3/4" DOWN & 6" IN FROM EDGE OF GENERATOR HOUSING. APPLY TOUCH UP PAINT TO HOLES FROM WHERE BATTERY CHARGER WAS REMOVED TO PREVENT RUSTING.
  2. SECURE UPS TO GENERATOR HOUSING.
  3. INSTALL RECEPTACLE J-BOX 2" DOWN AND 2" IN FROM EDGE OF GENERATOR HOUSING.



SEALTITE CONNECTION DETAIL

REV	BY	DATE	DESCRIPTION	APP. BY	DATE
P	RRG	10/31/12	CHANGED SIZE OF CONDUIT/CHANGED HEIGHT OF BATTERY CHARGER	LJL	10/31/12
N	RRG	6/8/12	ADDED UPS, RECEPTACLE, BATTERY CHARGER, & NOTES	LJL	6/8/12
M	JJ	7/25/11	ADDED BALLOON FOR GENSET	LJL	7/25/11

February 27, 2013



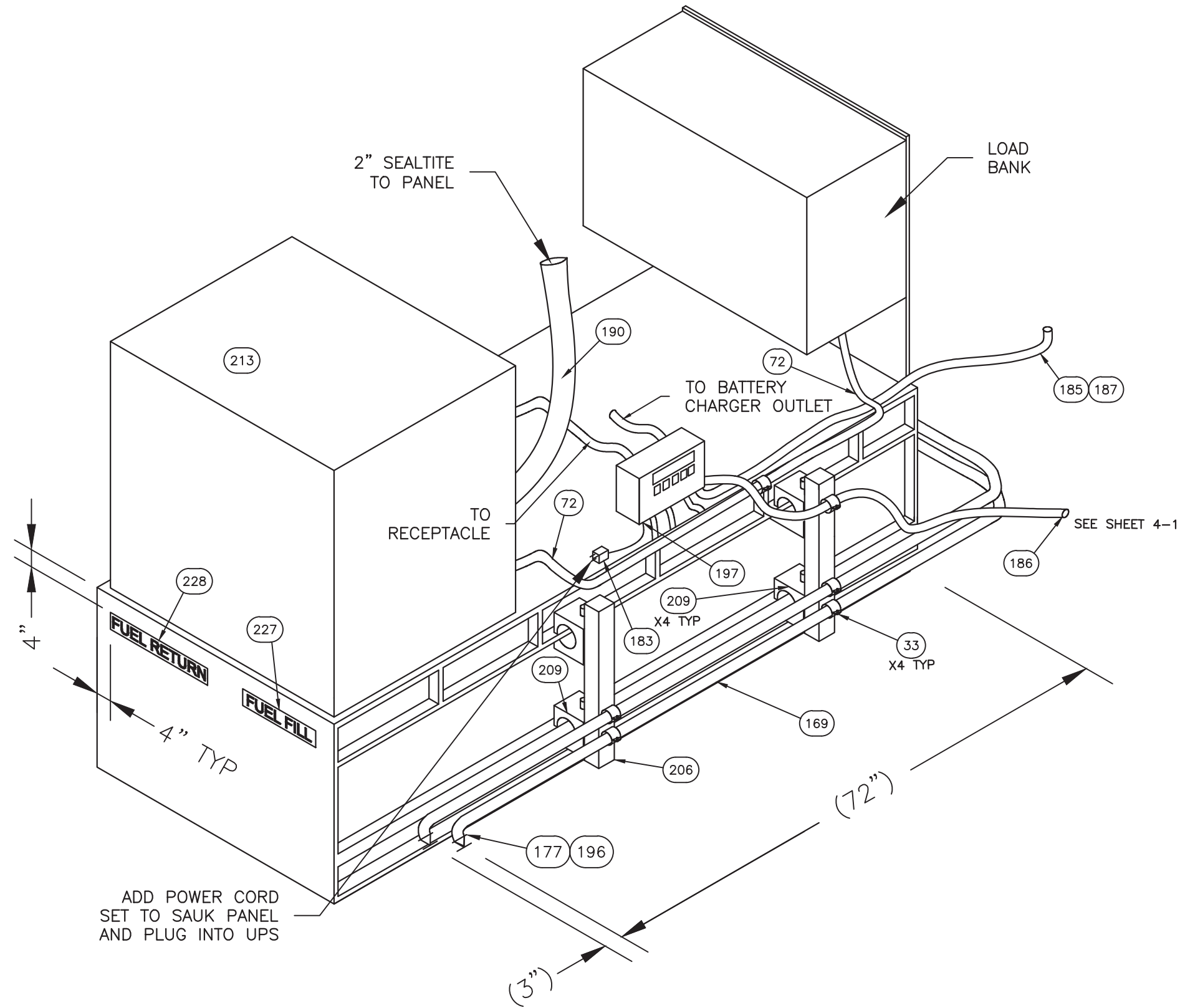
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CUSTOMER:  
**KELLOGG  
 BROWN & ROOT  
 FEMA (PEP)  
 EXPANSION PROGRAM**

PROJECT:  
**10'-0" X 14'-0"  
 CONCRETE SHELTER  
 SAUK PANEL  
 CONNECTION DETAIL**

FILENAME: KBR/SKBR01	
SCALE: N.T.S.	TOLERANCE:
DRWN. BY: D. CHRISTOPHE	DATE: 03/22/10
CHK. BY: G. BRINKMAN	DATE: 03/22/10
ENG. BY: A. DUMAS	DATE:
APP. BY: JI	DATE:
SHEET NO. 5-9	
DRAWING NO.:	REV.:
SKBR01	P



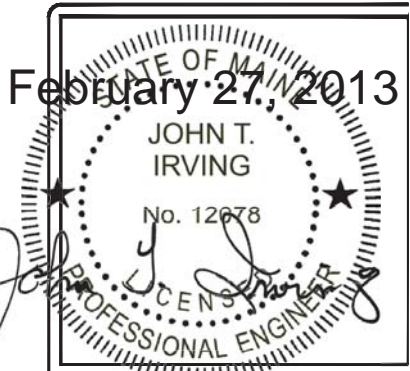
ADD POWER CORD SET TO SAUK PANEL AND PLUG INTO UPS

SAUK PANEL CONNECTION DETAIL FOR MANUFACTURING USE

REV	BY	DATE	DESCRIPTION	APP. BY	DATE
N	RRG	6/8/12	ADDED POWER CORD AND CONNECTOR/REMOVED BOX & CONDUIT	LJL	6/8/12
M	JJ	7/25/11	ADDED SIGNS & BUBBLES	LJL	7/25/11
L	RRG	04/25/11	ADDED DETAIL	LJL	04/25/11



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**KELLOGG  
 BROWN & ROOT  
 FEMA (PEP)  
 EXPANSION PROGRAM**

PROJECT:  
**10'-0" X 14'-0"  
 CONCRETE SHELTER  
 GROUND BAR  
 DETAILS**

FILENAME: KBR/SKBR01	
SCALE: N.T.S.	TOLERANCE:
DRWN. BY: D. CHRISTOPHE	DATE: 03/22/10
CHK. BY: G. BRINKMAN	DATE: 03/22/10
ENG. BY: A. DUMAS	DATE:
APP. BY: JI	DATE:
SHEET NO. 6-0	
DRAWING NO.:	REV.:
SKBR01	P

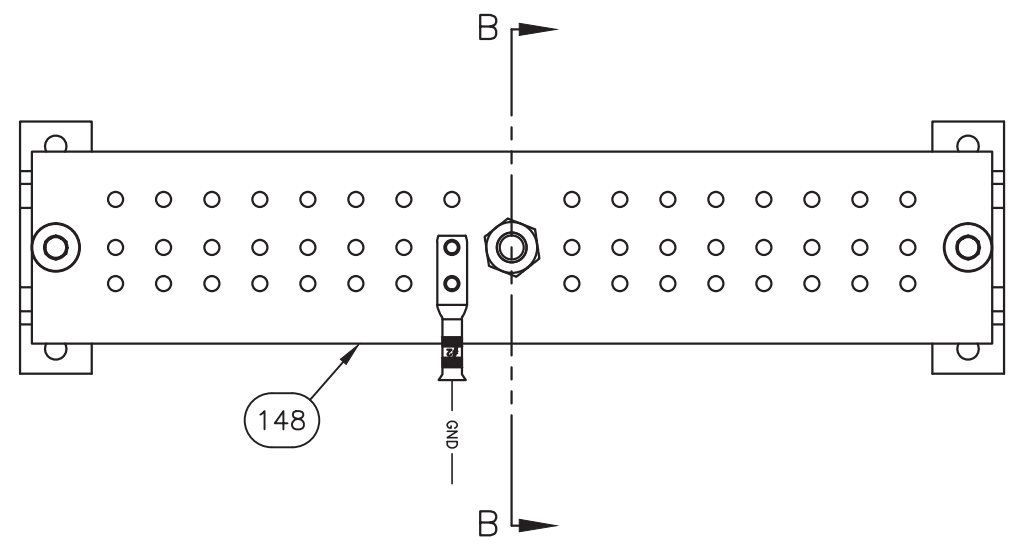
P/N 168100  
 ALL THREAD, 5/8" SOLID COPPER  
 SUPPLIED BY SHIELDING  
 SUBCONTRACTOR

P/N 510021  
 INSTALL PLASTIC  
 END CAP

P/N 163506  
 NUT, 5/8"-UNC, HEX,  
 STAINLESS STEEL

P/N 163506  
 NUT, 5/8"-UNC, HEX,  
 STAINLESS STEEL

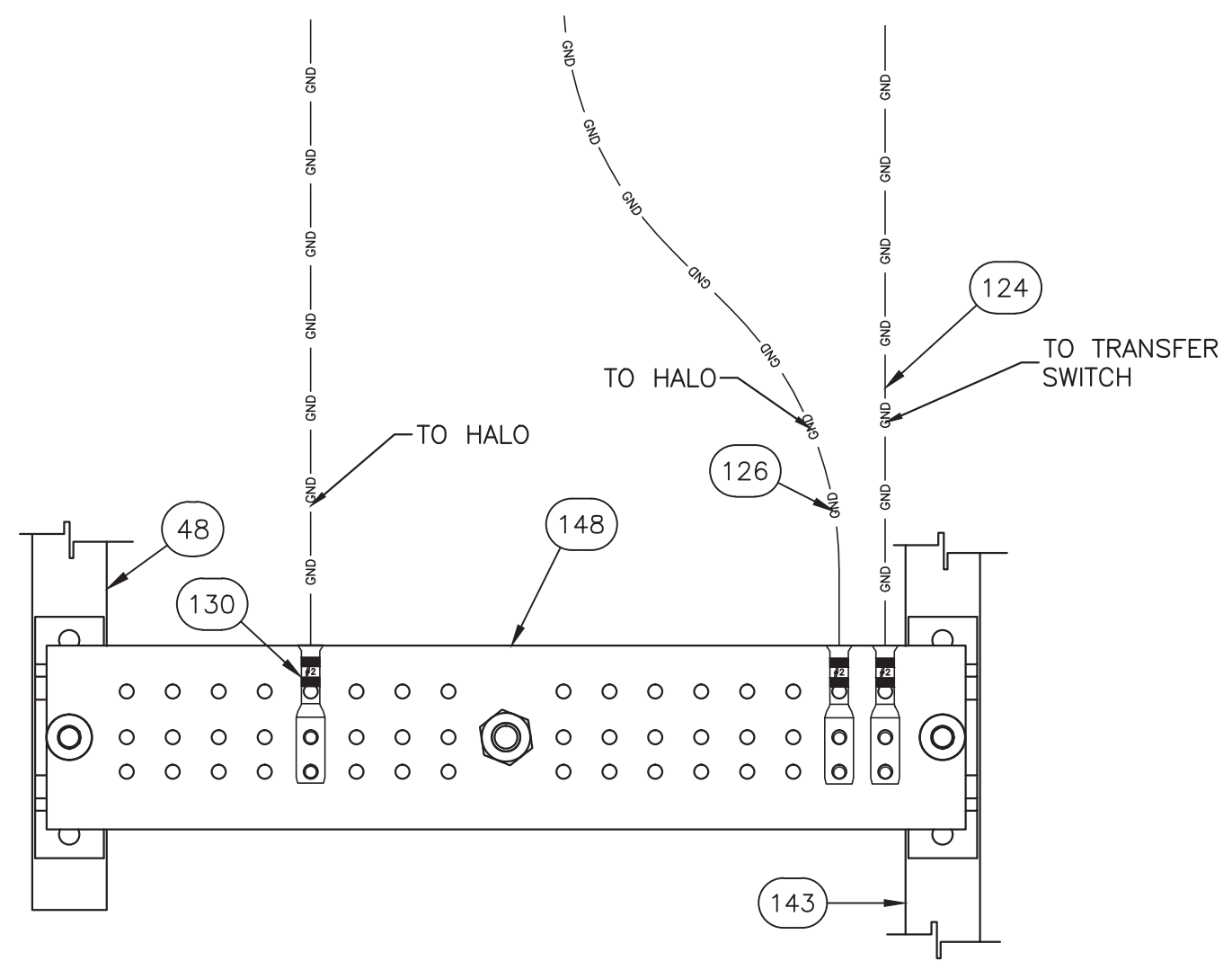
SECTION B-B



EXTERIOR GROUND BAR  
 DETAIL

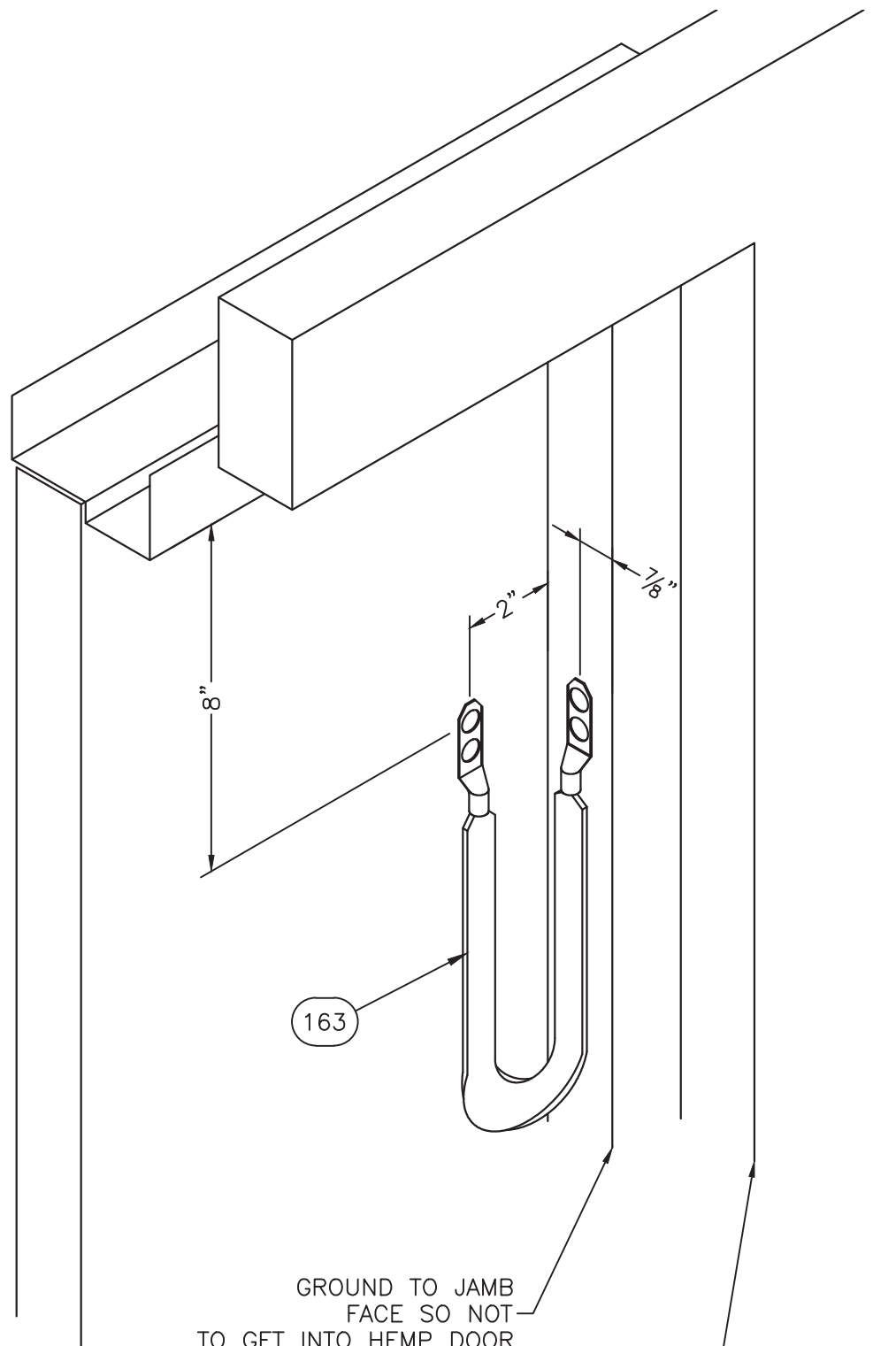
NOTE:  
 ALL EXTERIOR GROUND WIRES  
 TO BE INSTALLED BY OTHERS

REV	BY	DATE	DESCRIPTION	APP. BY	DATE
M	JJ	7/25/11	UPDATED HARDWARE TO STAINLESS STEEL	LJL	7/25/11
L	RRG	04/25/11	ADDED NOTE	LJL	04/25/11
F	MDF	08/03/10	PER MARKUPS	DB	08/03/10



INTERIOR GROUND BAR  
 DETAIL

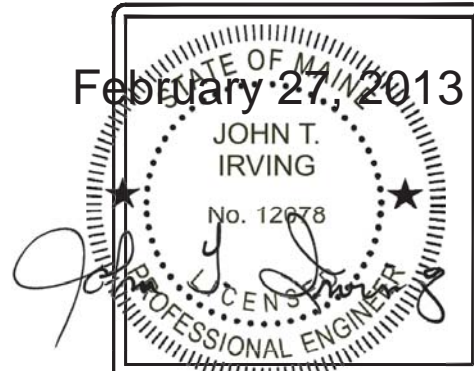
NOTE:  
 1. SEE SHEET 6-2 FOR MOUNTING DETAILS



GROUND TO JAMB  
FACE SO NOT  
TO GET INTO HEMP DOOR

INTERIOR HEMP PROTECTED DOOR  
GROUNDED TO HEMP SHIELD BUT  
ISOLATED FROM OUTSIDE DOOR.

February 27, 2013



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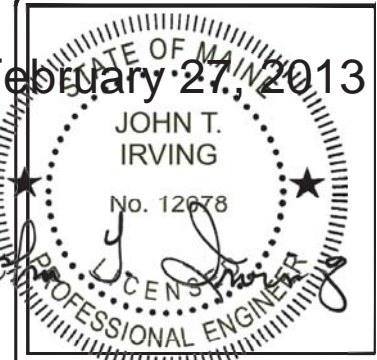
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 fax: (318) 213-2919  
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CUSTOMER:  
**KELLOGG  
 BROWN & ROOT  
 FEMA (PEP)  
 EXPANSION PROGRAM**

PROJECT:  
**10'-0" X 14'-0"  
 CONCRETE SHELTER  
 GROUND STRAP TO  
 DOOR FRAME DETAIL**

FILENAME: KBR/SKBR01	
SCALE: N.T.S.	TOLERANCE:
DRWN. BY: D. CHRISTOPHE	DATE: 03/22/10
CHK. BY: G. BRINKMAN	DATE: 03/22/10
ENG. BY: A. DUMAS	DATE:
APP. BY: JI	DATE:
SHEET NO. 6-1	
DRAWING NO.: SKBR01	REV.: P

February 27, 2013



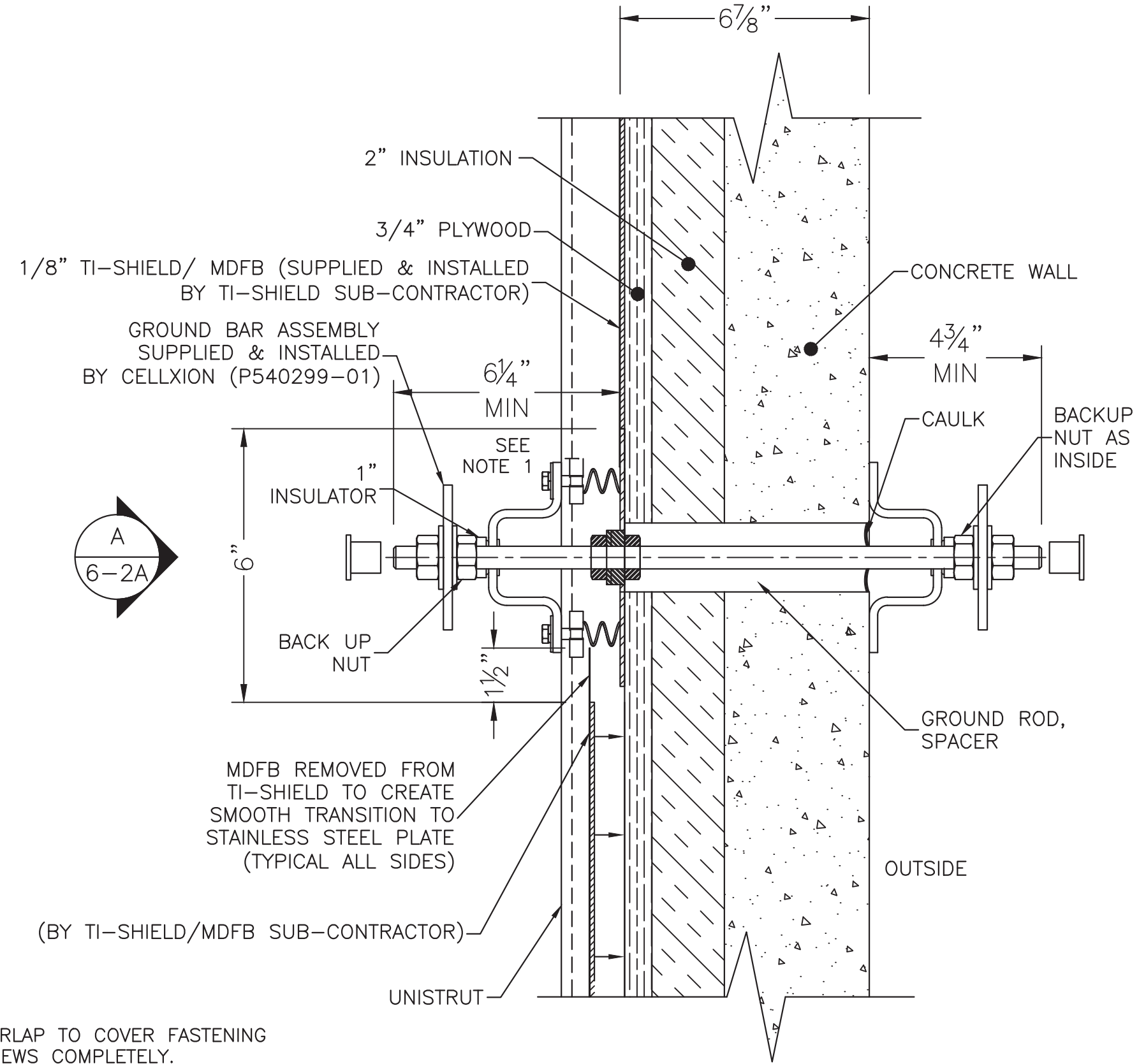
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CUSTOMER:  
**KELLOGG  
 BROWN & ROOT  
 FEMA (PEP)  
 EXPANSION PROGRAM**

PROJECT:  
**10'-0" X 14'-0"  
 CONCRETE SHELTER  
 GROUND BAR THRU  
 WALL DETAIL**

FILENAME: KBR/SKBR01	
SCALE: N.T.S.	TOLERANCE:
DRWN. BY: D. CHRISTOPHE	DATE: 03/22/10
CHK. BY: G. BRINKMAN	DATE: 03/22/10
ENG. BY: A. DUMAS	DATE:
APP. BY: JI	DATE:
SHEET NO. 6-2	
DRAWING NO.:	REV.:
SKBR01	P



NOTE:  
 1. OVERLAP TO COVER FASTENING SCREWS COMPLETELY.

1/8" TI-SHIELD/ MDFB (SUPPLIED & INSTALLED BY TI-SHIELD SUB-CONTRACTOR)

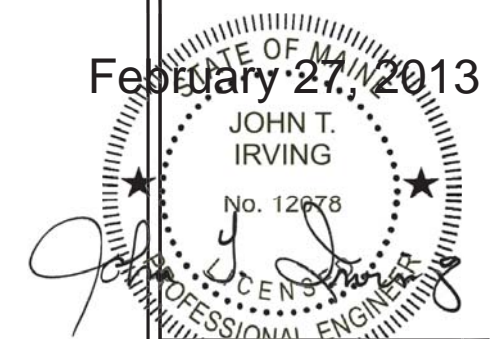
GROUND BAR ASSEMBLY SUPPLIED & INSTALLED BY CELLXION (P540299-01)

MDFB REMOVED FROM TI-SHIELD TO CREATE SMOOTH TRANSITION TO STAINLESS STEEL PLATE (TYPICAL ALL SIDES)

(BY TI-SHIELD/MDFB SUB-CONTRACTOR)

REV	BY	DATE	DESCRIPTION	APP. BY	DATE
N	RRG	6/8/12	UPDATED GROUND BAR DETAIL	LJL	6/8/12
M	JJ	7/25/11	UPDATED TO MATCH GAVEN DETAILS	LJL	7/25/11

February 27, 2013



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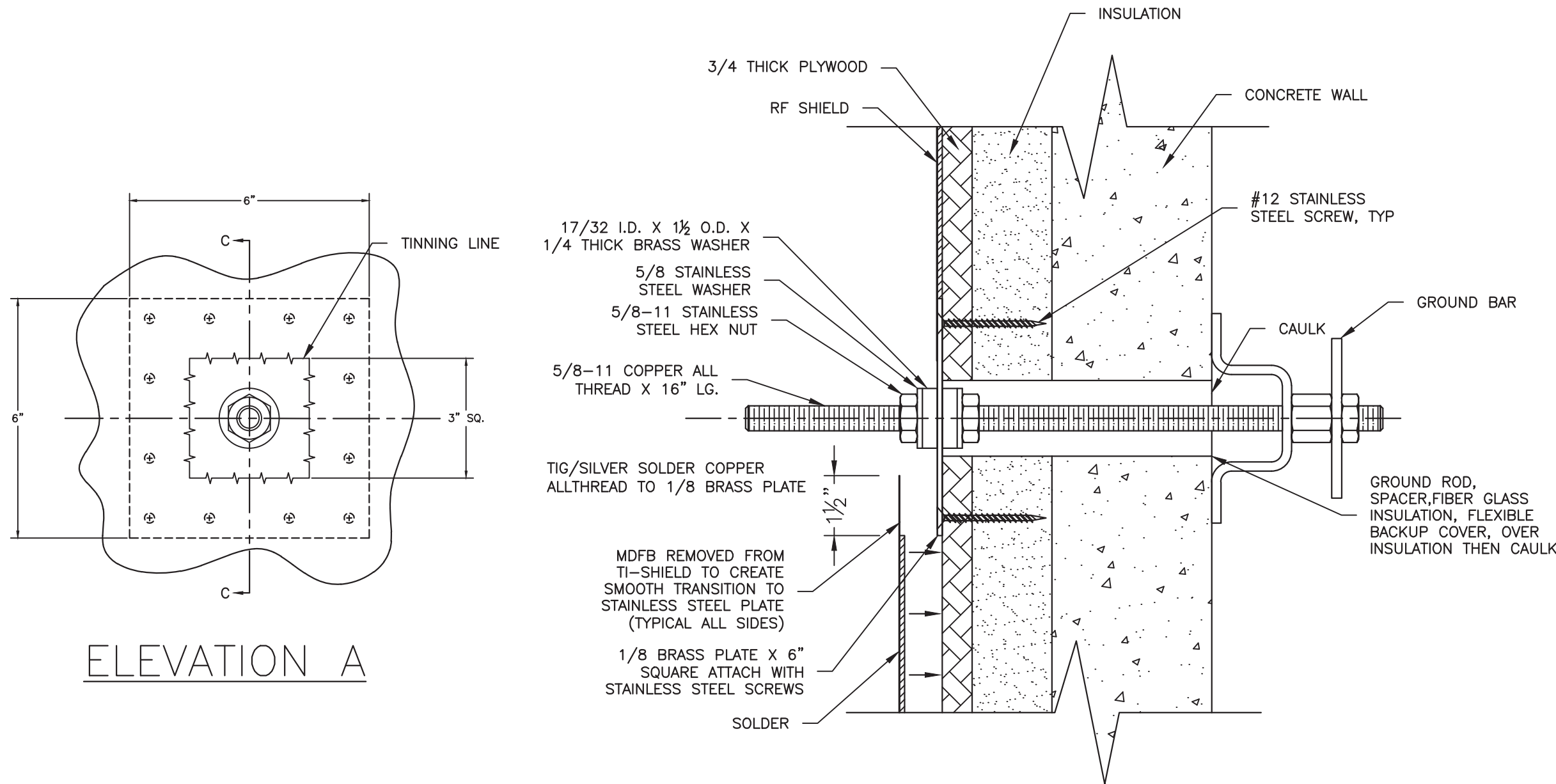
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 fax: (318) 213-2919  
 www.cellxion.com

CUSTOMER:  
**KELLOGG  
 BROWN & ROOT  
 FEMA (PEP)  
 EXPANSION PROGRAM**

PROJECT:  
**10'-0" X 14'-0"  
 CONCRETE SHELTER  
 GROUND BAR THRU  
 WALL DETAIL**

FILENAME: KBR/SKBR01	
SCALE: N.T.S.	TOLERANCE:
DRWN. BY: D. CHRISTOPHE	DATE: 03/22/10
CHK. BY: G. BRINKMAN	DATE: 03/22/10
ENG. BY: A. DUMAS	DATE:
APP. BY: JL	DATE:

SHEET NO. 6-2A	DRAWING NO.: SKBR01	REV.: P
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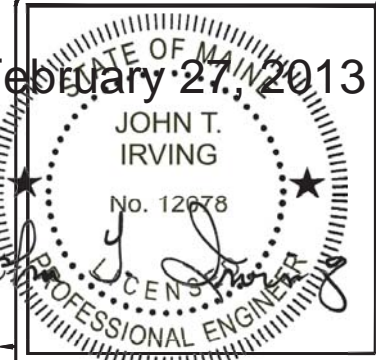
ELEVATION A

SECTION C-C

REV	BY	DATE	DESCRIPTION	APP. BY	DATE
N	RRG	6/8/12	UPDATED GROUND BAR DETAIL	LJL	6/8/12
M	JJ	7/25/11	ADDED SHEET WITH GAVEN DRAWING	LJL	7/25/11



February 27, 2013



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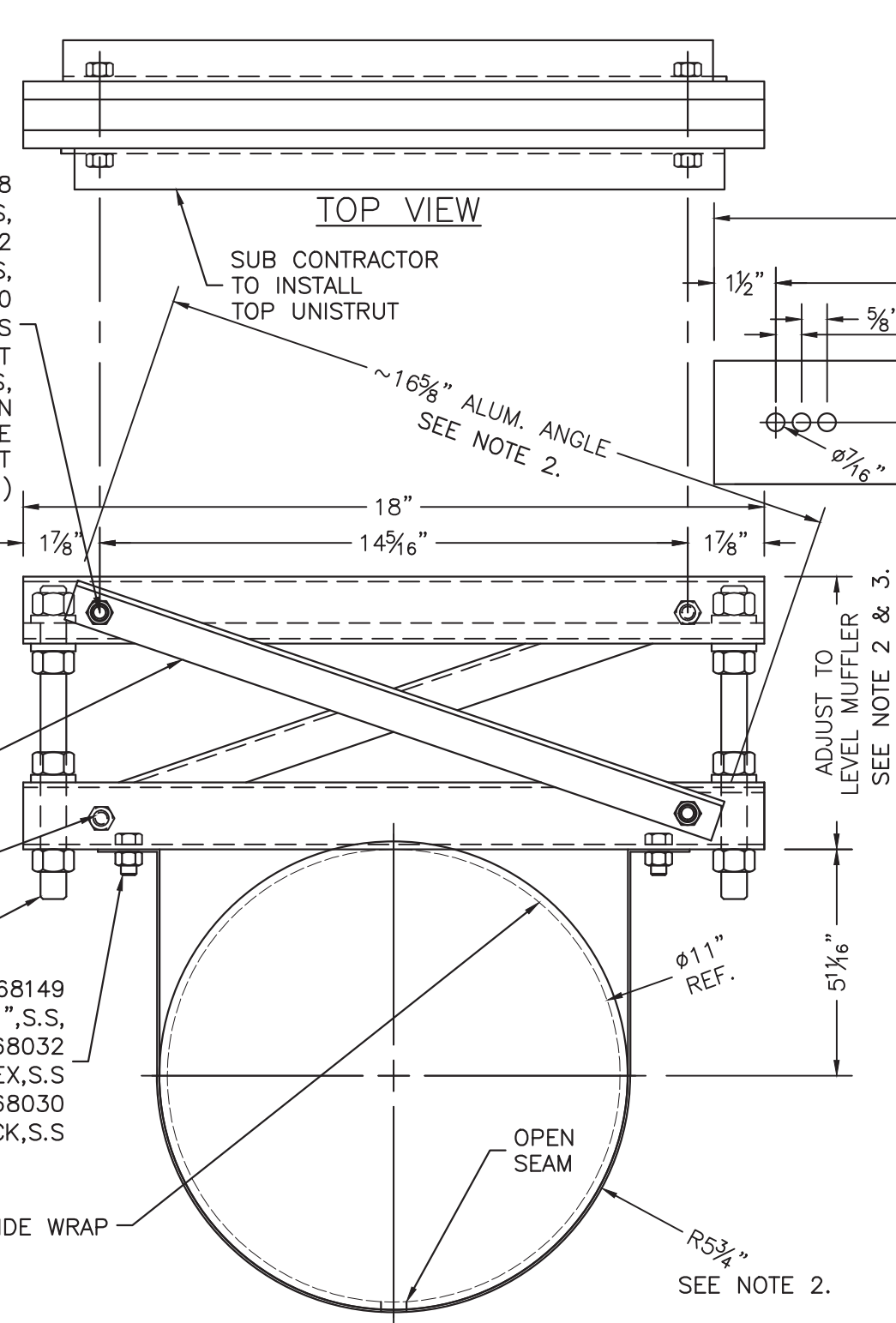
CUSTOMER:  
**KELLOGG  
 BROWN & ROOT  
 FEMA (PEP)  
 EXPANSION PROGRAM**

PROJECT:  
**10'-0" X 14'-0"  
 CONCRETE SHELTER  
 MUFFLER HANGER  
 DETAIL**

FILENAME: KBR/SKBR01	
SCALE: N.T.S.	TOLERANCE:
DRWN. BY: D. CHRISTOPHE	DATE: 03/22/10
CHK. BY: G. BRINKMAN	DATE: 03/22/10
ENG. BY: A. DUMAS	DATE:
APP. BY: JL	DATE:
SHEET NO. 6-3	
DRAWING NO.:	REV.:
SKBR01	P

- P/N 168388  
WASHER, 3/8" LOCK, S.S.
- P/N 168032  
NUT, 3/8"-UNC, HEX, S.S.
- P/N 168030  
WASHER, 3/8" LOCK, S.S.
- 3/8" HX BOLT & NUT  
TYP 4 PLACES,  
DRILL WITH ANGLES IN  
PLACE FOR HOLE  
ALIGNMENT  
(SEE SHOP NOTE 1)

- ALUM. ANGLE  
1x1x1/8  
2 EA. REQ'D.
- SEE SHOP NOTES  
1 & 3
- 5/8" ALL THD ROD  
& HEX NUT
- P/N 168149  
BOLT, 3/8"-UNCX1", S.S.
- P/N 168032  
NUT, 3/8"-UNC, HEX, S.S.
- P/N 168030  
WASHER, 3/8" LOCK, S.S.

