

## CB Series Rooftop Anchors:

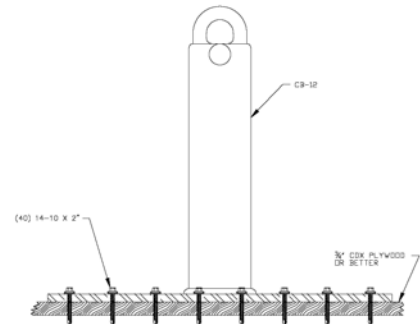
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### Attachment Methods:

- #14x10 2" self drill fasteners. Qty. 40 fasteners provided with each anchor.
- Epoxy Anchors for concrete applications (not included with anchors)

### Anchorage Requirements:

- 3/4" CDX plywood roofing
- 20ga. metal decking or thicker
- 2,000 PSI concrete or better



### System Features:

#### **CB Stanchions with baseplate:**

Designed for installation on flat or low slope roof structures.

Individual CB Series Anchors can be used for 1 person in fall arrest or fall restraint.

#### **CB Weld-On anchors without baseplate:**

Designed for installation into steel structural members.

#### **CB Plates:**

Designed for installation into structural members.

### Can Facilitate a Catenary Horizontal Line System:

#### **For Low Slope Roofs 4/12 pitch or less:**

Up to 4 workers per continuous run of cable with anchors spaced no more than 20ft. o.c.

#### **For Steep Slope Roofs 5/12 or steeper:**

1 worker in fall arrest per continuous run of cable with anchors spaced no more than 20ft. o.c.

**SECTION 11014 – FALL PREVENTION DEVICES**

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to this Section.

## 1.2 SUMMARY

A. Section Includes: Roof tie-down system of fall restraint and fall arrest for worker safety.

B. Related Sections:

**EDIT FOLLOWING TO LIST ONLY SECTIONS WHICH CONTAIN WORK RELATED TO FALL RESTRAINT DEVICES**

1. Section 03300 – Cast-In-Place Concrete: Structural requirements for substrate.
2. Section 05310 – Steel Deck.
3. Section 06100 – Rough Carpentry.
4. Section 07500 – Membrane Roofing.
5. Section 07720 – Roof Accessories: Accessories installed on or in roofing (other than structural or mechanical items).

## 1.3 SYSTEM DESCRIPTION

A. General: Provide structural fall restraint and fall arrest system capable of withstanding loads and stresses within limits and under conditions specified in OSHA and other applicable safety codes. Provide fall prevention anchors permanently attached to roof structure.

B. Design Requirements: Anchors and accessories comprising system of following types:

**DELETE BELOW THOSE SYSTEM DESCRIPTIONS WHICH DO NOT APPLY**

1. Roof anchors, spaced as indicated, for safety snap connection by individual workers cable of withstanding a 5,000lb. load or safety factor of 2.
2. Continuous steel cable lifeline restrained by u-bolts at anchor points, suitable for multiple safety snap connections along cable between anchors.

C. Performance Requirements: System and components tested for resistance of following loads:

1. Fall Restraint: 4 persons simultaneously applied.
2. Fall Arrest: 1 person.
3. Design tie-back anchors to resist at least 5000 lbf applied in any direction at a height of 12 inches above top of roof deck.

## 1.4 SUBMITTALS

A. Comply with requirements of Division-1 Section, Submittal Procedures.

B. Product Data: For each type of fall prevention device specified, including manufacturer's standard fabrication details and installation instructions.

C. Shop Drawings: Show layout, profiles, and anchorage details. Include structural analysis data.

D. Maintenance Data: Written instructions for maintenance of fall prevention safety devices to be included in the operation and maintenance manual specified in Division 1.

E. Welding certificates.

F. Test Reports:

1. Indicate compliance with required performance requirements.
2. On shop- and field-welded connections. Include data on types of tests conducted.

## 1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Firm having at least 10 years continuous experience in manufacturing fall safety equipment similar to systems specified and exhibiting records of successful in-service acceptability and performance.

B. OSHA Standards: Comply with Occupational Safety and Health Administration Standards for the Construction Industry 29 CFR § 1926.500 Subpart M (Fall Protection), and with applicable State Administrative Code safety standards for Fall Restraint and Fall Arrest.

- C. Welding: Qualify procedures and personnel for field-welding according to American Welding Society's AWS D1.1-00, Structural Welding Code – Steel.
  - D. Testing: Perform quality control tests for each system per manufacturer's requirements.
- 1.6 COORDINATION
- A. Coordinate installation of structural deck to meet requirements of roof anchor manufacturer:  
**EDIT FOLLOWING TO SUIT DECK CONSTRUCTION**
    - 1. Concrete Deck: Minimum concrete strength,  $F_c = 2000$  psi.
    - 2. Steel Deck: Minimum 20 gage, or provided with additional deck reinforcing per manufacturer's instructions.
    - 3. Wood Deck: Minimum  $\frac{3}{4}$  inch CDX Ext. plywood sheathing, or provided with additional wood blocking per manufacturer's instructions.
  - B. Coordinate installation of structural deck reinforcements and anchorages to receive fall prevention anchors.
  - C. Coordinate placement of roofing system insulation and flashings to ensure water-tight integrity of roof.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Basis of Design: Specified components are manufactured by Guardian Fall Protection Inc., 26513 79<sup>th</sup> Ave S, Kent WA 98032, and are specified as the established standard of quality. (Local: phone 253-854-5877, fax 253-854-5980. Out-of-State: phone 800-466-6385, fax 800-670-7892)
- B. Acceptable Manufacturers: Subject to compliance with requirements, other manufacturers offering fall prevention devices comparable in configuration and performance and which are judged by the Architect to be equivalent to those specified may be considered for acceptance for the Work.
- C. Substitutions: Comply with requirements of Division-1 Section, Product Substitution Procedures.