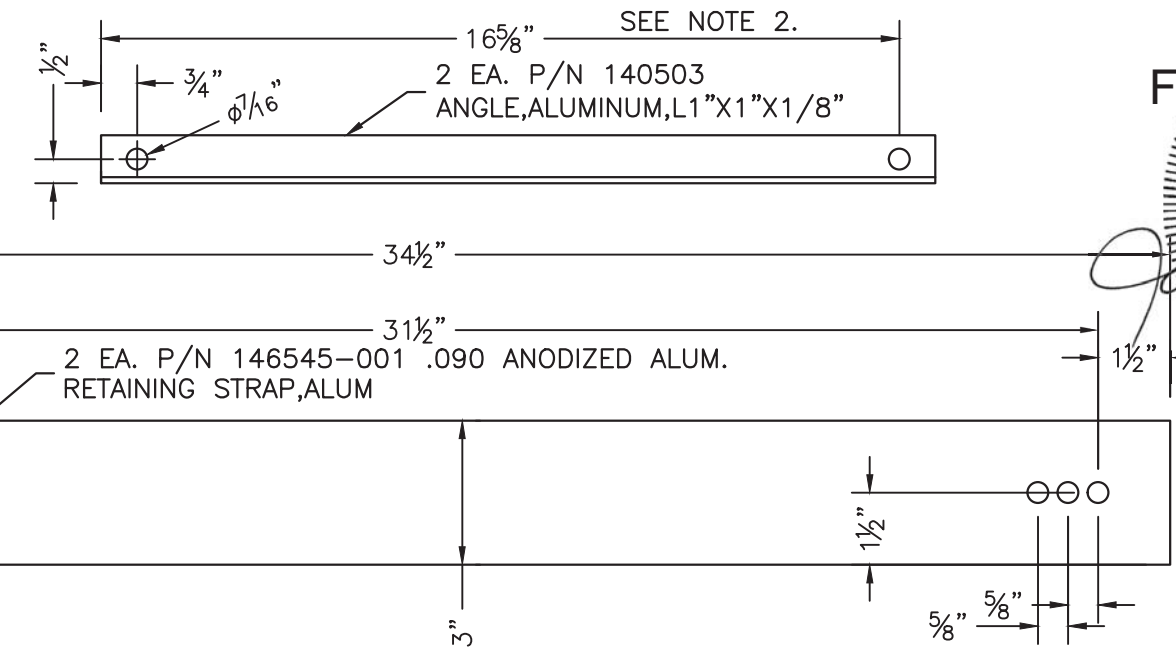


**NOTE:**

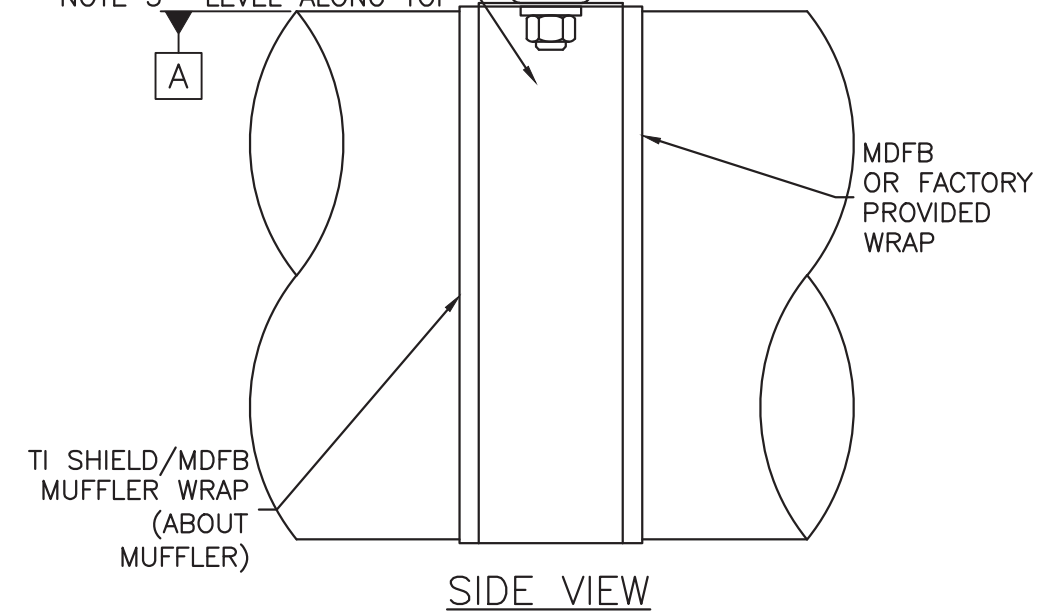
1. DO NOT PREDRILL 7/16" DIA. CLEARANCE HOLES FOR 3/8" HH BOLT UNTIL ASSEMBLY. AFTER MUFFLER IS MOUNTED (SEE NOTE 3) AND SNUGGED UP WITH MDF BOARD, LOOSELY FASTEN ALL ANGLES TO TOP UNISTRUT, THEN SWING TO POSITION ON LOWER UNISTRUT. THEN TRANSFER 7/16" DIA. HOLE LOCATION TO LOWER UNISTRUT. FINALLY SNUG UP ALL FASTENERS.

2. IF FACTORY PROVIDED MUFFLER WRAP IS USED, ADJUST 5<sup>1</sup>/<sub>16</sub> DIM & R5<sup>3</sup>/<sub>4</sub> DIM TO FIT.

3. USE SLANT LEVEL, MACHINIST'S LEVEL, OR INCLINOMETER TO ESTABLISH THAT DATUM "A" IS PARALLEL TO FLOOR. ADJUST POSITION OF LOWER UNISTRUT TO ESTABLISH ORIENTATION, THEN COMPLETE PROCESS DELINEATED IN NOTE 1.



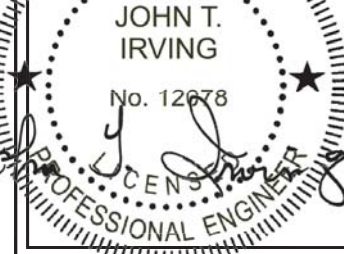
- 2 EA. FASTENER ASSEMBLY
  - 1 EA. 168390 BOLT, 5/8"X9" STAINLESS STEEL
  - 2 EA. 168390 WASHER, 5/8" FENDER, SS, 2"OD
  - 4 EA. 168329 WASHER, 5/8" FLAT, S.S.
  - 4 EA. 168212 WASHER, 5/8" LOCK, S.S.
  - 4 EA. 163506 NUT, 5/8"-UNC, HEX, STAINLESS STEEL
- 2" UNISTRUT MOUNTED TO CEILING BY SUB CONTRACTOR
- .090 ANODIZED ALUM 3" WIDE RETAINING STRAP  
NOTE 3 LEVEL ALONG TOP
- MDFB OR FACTORY PROVIDED WRAP



N	RRG	6/8/12	CORRECTED ANGLE ORIENTATION	LJL	6/8/12
L	RRG	04/25/11	ADDED NOTES	LJL	04/25/11
REV	BY	DATE	DESCRIPTION	APP. BY	DATE



February 27, 2013



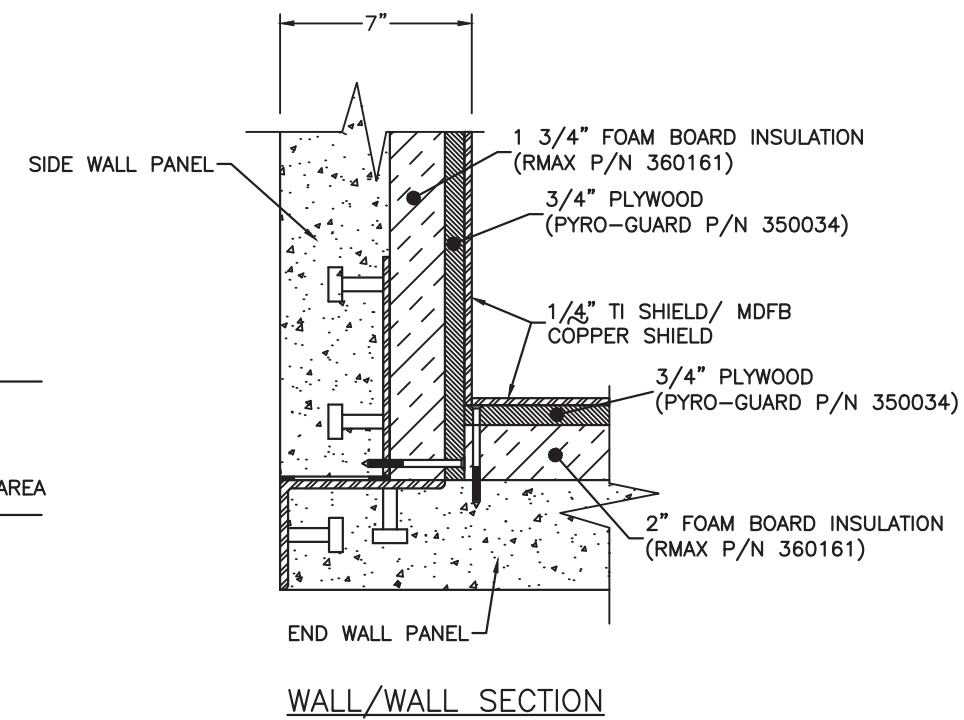
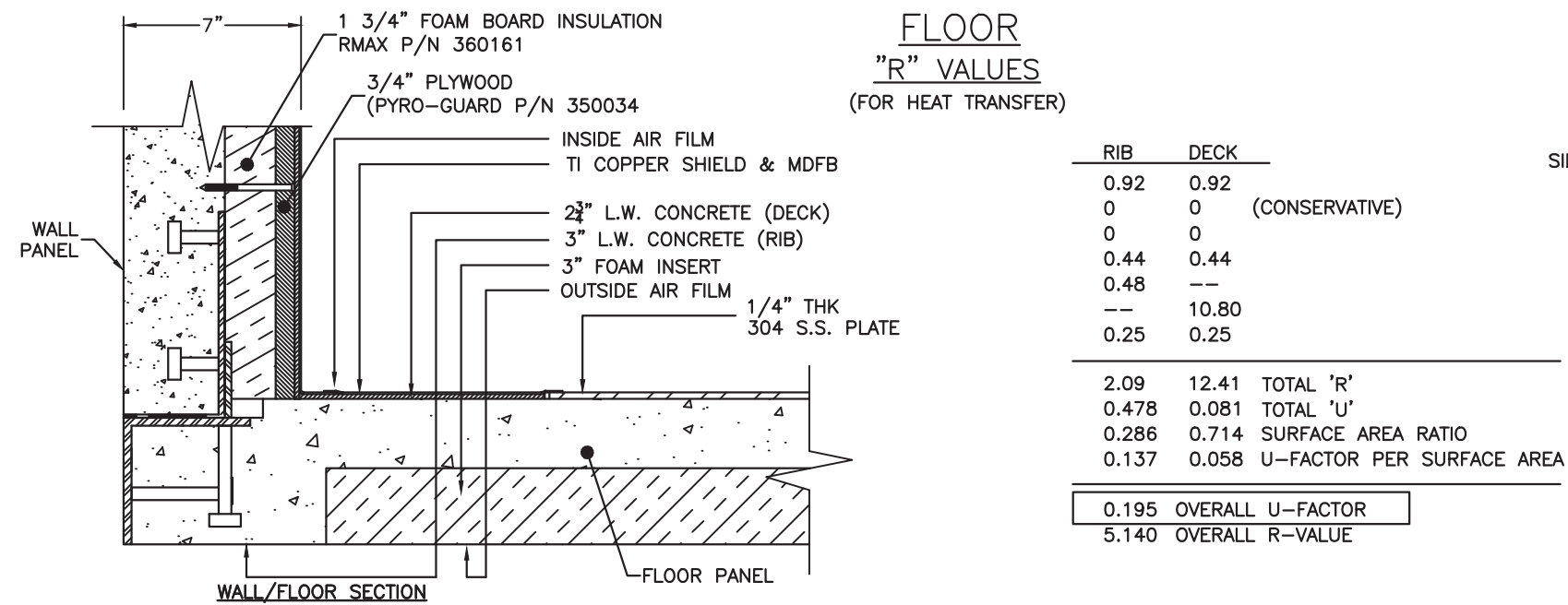
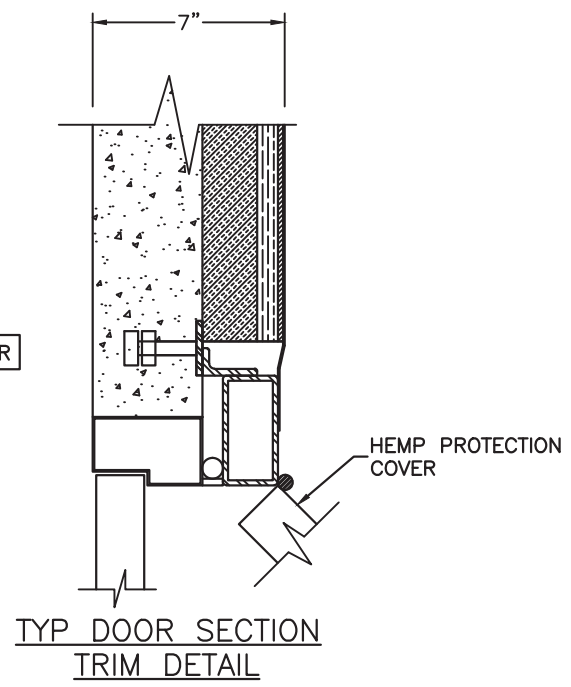
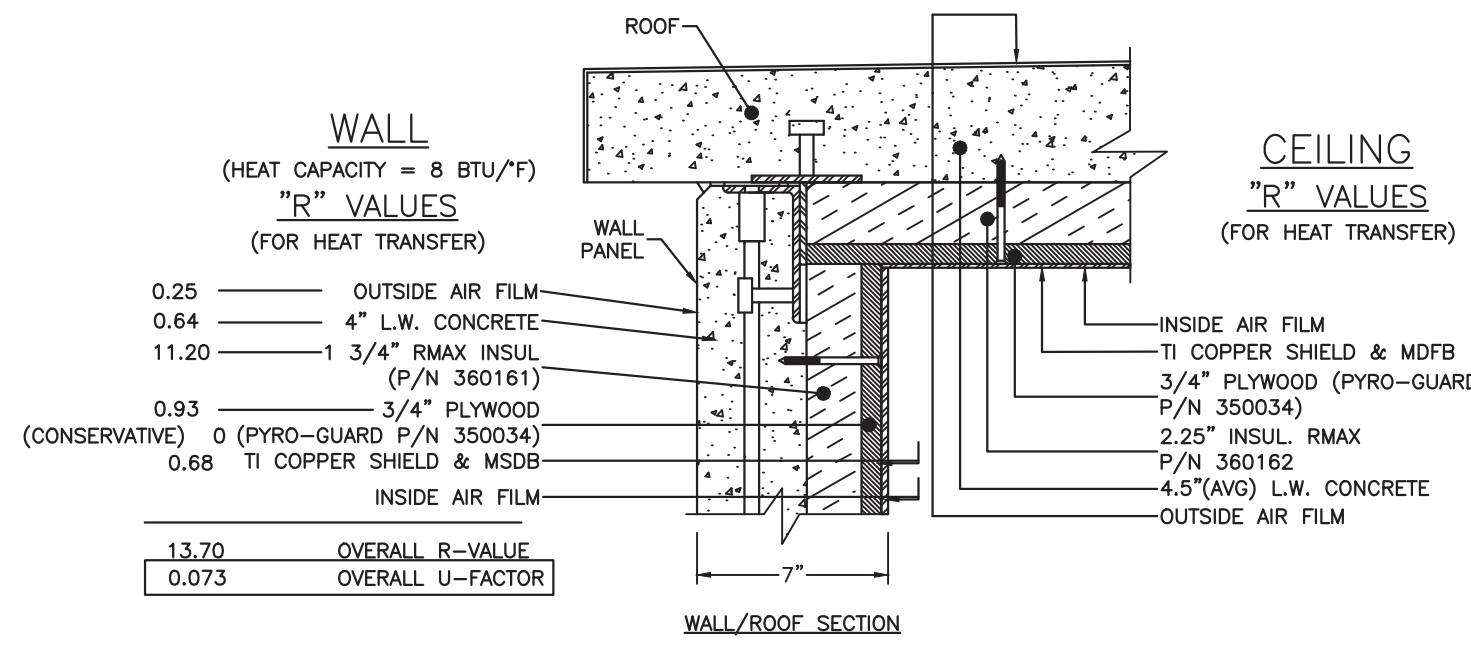
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CUSTOMER:  
**KELLOGG  
 BROWN & ROOT  
 FEMA (PEP)  
 EXPANSION PROGRAM**

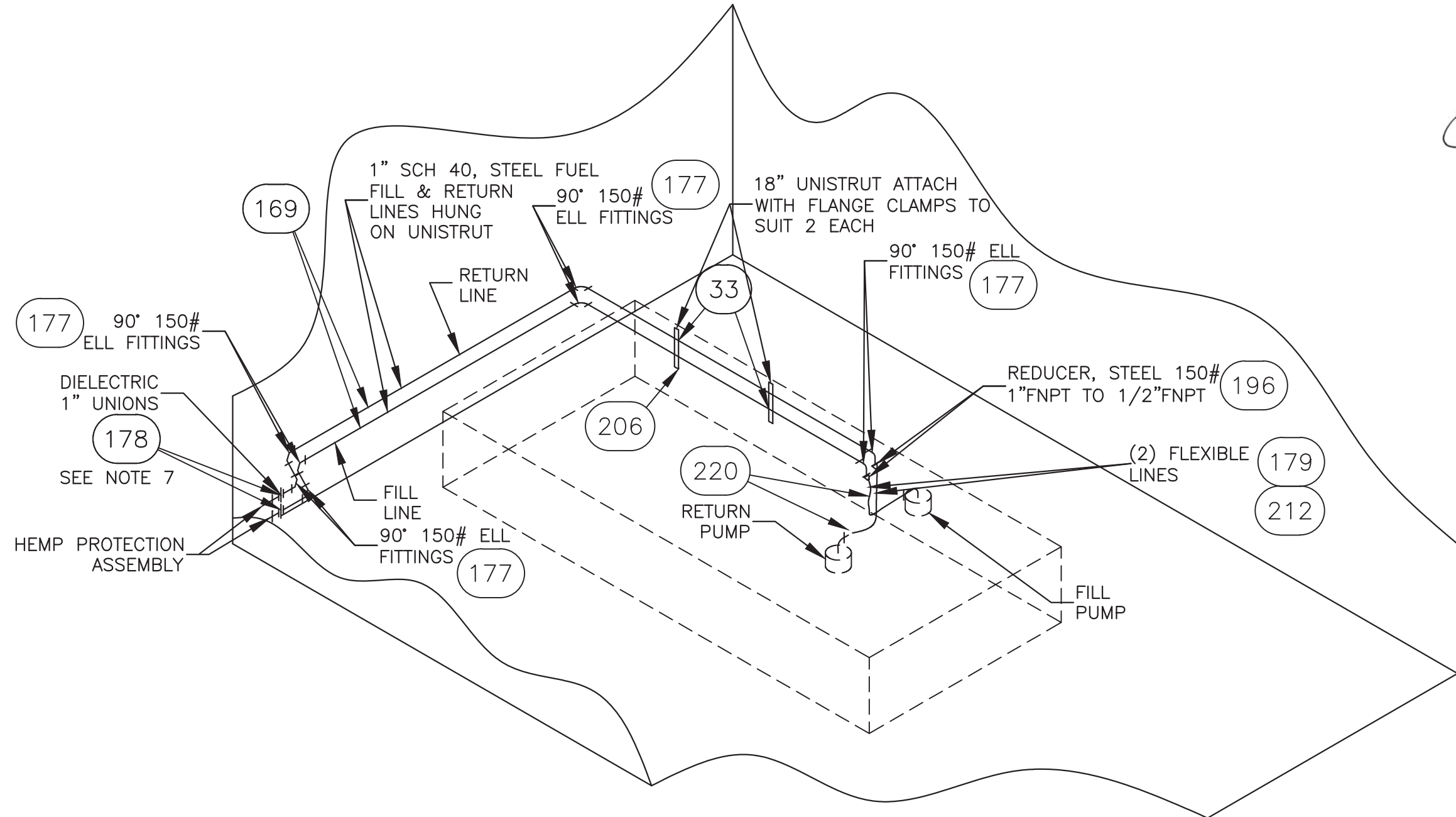
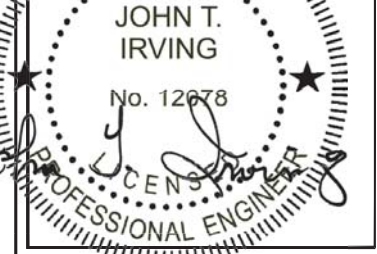
PROJECT:  
**10'-0" X 14'-0"  
 CONCRETE SHELTER  
 INTERIOR PANELING  
 R/U CALCULATIONS**

FILENAME: KBR/SKBR01	
SCALE: N.T.S.	TOLERANCE:
DRWN. BY: D. CHRISTOPHE	DATE: 03/22/10
CHK. BY: G. BRINKMAN	DATE: 03/22/10
ENG. BY: A. DUMAS	DATE:
APP. BY: JI	DATE:
SHEET NO. 7-0	
DRAWING NO.: SKBR01	REV.: P



F	MDF	08/03/10	WALL THICKNESS CHANGE AND MATERIAL CALLOUTS	DB	08/03/10
REV	BY	DATE	DESCRIPTION	APP. BY	DATE

February 27, 2013



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CUSTOMER:  
**KELLOGG  
 BROWN & ROOT  
 FEMA (PEP)  
 EXPANSION PROGRAM**

PROJECT:  
**10'-0" X 14'-0"  
 CONCRETE SHELTER  
 FUEL FILL & RETURN  
 RISER**

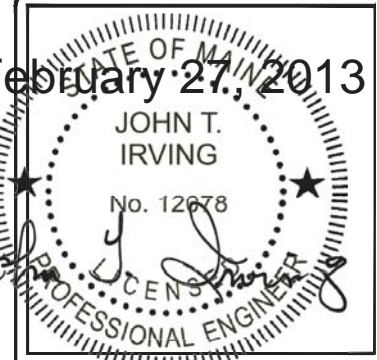
FILENAME: KBR/SKBR01	
SCALE: N.T.S.	TOLERANCE:
DRWN. BY: D. CHRISTOPHE	DATE: 03/22/10
CHK. BY: G. BRINKMAN	DATE: 03/22/10
ENG. BY: A. DUMAS	DATE:
APP. BY: JL	DATE:
SHEET NO. 7-1	
DRAWING NO.:	REV.:
SKBR01	P

NOTES:

- FUEL LINE ON BOTTOM. THIS LINE IS DESIGNATED AS FUEL OIL SUPPLY LINE ON KBR DRAWINGS.
- PIPE LENGTHS TO SUIT FITTER. MOUNT PIPE ON UNISTRUT USING P/N - 410461.
- PAINT ALL FUEL LINES BLACK.
- FIELD NOTE: WHEN ATTACHING PIPE PENETRATIONS TO FIELD PIPING, USE RECTOR SEAL NO.7 TM AND BACK UP STUBS WITH PIPE WRENCH WHILE TIGHTENING TO ELIMINATE TWISTING OF PIPE IN WALL.
- ELLS REDUCERS ETC... SHALL BE 150# STEEL OR MALLEABLE IRON FITTINGS, FNPT.
- USE ONLY RECTORSEAL® 7 PIPE DOPE ON FUEL LINE FITTINGS.
- ORIENT DIELECTRIC COUPLING SO THAT S.S. SIDE IS ATTACHED TO S.S. PENETRATING PIPING, AND INSULATED C.S. PIPE IS ATTACHED TO INTERIOR C.S. PIPING.

REV	BY	DATE	DESCRIPTION	APP. BY	DATE
N	RRG	6/8/12	UPDATED NOTE #3	LJL	6/8/12
M	JJ	1/20/11	EDIT FUEL LINE	LJL	1/20/12
L	RRG	04/25/11	UPDATED DESCRIPTIONS	LJL	04/25/11
F	MDF	08/03/10	OFFSET WALL PENETRATIONS	DB	08/05/10

February 27, 2013



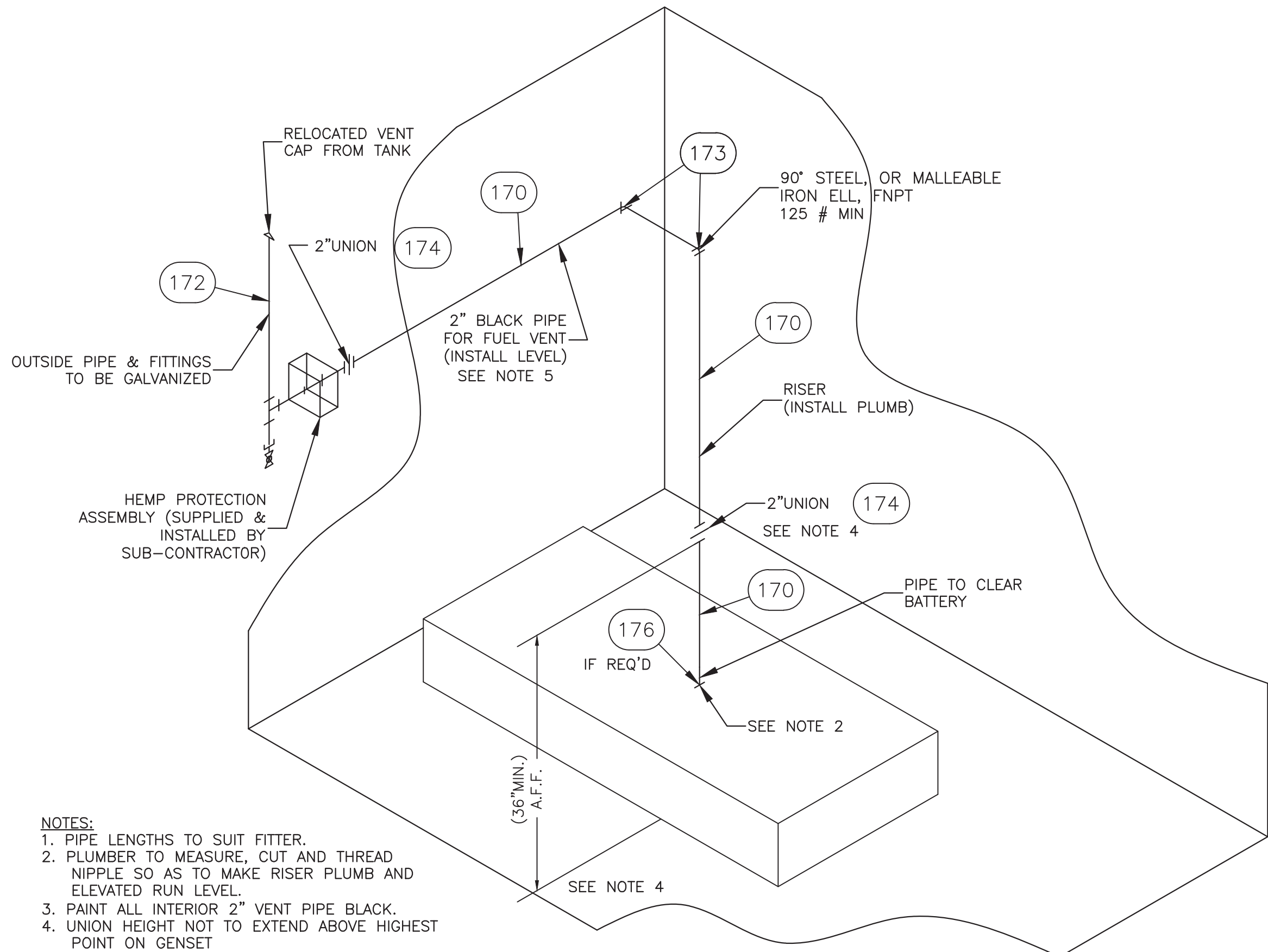
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CUSTOMER:  
**KELLOGG  
 BROWN & ROOT  
 FEMA (PEP)  
 EXPANSION PROGRAM**

PROJECT:  
**10'-0" X 14'-0"  
 CONCRETE SHELTER  
 FUEL VENT  
 RISER**

FILENAME: KBR/SKBR01	
SCALE: N.T.S.	TOLERANCE:
DRWN. BY: D. CHRISTOPHE	DATE: 03/22/10
CHK. BY: G. BRINKMAN	DATE: 03/22/10
ENG. BY: A. DUMAS	DATE:
APP. BY: JI	DATE:
SHEET NO. 7-2	
DRAWING NO.:	REV.:
SKBR01	P

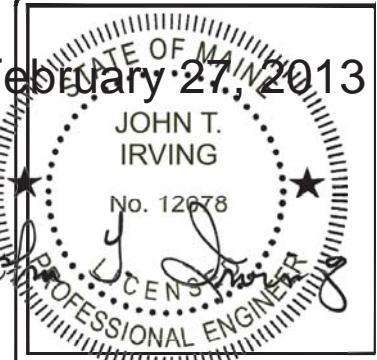


- NOTES:**
1. PIPE LENGTHS TO SUIT FITTER.
  2. PLUMBER TO MEASURE, CUT AND THREAD NIPPLE SO AS TO MAKE RISER PLUMB AND ELEVATED RUN LEVEL.
  3. PAINT ALL INTERIOR 2" VENT PIPE BLACK.
  4. UNION HEIGHT NOT TO EXTEND ABOVE HIGHEST POINT ON GENSET
  5. USE SLANT LEVEL, MACHINIST'S LEVEL, OR INCLINOMETER TO MAKE PIPING PARALLEL TO FLOOR.

N	RRG	6/8/12	UPDATED NOTE #3	LJL	6/8/12
L	RRG	04/25/11	CHANGED PIPE TO RUN STRAIGHT UP	LJL	04/25/11
REV	BY	DATE	DESCRIPTION	APP. BY	DATE



February 27, 2013



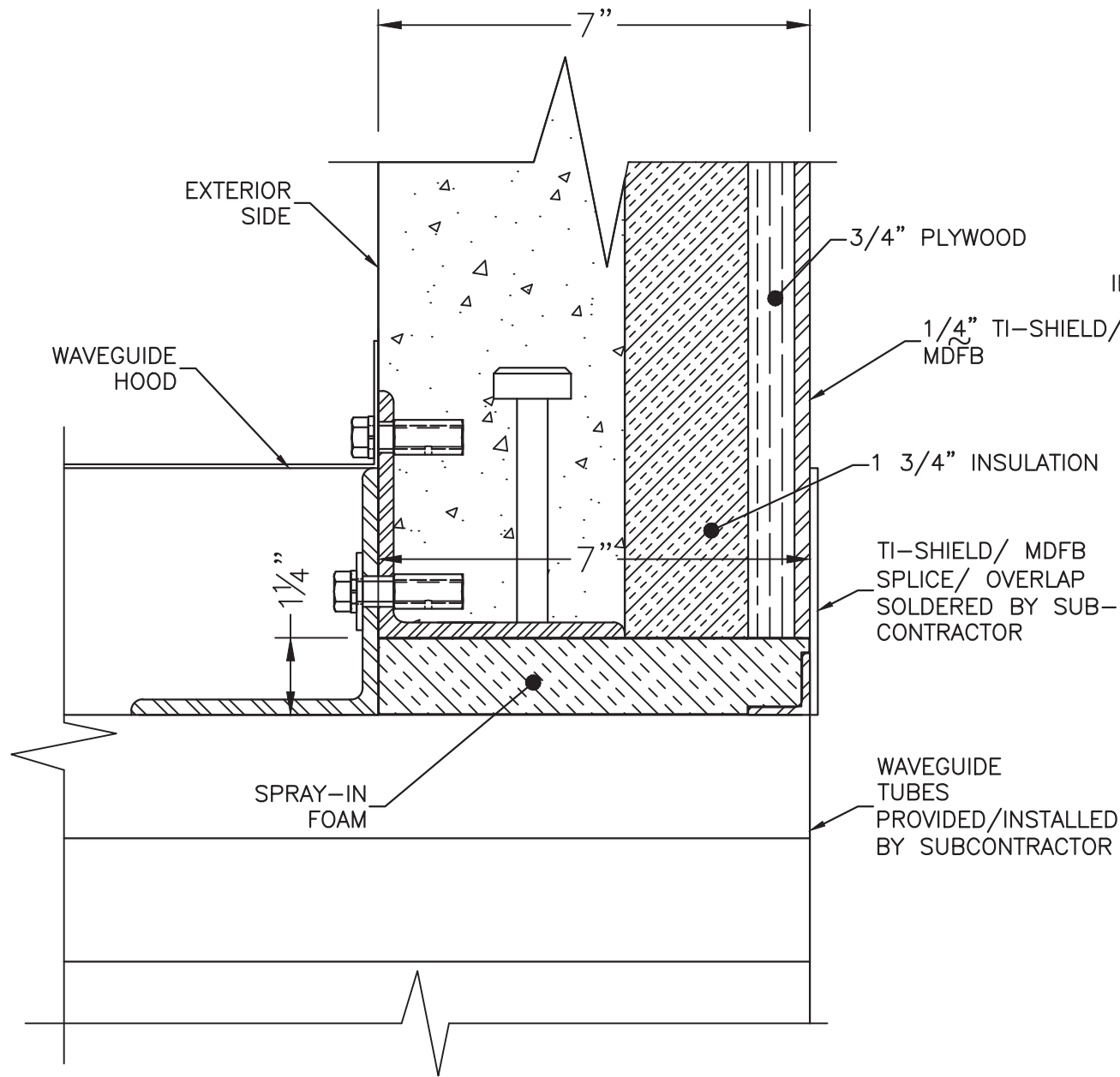
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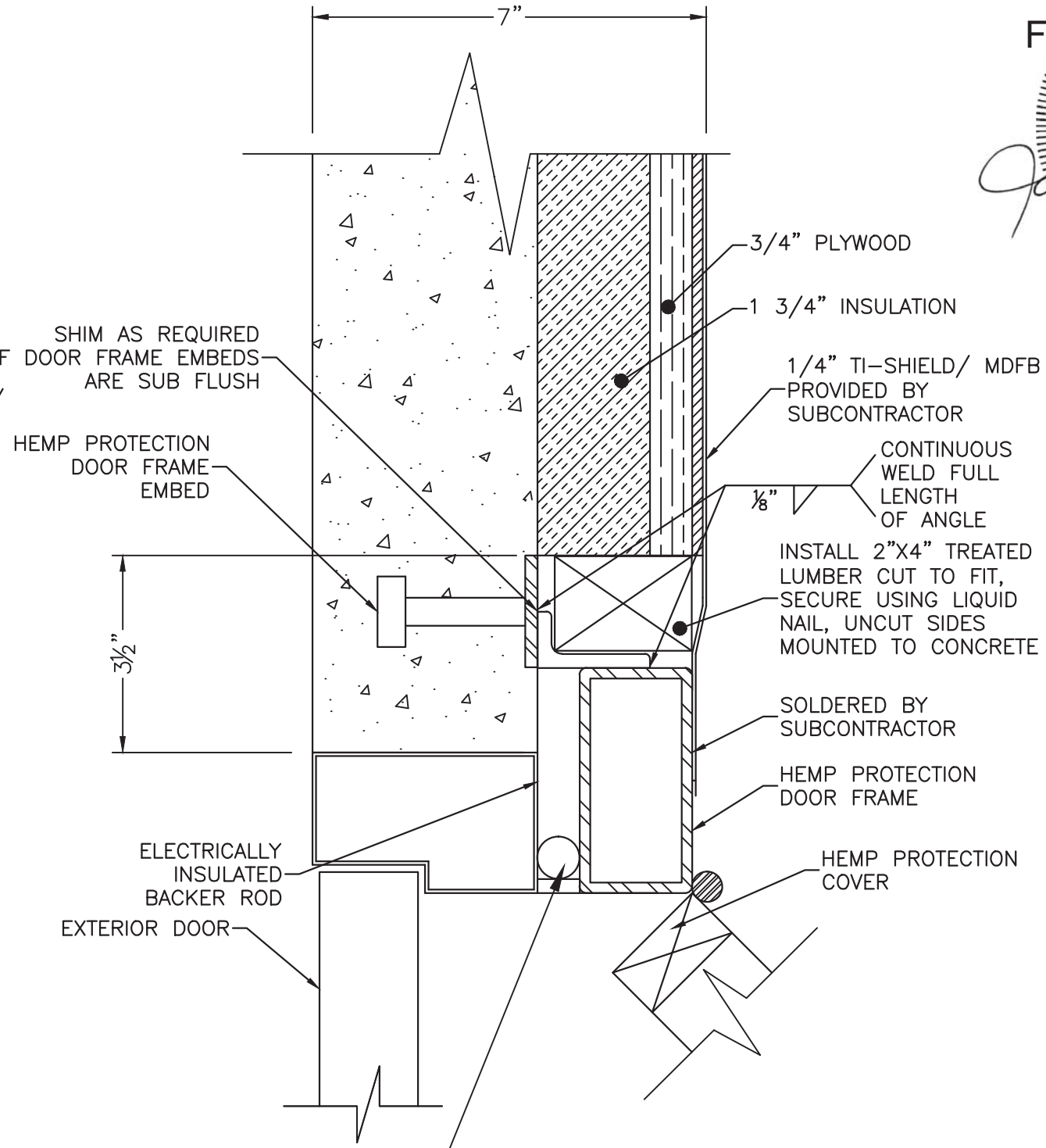
CUSTOMER:  
**KELLOGG  
 BROWN & ROOT  
 FEMA (PEP)  
 EXPANSION PROGRAM**

PROJECT:  
**10'-0" X 14'-0"  
 CONCRETE SHELTER  
 HEMP PROTECTION  
 W/G & DOOR SECTIONS**

FILENAME: KBR/SKBR01	
SCALE: N.T.S.	TOLERANCE:
DRWN. BY: D. CHRISTOPHE	DATE: 03/22/10
CHK. BY: G. BRINKMAN	DATE: 03/22/10
ENG. BY: A. DUMAS	DATE:
APP. BY: JI	DATE:
SHEET NO. 7-3	
DRAWING NO.:	REV.:
SKBR01	P



W/G CONNECTION SECTION



HEMP DOOR SECTION

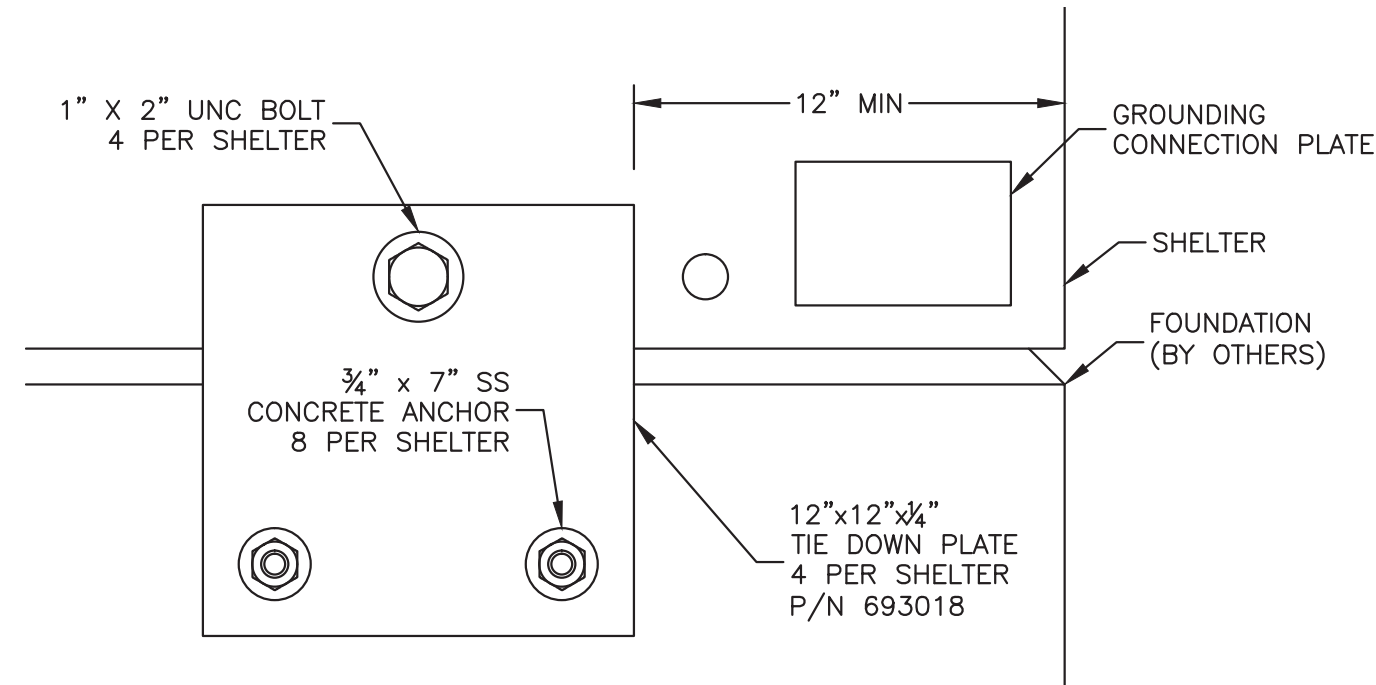
N	RRG	6/8/12	UPDATED LUMBER & ADDED SPRAY-IN FOAM	LJL	6/8/12
M	JJ	7/25/11	UPDATED DRAWING	LJL	7/25/11
F	MDF	08/03/10	WALL THICKNESS CHANGE AND MATERIAL CALLOUTS	DB	08/03/10
REV	BY	DATE	DESCRIPTION	APP. BY	DATE

149

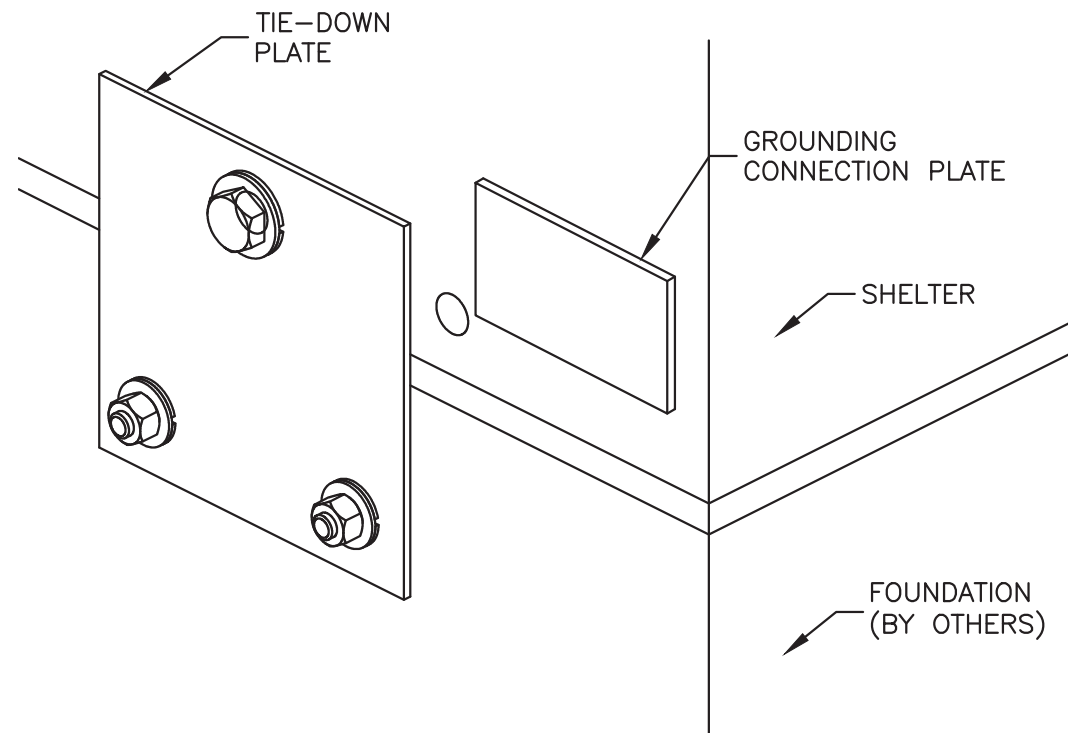


NOTES:

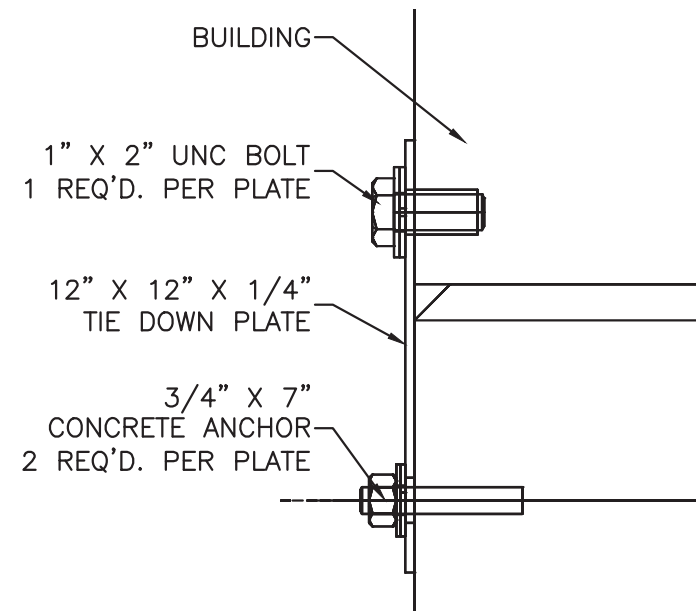
1. ALL REQUIRED TIE DOWN PLATES, SHIMS, BOLTS AND ANCHORS SHALL BE PLACED INSIDE SHELTER PRIOR TO SHIPMENT FROM MANUFACTURER
2. USE SHIMS AS REQUIRED TO ASSURE SHELTER IS BEARING AT PERIMETER. SEAL PERIMETER W/ CAULK OR GROUT AS DESIRED.



CONNECTION DETAIL FRONT



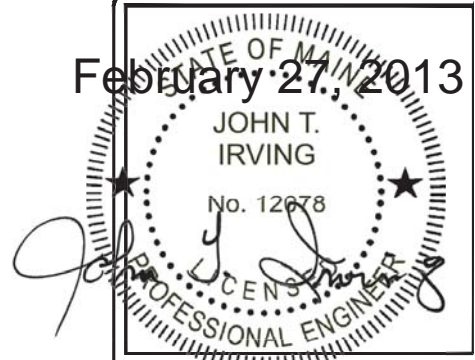
CONNECTION DETAIL ISOMETRIC



CONNECTION DETAIL SIDE

N	RRG	6/8/12	MOVED CONNECTION PLATE & ADDED GROUNDING PLATE	LJL	6/8/12
REV	BY	DATE	DESCRIPTION	APP. BY	DATE

February 27, 2013



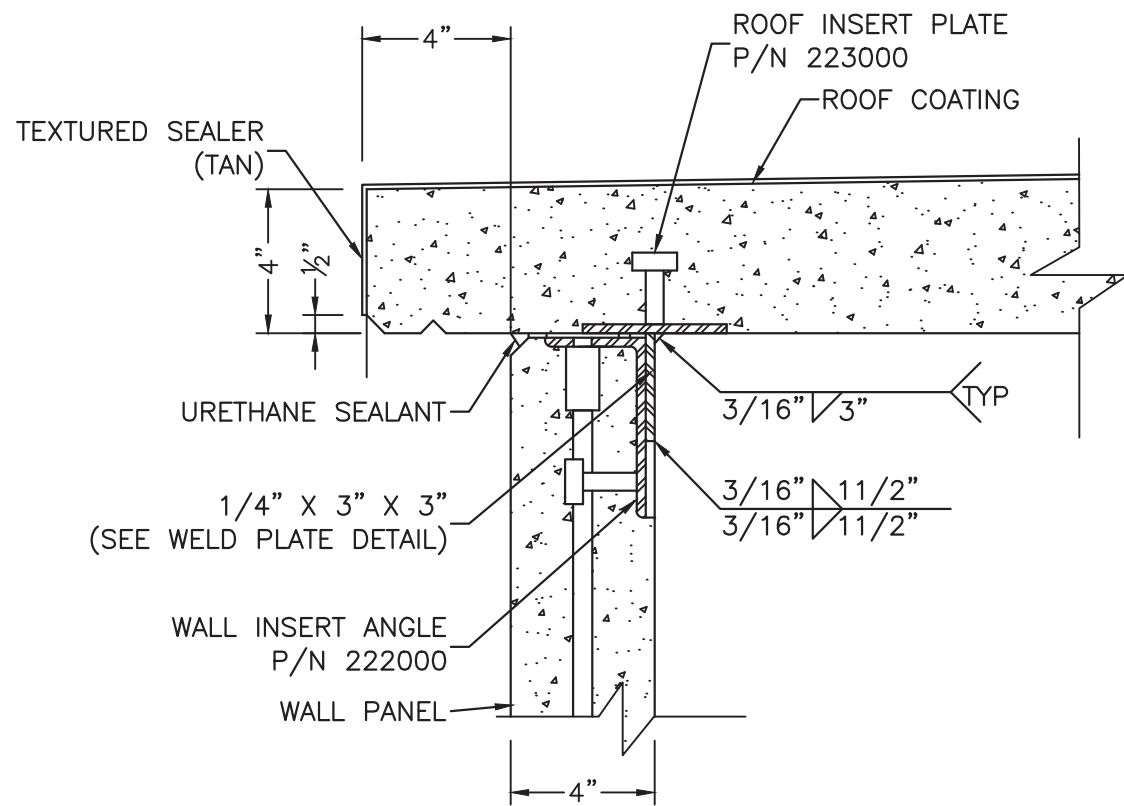
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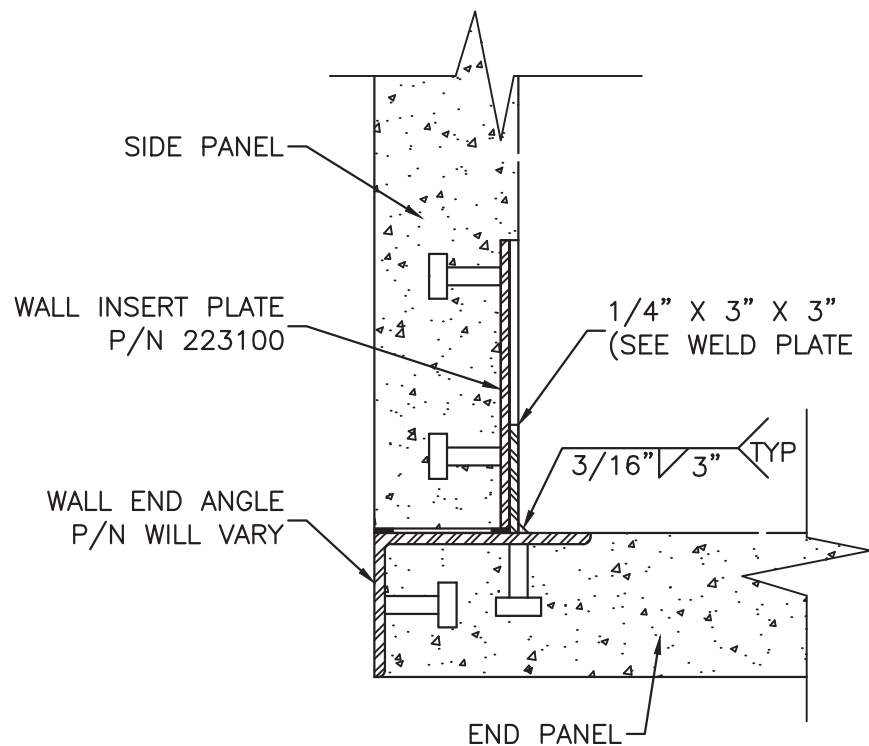
CUSTOMER:  
**KELLOGG  
 BROWN & ROOT  
 FEMA (PEP)  
 EXPANSION PROGRAM**

PROJECT:  
**10'-0" X 14'-0"  
 CONCRETE SHELTER  
 6" SLAB FOUNDATION  
 FLAT TIEDOWN DETAILS**

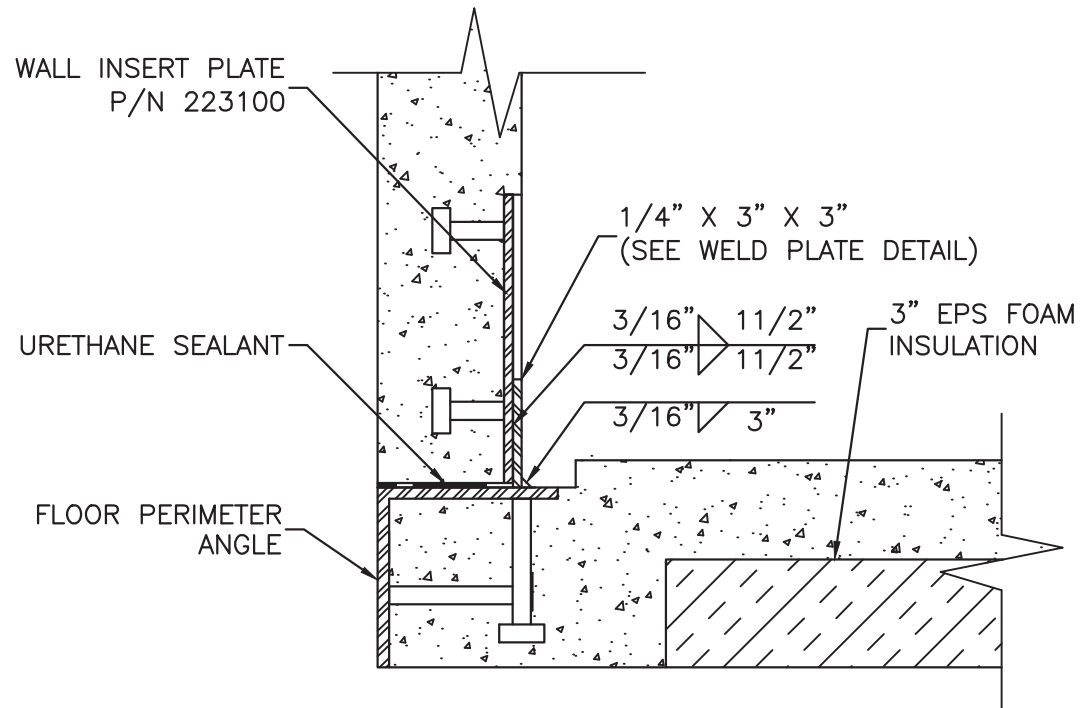
FILENAME: KBR/SKBR01	
SCALE: N.T.S.	TOLERANCE:
DRWN. BY: D. CHRISTOPHE	DATE: 03/22/10
CHK. BY: G. BRINKMAN	DATE: 03/22/10
ENG. BY: A. DUMAS	DATE:
APP. BY: JI	DATE:
SHEET NO. 7-4	
DRAWING NO.: SKBR01	REV.: P



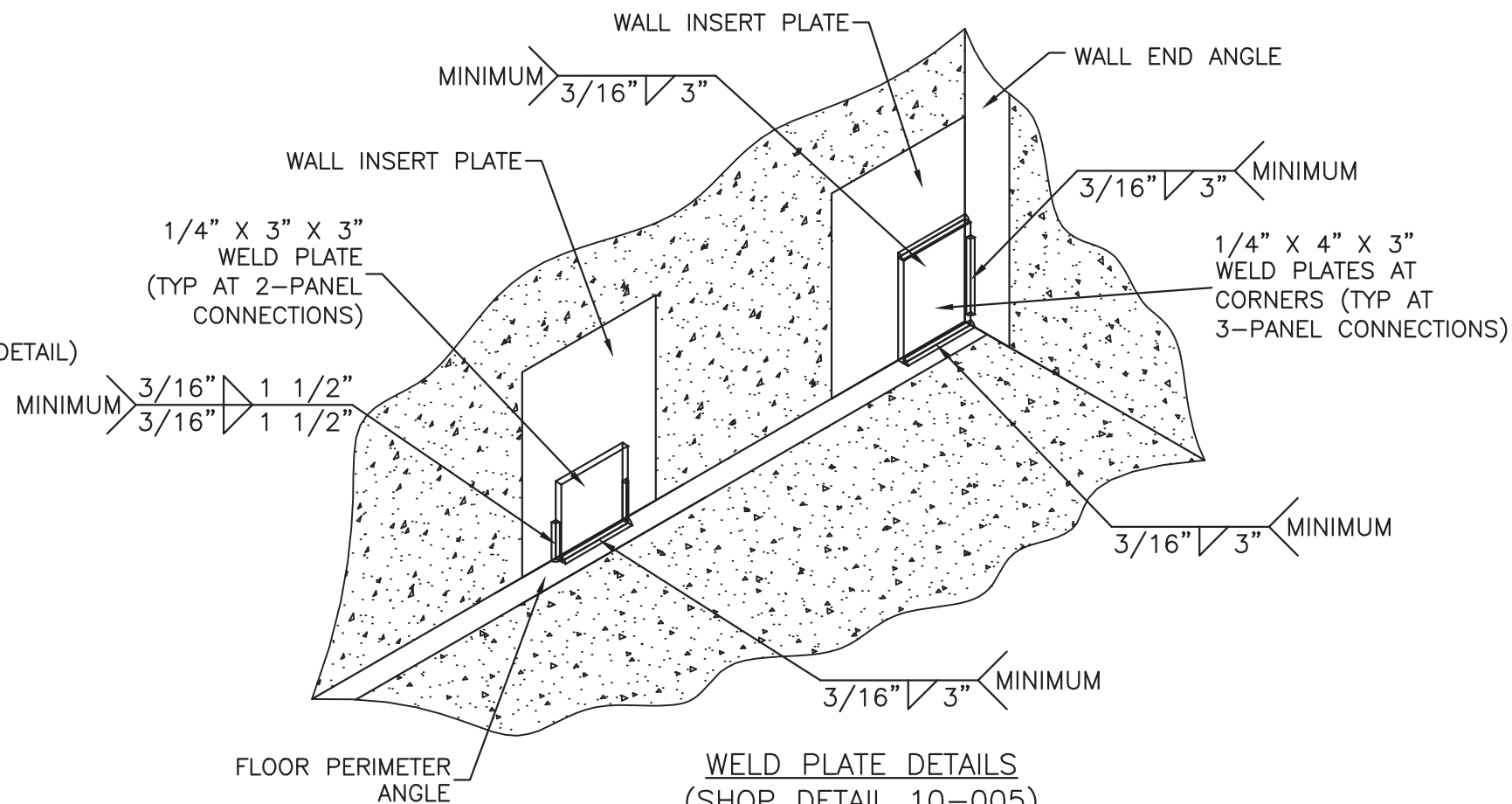
**WALL/ROOF CONNECTION**  
(SHOP DETAIL 10-002)



**WALL/WALL CONNECTION**  
(SHOP DETAIL 10-003)

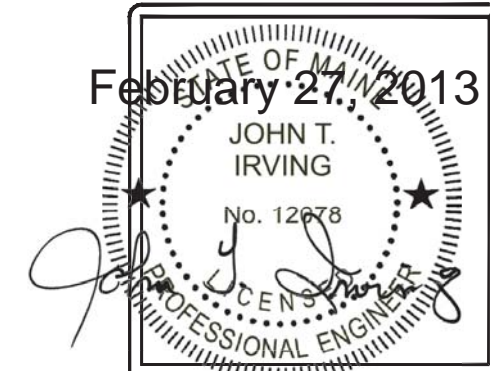


**WALL/FLOOR CONNECTION**  
(SHOP DETAIL 10-004)



**WELD PLATE DETAILS**  
(SHOP DETAIL 10-005)

February 27, 2013



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CUSTOMER:  
**KELLOGG  
BROWN & ROOT  
FEMA (PEP)  
EXPANSION PROGRAM**

PROJECT:  
**10'-0" X 14'-0"  
CONCRETE SHELTER  
CONCRETE SHELTER PANEL  
CONNECTION DETAILS**

FILENAME: KBR/SKBR01	
SCALE: N.T.S.	TOLERANCE:
DRWN. BY: D. CHRISTOPHE	DATE: 03/22/10
CHK. BY: G. BRINKMAN	DATE: 03/22/10
ENG. BY: A. DUMAS	DATE:
APP. BY: JI	DATE:
SHEET NO. 7-5	
DRAWING NO.: SKBR01	REV.: P

**NOTES:**

1. CONDUCTOR COLORS ARE AS FOLLOWING:

120/240 SINGLE PHASE

PHASE "A" = BLACK

PHASE "B" = RED

NEUTRAL = WHITE

120/208 THREE PHASE

PHASE "A" = BLACK

PHASE "B" = RED

PHASE "C" = BLUE

NEUTRAL = WHITE

277/480 THREE PHASE

PHASE "A" = YELLOW

PHASE "B" = BROWN

PHASE "C" = ORANGE

NEUTRAL = GRAY

ALL ELECTRICAL GROUND = GREEN

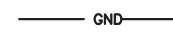
ALL ISOLATED GROUND = GREEN/YELLOW STRIPE

ALL SWITCHED = PURPLE

2. ALL CONDUCTORS (UNLESS OTHERWISE NOTED) TO BE STRANDED THHN OR THWN COPPER WIRE.
3. ALL CONDUIT TO BE 1/2" ENT UNLESS OTHERWISE NOTED.
4. ALL LOW VOLTAGE CONDUIT TO BE 1/2" ENT UNLESS NOTED.
5. ALL CONDUCTOR AMPACITIES ARE BASED ON TABLE 310-16 NATIONAL ELECTRICAL CODE.
6. CONDUIT FILL BASED ON CHAPTER 9 - NATIONAL ELECTRICAL CODE.
7. PLACEMENT OF ELECTRICAL AND CONDUIT COMPONENTS OR BOXES MAY VARY TO ALIGN WITH COMPONENTS MANUFACTURE'S PRE-MADE BOX KNOCKOUTS. THIS MAY INCLUDE ALIGNMENT WITH SHELTER PENETRATIONS AND/OR INTERFERENCE WITH OTHER COMPONENTS.
8. CONDUIT, ELECTRICAL AND MECHANICAL DIMENSION TOLERANCE SHALL BE ±1/4".
9. DASHED LINES (-----) DENOTE FIELD WORK.
10. ALL CIRCUITS ON 25 AMP THROUGH 60 AMP BREAKER MUST USE #10 GROUND CONDUCTOR.
11. CONDUCTORS SMALLER THAN 4 AWG MUST HAVE CORRECT COLOR INSULATION. CONDUCTORS 4 AWG AND LARGER MAY BE RE-IDENTIFIED BY COLORED TAPE. BLACK INSULATED CONDUCTOR SHALL BE THE ONLY COLOR TO BE RE-IDENTIFIED. IF CONDUCTORS ARE RE-IDENTIFIED, IDENTIFICATION MUST BE APPLIED IN THREE INCH (3") WRAPS, MINIMUM EVERY THREE FEET (3'-0"). RE-IDENTIFICATION SHALL BE VISIBLE BY OPENING ANY ENCLOSURE. WHITE, GRAY AND GREEN CONDUCTORS SHALL NOT BE RE-IDENTIFIED.
12. ALL METALLIC ELECTRICAL BOXES (SWITCH BOXES, DUPLEX BOXES, LIGHTS, JUNCTION BOXES, ETC) SHALL BE CONNECTED TO THE PROTECTED GROUND OF THE ACG DISTRIBUTION PANEL WITH A #12 GREEN INSULATED STRANDED CONDUCTOR WHICH SHALL BE RUN INTERNAL TO THE CONDUIT.
13. ALL CIRCUIT RUNS TO INCLUDE INDEPENDENT NEUTRAL.
14. ALL WIRES TO BE LABELED FROM END WITH CIRCUIT NO.
15. USE GROUNDING WIRENUT FOR TIEING MULTIPLE GROUNDS TOGETHER.
16. WEEP HOLES IN CAULKING SHOULD BE CENTERED IN THE LOWER BEAD UNDERNEATH THE DEVICE AND BE BETWEEN 1/8" TO 1" WIDE.