### 2.2 MATERIALS

- A. Steel Plates, Bars: ASTM A36/A36M-01 carbon structural steel.
- B. Steel Pipe: ASTM A53/A53M-02, Schedule 80, welded and seamless.
- C. Bronze Castings: ASTM B584-00 copper alloy sand castings, Alloy UNS No. C86500 (No. 1 manganese bronze).
- D. Coating: Hot-dip galvanized after fabrication per ASTM A123/A123M-02
- E. Cable: Steel wire cable, 0.375 inch diameter.
- F. Accessories: Anchors and fasteners tested for substrate and structure assembly and approved by fall protection device manufacturer. ITW Buildex by Illinois Tool Works Inc., or Rawl by BPB Rawlplug, or approved.

### 2.3 MANUFACTURED ASSEMBLIES

- A. Standard Roof Anchors: Guardian CB Series anchors, each a welded assembly consisting of top U-bolt eyelet, pipe upright, and base plate.
  - 1. Steel Upright: 2-1/2-inch ID steel pipe, height varies to suit roof construction.
  - 2. Steel U-Bolt:  $\frac{1}{2}$  inch cold rolled steel bar, bent to 2-inch clear diameter U-shape.
  - 3. Base Plate:  $\frac{3}{8}$ -inch steel plate punched with holes for attachment to roof deck.
- B. Lifeline: Continuous steel cable as tested by fall prevention device manufacturer to permit worker mobility and safety.

## 2.4 FINISH

- A. Standard Roof Anchor Finish: Hot Dipped Galvanized.
  - 1. Galvanized: Hot-dip galvanized after fabrication per ASTM A123/A123M-02.
  - 2. Mill finish.

## PART 3 - EXECUTION

## 3.1 EXAMINATION

- A. Examine framing and substrate and verify conditions comply with structural requirements for system performance.
- B. Notify Architect of unsatisfactory conditions and improper coordination. Proceed with installation of roof anchors only after verifying conditions are satisfactory.