**LEGEND**

 = CONDUIT (THICKNESS VARIES WITH SIZE OF CONDUIT)

 = GROUND WIRE

 = 4 X 4 BOX WITH QUAD RECEPTACLE

 = 4 X 4 BOX WITH DUPLEX RECEPTACLE

 = 4 X 4 BOX WITH PENETRATION

 = 4 X 4 BOX BLANK

 = 4 X 4 BOX WITH 2 SWITCHES

 = 4 X 4 BOX WITH SINGLE SWITCH

 = 4" OCTAGON BOX WITH SMOKE DETECTOR

 = 4" OCTAGON BOX WITH HEAT DETECTOR

 = 4 X 4 BOX WITH TWIST-LOCK RECEPTACLE

 = 4 X 4 BOX WITH TIMER SWITCH

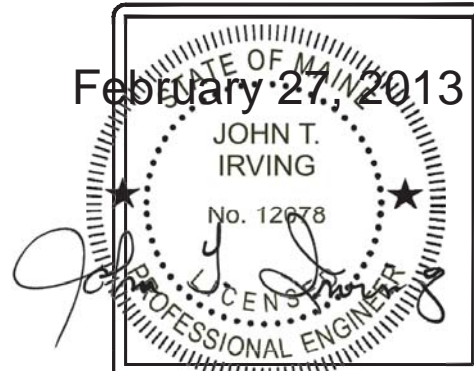
 = PHOTOCELL SWITCH

 = SYSTEM GROUND FOR AC CIRCUITS

 = ISOLATED GROUND FOR AC CIRCUITS

 = VENT FAN

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CUSTOMER:  
**KELLOGG  
 BROWN & ROOT  
 FEMA (PEP)  
 EXPANSION PROGRAM**

PROJECT:  
**10'-0" X 14'-0"  
 CONCRETE SHELTER  
 GENERAL ELECTRICAL  
 NOTES & LEGEND**

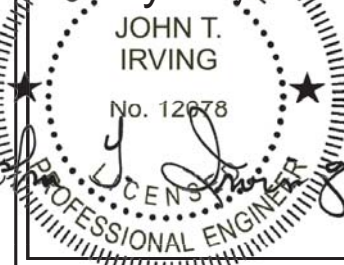
FILENAME: KBR/SKBR01	
SCALE: N.T.S.	TOLERANCE:
DRWN. BY: D. CHRISTOPHE	DATE: 03/22/10
CHK. BY: G. BRINKMAN	DATE: 03/22/10
ENG. BY: A. DUMAS	DATE:
APP. BY: JL	DATE:
SHEET NO. 7-6	
DRAWING NO.: SKBR01	REV.: P

REV	BY	DATE	DESCRIPTION	APP. BY	DATE
M	LJL	1/16/12	ADDED NOTE 16	LJL	1/16/12
L	RRG	04/25/11	ADDED NOTES 13-15	LJL	04/25/11



NIPPLE SCHEDULE					
DESCRIPTION	QTY.	DIAMETER - A	LENGTH - B	OUTSIDE - C	NIPPLE FLANGE - D
FUEL LINES	2	1"	14"	4"	7 1/2" X 7 1/2"
FIBER OPTIC	1	1"	14"	4"	8" X 8"
FUEL VENT	1	2"	14"	4"	8 3/8" X 8 3/8"
GENERATOR EXHAUST	1	3"	16"	4"	16" X 16"

February 27, 2013



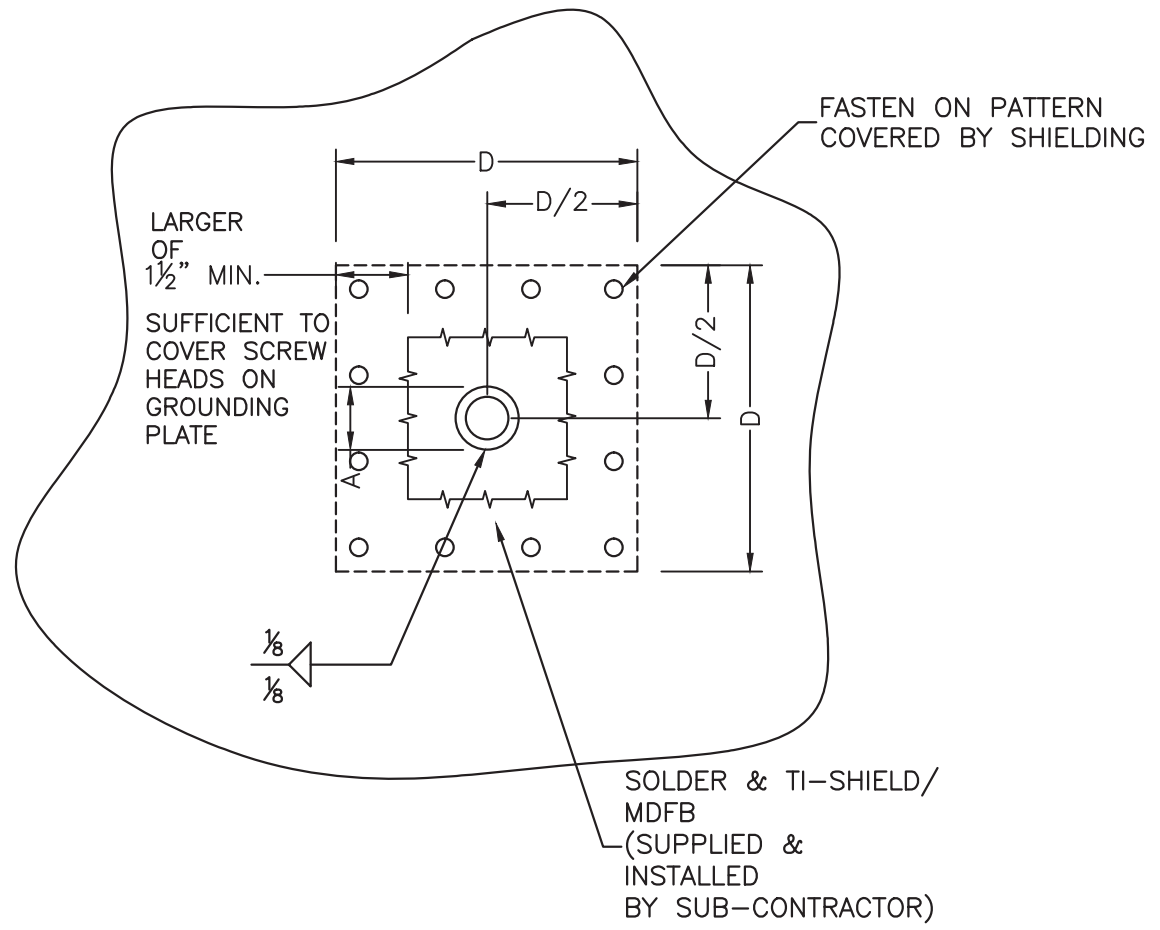
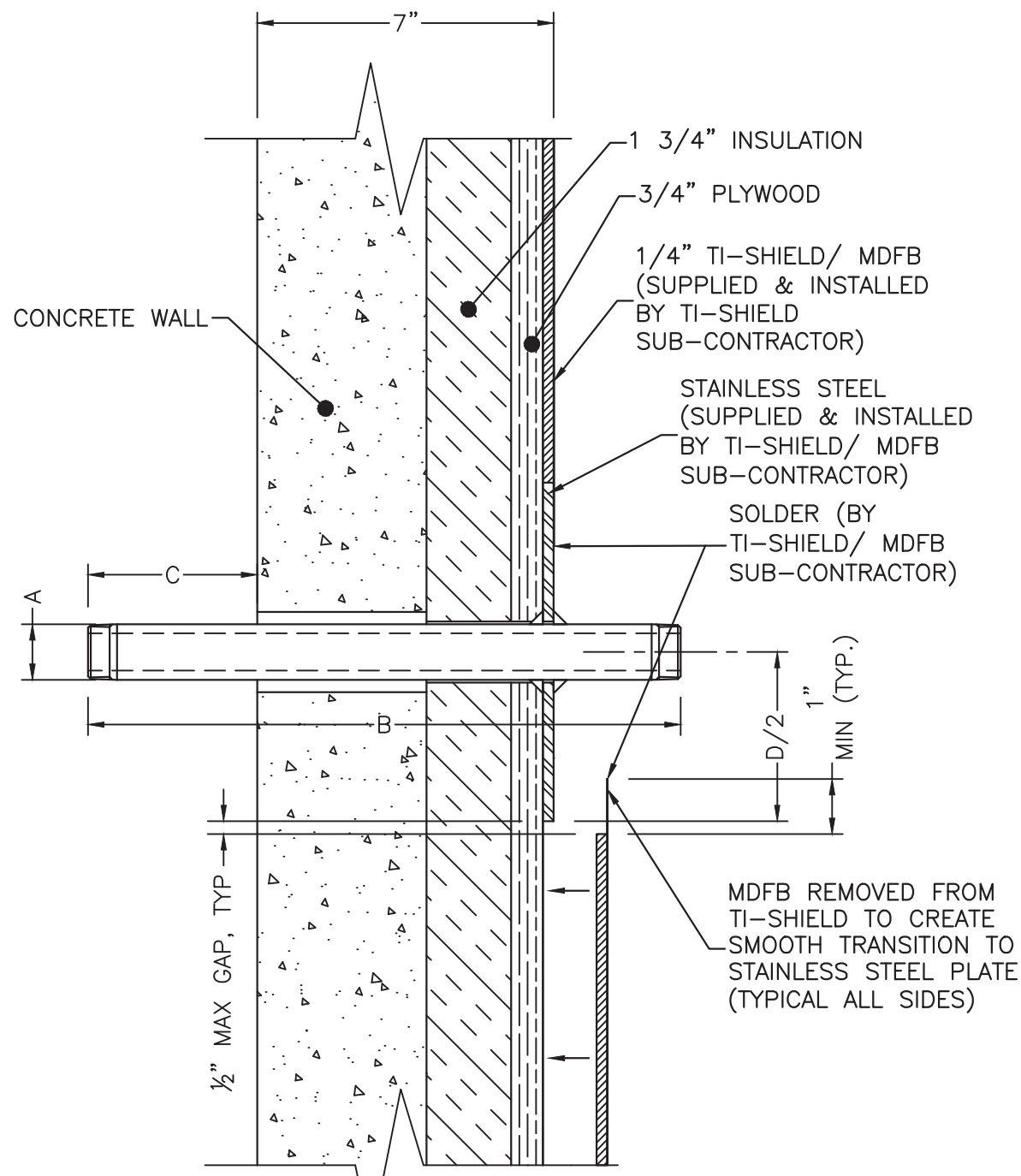
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CUSTOMER:  
**KELLOGG  
 BROWN & ROOT  
 FEMA (PEP)  
 EXPANSION PROGRAM**

PROJECT:  
**10'-0" X 14'-0"  
 CONCRETE SHELTER  
 THRU WALL PENETRATION  
 DETAIL**

FILENAME: KBR/SKBR01	
SCALE: N.T.S.	TOLERANCE:
DRWN. BY: D. CHRISTOPHE	DATE: 03/22/10
CHK. BY: G. BRINKMAN	DATE: 03/22/10
ENG. BY: A. DUMAS	DATE:
APP. BY: JI	DATE:
SHEET NO. 7-7	
DRAWING NO.:	REV.:
SKBR01	P



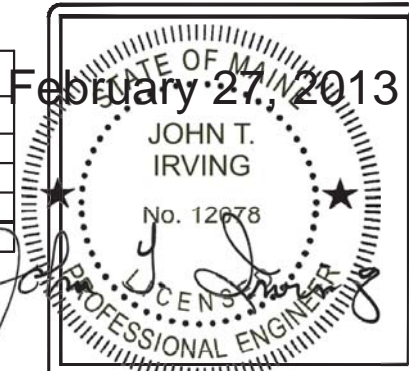
WAVEGUIDE PENETRATION  
 DETAIL

NOTE:  
 1. ON GROUNDING PLATE, THE OVERLAP SHALL BE SUFFICIENT TO COVER THE FASTENER HEADS COMPLETELY. SEE SHTS 6-2 (AND 6-2A)

REV	BY	DATE	DESCRIPTION	APP. BY	DATE
N	RRG	6/8/12	ADDED HOLE PATTERN AND NOTE	LJL	6/8/12
K	AMM	02/03/11	UPDATED DETAIL AS PER COMMENTS	LJL	02/03/11
F	MDF	08/03/10	WALL THICKNESS CHANGE AND MATERIAL CALLOUTS	DB	08/03/10



NIPPLE SCHEDULE					
DESCRIPTION	QTY.	DIAMETER -- A	LENGTH -- B	OUTSIDE -- C	NIPPLE FLANGE -- D
FUEL LINES	2	1"	14"	4"	7 1/2" X 7 1/2"
FIBER OPTIC	1	1"	14"	4"	8" X 8"
FUEL VENT	1	2"	14"	4"	8 3/8" X 8 3/8"
GENERATOR EXHAUST	1	3"	16"	4"	16" X 16"



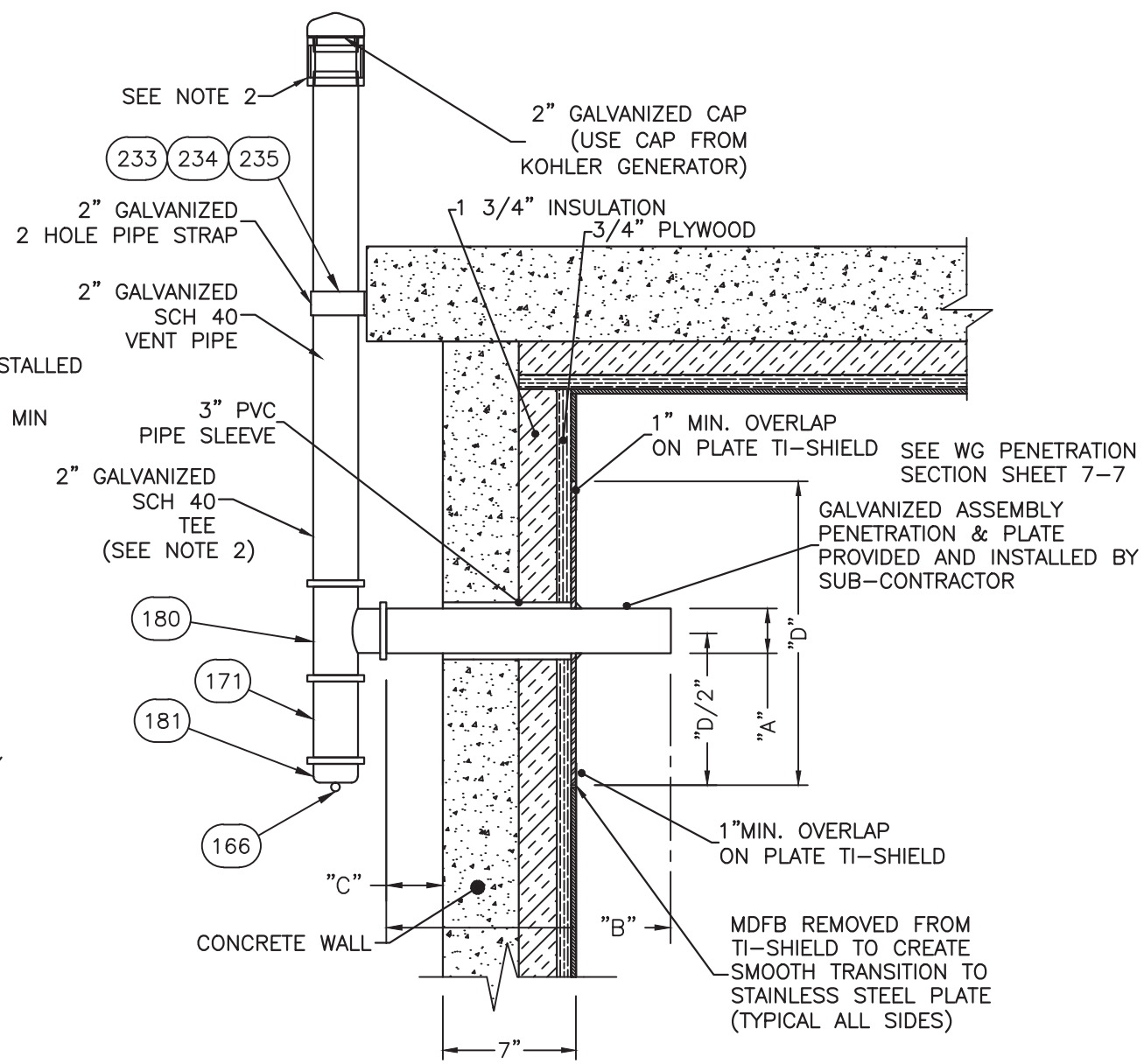
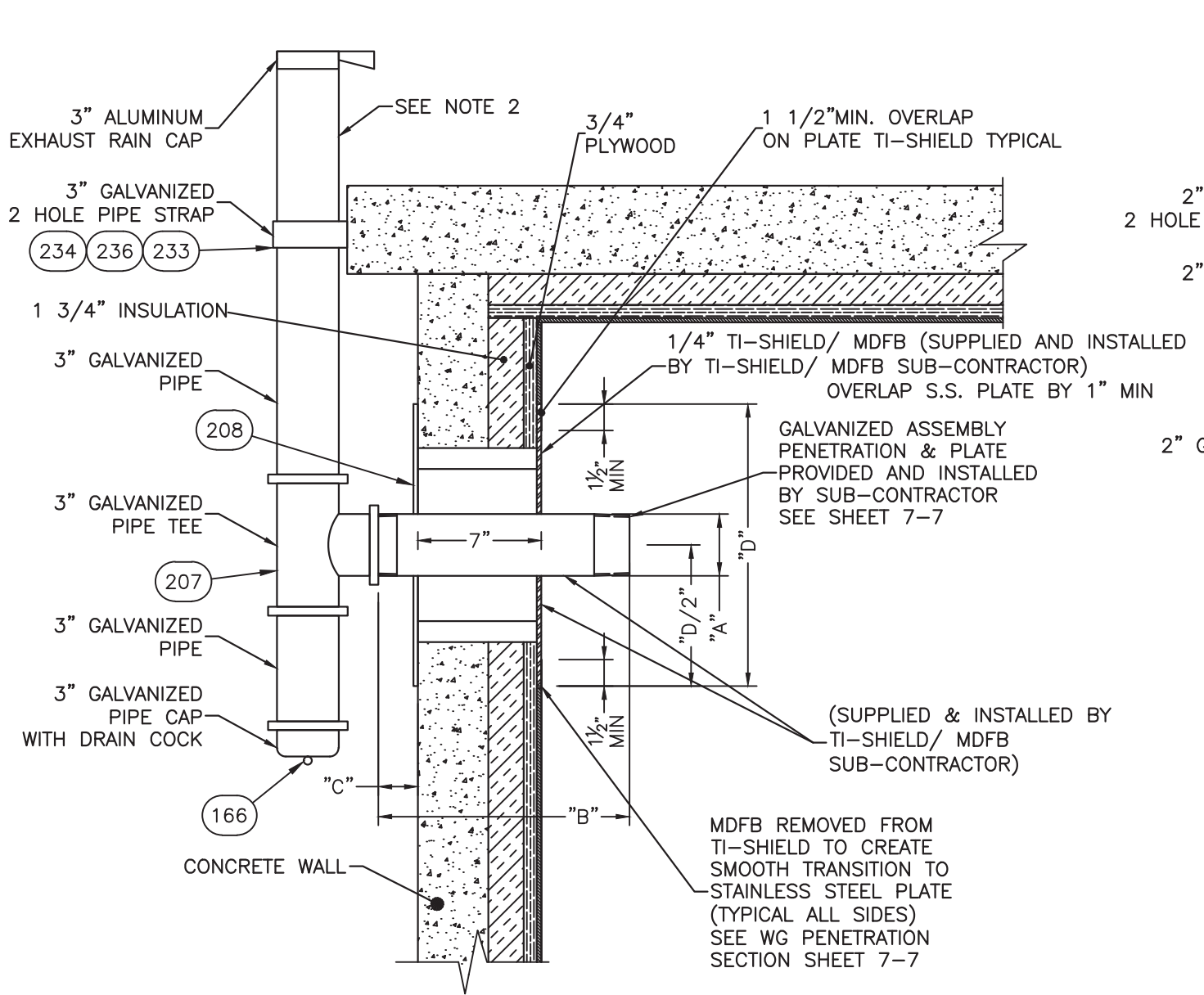
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CUSTOMER:  
**KELLOGG  
 BROWN & ROOT  
 FEMA (PEP)  
 EXPANSION PROGRAM**

PROJECT:  
**10'-0" X 14'-0"  
 CONCRETE SHELTER  
 GENERATOR THIMBLE  
 DETAIL**

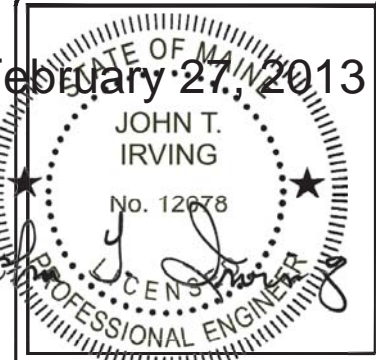
FILENAME: KBR/SKBR01	
SCALE: N.T.S.	TOLERANCE:
DRWN. BY: D. CHRISTOPHE	DATE: 03/22/10
CHK. BY: G. BRINKMAN	DATE: 03/22/10
ENG. BY: A. DUMAS	DATE:
APP. BY: JI	DATE:
SHEET NO. 7-8	
DRAWING NO.:	REV.:
SKBR01	P



- NOTE:**  
 1. SEE ALSO SHEET 7-7 FOR MDFB TI-SHIELD MODIFICATION & SOLDER DETAILS  
 2. USE TEFLON TAPE AND RECTOR SEAL #5 OR #7 PIPE DOPE (OR EQUAL) TO COVER ALL CUT THREADS BEFORE ASSEMBLING. (FOR GALVANIC ISOLATION AND CORROSION PROTECTION.) PAINT ANY REMAINING EXPOSED STEEL ON THREAD.

REV	BY	DATE	DESCRIPTION	APP. BY	DATE
N	RRG	6/8/12	UPDATED DIMENSION	LJL	6/8/12
M	JJ	7/25/11	UPDATED PIPE DETAILS & P/N'S	LJL	7/25/11
L	RRG	04/25/11	UPDATED NOTES/DETAIL	LJL	04/25/11
K	AMM	02/03/11	UPDATED DETAIL AS PER COMMENTS	LJL	02/03/11

February 27, 2013



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CUSTOMER:  
**KELLOGG  
 BROWN & ROOT  
 FEMA (PEP)  
 EXPANSION PROGRAM**

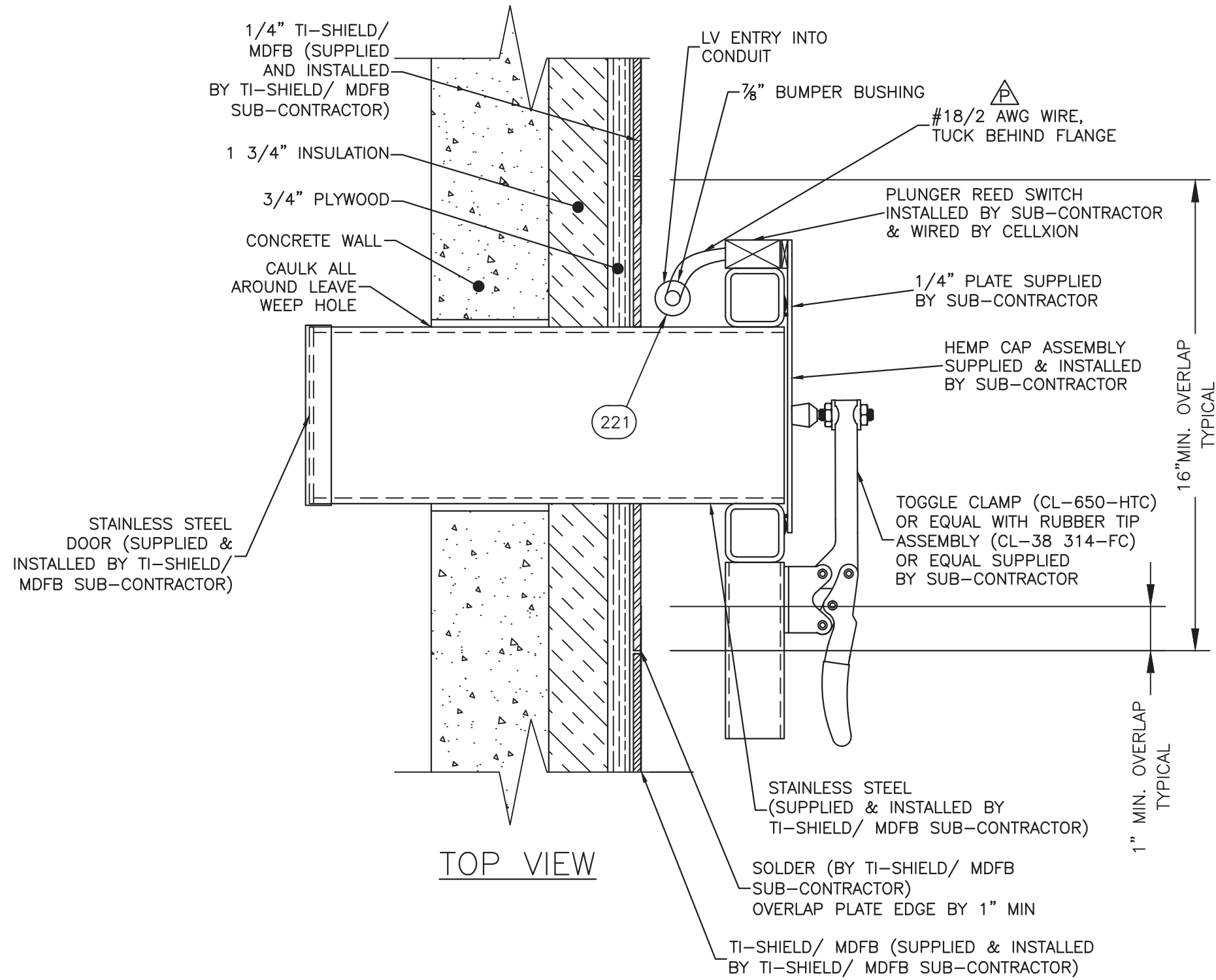
PROJECT:  
**10'-0" X 14'-0"  
 CONCRETE SHELTER  
 UMBILICAL CORD  
 PENETRATION DETAIL**

FILENAME: KBR/SKBR01	
SCALE: N.T.S.	TOLERANCE:
DRWN. BY: D. CHRISTOPHE	DATE: 03/22/10
CHK. BY: G. BRINKMAN	DATE: 03/22/10
ENG. BY: A. DUMAS	DATE:
APP. BY: JI	DATE:

SHEET NO.  
7-9

DRAWING NO.:  
SKBR01

REV.:  
P



**NOTE:**  
 1. SEE ALSO SHEET 7-7 FOR MDFB TI-SHIELD MODIFICATION & SOLDER DETAILS  
 2. PASS-THROUGH ASSY PROVIDED & INSTALLED BY SUB-CONTRACTOR

REV	BY	DATE	DESCRIPTION	APP. BY	DATE
P	RRG	10/31/12	CHANGED WIRE FROM #22 TO #18	LJL	10/31/12
N	RRG	6/8/12	CORRECTED DIMENSION	LJL	6/8/12
L	RRG	04/25/11	ADDED BUSHING	LJL	04/25/11
K	AMM	02/03/11	UPDATED DETAIL AS PER COMMENTS	LJL	02/03/11
F	MDF	08/03/10	WALL THICKNESS CHANGE AND MATERIAL CALLOUTS	DB	08/03/10

STATE OF MISSISSIPPI  
 February 27, 2013  
 JOHN T. IRVING  
 No. 12678  
 PROFESSIONAL ENGINEER

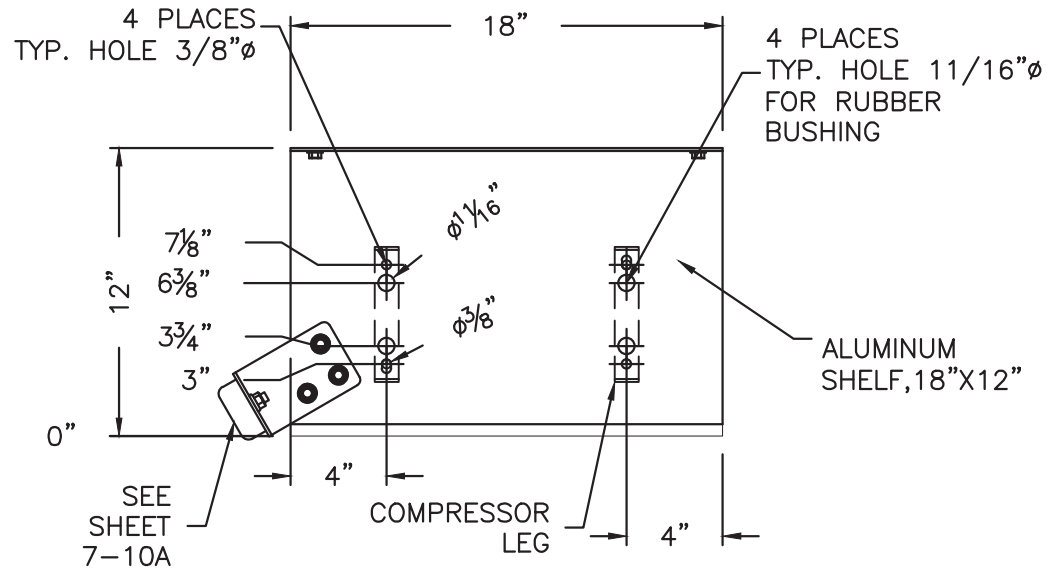
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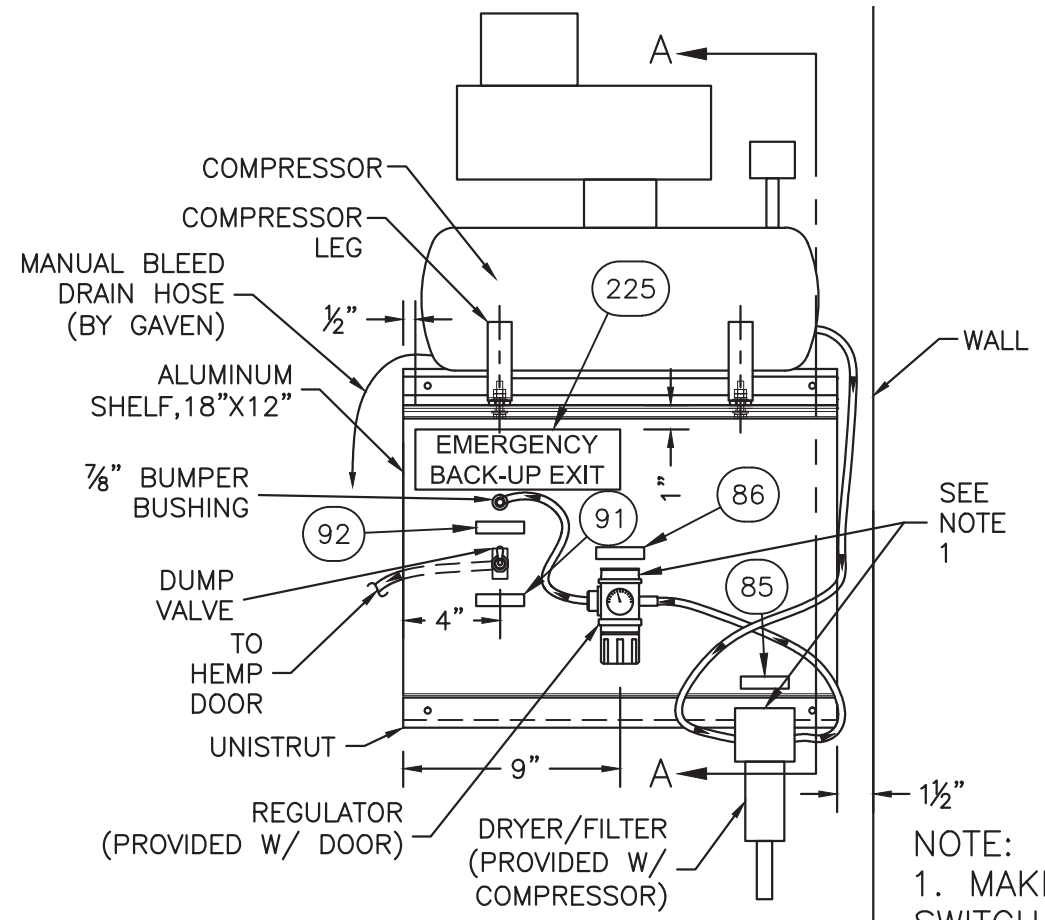
CUSTOMER:  
**KELLOGG  
 BROWN & ROOT  
 FEMA (PEP)  
 EXPANSION PROGRAM**