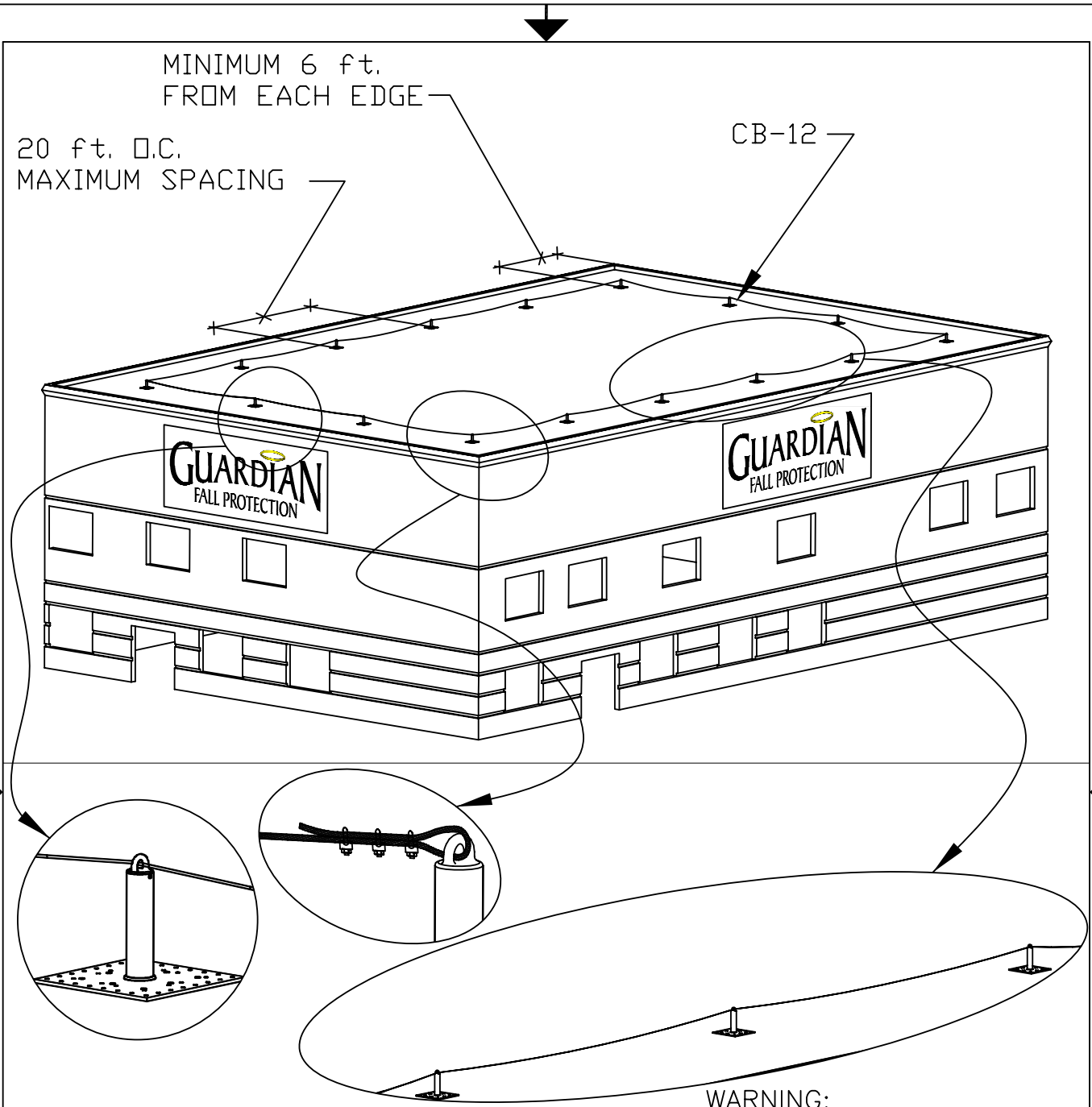
## 3.2 INSTALLATION

- A. General: Install exterior fall prevention system devices according to manufacturer's instructions and recommendations.
- B. Provide on-site inspection and supervision of installation by factory-trained representative.

## 3.3 DEMONSTRATION

- A. Instruct Owner's designated safety engineer in proper use of fall prevention safety devices.
- B. Test and adjust system devices. Replace damaged or malfunctioning items.

END OF SECTION



**RECOMMENDED INSTALLATION:**  
 Install CBs a minimum of 6 ft. (Guardian recommends 10 ft.) from the roof edge and space them a maximum of 20 ft. apart.  
 Installation around the perimeter of the leading edge areas is recommended to ensure compliance and allow the user to easily switch from anchor to anchor.

**WARNING:**  
 Attach a maximum of 4 workers in fall restraint or a maximum of 1 worker in fall arrest per cable run.

**NOTE:** A terminated cable run sharing a CB anchor with another run is considered one run.

INSTALLATION INSTRUCTIONS			TITLE CB SERIES RECOMMENDED LAYOUT INFORMATION			
DESIGNED BY:	B. WOODYARD	1992	DWG NO.			
DRAWN BY:	PHIL GOMES	09/01/2004	SCALE: NONE		SHEET: 1	
CHECKED BY:	MATT VOLLMER	CHECKED DATE				
APPD BY:	MATT VOLLMER	APPROVED DATE				



# CB Series Installation Information

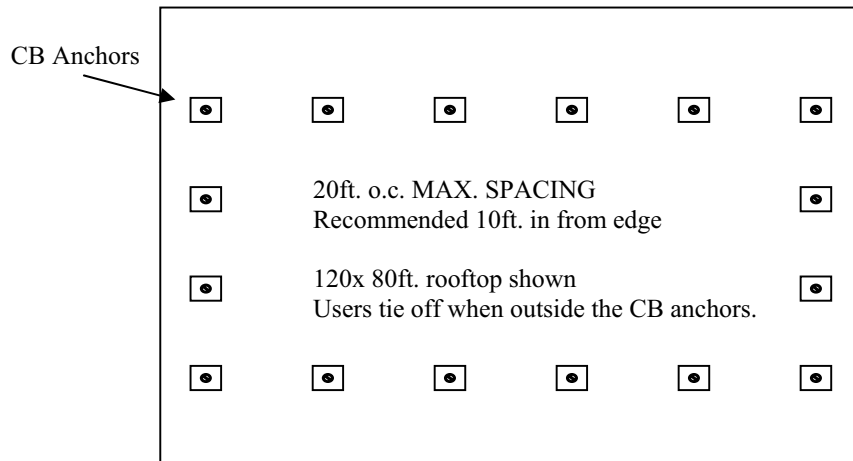
## RECOMMENDED INSTALLATION:

CBs must be installed and spaced a maximum of 20ft. apart.

Installation around the perimeter of the leading edge areas is recommended to ensure compliance and allow the user to easily switch from anchor to anchor.

Recommended spacing is between 6 and 10ft. from edge of roof.

## EXAMPLE OF RECOMMENDED ROOFTOP LAYOUT:



## IF YOUR SUBSTRATE DOES NOT MEET MIN. THICKNESS:

If the metal decking is less than 20ga. thickness, or wood decking is less than  $\frac{3}{4}$ " thick, additional material is required to provide sufficient strength to withstand the potential impact of a fall as required by Federal OSHA.