PROJECT:  
**10'-0" X 14'-0"  
 CONCRETE SHELTER  
 COMPRESSOR BRACKET  
 SUPPORT DETAIL**

FILENAME:  
**KBR/SKBRO1**  
 SCALE: N.T.S. TOLERANCE:  
 DRWN. BY: D. CHRISTOPHE DATE: 03/22/10  
 CHK. BY: G. BRINKMAN DATE: 03/22/10  
 ENG. BY: A. DUMAS  
 APP. BY: JI  
 SHEET NO. 7-10  
 DRAWING NO.: SKBR01 REV.: P

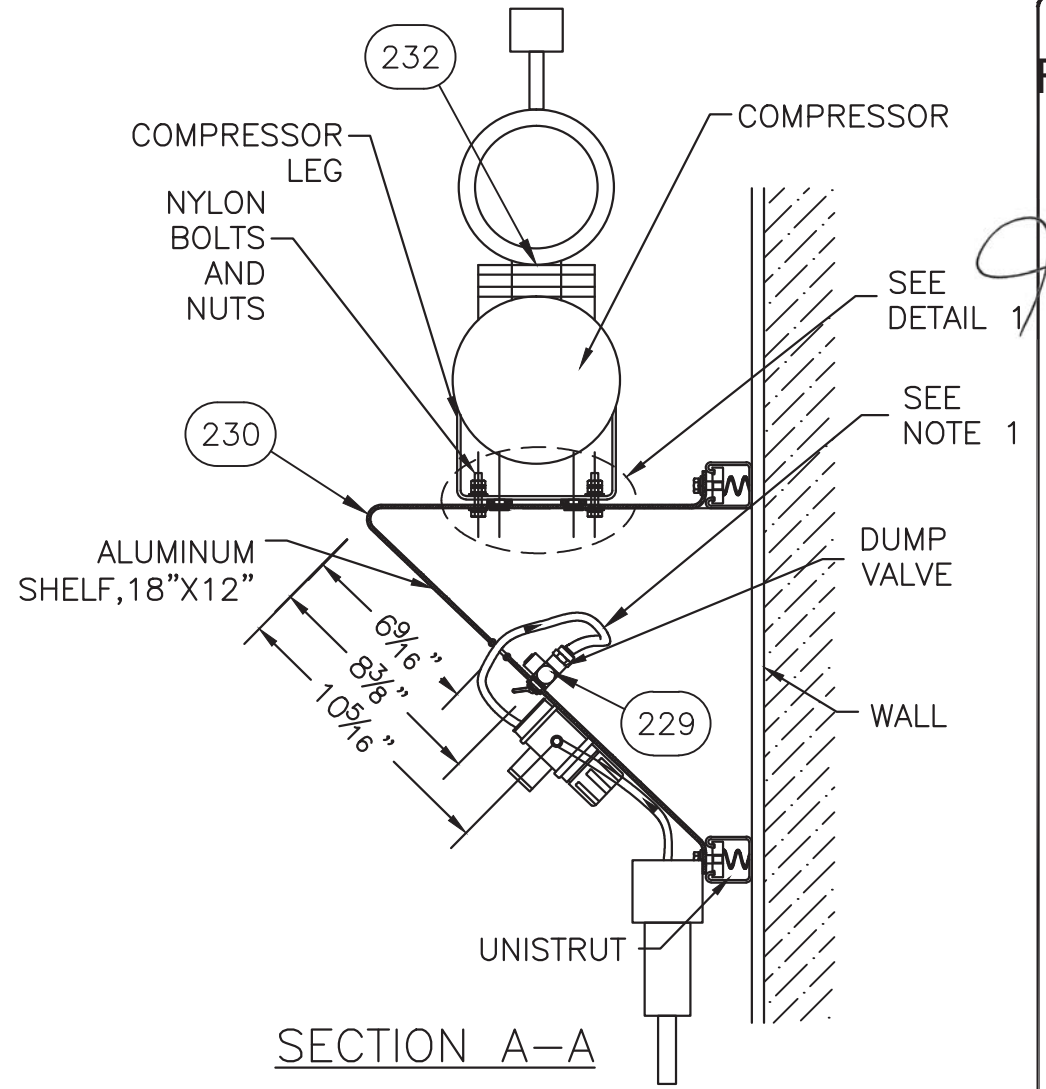


TOP VIEW

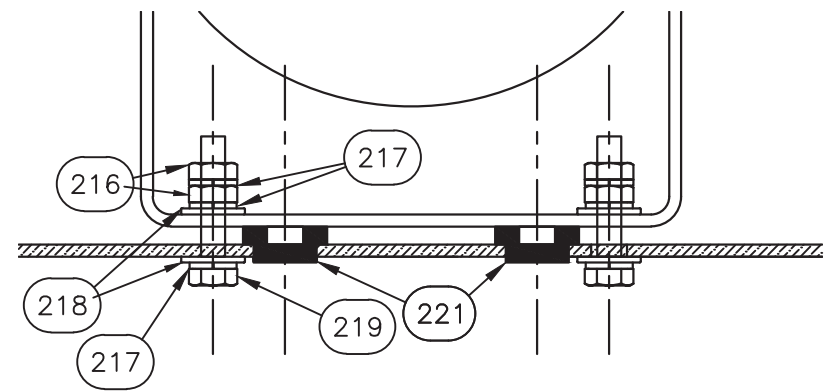


FRONT

NOTE:  
 1. MAKE SURE DRYER, FILTER & SWITCH CONNECTED SO THAT AIR TRAVELS THROUGH THEM IN CORRECT DIRECTION



SECTION A-A



DETAIL 1

REV	BY	DATE	DESCRIPTION	APP. BY	DATE
N	RRG	6/8/12	CORRECTED DRYER/FILTER CONNECTIONS	LJL	6/8/12
L	RRG	04/25/11	UPDATED NOTES/DETAILS	LJL	04/25/11
K	AMM	2/8/11	UPDATED DETAILS & ADDED DIMENSIONS	LJL	2/8/11



February 27, 2013



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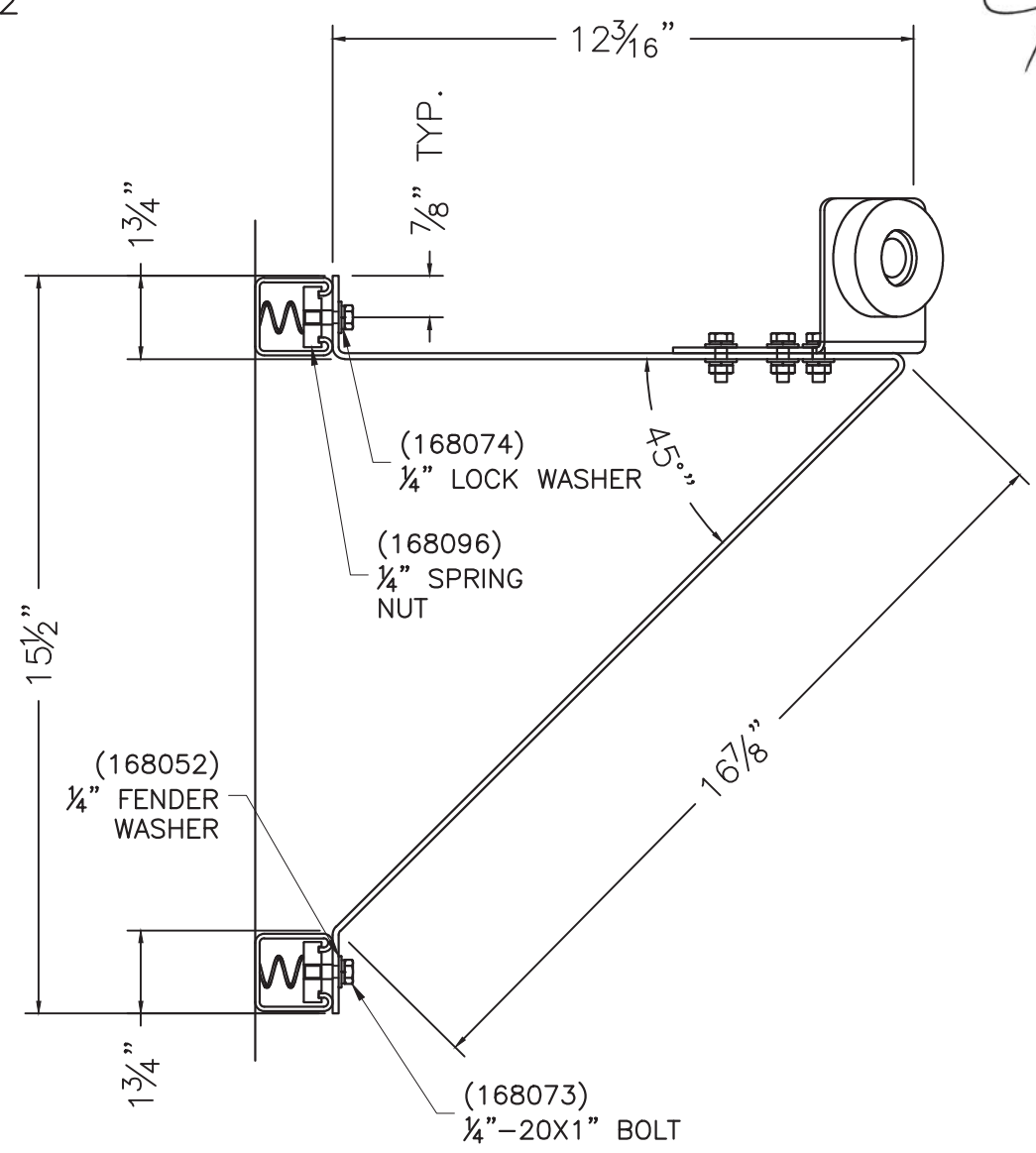
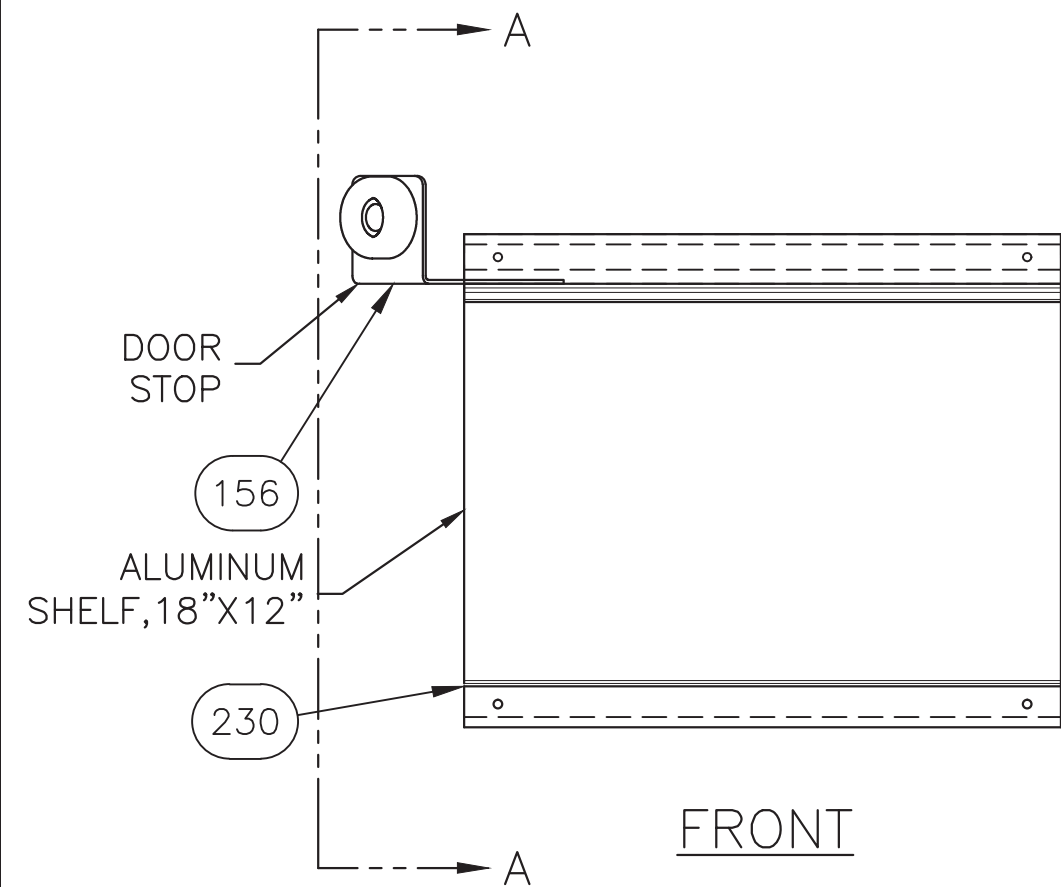
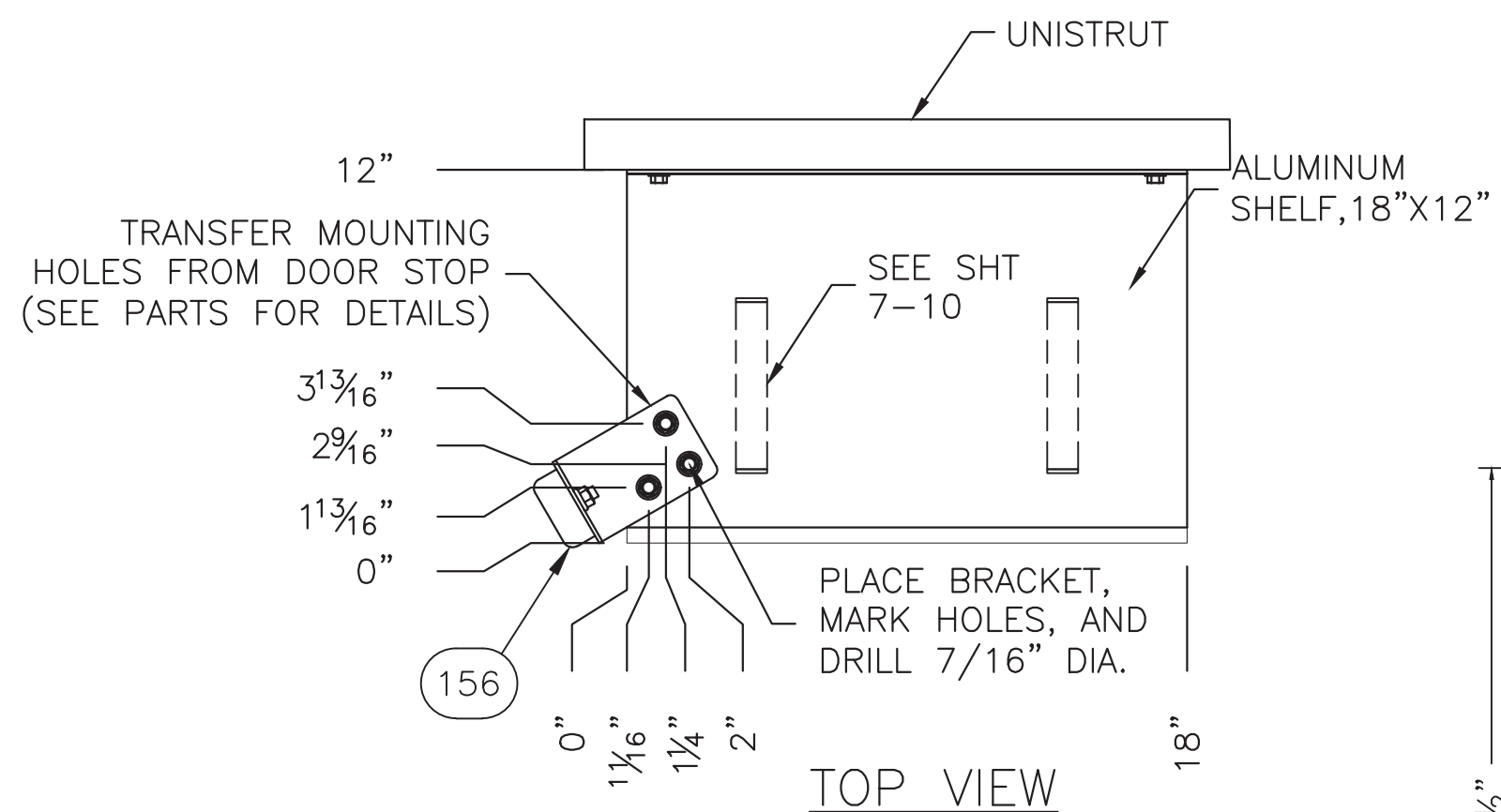
CUSTOMER:  
**KELLOGG  
 BROWN & ROOT  
 FEMA (PEP)  
 EXPANSION PROGRAM**

PROJECT:  
**10'-0" X 14'-0"  
 CONCRETE SHELTER  
 DOOR STOP BRACKET  
 INSTALLATION DETAIL**

FILENAME: KBR/SKBRO1	
SCALE: N.T.S.	TOLERANCE:
DRWN. BY: D. CHRISTOPHE	DATE: 03/22/10
CHK. BY: G. BRINKMAN	DATE: 03/22/10
ENG. BY: A. DUMAS	DATE:
APP. BY: JI	DATE:

SHEET NO.  
7-10A

DRAWING NO.:	REV.:
SKBR01	P



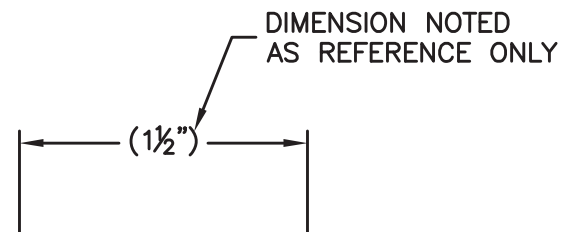
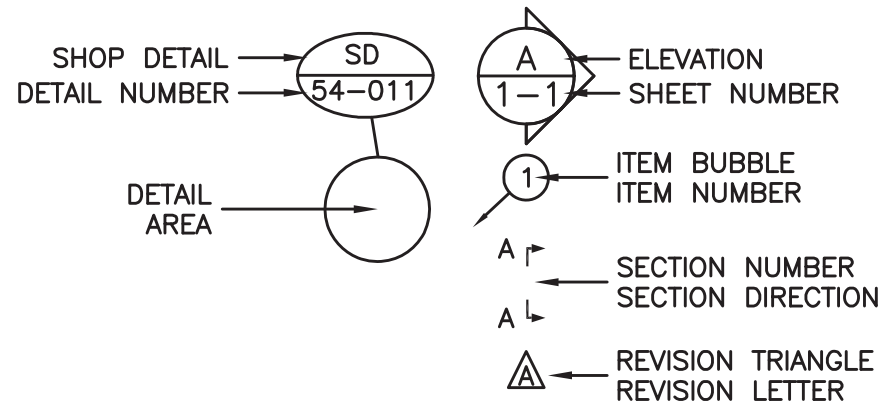
REV	BY	DATE	DESCRIPTION	APP. BY	DATE
N	RRG	6/8/12	ADDED DIMENSIONS, NEW DETAIL, & NOTES	LJL	6/8/12
M	JJ	7/25/11	UPDATED PER MARKUP	LJL	7/25/11
L	RRG	04/12/11	ADDED DOOR STOP BUBBLE	LJL	04/12/11
K	AMM	2/8/11	UPDATED VIEWS & PART NUMBERS	LJL	2/8/11
F	MDF	08/03/10	WALL THICKNESS CHANGE AND MATERIAL CALLOUTS	DB	08/03/10



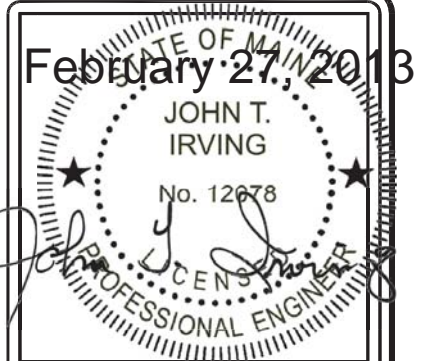
**ABBREVIATIONS**

⊙	AT	MFG	MANUFACTURER
A	AMPS	MISC	MISCELLANEOUS
AFF	ABOVE FINISH FLOOR	NEC	NATIONAL ELECTRIC CODE
BCW	BARE COPPER WIRE	NEG	NEGATIVE
BLK	BLACK	NEMA	NATIONAL ELECTRIC MANUFACTURER'S ASSOCIATION
BLU	BLUE	NOM	NOMINAL
BRN	BROWN	NO	NORMALLY OPEN
BLDG	BUILDING	NC	NORMALLY CLOSED
BOCA	BUILDING OFFICIALS CODE ADMINISTRATION	NTS	NOT TO SCALE
C	CENTERLINE	OR	ORANGE
C/C	CENTER TO CENTER	OD	OUTSIDE DIAMETER/OUTSIDE DIMENSION
CKT	CIRCUIT	OSB	ORIENTED STRAND BOARD
CONC	CONCRETE	P	POLE
CU YD	CUBIC YARD	PDC	POWER DISTRIBUTION CABINET
DIA / ∅	DIAMETER	POS	POSITIVE
DIM	DIMENSION	LB	POUND (S)
DP	DOUBLE POLE	PSF	POUNDS PER SQUARE FOOT
DPDT	DOUBLE POLE DOUBLE THROW	PSI	POUNDS PER SQUARE INCH
DPST	DOUBLE POLE SINGLE THROW	QTY	QUANTITY
DT	DOUBLE THROW	RECT	RECTIFIER
DWG	DRAWING	REBAR	REINFORCING STEEL BAR
EA	EACH	REQ'D.	REQUIRED
EGR	EQUIPMENT GROUND RING	REV	REVISION
ELEC	ELECTRIC/ELECTRICAL	R	RIGHT
EMT	ELECTRICAL METALLIC TUBING	RH	RIGHT HAND
ENT	ELECTRICAL NONMETALLIC TUBING	SHT	SHEET
ELEV	ELEVATION	1∅	SINGLE PHASE
EQUIP	EQUIPMENT	S/G	SERVICE GROUND
EXT	EXTERIOR	S/N	SERVICE NEUTRAL
FMLC	FLEXIBLE METALLIC LIQUID TIGHT CONDUIT	SPDT	SINGLE POLE DOUBLE THROW
FNLC	FLEXIBLE NONMETALLIC LIQUID TIGHT CONDUIT	SPST	SINGLE POLE SINGLE THROW
FND	FOUNDATION	SW	SINGLE POLE SWITCH
FRP	FIBERGLASS REINFORCED POLYESTER	SQ FT	SQUARE FEET
FS	FIRE SUPPRESSION	SQ IN	SQUARE INCH
GALV	GALVANIZED	STD	STANDARD
GEN	GENERATOR	SBC	STANDARD BUILDING CODE
GRN	GREEN	SW	SWITCH
GND	GROUND	TEMP	TEMPERATURE
GFCI	GROUND FAULT CIRCUIT INTERRUPTER	TSTAT	THERMOSTAT
HVAC	HEATING, VENTILATION, AND AIR CONDITIONING	3∅	THREE PHASE
HOR	HORIZONTAL	3P	THREE POLE
IAW	IN ACCORDANCE WITH	3W	THREE WIRE
IN	INCH	TYP	TYPICAL
ID	INSIDE DIAMETER/INSIDE DIMENSION	UL	UNDERWRITERS LABORATORIES INC.
INSUL	INSULATION	UBC	UNIFORM BUILDING CODE
INT	INTERIOR	UMC	UNIFORM MECHANICAL CODE
IMC	INTERNATIONAL MECHANICAL CODE	VENT	VENTILATION
IPC	INTERNATIONAL PLUMBING CODE	V	VOLT
IG	ISOLATED GROUND	W	WATTS
JB	JUNCTION BOX	WP	WEATHER PROOF
KW	KILOWATT	WLD	WELDED
KO	KNOCKOUT	WWF	WELDED WIRE FABRIC
L	LEFT	WHT	WHITE
L/N	LOAD NEUTRAL	W/	WITH
LH	LEFT HAND	W/O	WITHOUT
LTG	LIGHT/LIGHTNING	YEL	YELLOW
LL	LIVE LOAD		
LV	LOW VOLTAGE		

**SYMBOLS**



REV	BY	DATE	DESCRIPTION	APP. BY	DATE
D	LJL	6/1/09	ADDED ABBREVIATION: AFF	LJL	6/1/09
C	ACM	8/15/08	ADDED ABBREVIATIONS: S/N, S/G, & L/N	VGH	8/15/08
B	VGH	06/02/08	ADDED REFERENCE DIMENSION	VGH	06/02/08
A	CC	7/27/04	REVISED DETAIL SYMBOL	VGH	7/27/04



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**Cellxion**  
 A Division of Sabre Industries, Inc.  
 5031 Hazel Jones Road  
 Bossier City, Louisiana 71111  
 voice: (318) 213-2900  
 fax: (318) 213-2919  
 www.cellxion.com

CUSTOMER:  
 ENGINEERING STANDARD

PROJECT:  
 ABBREVIATIONS AND SYMBOLS

FILENAME: 108-007	
SCALE: 1"=1"	TOLERANCE: NA
DRWN. BY: C.CASINGER	DATE: 12/4/03
CHK. BY: K.BARNETT	DATE: 12/4/03
ENG. BY: K.BARNETT	DATE: 12/4/03
APP. BY:	DATE:

SHEET NO.  
 1 OF 1  
 DRAWING NO.:  
 108-007

D

## GENERAL NOTES

1. ALL STEEL FABRICATION AND INSTALLATION SHALL BE DONE IN ACCORDANCE WITH THE AMERICAN INSTITUTE OF STEEL CONSTRUCTION MANUAL AISC LRFD(1999) AND AWS D1.1 SPECIFICATIONS.
2. ALL WELDING SHALL BE MIG TYPE WITH THE FOLLOWING OPERATING SETTINGS:
 

WIRE SIZE -----	0.35
WIRE FEED SPEED (in/min) -----	5
VOLTAGE, DC (+) -----	18.5
AMPERAGE, DC -----	140
TRAVEL SPEED (in/min) -----	10-12
SHIELDING GAS -----	75/25
3. STRUCTURAL STEEL SPECIFICATIONS:
  - STRUCTURAL SHAPES ASTM A36M-97a
  - HIGH STRENGTH BOLTS, ASTM A 307-97
  - OTHER BOLTS, SAE J429 GRADE 5
4. ALL CONCRETE WORK SHALL CONFORM TO AMERICAN CONCRETE INSTITUTE A.C.I. 318-99 BUILDING CODES 311 & 211, AND ASTM STANDARDS C-172-97, C-31/31M96, C-39-96, AND PROVISIONS OF C-94-98.
5. ALL PRECAST STRUCTURAL SAND-LIGHTWEIGHT CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 5000 PSI AT 28 DAYS.
6. ALL REINFORCING STEEL BARS SHALL BE DOMESTIC, NEW BILLET STEEL CONFORMING TO ASTM A-615m-96a SPECIFICATIONS.
7. CONCRETE COVERAGE OVER ALL REINFORCING STEEL SHALL BE A MINIMUM OF 3/4".
8. ALL REBAR SHALL BE TIED 100% AT THE PERIMETER, AND 50% ELSEWHERE.
9. ALL REBAR WIRE TIES TO BE 16 GAUGE.
10. FIBROUS REINFORCED LIGHTWEIGHT CONCRETE MAY BE USED IN THE ROOF AND FLOOR AND SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 5000 PSI AT 28 DAYS. FIBER REINFORCEMENT MAY BE USED IN THE FLOOR IF DESIRED IN ORDER TO MAKE BATCHING OPERATION MORE EFFICIENT.
11. MAXIMUM JOINT SPACE BETWEEN PANELS SHALL BE 3/8" MEASURED BY REFUSAL OF ABILITY TO PASS A 3/8" ROD ALL THE WAY THROUGH THE JOINT AT ANY POINT ALONG THE JOINT.
12. WELD PLATE CONNECTIONS SHALL BE SPACED AT 4'-8" MAXIMUM ON THE FLOOR AND ROOF PANELS. THIS DIMENSION SHALL BE MAINTAINED EXCEPT IN CASES WHERE OPENINGS PROHIBIT.
13. TOLERANCES SHALL BE AS FOLLOWS:
  - PANEL THICKNESS:  $\pm 1/8"$
  - PANEL SIZE:  $\pm 1/16"$
  - PANEL SQUARENESS:  $\pm 1/8"$  AGREEMENT ON DIAGONALS
  - LOCATION OF BLOCKOUTS & PVC'S:  $\pm 1/4"$
  - BLOCKOUT DIMENSIONS:  $+1/4"$ ,  $-0"$
  - PVC SIZE: USE TRADE SIZE AS LISTED ON PROJECT DRAWINGS
14. REBAR SPLICING IS ALLOWED WHERE SPACE PERMITS. MINIMUM LAP IS 18" FOR #4 REBAR AND 30" FOR #6 REBAR.
15. CONCRETE SHALL HAVE AIR ENTRAINMENT OF 6%, MODERATE EXPOSURE AND A MAXIMUM AGGREGATE SIZE OF 3/8 INCH.
16. CONCRETE SHALL HAVE A WATER-CEMENTITIOUS MATERIAL RATIO OF 0.50.

GENERAL: THESE REBAR SIZES AND SPACING REPRESENT THE MINIMUM AMOUNT FOR ALL CASTING PLANS. PROJECT DRAWINGS MAY REQUIRE REINFORCEMENT IN ADDITION TO CELLXION STANDARDS.

ROOF PANEL: #4 (SHORT AXIS) 12" O.C. ON SHELTER WIDTH OF 11'-6" AND LESS, 10" O.C. ON SHELTER WIDTH GREATER THAN 11'-6" AND #4 (LONG AXIS) AT 18" O.C.

WALL PANEL: #4 AT PERIMETER AND 4 X 4 X W4.5 X W4.5 MESH THROUGHOUT.

FLOOR: (2)-#6 (SHORT AXIS) EACH RIB, #6 (LONG AXIS) EACH INTERIOR RIB. DECK: 4 X 4 X W4.5 X W4.5 MESH.

## SEALANT APPLICATION

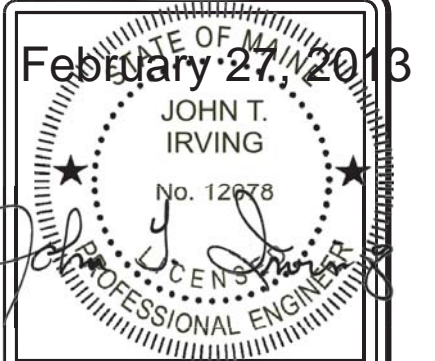
STEP 1. AT MATING SURFACES BETWEEN PANELS, APPLY URETHANE SEALANT ( $\frac{1}{2}$ " BEAD) DURING ASSEMBLY.