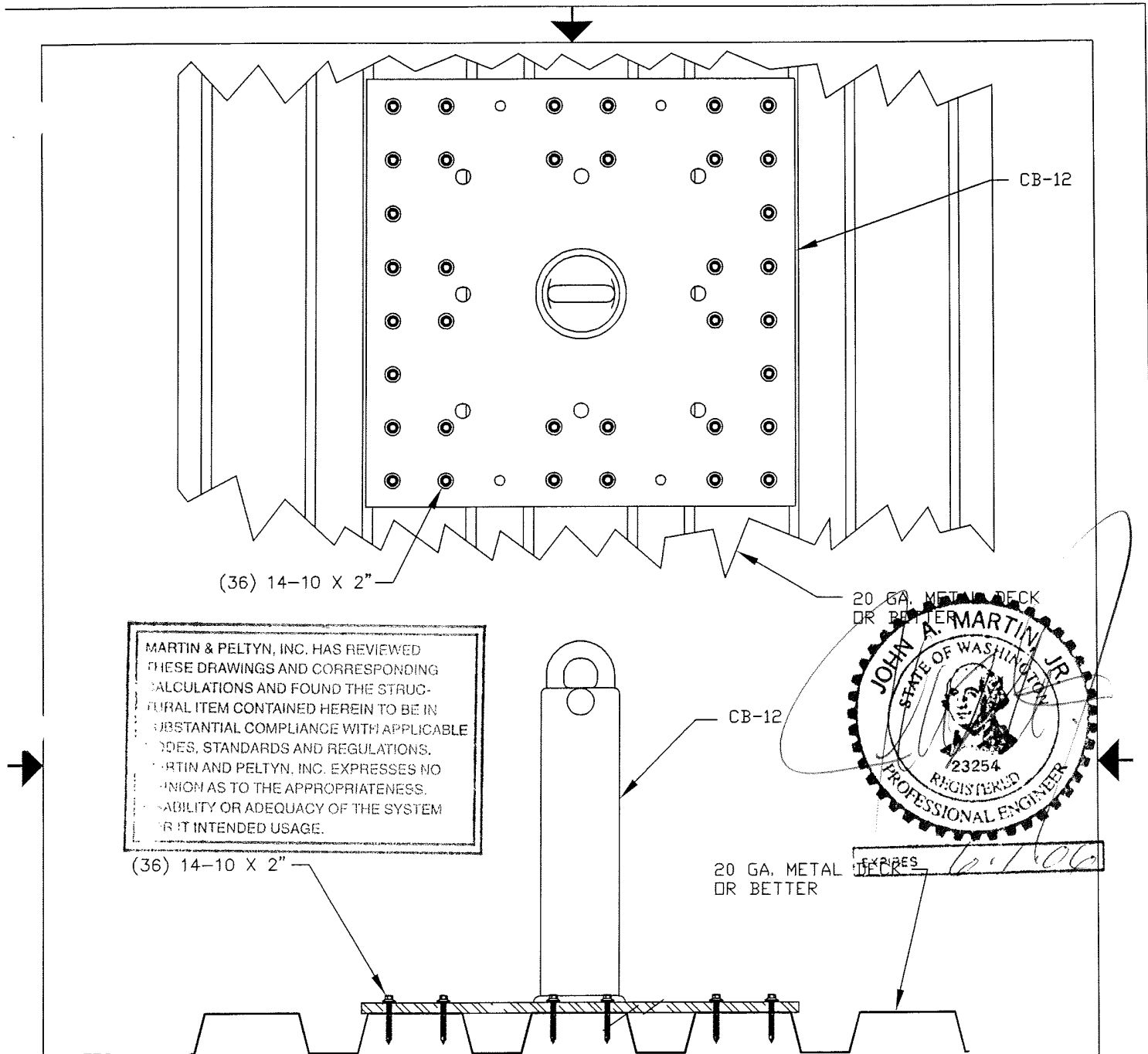
Additional backing used in the following manner will meet the requirements of the fall protection installation requirements:

A 4' x 4', 5/8" or thicker CDX plywood material is required to be installed atop the existing deck to redistribute the load. Secure to deck with 40 #14 Rawl deck screws or approved equal per anchor. Hardened washers may be required to prevent deck screws from pulling through mounting hole in anchor. For metal decking you can substitute the 5/8" or thicker CDX with 20ga. or thicker metal sheeting. Fasten the roof anchor to the center of the 4'x4' backing, filling all of the holes with the provided fasteners.

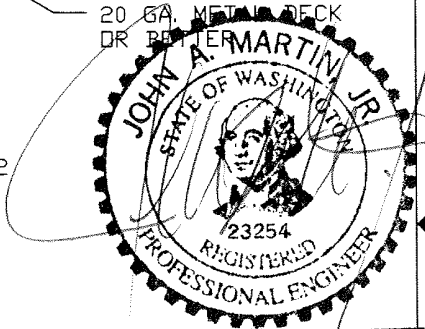
For metal decking products, sufficient strength can also be achieved by placing a metal backing plate on the underside of the anchor placement or on top if it reaches from purlin to purlin. I.E. double the material thickness to double the load capacity.

Fastening of added material is 6" on center of perimeter and 8" in the field.

CB anchors are tested to meet all applicable ANSI Z359.1 standards and comply with OSHA standards. Use only with compatible equipment.



MARTIN & PELTYN, INC. HAS REVIEWED THESE DRAWINGS AND CORRESPONDING CALCULATIONS AND FOUND THE STRUCTURAL ITEM CONTAINED HEREIN TO BE IN SUBSTANTIAL COMPLIANCE WITH APPLICABLE CODES, STANDARDS AND REGULATIONS. MARTIN AND PELTYN, INC. EXPRESSES NO OPINION AS TO THE APPROPRIATENESS, LIABILITY OR ADEQUACY OF THE SYSTEM FOR ITS INTENDED USAGE.



**NOTES:**

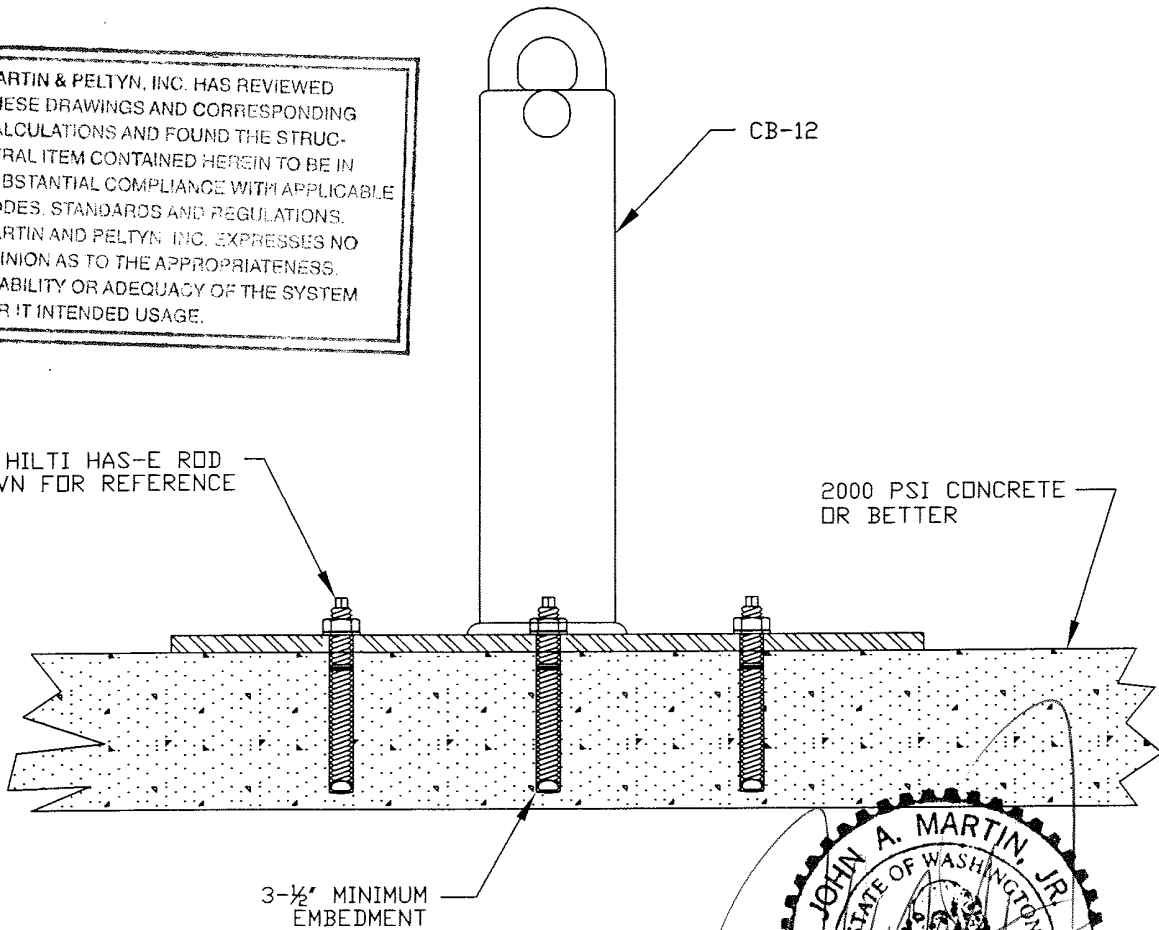
1. Secure the CB-12 anchor to 20 GA. or thicker metal decking.
2. Metal decking must have a 1-1/2" minimum valley depth.
3. It is recommended that all 40 of the provided 14-10 X 2" fasteners or equivalent be used to secure the CB-12 anchor to the deck.
4. The fasteners must be installed into a structure capable of resisting a 5,000 lb. load.

INSTALLATION INSTRUCTIONS			TITLE CB SERIES ROOF ANCHOR		<b>GUARDIAN</b> FALL PROTECTION	
DESIGNED BY:	B. WDDDYARD	1992	DWG NO. CB-12			
DRAWN BY:	PHIL GOMES	07/28/2004			A	NEW
CHECKED BY:	M. VDOLLMER	CHECKED DATE	SCALE: NONE	SHEET: 1		
APPD BY:	M. VDOLLMER	APPROVED DATE				