STEP 2. URETHANE SEALANT REQUIRED ON ALL JOINTS. APPLY TO EXTERIOR AFTER PANEL ASSEMBLY.

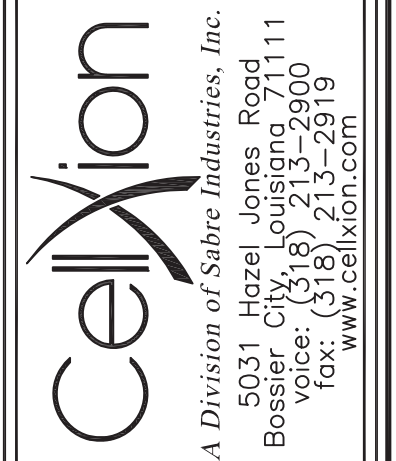
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APPLY SHELTER ROOF COATING PER MANUFACTURER INSTRUCTION. ROOF COATING TO CONFORM TO, ASTM D6083-97A, OBC 1507.15.2 & 2000 IBC 1507.15.2.

STEP 4. APPLY AGGREGATE SEALER TO EXTERIOR WALLS. USE 1 GALLON PER 200 SQ. FEET.

STEP 5. USE TEXTURED SEALER ON ALL SMOOTH EXPOSED SURFACES. USE CEMENTITIOUS GRAY PAINT.



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CUSTOMER:  
**ENGINEERING STANDARD**

PROJECT:  
**GENERAL CASTING SPECIFICATIONS 2000 IBC**

FILENAME: 108-016	
SCALE: 1"=1"	TOLERANCE:
DRWN. BY: C.CASINGER	DATE: 7/28/04
CHK. BY:	DATE:
ENG. BY:	DATE:
APP. BY:	DATE:
SHEET NO. 1 OF 4	
DRAWING NO.: 108-016	M

## GENERAL NOTES

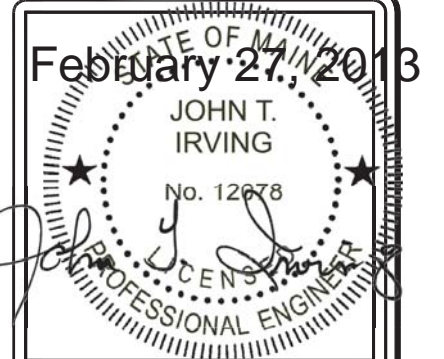
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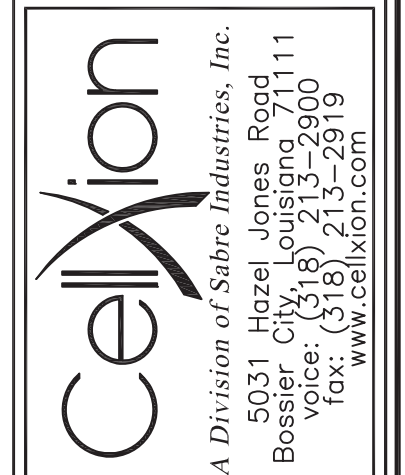
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## SEALANT APPLICATION

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CUSTOMER:  
ENGINEERING STANDARD

PROJECT:  
GENERAL CASTING  
SPECIFICATIONS  
2003 IBC

FILENAME: 108-016	
SCALE: 1"=1"	TOLERANCE:
DRWN. BY: L. DROZDZ	DATE: 9/17/07
CHK. BY:	DATE:
ENG. BY:	DATE:
APP. BY:	DATE:
SHEET NO. 2 OF 4	
DRAWING NO.: 108-016	M



## GENERAL NOTES

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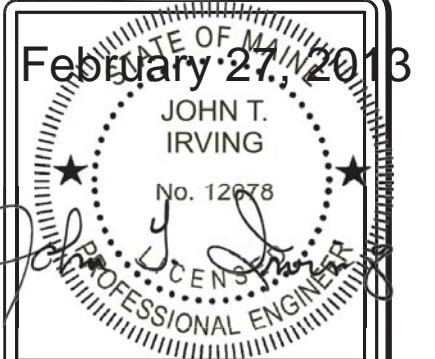
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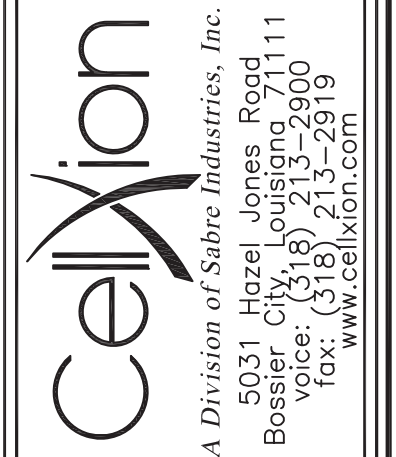
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CUSTOMER:  
ENGINEERING STANDARD

PROJECT:  
GENERAL CASTING  
SPECIFICATIONS  
2006 IBC

FILENAME: 108-016	
SCALE: 1"=1"	TOLERANCE:
DRWN. BY: L. DROZDZ	DATE: 10/1/07
CHK. BY:	DATE:
ENG. BY:	DATE:
APP. BY:	DATE:
SHEET NO. 3 OF 4	
DRAWING NO.: 108-016	M



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  - LOCATION OF BLOCKOUTS & PVC'S:  $\pm 1/4"$
  - BLOCKOUT DIMENSIONS:  $+1/4"$ ,  $-0"$
  - PVC SIZE: USE TRADE SIZE AS LISTED ON PROJECT DRAWINGS
14. REBAR SPLICING IS ALLOWED WHERE SPACE PERMITS. MINIMUM LAP IS 18" FOR #4 REBAR AND 30" FOR #6 REBAR.
15. CONCRETE SHALL HAVE AIR ENTRAINMENT OF 6%, MODERATE EXPOSURE AND A MAXIMUM AGGREGATE SIZE OF 3/8 INCH.
16. CONCRETE SHALL HAVE A WATER-CEMENTITIOUS MATERIAL RATIO OF 0.50.

GENERAL: THESE REBAR SIZES AND SPACING REPRESENT THE MINIMUM AMOUNT FOR ALL CASTING PLANS. PROJECT DRAWINGS MAY REQUIRE REINFORCEMENT IN ADDITION TO CELLXION STANDARDS.

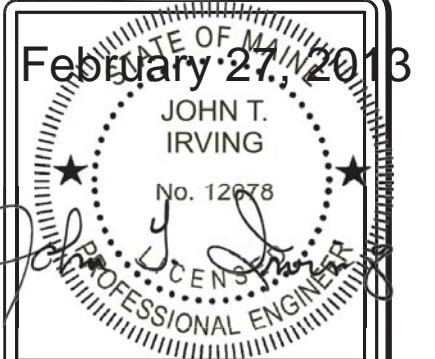
ROOF PANEL: #4 (SHORT AXIS) 12" O.C. ON SHELTER WIDTH OF 11'-6" AND LESS, 10" O.C. ON SHELTER WIDTH GREATER THAN 11'-6" AND #4 (LONG AXIS) AT 18" O.C.

WALL PANEL: #4 AT PERIMETER AND 4 X 4 X W4.5 X W4.5 MESH THROUGHOUT.

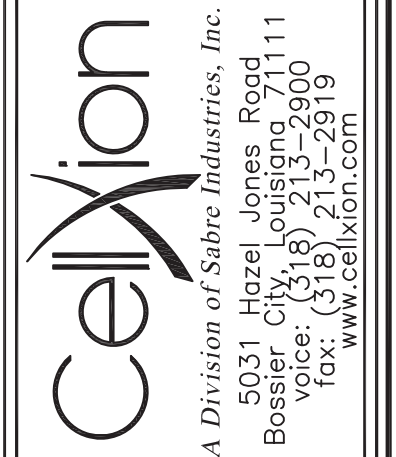
FLOOR: (2)-#6 (SHORT AXIS) EACH RIB, #6 (LONG AXIS) EACH INTERIOR RIB. DECK: 4 X 4 X W4.5 X W4.5 MESH.

## SEALANT APPLICATION

- STEP 1. AT MATING SURFACES BETWEEN PANELS, APPLY URETHANE SEALANT (1/2" BEAD) DURING ASSEMBLY.
- STEP 2. URETHANE SEALANT REQUIRED ON ALL JOINTS. APPLY TO EXTERIOR AFTER PANEL ASSEMBLY.
- STEP 3. ROOF COATING:  
APPLY SHELTER ROOF COATING PER MANUFACTURER INSTRUCTION. ROOF COATING TO CONFORM TO, ASTM D6083-05e01, OBC 1507.15.2 & 2009 IBC 1507.15.2.
- STEP 4. APPLY AGGREGATE SEALER TO EXTERIOR WALLS. USE 1 GALLON PER 200 SQ. FEET.
- STEP 5. USE TEXTURED SEALER ON ALL SMOOTH EXPOSED SURFACES. USE CEMENTITIOUS GRAY PAINT.



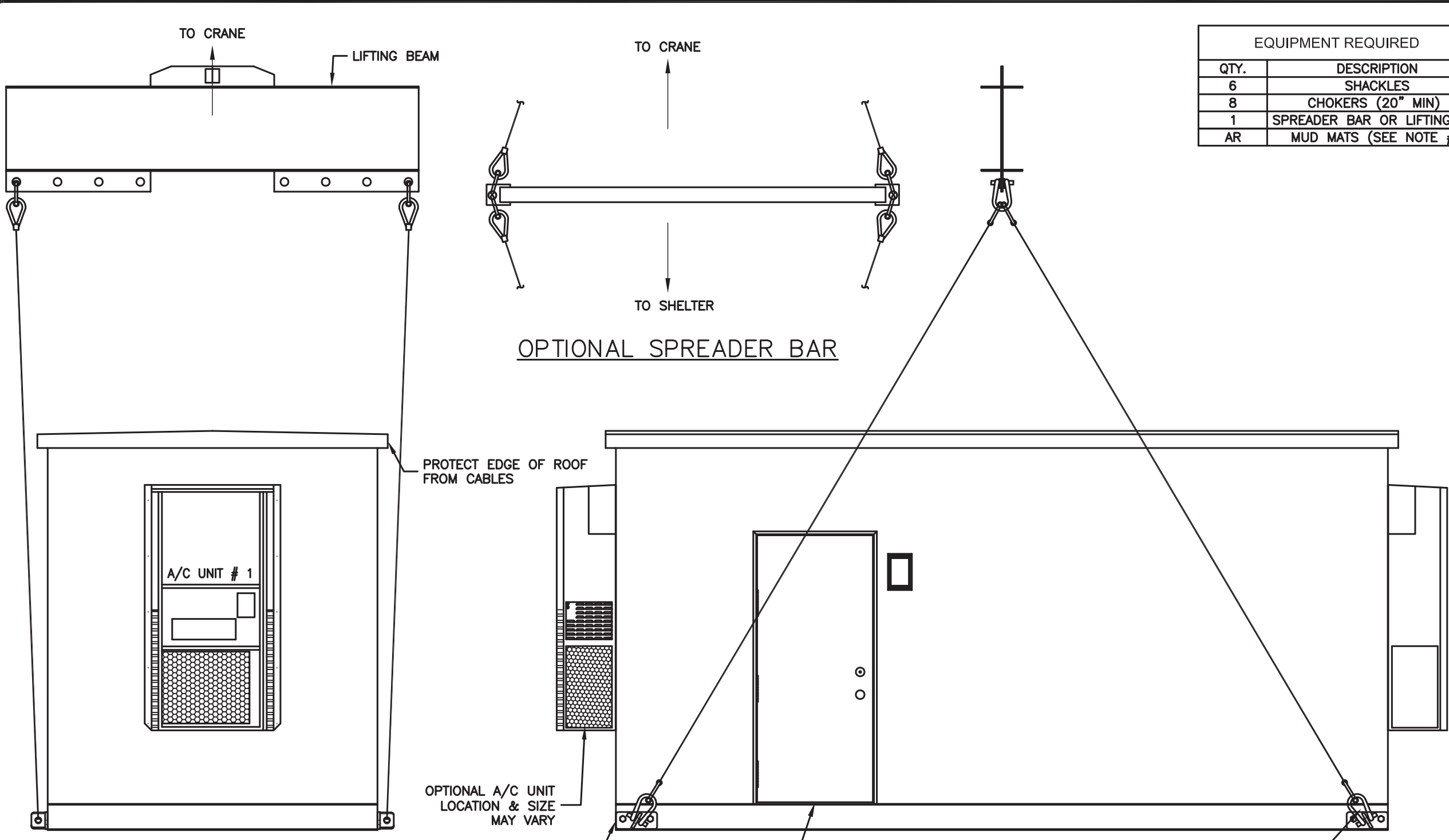
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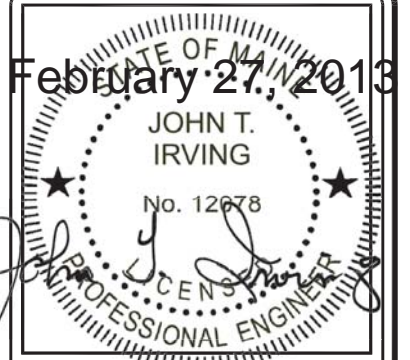
CUSTOMER:  
ENGINEERING STANDARD

PROJECT:  
GENERAL CASTING  
SPECIFICATIONS  
2009 IBC

FILENAME: 108-016	
SCALE: 1"=1"	TOLERANCE:
DRWN. BY: L. DROZDZ	DATE: 7/21/10
CHK. BY:	DATE:
ENG. BY:	DATE:
APP. BY:	DATE:
SHEET NO. 4 OF 4	
DRAWING NO.: 108-016	M



EQUIPMENT REQUIRED	
QTY.	DESCRIPTION
6	SHACKLES
8	CHOKERS (20" MIN)
1	SPREADER BAR OR LIFTING BEAM
AR	MUD MATS (SEE NOTE #2)



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 5031 Hazel Jones Road  
 Bossier City, Louisiana 71111  
 voice: (318) 213-2900  
 fax: (318) 213-2919  
 www.cellxion.com

CUSTOMER:  
 PREP TO MOVE STANDARD

PROJECT:  
 SHELTER LIFTING DETAILS  
 4 LIFTING POINTS

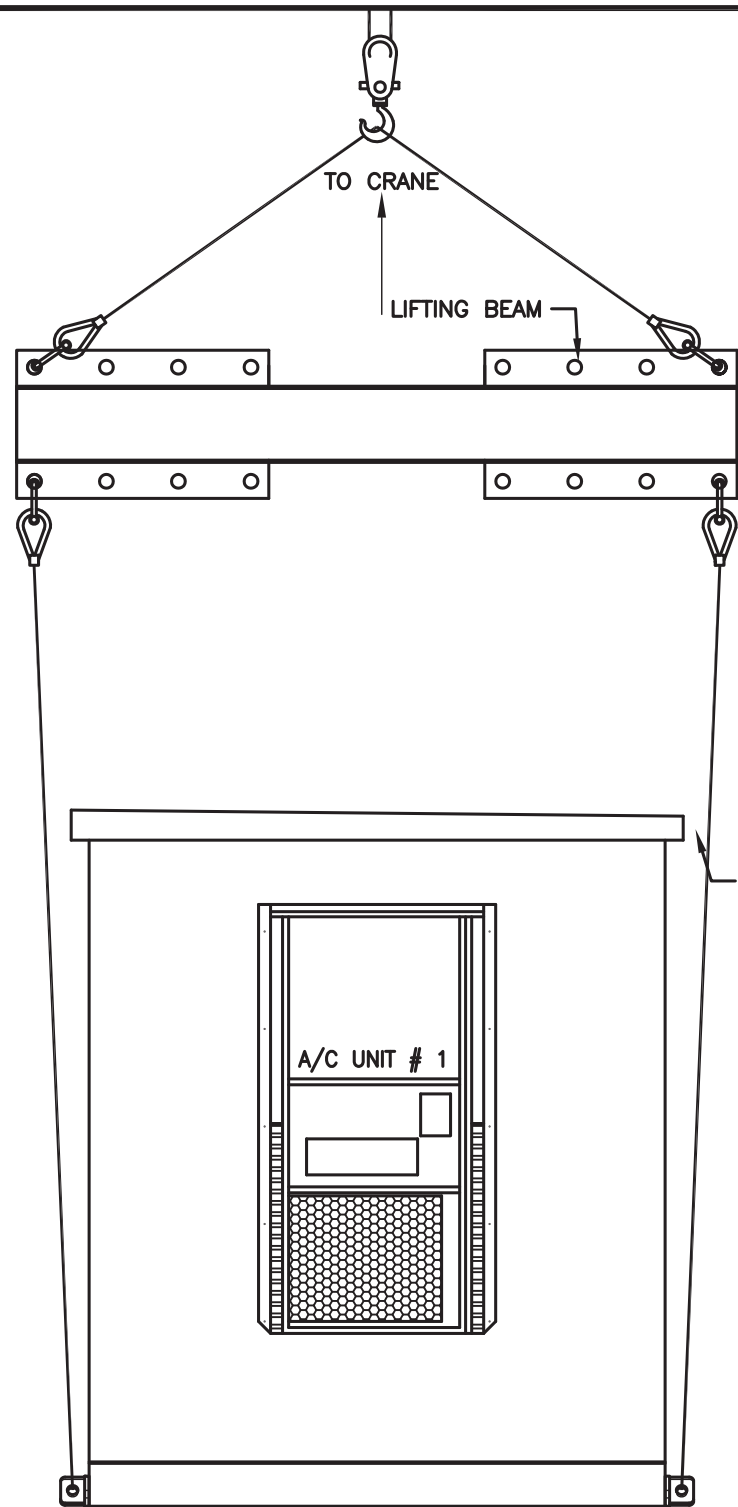
FILENAME: 108-088	
SCALE: N.T.S.	TOLERANCE:
DRWN. BY: J. ASHLEY	DATE: 5/13/08
CHK. BY: V. HASSELL	DATE: 5/13/08
ENG. BY:	DATE:
APP. BY:	DATE:
SHEET NO. 1 OF 3	
DRAWING NO.:	B
108-088	

**END VIEW**  
 SCALE: 1/4" = 1'-0"

**SIDE VIEW**  
 SCALE: 1/4" = 1'-0"

- NOTES:
- FOUR (4) LIFTING POINTS REQUIRED ONLY FOR SHELTER LESS THAN 24' LONG.
  - SHELTER SIZE & CONFIG. MAY VARY.
  - COMPENSATE WEIGHT DIFFERENCE WITH ADDITIONAL SHACKLES IF REQ'D.
  - MUD MATS ARE TO BE USED IF SITE CONDITIONS WARRANT.
  - REVIEW WEIGHT TICKETS AND SITE CONDITIONS TO DETERMINE PROPER SIZING OF EQUIPMENT AND RIGGING.
  - SPREADER LENGTH TO BE WIDER THAN SHELTER TO KEEP CABLES FROM RUBBING AT ROOF.

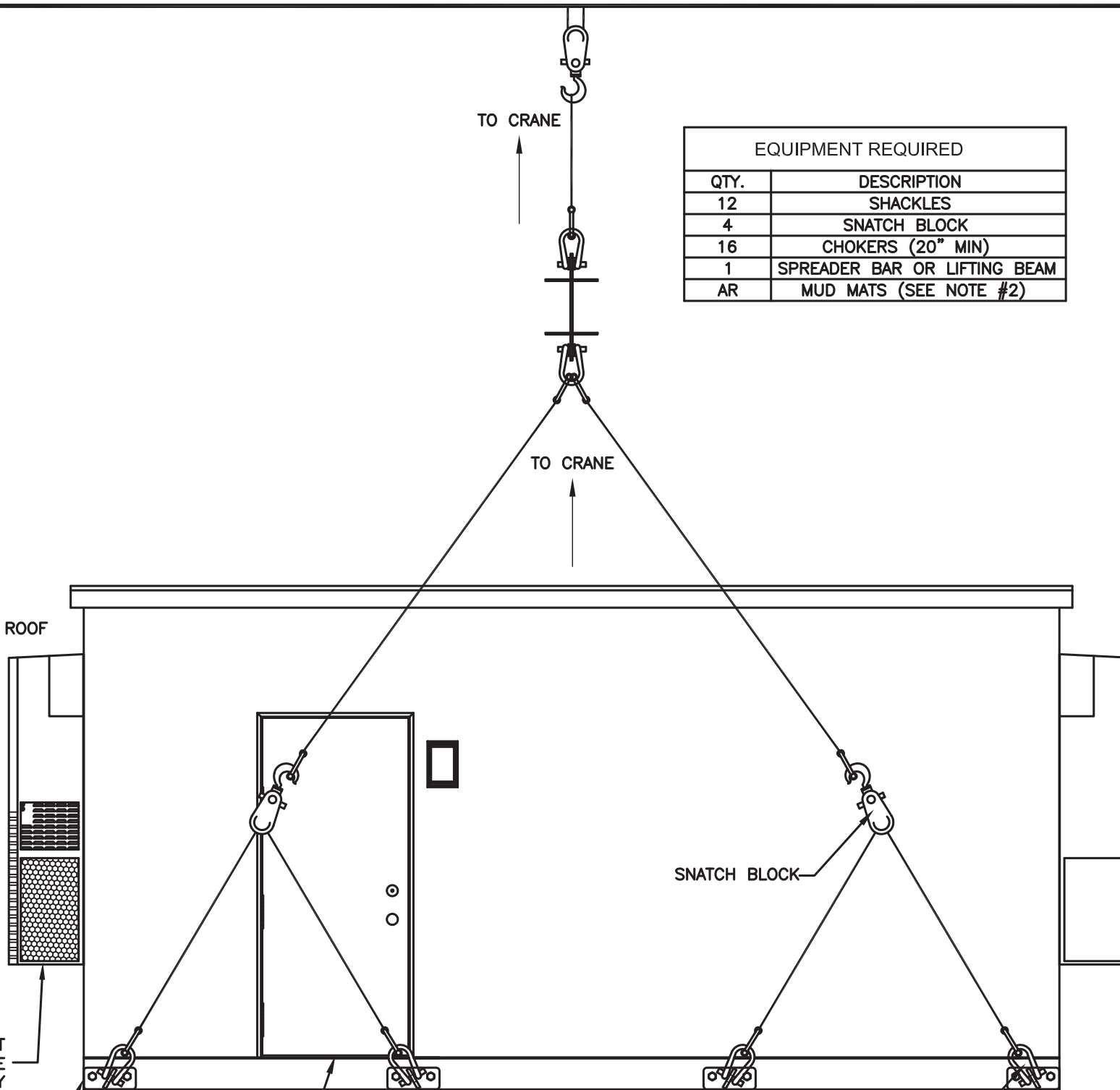
REV	BY	DATE	DESCRIPTION	APP. BY	DATE
B	GAB	01/19/11	ADDED THE WORD OPTIONAL TO THE A/C	GAB	01/19/11
A	AMM	9/15/09	ADDED 8 LIFTING POINTS OPTION	LD	9/15/09



**END VIEW**  
SCALE: 1/4" = 1'-0"

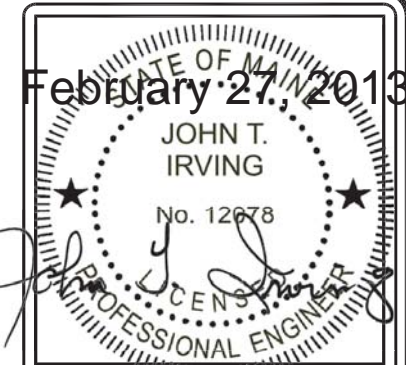
**NOTES:**

1. EIGHT (8) LIFTING POINTS REQUIRED ONLY FOR SHELTER 24' AND LONGER.
2. SHELTER SIZE & CONFIG. MAY VARY.
3. COMPENSATE WEIGHT DIFFERENCE WITH ADDITIONAL SHACKLES IF REQ'D.
4. MUD MATS ARE TO BE USED IF SITE CONDITIONS WARRANT.
5. REVIEW WEIGHT TICKETS AND SITE CONDITIONS TO DETERMINE PROPER SIZING OF EQUIPMENT AND RIGGING.
6. SPREADER LENGTH TO BE WIDER THAN SHELTER TO KEEP CABLES FROM RUBBING AT ROOF.



**SIDE VIEW**  
SCALE: 1/4" = 1'-0"

EQUIPMENT REQUIRED	
QTY.	DESCRIPTION
12	SHACKLES
4	SNATCH BLOCK
16	CHOKERS (20" MIN)
1	SPREADER BAR OR LIFTING BEAM
AR	MUD MATS (SEE NOTE #2)



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CUSTOMER:  
**PREP TO MOVE STANDARD**

PROJECT:  
**SHELTER LIFTING DETAILS  
8 LIFTING POINTS  
OPTION-1**

FILENAME: 108-088	
SCALE: N.T.S.	TOLERANCE:
DRWN. BY: J. ASHLEY	DATE: 5/13/08
CHK. BY: V. HASSELL	DATE: 5/13/08
APP. BY:	DATE:

SHEET NO.  
2 OF 3

DRAWING NO.:  
108-088

B

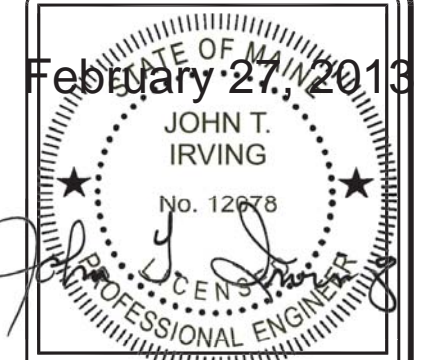
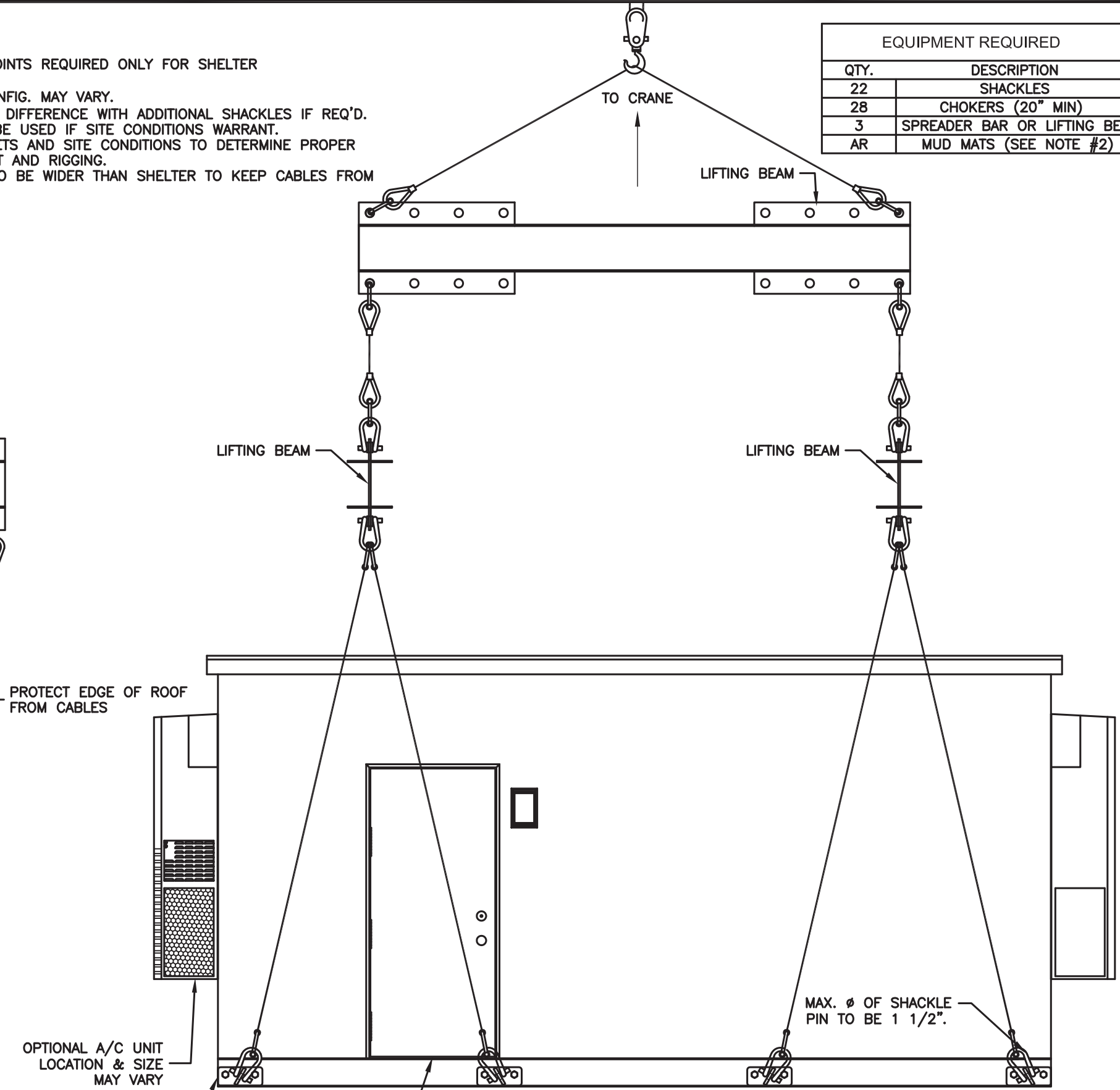
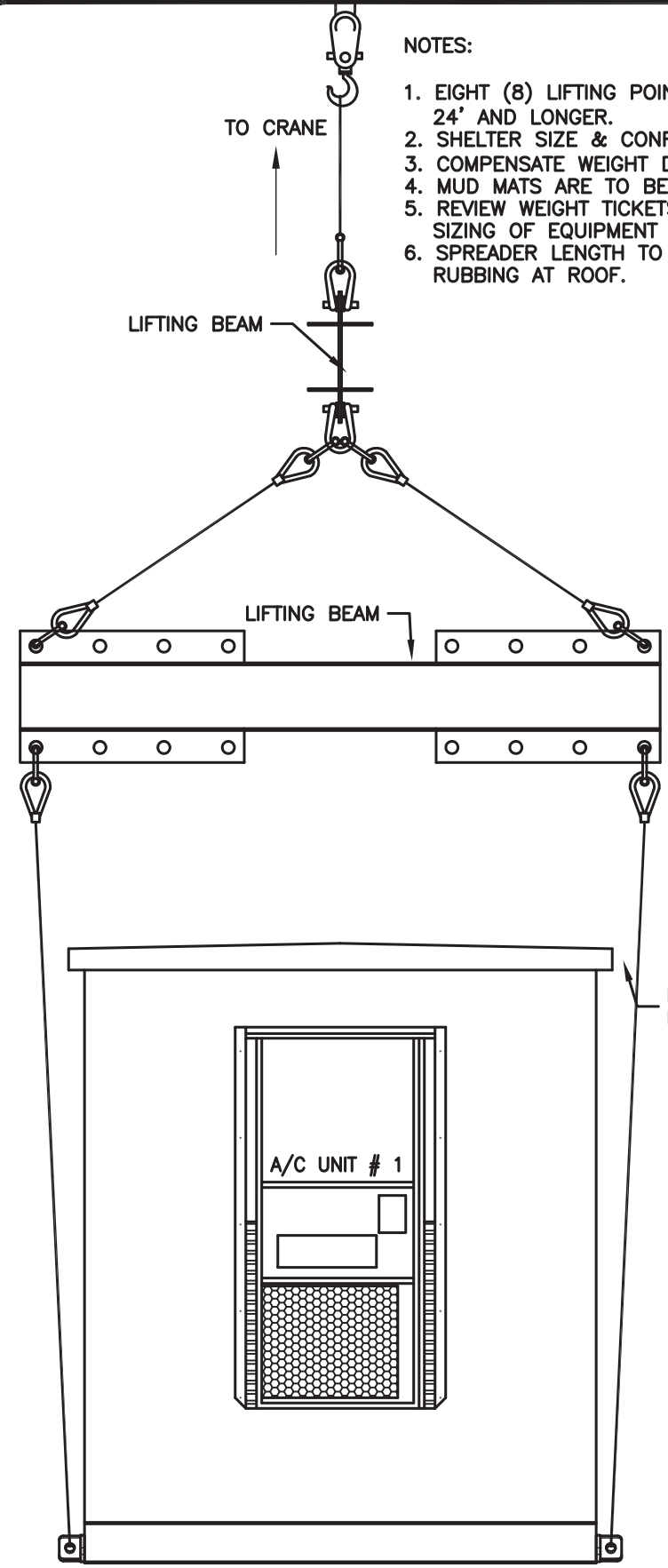
REV	BY	DATE	DESCRIPTION	APP. BY	DATE
B	GAB	01/19/11	ADDED THE WORD OPTIONAL TO THE A/C	GAB	01/19/11
A	AMM	9/15/09	ADDED 8 LIFTING POINTS OPTION	LD	9/15/09



NOTES:

1. EIGHT (8) LIFTING POINTS REQUIRED ONLY FOR SHELTER 24' AND LONGER.
2. SHELTER SIZE & CONFIG. MAY VARY.
3. COMPENSATE WEIGHT DIFFERENCE WITH ADDITIONAL SHACKLES IF REQ'D.
4. MUD MATS ARE TO BE USED IF SITE CONDITIONS WARRANT.
5. REVIEW WEIGHT TICKETS AND SITE CONDITIONS TO DETERMINE PROPER SIZING OF EQUIPMENT AND RIGGING.
6. SPREADER LENGTH TO BE WIDER THAN SHELTER TO KEEP CABLES FROM RUBBING AT ROOF.