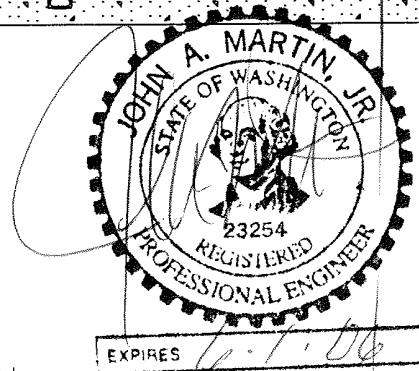
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1/2" HILTI HAS-E ROD SHOWN FOR REFERENCE

2000 PSI CONCRETE OR BETTER



3-1/2" MINIMUM EMBEDMENT

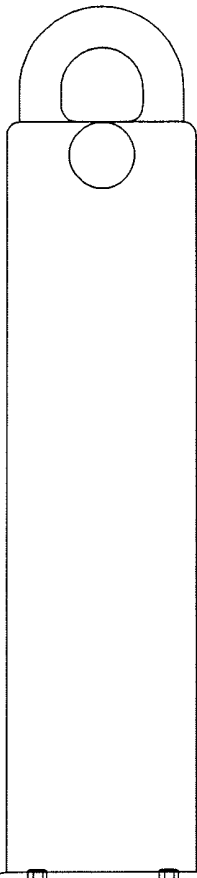


**NOTES:**

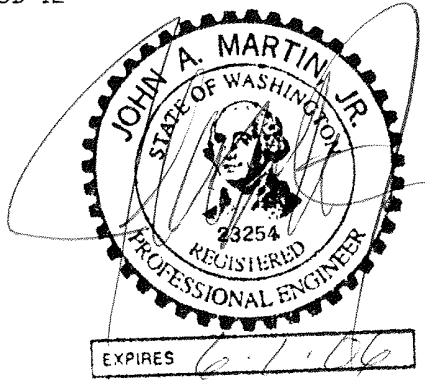
1. Secure the CB-12 anchor to 2000 psi concrete or better.
2. Use all 8 of the 7/16" diameter holes provided.
3. Use 1/2" diameter anchor bolts with an ultimate tensile strength of 6000 lbs. or higher. All anchor bolts must be embedded a minimum of 3-1/2".
4. Hilti HIT HY-150/HIT-ICE adhesive using HAS-E rods are shown for reference. Use an equivalent or superior system when substituting.
5. Severe weather installations/conditions must be taken into consideration when selecting anchor bolts for installing CB-12 anchors.
6. Always follow the anchor bolt manufacturer's installation instructions for minimum concrete thickness and torque requirements.

INSTALLATION INSTRUCTIONS			TITLE CB SERIES ROOF ANCHOR		<b>GUARDIAN</b> FALL PROTECTION	
DESIGNED BY:	B. WODDYARD	1992	DWG NO. CB-12			
DRAWN BY:	PHIL GDMES	07/28/2004			SCALE: NONE	A
CHECKED BY:	M. VDILLMER	CHECKED DATE			SHEET: 1	
APPD BY:	M. VDILLMER	APPROVED DATE				

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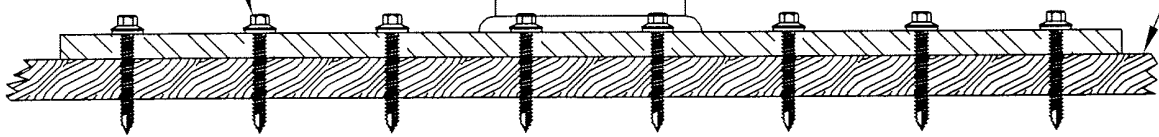


CB-12



(40) 14-10 X 2"

3/4" CDX PLYWOOD OR BETTER



**NOTES:**

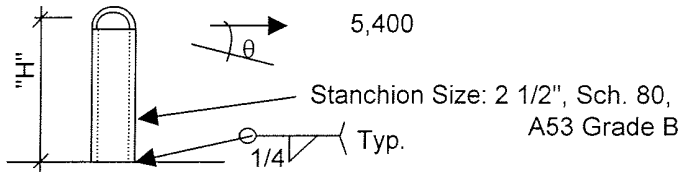
1. Secure the CB-12 anchor to 3/4" CDX wood decking or better.
2. Use all 40 of the 14-10 X 2" screws provided and all of the 3/8" diameter holes provided in the CB-12 base plate.
3. The fasteners must be installed into a structure capable of resisting a 5000 lb. load.

INSTALLATION INSTRUCTIONS			TITLE CB SERIES ROOF ANCHOR			
DESIGNED BY:	B. WDDDYARD	1992	DWG NO. CB-12			
DRAWN BY:	PHIL GOMES	07/28/2004			SCALE: NONE	A
CHECKED BY:	M. VDILLMER	CHECKED DATE			SHEET: 1	
APPD BY:	M. VDILLMER	APPROVED DATE				

Design per OSHA 1926.500 and California OSHA

$$\begin{aligned}
 P &= 5,400 \text{ lbs} \\
 \text{Height, } H &= 12.25 \text{ in} \\
 \theta_{\text{max}} &= \pm 30 \text{ deg.} \\
 P' = P \cdot \sin(\theta) &= 2,700 \text{ lbs} \\
 P'' = P \cdot \cos(\theta) &= 4,677 \text{ lbs}
 \end{aligned}$$

$$\begin{aligned}
 M_{\text{max}} = H \cdot P &= 66,150 \text{ in-lbs} \\
 \text{Torsion, } T = 2.5/2 \cdot P &= 6,750 \text{ in-lbs}
 \end{aligned}$$



Top Loop Size:  
 Thickness,  $t = 5/8$  in  
 Weld size,  $t_w = 1/4$  in  
 Weld Mat. E70XX

**Stanchion:**

Pipe size	2.5	Pipe dia. =	2.875 in	$t_p =$	0.276 in
Pipe Sch.	80	$F_u =$	60,000 psi	$A =$	2.25 in <sup>2</sup>
Pipe Mat.,	A53 Gr B			$S_x =$	1.34 in <sup>3</sup>
				$R = 2\pi r^3 t =$	3.81 in <sup>4</sup>

$$\text{Pipe bending, } \sigma_{\text{max}} = \frac{2,700}{2.25} + \frac{66,150}{1.34} = 50,566 \text{ psi}$$

$$\text{Torsion, } T = 6,750, \quad \tau_1 = \frac{6,750 \times 2.875 / 2}{R} = 2,550 \text{ psi}$$

$$\text{Shear, } \tau_2 = 1.2 \cdot 5,400 / 2.25 = 2,880 \text{ psi}, \quad \tau_T = \tau_1 + \tau_2 = 5,430 \text{ psi}$$

Combined Stresses:

$$\sigma_1 = \frac{\sigma}{2} + \sqrt{\left(\frac{\sigma}{2}\right)^2 + \tau_T^2} = \frac{50,566}{2} + \sqrt{\left(\frac{50,566}{2}\right)^2 + 5,430^2} = 51,142 \text{ psi}$$

$$\text{Safety Factor, } \sigma_1 = 60000 / 51,142 = 1.17 \geq 1.0 \text{ OK}$$

$$\tau_1 = \sqrt{\left(\frac{\sigma}{2}\right)^2 + \tau_T^2} = \sqrt{\left(\frac{50,566}{2}\right)^2 + 5,430^2} = 25,859 \text{ psi}$$

$$\text{Safety Factor, } \tau_1 = .577F_u = 34620 / 25,859 = 1.34 \geq 1.0 \text{ OK}$$

**Welds:**

Thru Throat:

$$\begin{aligned}
 I_w &= \pi(d+t_e) = \text{Pi} * 2.938 = & 9.23 \text{ in} & \quad t_e = t_w/4 = & 0.063 \text{ in} \\
 Z_w &= ((d+t_w)^3 - d^3)/6 / t_r * 1.41 = & 8.98 \text{ in}^2 & \quad t_r = .7071 * t_w = & 0.177 \\
 J_w &= \pi(d+t_e)^3/4 = \text{Pi} * (2.938)^3/4 = & 19.91 \text{ in}^3 & & 
 \end{aligned}$$

$$\tau_w = \frac{\left[ \left( \frac{F}{A} + \frac{T_r}{J} \right)^2 + \left( \frac{M}{Z} \right)^2 \right]^{0.5}}{.7071 t_w} = \frac{\left[ \left( \frac{2,700}{9.23} + \frac{9,703}{19.91} \right)^2 + \left( \frac{66,150}{8.98} \right)^2 \right]^{0.5}}{(0.7071 * 0.250)} = 41,911 \text{ psi}$$

$$F_w = .75 * 1.5 * .6 * 70,000 = 47,250 \text{ psi}$$

$$\text{Safety Factor} = 47,250 / 41,911 = 1.13 \geq 1.0 \text{ OK}$$

Base Metal:

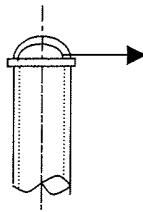
$$\text{Factor of Safety on Stanchion} = 1.34$$

$$t_p = 0.276 \text{ in}$$

$$\text{Weld size, } t_w = 1/4 \text{ in}$$

$$\text{Factor of Safety on Base Metal} = 1.34 \times 0.25 / 0.276 = 1.21 \geq 1.0 \text{ OK}$$

**Top Hoop:**



$$\begin{aligned}
 \text{Thickness, } t &= 0.625 \text{ in} \\
 A &= 0.307 \text{ in}^2
 \end{aligned}$$

$$P = 5,400 \text{ lbs}$$

$$f_v = P/A = 17,601 \text{ psi}$$

$$F_y = 36 \text{ ksi}$$

$$F_v = .6F_y = 20.8 \text{ ksi}$$

$$\text{Factor of Safety} = F_v/f_v = 1.18 \geq 1.0 \text{ OK}$$

**Weld:**

E70XX

$$t_w = 0.177 \text{ in}$$

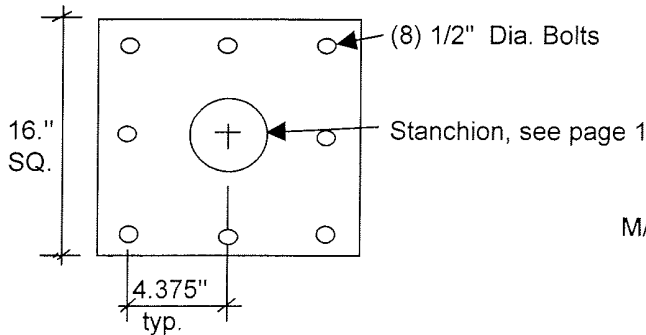
$$A_w = (d+t_w) * t_w = 0.445 \text{ in}^2$$