EQUIPMENT REQUIRED	
QTY.	DESCRIPTION
22	SHACKLES
28	CHOKERS (20" MIN)
3	SPREADER BAR OR LIFTING BEAM
AR	MUD MATS (SEE NOTE #2)



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CUSTOMER:  
**PREP TO MOVE STANDARD**

PROJECT:  
**SHELTER LIFTING DETAILS  
8 LIFTING POINTS  
OPTION-2**

FILENAME: 108-088	
SCALE: N.T.S.	TOLERANCE:
DRWN. BY: J. ASHLEY	DATE: 5/13/08
CHK. BY: V. HASSELL	DATE: 5/13/08
ENG. BY:	DATE:
APP. BY:	DATE:

SHEET NO.  
3 OF 3

DRAWING NO.:  
108-088

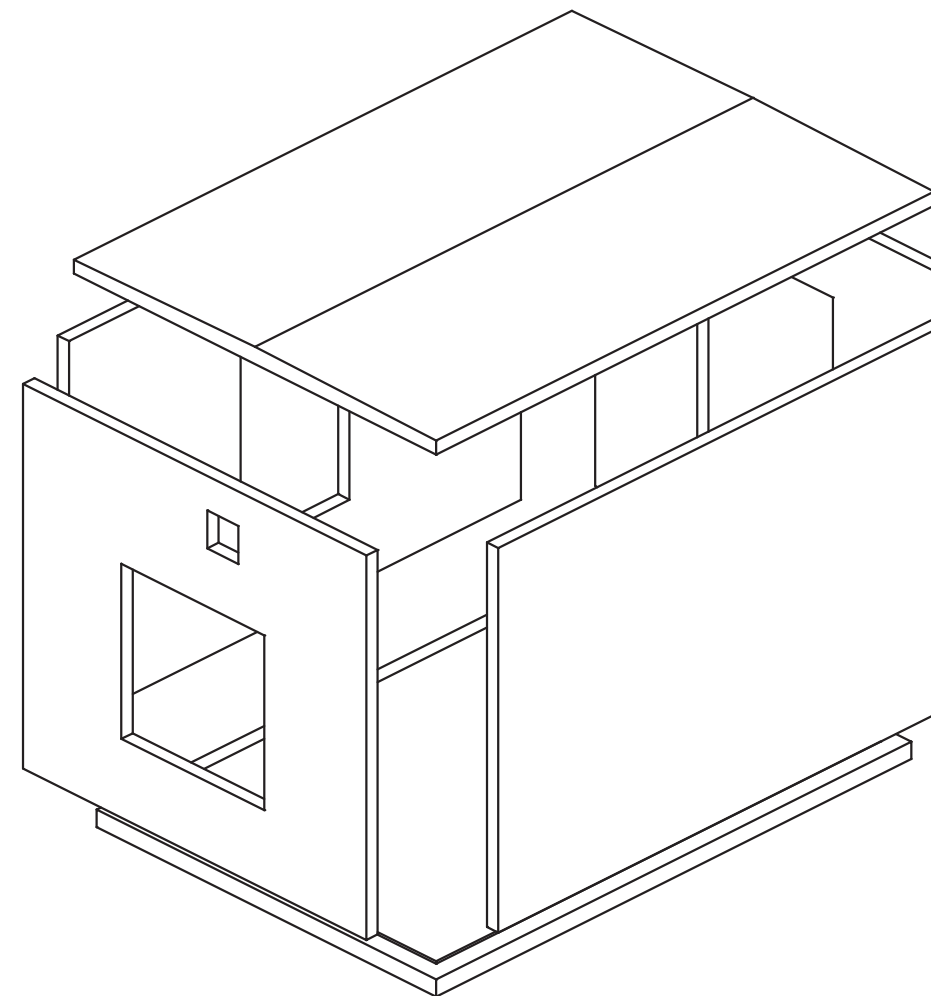
B

REV	BY	DATE	DESCRIPTION	APP. BY	DATE
B	GAB	01/19/11	ADDED THE WORD OPTIONAL TO THE A/C	GAB	01/19/11
A	AMM	9/15/09	ADDED 8 LIFTING POINTS OPTION	LD	9/15/09

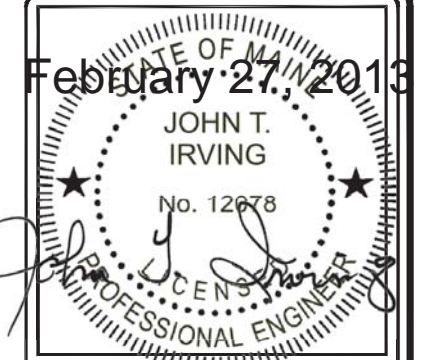


PARTS LIST				
ITEM	QTY	U/M	P/N	DESCRIPTION
500	1.0000	EA.	022008	BLOCKOUT ASSY, ANGLE,58 1/2"X58 1/2"
501	1.0000	EA.	022009	BLOCKOUT ASSY, ANGLE,46 1/2"X82 1/2"
502	1.0000	EA.	022010	BLOCKOUT ASSY,FLAT BAR,56"X88"
503	4.5200	CU.YD.	100052-001	CONCRETE,1 CUBIC YARD BATCH,WALLS
504	2.4100	CU.YD.	100052-003	CONCRETE,1 CUBIC YARD BATCH,ROOF
505	2.7000	EA.	110001	MESH,WIRE,4X4,W4XW4,B'X20'
	646.1450	FT.	112502	REBAR,#4 (1/2") #13 METRIC,GRADE 60
	229.2290	FT.	112505	REBAR,#4 (1/2") #13 METRIC,FIBERGLS
519	15.0000	EA.	119010	REBAR CHAIR,PLASTIC,#4 W/BASE 1"
520	80.0000	EA.	119026	REBAR CHAIR,PLASTIC,#4,2",W/BASE
521	70.0000	EA.	119027	REBAR CHAIR,PLASTIC,MESH,2-1/2",W/B
522	1.0000	FT.	170000	PIPE,PVC,SCH 40,1"
523	2.0000	FT.	170003	PIPE,PVC,SCH 40,1 1/2"
524	0.5000	FT.	170005	PIPE,PVC,SCH 40,3"
525	4.0000	EA.	220219-01	ROOF ANCHOR,LIFTING INSERT
526	1.0000	EA.	221-1000X1400-03	CONCRETE FLOOR ASSY KIT,10'0"X14'0"
527	4.0000	EA.	221011	WALL EMBED ANGLE ASSY,6"X4" X 9'3"
528	16.0000	EA.	222000	INSERT ANGLE,WALL TO ROOF
529	16.0000	EA.	223000	INSERT PLATE,ROOF TO 4" WALL
530	21.0000	EA.	223100	EMBED PLATE,WALL,1/4"X6"X8"
531	37.0000	EA.	223102	INSERT,WELD PLATE 1/4"X3"X4",F/B
532	15.0000	EA.	350034	PLYWOOD,3/4"X4'X8',PYRO-GUARD
	4.5347	FBM	360151	INSULATION,EPS,FOAM,RAW MATL B-FOOT
535	11.0000	EA.	360161	INSULATION,RMAX,1 3/4",MULTI-MAX,RM
536	4.0000	EA.	360162	INSULATION,RMAX,2 1/4",MULTI-MAX,RM
537	1.0000	EA.	501047-00003	DOOR FRM,CURRIES,4068 RH,4 SIDED
538	6.0000	EA.	502011	T-ANCHOR,DOOR FRAME
539	5.0000	EA.	540237	GROUND STRAP ASSY,STRUCTURE,12"SOLID

CUT LIST				
ITEM	P/N	DESCRIPTION	CUT	PCS
506	112502	REBAR,#4 (1/2") #13 METRIC,GRADE 60	156 3/4"	5
507	112502	REBAR,#4 (1/2") #13 METRIC,GRADE 60	108"	20
508	112502	REBAR,#4 (1/2") #13 METRIC,GRADE 60	117"	8
509	112502	REBAR,#4 (1/2") #13 METRIC,GRADE 60	31 1/2"	2
510	112502	REBAR,#4 (1/2") #13 METRIC,GRADE 60	36"	18
511	112502	REBAR,#4 (1/2") #13 METRIC,GRADE 60	125"	15
512	112502	REBAR,#4 (1/2") #13 METRIC,GRADE 60	161"	8
513	112505	REBAR,#4 (1/2") #13 METRIC,FIBERGLS	36"	4
514	112505	REBAR,#4 (1/2") #13 METRIC,FIBERGLS	156 3/4"	2
515	112505	REBAR,#4 (1/2") #13 METRIC,FIBERGLS	108"	11
516	112505	REBAR,#4 (1/2") #13 METRIC,FIBERGLS	117"	7
517	112505	REBAR,#4 (1/2") #13 METRIC,FIBERGLS	86 1/4"	1
518	112505	REBAR,#4 (1/2") #13 METRIC,FIBERGLS	100"	2
523	170003	PIPE,PVC,SCH 40,1 1/2"	6"	4
524	170005	PIPE,PVC,SCH 40,3"	6"	1
533	360151	INSULATION,EPS,FOAM,RAW MATL B-FOOT	11" X 11" X 4"	1
534	360151	INSULATION,EPS,FOAM,RAW MATL B-FOOT	6 1/2" X 6 1/2" X 4"	1



N	RRG	6/8/12	CHANGES PER 12KBR002-3	LJL	6/8/12
K	AMM	02/10/11	UPDATED BUBBLES, PEN DIMENSIONS & RMAX PANELS	LJL	02/10/11
D	MDF	07/28/10	PER MARKUPS	DB	07/29/10
REV	BY	DATE	DESCRIPTION	APP.BY	DATE



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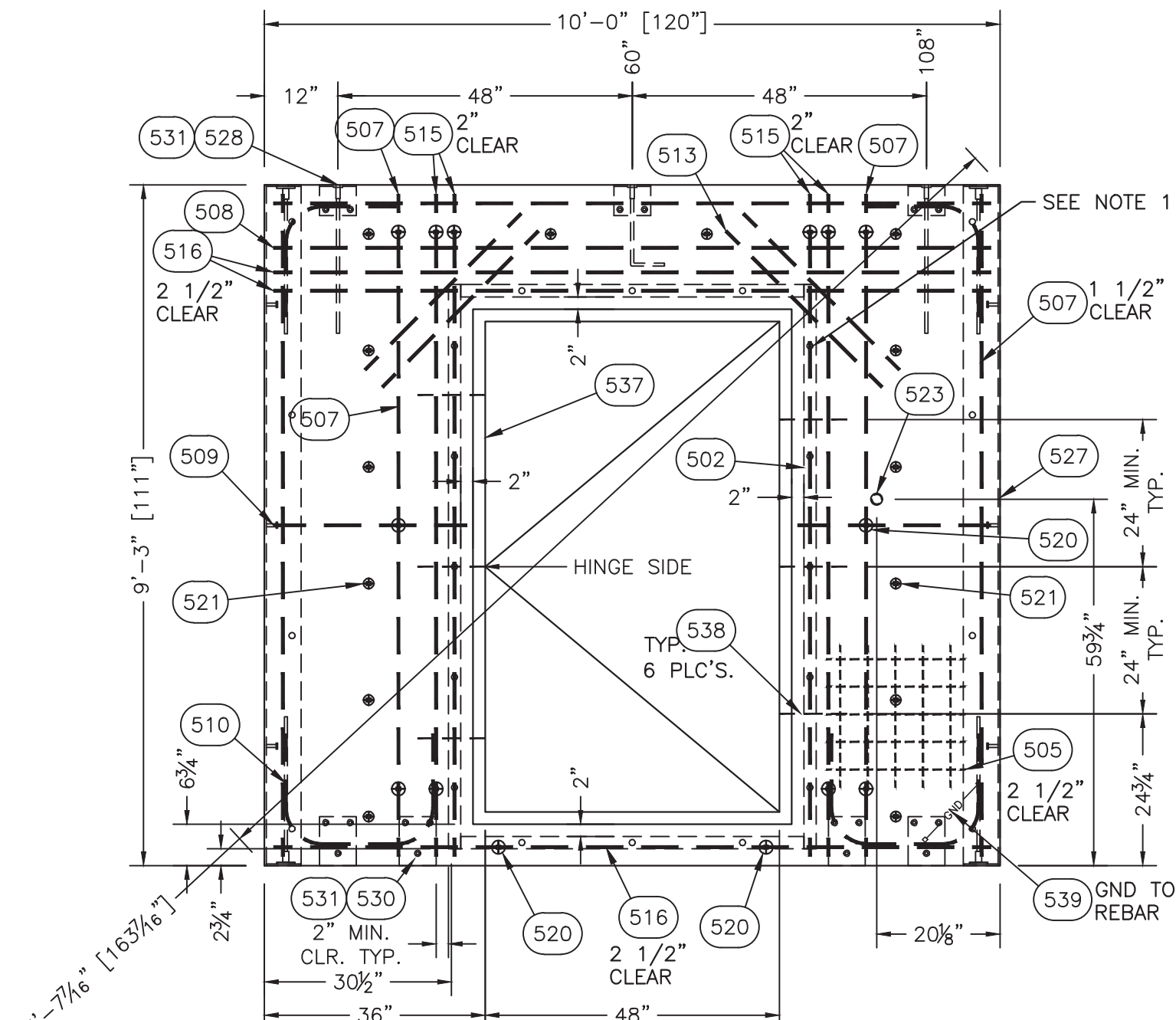
CUSTOMER:  
**KELLOGG  
 BROWN & ROOT  
 FEMA (PEP)  
 EXPANSION PROGRAM**

PROJECT:  
**10'-0" X 14'-0"  
 CONCRETE SHELTER  
 STRUCTURAL  
 SPECIFICATIONS**

FILENAME: KBR/SKBR01S	
SCALE:	TOLERANCE:
DRWN. BY: J. ASHLEY	DATE: 5/02/10
CHK. BY: G. BRINKMAN	DATE: 5/02/10
ENG. BY:	DATE:
APP. BY:	DATE:
SHEET NO. 50-0	
DRAWING NO.:	REV.:
SKBR01S	P

SUB-PARTS LIST

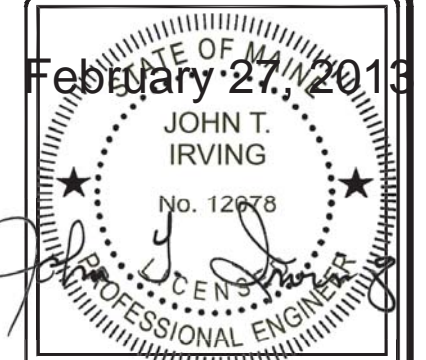
ITEM	P/N	DESCRIPTION	CUT	ITEM	P/N	DESCRIPTION	CUT
502	022010	BLOCKOUT ASSY, FLAT BAR, 56" X 88"		521	119027	REBAR CHAIR, PLASTIC, MESH, 2-1/2", W/B	
507	112502	REBAR, #4 (1/2") #13 METRIC, GRADE 60	108"	523	170003	PIPE, PVC, SCH 40, 1 1/2"	6"
508	112502	REBAR, #4 (1/2") #13 METRIC, GRADE 60	117"	527	221011	WALL EMBED ANGLE ASSY, 6" X 4" X 9'3"	
509	112502	REBAR, #4 (1/2") #13 METRIC, GRADE 60	31 1/2"	528	222000	INSERT ANGLE, WALL TO ROOF	
510	112502	REBAR, #4 (1/2") #13 METRIC, GRADE 60	36"	530	223100	EMBED PLATE, WALL, 1/4" X 6" X 8"	
513	112505	REBAR, #4 (1/2") #13 METRIC, FIBERGLS	36"	531	223102	INSERT, WELD PLATE 1/4" X 3" X 4", F/B	
515	112505	REBAR, #4 (1/2") #13 METRIC, FIBERGLS	108"	537	501047-00003	DOOR FRM, CURRIES, 4068 RH, 4 SIDED	
516	112505	REBAR, #4 (1/2") #13 METRIC, FIBERGLS	117"	538	502011	T-ANCHOR, DOOR FRAME	
520	119026	REBAR CHAIR, PLASTIC, #4, 2", W/BASE		539	540237	GROUND STRAP ASSY, STRUCTURE, 12" SOLID	



STRUCTURAL LAYOUT  
END WALL "A"  
.81 CU. YDS.

NOTE:  
1. EMBED MUST BE ISOLATED FROM STRUCTURAL STEEL BY MIN. 3/4".

REV	BY	DATE	DESCRIPTION	APP. BY	DATE
N	RRG	6/8/12	ADJUSTED PENETRATION HEIGHT	LJL	6/8/12
K	AMM	02/10/11	UPDATED BUBBLES AND PENETRATION DIMENSIONS	LJL	02/10/11
D	MDF	07/28/10	PER MARKUPS	DB	07/29/10



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CUSTOMER:  
**KELLOGG  
BROWN & ROOT  
FEMA (PEP)  
EXPANSION PROGRAM**

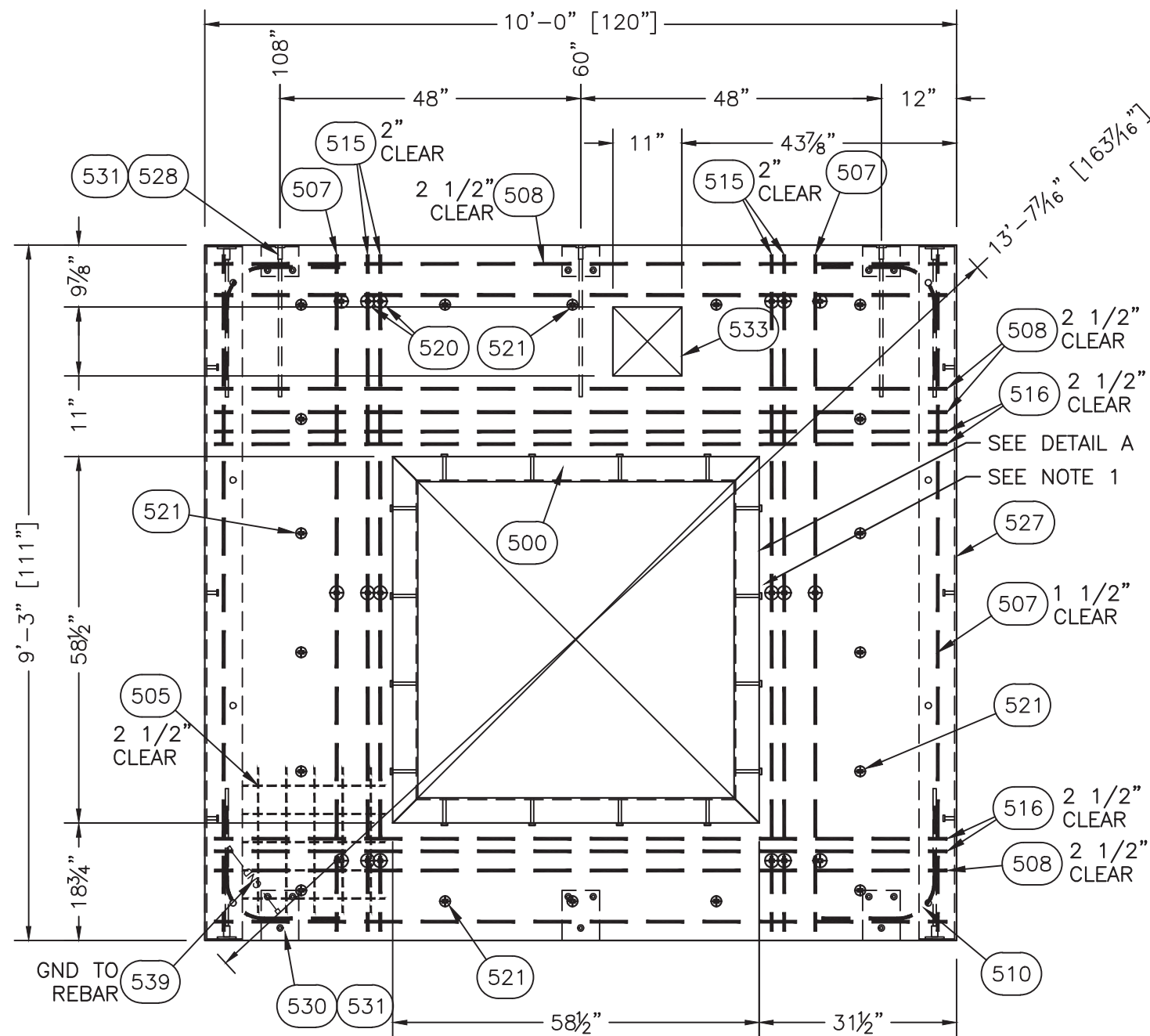
PROJECT:  
**10'-0" X 14'-0"  
CONCRETE SHELTER  
STRUCTURAL LAYOUT  
ELEVATION "A"**

FILENAME: KBR/SKBR01S	
SCALE: 1/2" = 1'-0"	TOLERANCE:
DRWN. BY: J. ASHLEY	DATE: 5/02/10
CHK. BY: G. BRINKMAN	DATE: 5/02/10
ENG. BY:	DATE:
APP. BY:	DATE:

SHEET NO.  
S1-0  
DRAWING NO.:  
SKBR01S  
REV.:  
P

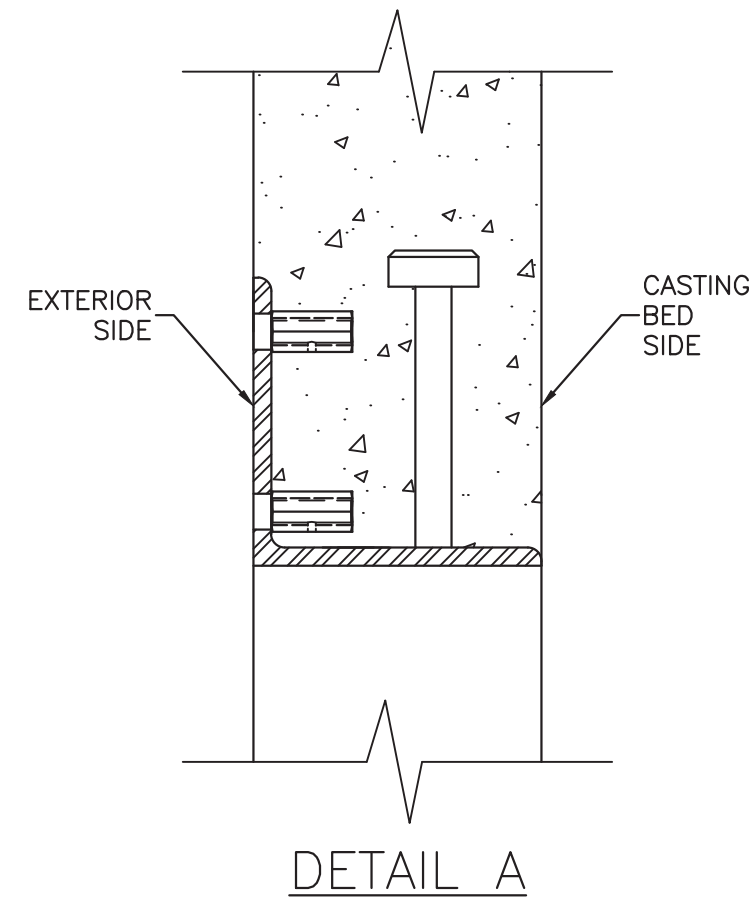
SUB-PARTS LIST

ITEM	P/N	DESCRIPTION	CUT	ITEM	P/N	DESCRIPTION	CUT
500	022008	BLOCKOUT ASSY, ANGLE, 58 1/2" X 58 1/2"		521	119027	REBAR CHAIR, PLASTIC, MESH, 2-1/2", W/B	
507	112502	REBAR, #4 (1/2") #13 METRIC, GRADE 60	108"	527	221011	WALL EMBED ANGLE ASSY, 6" X 4" X 9'3"	
508	112502	REBAR, #4 (1/2") #13 METRIC, GRADE 60	117"	528	222000	INSERT ANGLE, WALL TO ROOF	
510	112502	REBAR, #4 (1/2") #13 METRIC, GRADE 60	36"	530	223100	EMBED PLATE, WALL, 1/4" X 6" X 8"	
515	112505	REBAR, #4 (1/2") #13 METRIC, FIBERGLS	108"	531	223102	INSERT, WELD PLATE 1/4" X 3" X 4", F/B	
516	112505	REBAR, #4 (1/2") #13 METRIC, FIBERGLS	117"	533	360151	INSULATION, EPS, FOAM, RAW MATL B-FOOT	11" X 11" X 4"
520	119026	REBAR CHAIR, PLASTIC, #4, 2", W/BASE		539	540237	GROUND STRAP ASSY, STRUCTURE, 12" SOLID	

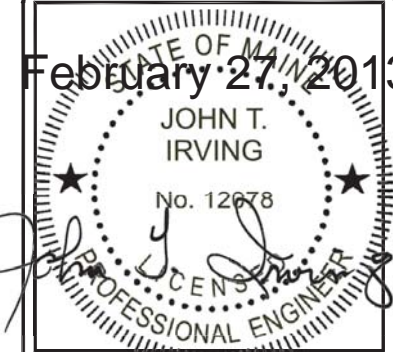


STRUCTURAL LAYOUT  
END WALL "C"  
.91 CU. YD.

NOTE:  
1. EMBED MUST BE ISOLATED FROM  
STRUCTURAL STEEL BY MIN. 3/4".



DETAIL A



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CUSTOMER:  
**KELLOGG  
BROWN & ROOT  
FEMA (PEP)  
EXPANSION PROGRAM**

PROJECT:  
**10'-0" X 14'-0"  
CONCRETE SHELTER  
STRUCTURAL LAYOUT  
ELEVATION "C"**

FILENAME: KBR/SKBR01S	
SCALE: 1/2" = 1'-0"	TOLERANCE:
DRWN. BY: J. ASHLEY	DATE: 5/02/10
CHK. BY: G. BRINKMAN	DATE: 5/02/10
ENG. BY:	DATE:
APP. BY:	DATE:

SHEET NO.  
S1-1

DRAWING NO.:  
SKBR01S

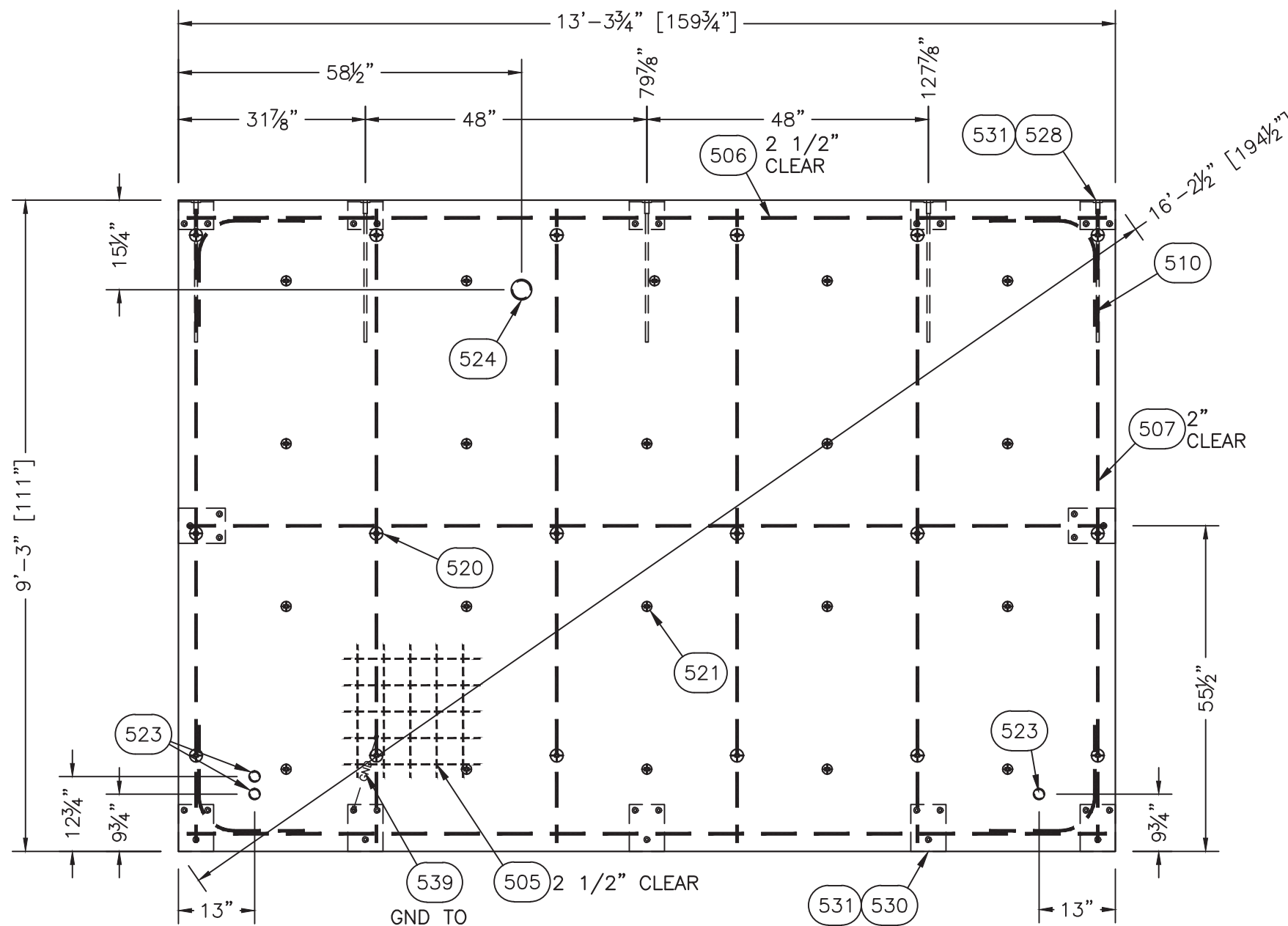
REV.:  
P

REV	BY	DATE	DESCRIPTION	APP. BY	DATE
K	AMM	02/10/11	UPDATED BUBBLES AND PENETRATION DIMENSIONS	LJL	02/10/11
D	MDF	07/28/10	PER MARKUPS	DB	07/29/10



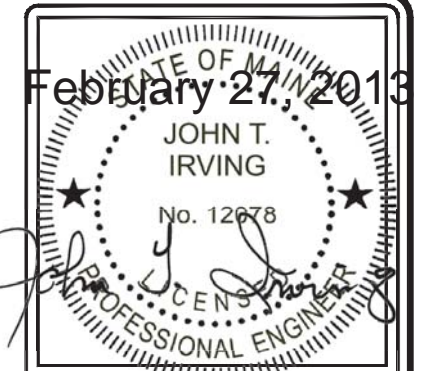
SUB-PARTS LIST

ITEM	P/N	DESCRIPTION	CUT	ITEM	P/N	DESCRIPTION	CUT
506	112502	REBAR,#4 (1/2") #13 METRIC,GRADE 60	156 3/4"	524	170005	PIPE,PVC,SCH 40,3"	6"
507	112502	REBAR,#4 (1/2") #13 METRIC,GRADE 60	108"	528	222000	INSERT ANGLE,WALL TO ROOF	
510	112502	REBAR,#4 (1/2") #13 METRIC,GRADE 60	36"	530	223100	EMBED PLATE,WALL,1/4"X6"X8"	
520	119026	REBAR CHAIR,PLASTIC,#4,2",W/BASE		531	223102	INSERT,WELD PLATE 1/4"X3"X4",F/B	
521	119027	REBAR CHAIR,PLASTIC,MESH,2-1/2",W/B		539	540237	GROUND STRAP ASSY,STRUCTURE,12"SOLID	
523	170003	PIPE,PVC,SCH 40,1 1/2"	6"				



STRUCTURAL LAYOUT  
SIDE WALL "B"  
1.52 CU. YDS.

REV	BY	DATE	DESCRIPTION	APP. BY	DATE
M	JJ	11/15/11	CORRECTED PENETRATION LOCATIONS	LJL	11/15/11
L	RRG	04/25/11	MOVED PENETRATIONS	LJL	04/25/11
K	AMM	02/10/11	UPDATED BUBBLES AND PENETRATION DIMENSIONS	LJL	02/10/11
H	AMM	12/22/10	REPLACED PVC PENETRATION SIZE	WAR	12/22/10
D	MDF	07/28/10	PER MARKUPS	DB	07/29/10



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CUSTOMER:  
**KELLOGG  
BROWN & ROOT  
FEMA (PEP)  
EXPANSION PROGRAM**

PROJECT:  
**10'-0" X 14'-0"  
CONCRETE SHELTER  
STRUCTURAL LAYOUT  
ELEVATION "B"**

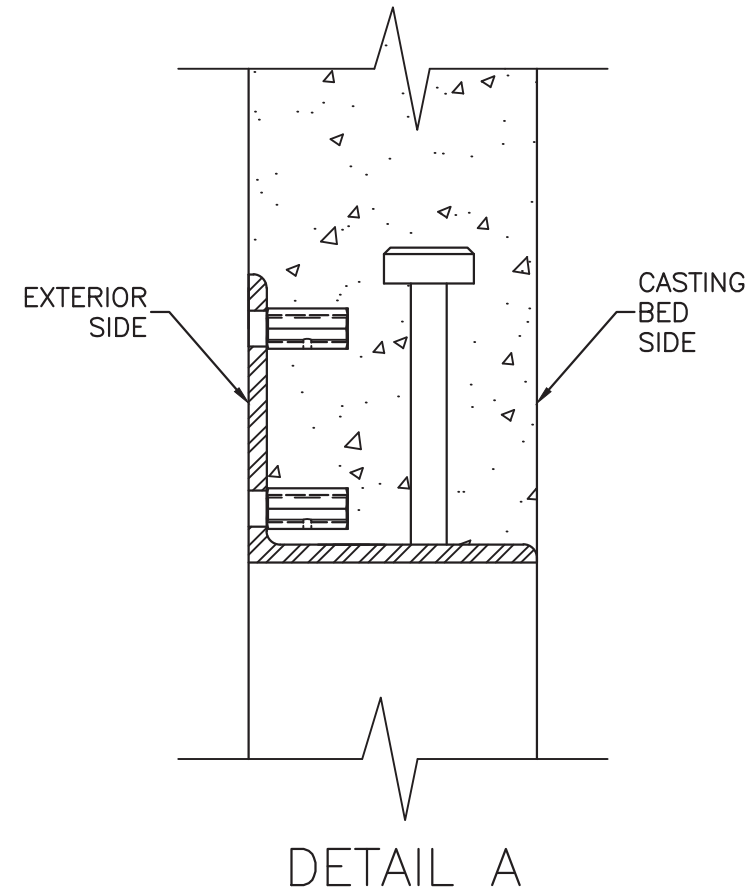
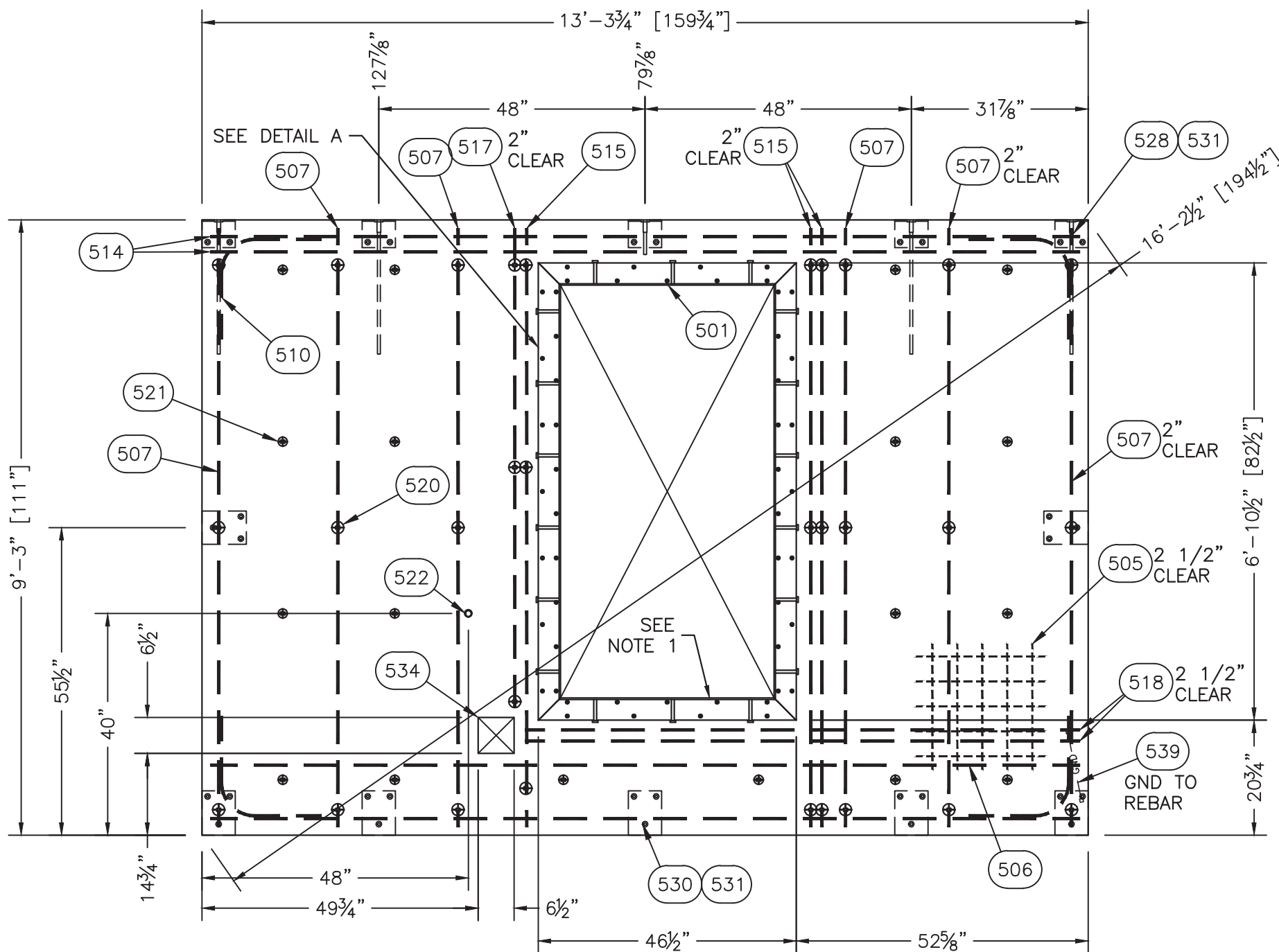
FILENAME: KBR/SKBR01S	
SCALE: 1/2" = 1'-0"	TOLERANCE:
DRWN. BY: J. ASHLEY	DATE: 5/02/10
CHK. BY: G. BRINKMAN	DATE: 5/02/10
ENG. BY:	DATE:
APP. BY:	DATE:

SHEET NO.  
S1-2  
DRAWING NO.:  
SKBR01S  
REV.:  
P



SUB-PARTS LIST

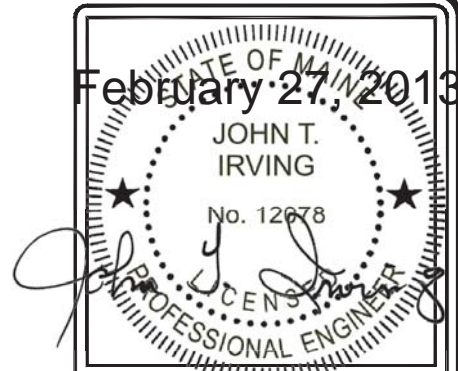
ITEM	P/N	DESCRIPTION	CUT	ITEM	P/N	DESCRIPTION	CUT
501	022009	BLOCKOUT ASSY, ANGLE, 46 1/2" X 82 1/2"		520	119026	REBAR CHAIR, PLASTIC, #4, 2" W/BASE	
506	112502	REBAR, #4 (1/2") #13 METRIC, GRADE 60	156 3/4"	521	119027	REBAR CHAIR, PLASTIC, MESH, 2-1/2" W/B	
507	112502	REBAR, #4 (1/2") #13 METRIC, GRADE 60	108"	522	170000	PIPE, PVC, SCH 40, 1"	
510	112502	REBAR, #4 (1/2") #13 METRIC, GRADE 60	36"	528	222000	INSERT ANGLE, WALL TO ROOF	
514	112505	REBAR, #4 (1/2") #13 METRIC, FIBERGLS	156 3/4"	530	223100	EMBED PLATE, WALL, 1/4" X 6" X 8"	
515	112505	REBAR, #4 (1/2") #13 METRIC, FIBERGLS	108"	531	223102	INSERT, WELD PLATE 1/4" X 3" X 4", F/B	
517	112505	REBAR, #4 (1/2") #13 METRIC, FIBERGLS	86 1/4"	534	360151	INSULATION, EPS, FOAM, RAW MATL B-FOOT	6 1/2" X 6 1/2" X 4"
518	112505	REBAR, #4 (1/2") #13 METRIC, FIBERGLS	100"	539	540237	GROUND STRAP ASSY, STRUCTURE, 12" SOLID	



NOTE:  
1. EMBED MUST BE ISOLATED FROM STRUCTURAL STEEL BY MIN. 3/4".

STRUCTURAL LAYOUT  
SIDE WALL "D"  
1.27 CU. YDS.

REV	BY	DATE	DESCRIPTION	APP. BY	DATE
M	JJ	11/15/11	CORRECTED PENETRATION LOCATION FOR GROUND BAR	LJL	11/15/11
K	AMM	02/10/11	UPDATED BUBBLES AND PENETRATION DIMENSIONS	LJL	02/10/11
D	MDF	07/28/10	PER MARKUPS	DB	07/29/10



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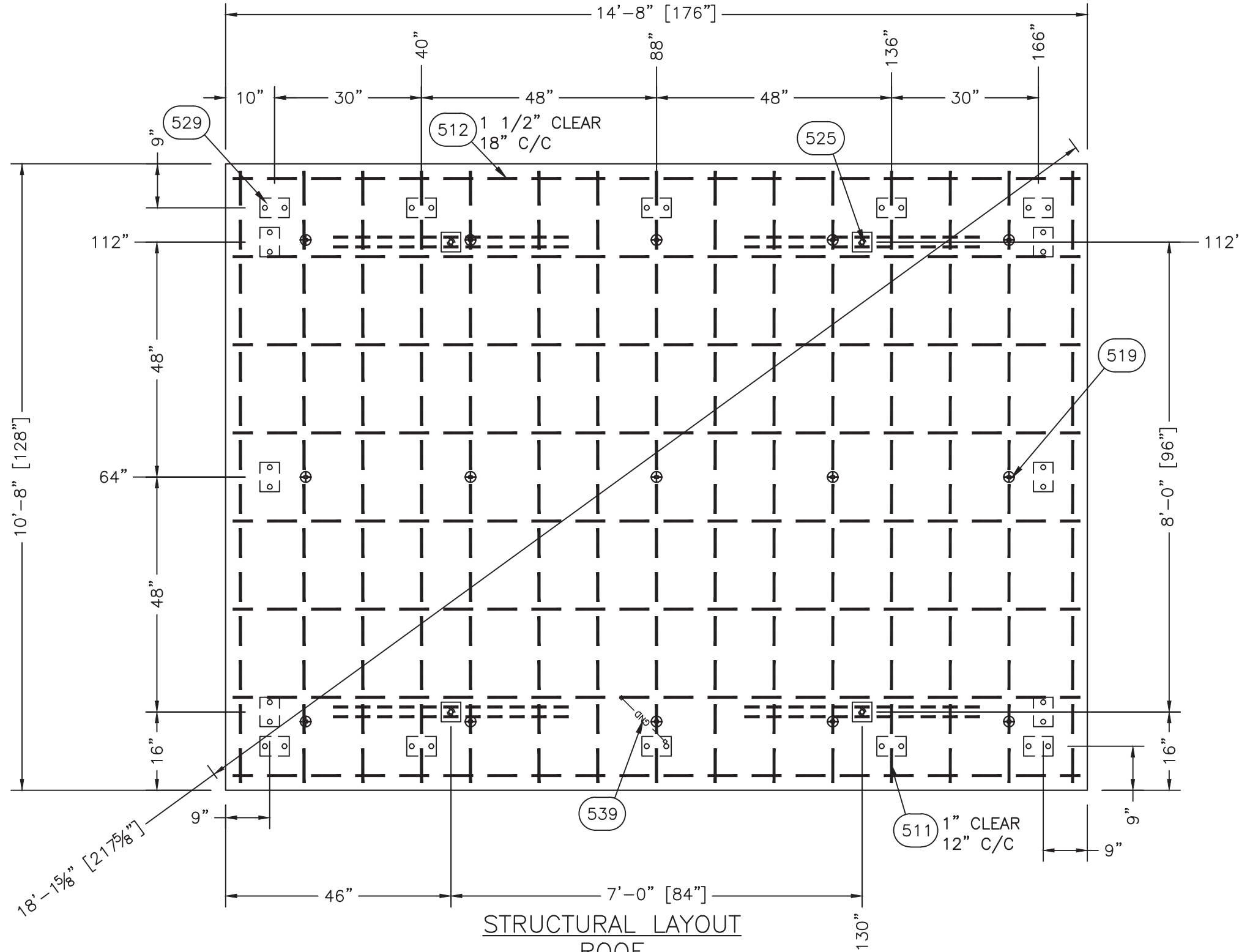
CUSTOMER:  
**KELLOGG  
BROWN & ROOT  
FEMA (PEP)  
EXPANSION PROGRAM**

PROJECT:  
**10'-0" X 14'-0"  
CONCRETE SHELTER  
STRUCTURAL LAYOUT  
ELEVATION "D"**

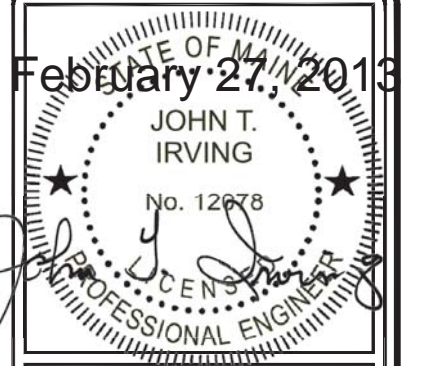
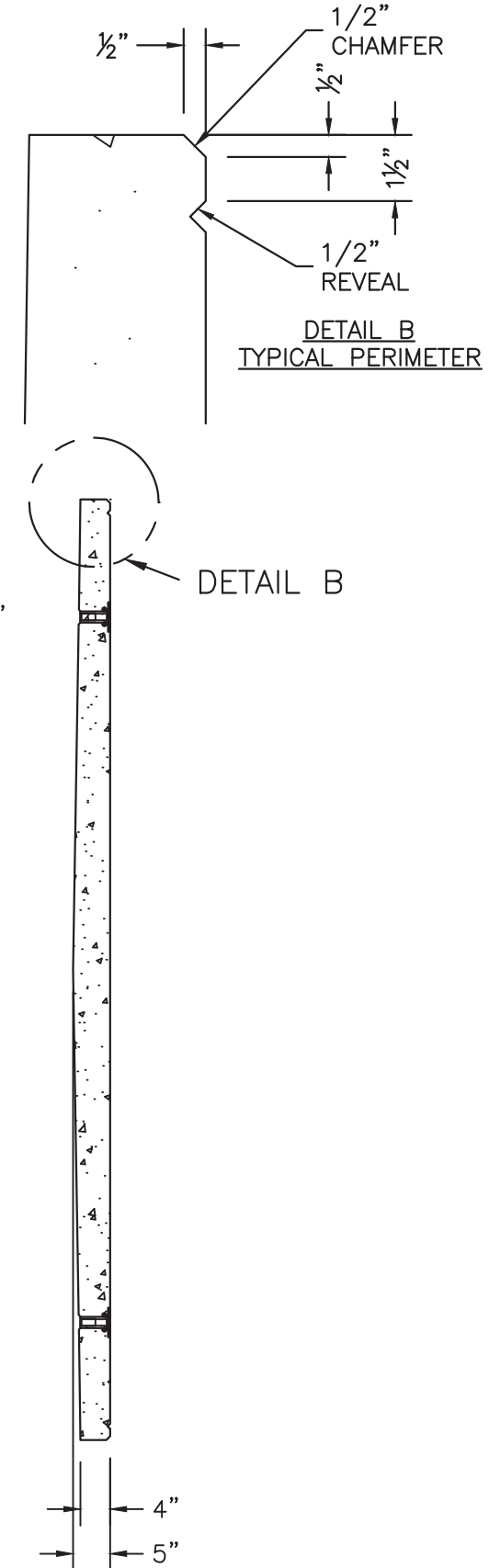
FILENAME: KBR/SKBRO1S	TOLERANCE:
SCALE: 1/2" = 1'-0"	DATE:
DRWN. BY: J. ASHLEY	DATE: 5/02/10
CHK. BY: G. BRINKMAN	DATE: 5/02/10
ENG. BY:	DATE:
APP. BY:	DATE:

SHEET NO.  
S1-3  
DRAWING NO.:  
SKBR01S  
REV.:  
P

SUB-PART LIST			
ITEM	P/N	DESCRIPTION	CUT
511	112502	REBAR,#4 (1/2") #13 METRIC, GRADE 60	125"
512	112502	REBAR,#4 (1/2") #13 METRIC, GRADE 60	161"
519	119010	REBAR CHAIR, PLASTIC, #4 W/BASE 1"	
525	220219-01	ROOF ANCHOR, LIFTING INSERT	
529	223000	INSERT PLATE, ROOF TO 4" WALL	
539	540237	GROUND STRAP ASSY, STRUCTURE, 12" SOLID	



STRUCTURAL LAYOUT  
ROOF  
2.41 CU. YDS



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CUSTOMER:  
**KELLOGG  
 BROWN & ROOT  
 FEMA (PEP)  
 EXPANSION PROGRAM**

PROJECT:  
**10'-0" X 14'-0"  
 CONCRETE SHELTER  
 STRUCTURAL LAYOUT  
 ROOF**

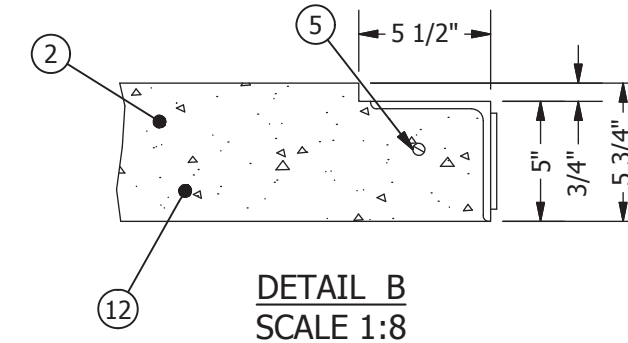
FILENAME: KBR/SKBRO1S	
SCALE: 1/2" = 1'-0"	TOLERANCE:
DRWN. BY: J. ASHLEY	DATE: 5/02/10
CHK. BY: G. BRINKMAN	DATE: 5/02/10
ENG. BY:	DATE:
APP. BY:	DATE:

SHEET NO. S2-0	
DRAWING NO.: SKBR01S	REV.: P

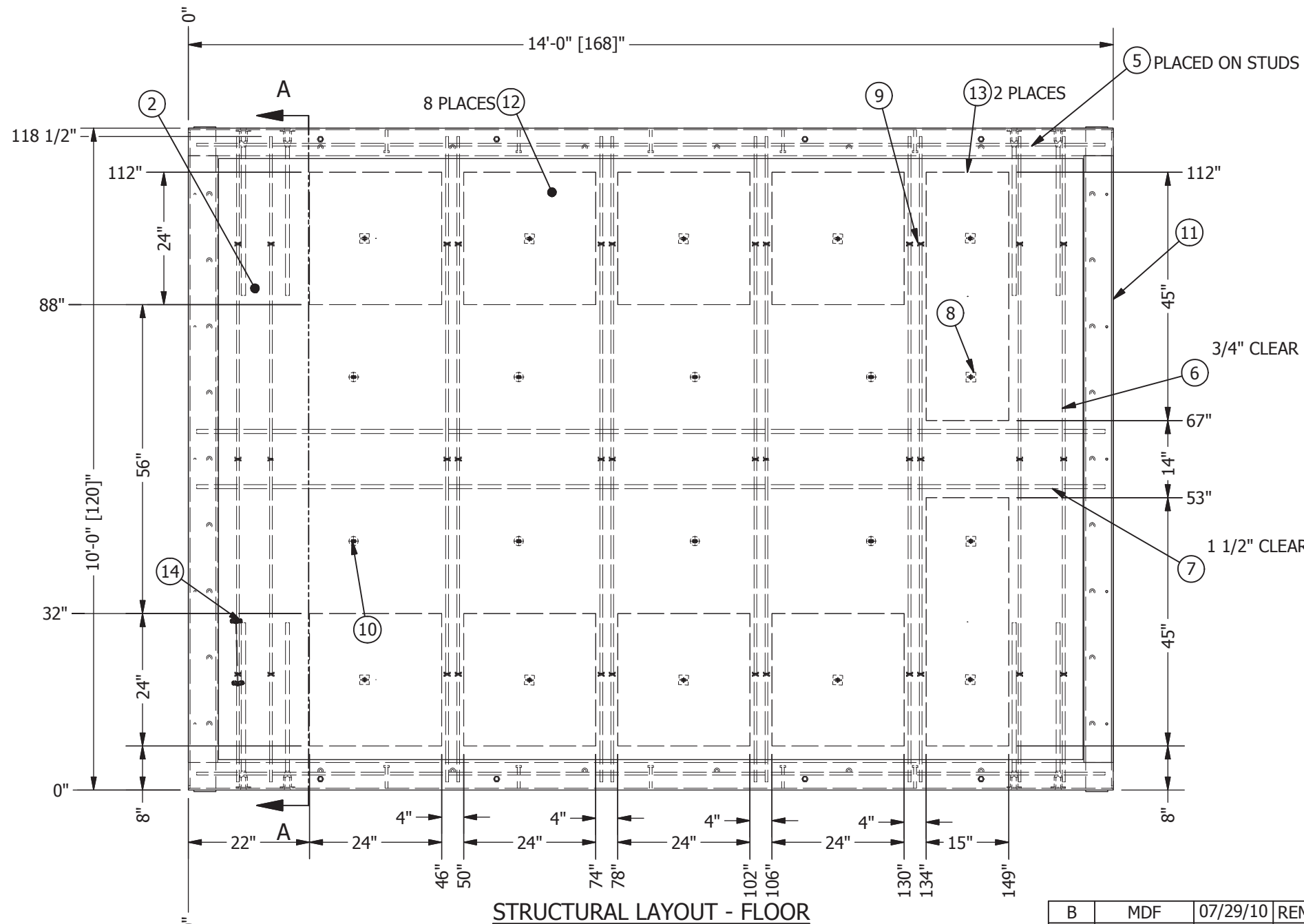
K	AMM	02/10/11	UPDATED BUBBLES AND PENETRATION DIMENSIONS	LJL	02/10/11
REV	BY	DATE	DESCRIPTION	APP. BY	DATE

PARTS LIST							
ITEM	QTY	U/M	P/N	DESCRIPTION	LENGTH	WIDTH	PCS
1	1.33333 ft	ft	141034	FLATBAR, 1/4" X 4, GRADE 36	4.000 in		4
2	2.053	CU.YD.	100052-002	CONCRETE, 1 CUBIC YARD BATCH, FLOOR	168.000 in	120.000 in	1
3	.492	EA.	110001	MESH, WIRE, 4X4, W4XW4, 8'X20'	118.000 in	96.000 in	1
4	.379	EA.	110001	MESH, WIRE, 4X4, W4XW4, 8'X20'	118.000 in	74.000 in	1
5	27.5	FT.	112502	REBAR, #4 (1/2") #13 METRIC, GRADE 60	165.000 in		2
6	117	FT.	112502	REBAR, #4 (1/2") #13 METRIC, GRADE 60	117.000 in		12
7	27.5	FT.	112503	REBAR #6 (3/4") #19 METRIC, GRADE 60	165.000 in		2
8	12	Each	119013	REBAR CHAIR, PLASTIC, MESH WITH BASE 1"			12
9	36	Each	119016	REBAR CHAIR, PLASTIC, #6, 3/4"			36
10	8	Each	119022	REBAR CHAIR, PLASTIC, MESH W/BASE 4"			8
11	1	Each	22-1000X1400-00	PMTR ANGLE FRAME ASSY H.S.10'0"X14'			1
12	96	FBM	360151	INSULATION, EPS, FOAM, RAW MATL B-FOOT	24.000 in	24.000 in	8
13	28.125	FBM	360151	INSULATION, EPS, FOAM, RAW MATL B-FOOT	45.000 in	15.000 in	2
14	1	Each	540237	GROUND STRAP ASSEMBLY, STRUCTURE, 12" SOLID			1

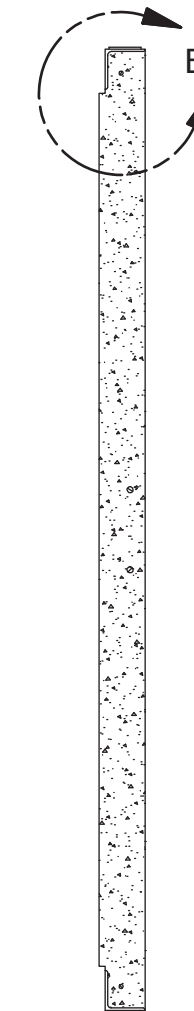
SHOP DETAILS	
DWG. NO.	DESCRIPTION
12-001	CONCRETE STEP JOINT DETAIL
12-002	CONCRETE RIB SECTION DETAIL



DETAIL B  
SCALE 1:8

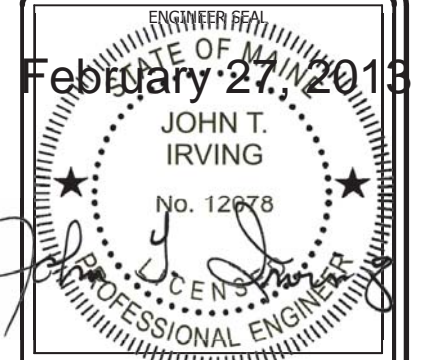


STRUCTURAL LAYOUT - FLOOR  
2.00 CU. YD.  
SCALE 1:24



SECTION A-A  
SCALE 1:24

REV	BY	DATE	DESCRIPTION	APP BY
B	MDF	07/29/10	REMOVED 8" PVC PENETRATIONS	DB
A	AMM	06/04/10	ADDED FLOOR PENETRATION	GAB



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www.cellxion.com

CUSTOMER:

PROJECT:  
CONCRETE FLOOR ASSY KIT, 10'0"X14'0"

FILENAME: 221-1000X1400-03.dwg	
DESIGN BY: A. MENDOZA	DATE: 9/18/2009
DRAWN BY: J. ASHLEY	DATE: 5/3/2010
CHECKED BY:	DATE:
ENGINEERED BY:	DATE:
APPROVED BY:	DATE:

SHEET NO.:  
1 OF 2  
DRAWING NO.:  
221-1000X1400-03  
REV:  
B



ENGINEER SEAL  
 STATE OF MAINE  
 February 27, 2013  
 JOHN T. IRVING  
 No. 12678  
 PROFESSIONAL ENGINEER

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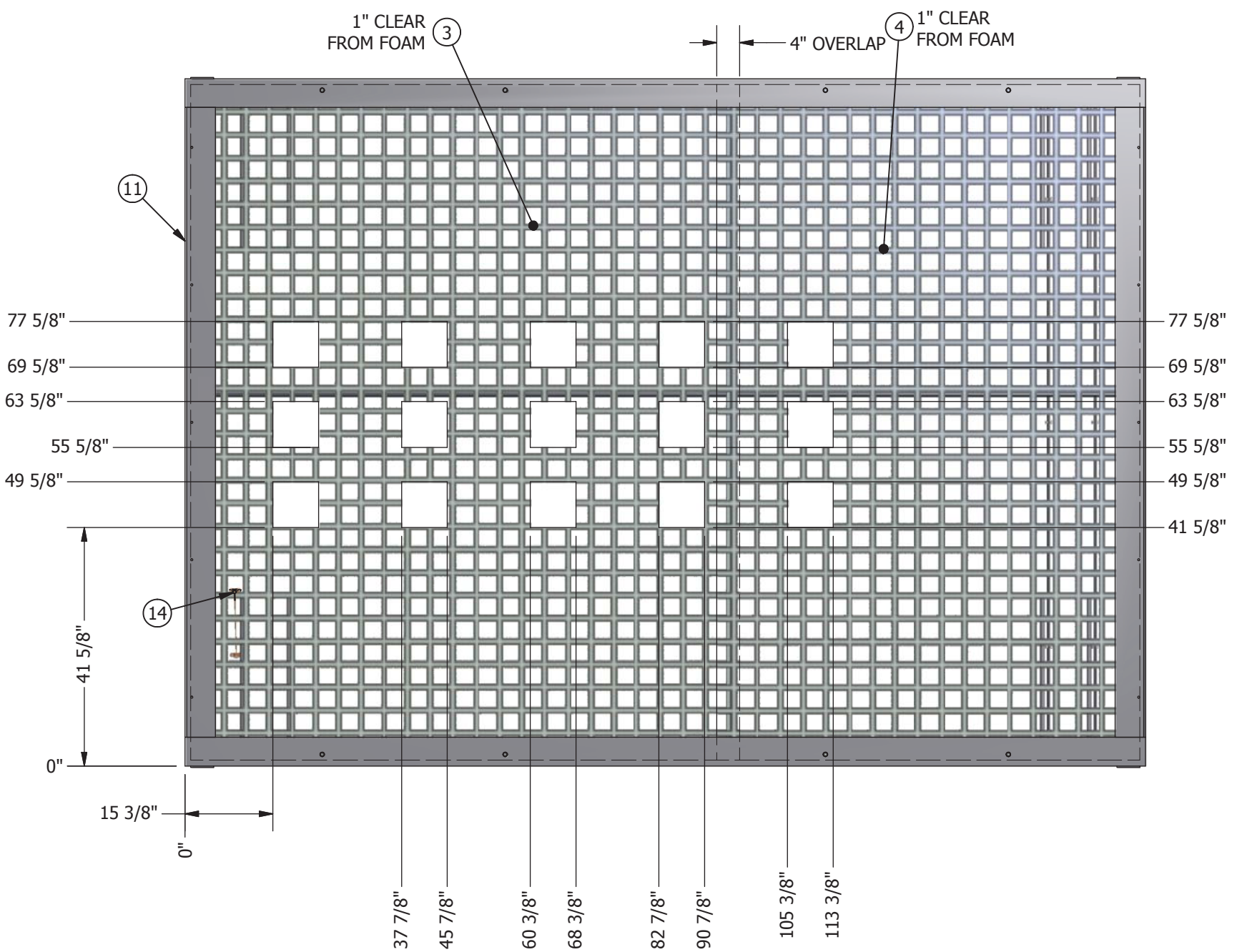
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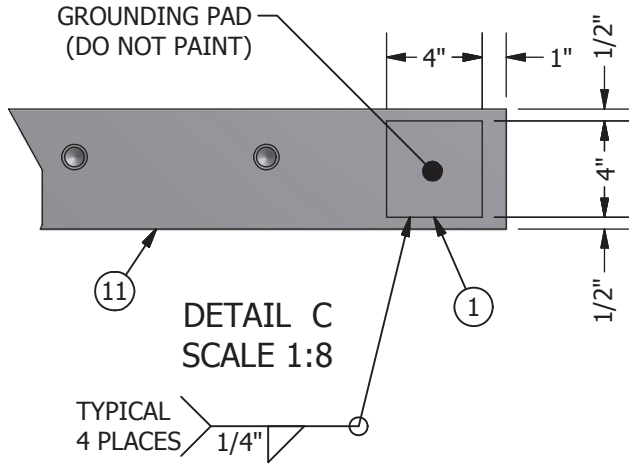
PROJECT:  
**CONCRETE FLOOR ASSY KIT, 10'0"X14'0"**

FILENAME:  
 221-1000X1400-03.dwg  
 DESIGN BY: A. MENDOZA DATE: 9/18/2009  
 DRAWN BY: J. ASHLEY DATE: 5/3/2010  
 CHECKED BY: DATE:  
 ENGINEERED BY: DATE:  
 APPROVED BY: DATE:

SHEET NO.:  
**2 OF 2**  
 DRAWING NO.: **221-1000X1400-03** REV: **B**  
 APP BY:



MESH LAYOUT  
 SCALE 1:24



REV	BY	DATE	DESCRIPTION	APP BY
B	MDF	07/29/10	REMOVED 8" PVC PENETRATIONS	DB
A	AMM	06/04/10	ADDED CUTOUTS FOR WIRE MESH 8"X8"	GAB