$$f_w = P/A_w = 12,127 \text{ psi}$$

$$F_w = 0.6F_{xx} = 42,000 \text{ psi}$$

$$\text{Factor of Safety} = F_w/f_w = 3.46 \geq 1.0 \text{ OK}$$

**Concrete Attachment Method  
 Orthogonal Case**



**Bottom Plate Size:** Thickness 3/8 in  
 Size 16 in

**Bottom Plate:**

Base Conc. ,  $f_c = 3000$  psi  
 Pressure width,  $X = (2T-P') / (.85f_cB)$   
 = 0.09 in  
 Pressure,  $w = 2,089$  psi  
 $C = (2T-P') = 3,058$  lbs

**Tension in each bolt:**

$$\begin{aligned} M / ((B-E-E'-X)/2)^2 &= 93,531 / (10.83^2) = 2,879 \\ + 2,700 / 8 &= 337.50 \\ \hline &= 3,216 \text{ lbs} \end{aligned}$$

E, Anchor Edge Distance = 3.625 in  
 Bolt,  $F_u = 60,000$  psi  
 Bolt Dia. = 0.5 in  
 Threaded Area,  $A_s = 0.142$  in<sup>2</sup>

Tensile Stress,  $\sigma = 3,216 / 0.142 = 22,651$  psi  
 Safety Factor =  $60,000 / 22,651 = 2.65 \geq 1.0$  OK

Shear Stress,  $f_v = 5,400 / 1.136 = 4,754$  psi  
 Allowable Shear Stress =  $.577 * F_u = 34,620$  psi  
 Safety Factor =  $34,620 / 4,754 = 7.28 \geq 1.0$  OK

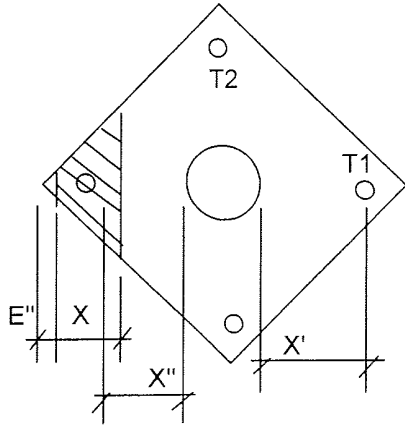
Allowable Combined Shear and Tension =  $45 - 1.8 * f_v < 34.6 = 34.60$  ksi  
 Safety Factor =  $34,600 / 22,651 = 1.53 \geq 1.0$  OK

**Plate Bending:**

Ignore plate beyond compression zone on compr. side,  $E' = 1.5$  in  
 Compr. Side  $M = C * (B - \text{DIA Stanchion}) / 2 - X - E' = 3,058 * 4.97 = 15,201$  in-lbs  
 $M_{cap} = Bt^2 / 4 * F_u = 0.563 * 58,000 = 32,625$  in-lbs  
 Factor of Safety =  $M_{cap} / M = 32,625 / 15,201 = 2.15 \geq 1.0$  OK

Tension Side  $M = 2 * T * (B - \text{Dia. Stanchion}) / 2 - E = 6,433 * 2.94 = 18,897$  in-lbs  
 Factor of Safety =  $M_{cap} / M = 32,625 / 18,897 = 1.73 \geq 1.0$  OK

**Diagonal Case (Conservatively ignoring intermediate bolts)**



**Tension in Bolts:**

$$\begin{aligned}
 P'' &= 4,677 \text{ lbs} \\
 M &= 93,531 \text{ in-lbs} \\
 \text{Compr. Force, } C &= P+T1+2*T2 = 14,455 \\
 A_c &= C/.85f_c = 5.67 \text{ sq. in} \\
 X &= -E''+\text{sqrt}(E''^2+A) = 0.538 \\
 d &= 1.414(B-E)-X/3-E'' = 12.24 \text{ in} \\
 T1 &= .5(M/d)+P' = 6,519 \text{ lbs}
 \end{aligned}$$

$$\begin{aligned}
 \text{Tensile Stress, } \sigma &= 6,519 / 0.142 = 45,910 \text{ psi} \\
 \text{Safety Factor} &= 60,000 / 45,910 = 1.31 \geq 1.0 \text{ OK}
 \end{aligned}$$

$$\begin{aligned}
 \text{Shear Stress, } f_v &= 5,400 / 0.568 = 9,507 \text{ psi} \\
 \text{Allowable Shear Stress} &= .577 * F_u = 34,620 \text{ psi} \\
 \text{Safety Factor} &= 34,620 / 9,507 = 3.64 \geq 1.0 \text{ OK}
 \end{aligned}$$

$$\begin{aligned}
 \text{Allowable Combined Shear and Tension} &= 45-1.8*f_v < 34.6 = 27.89 \text{ ksi} \\
 \text{Safety Factor} &= 27,887 / 6,519 = 4.28 \geq 1.0 \text{ OK}
 \end{aligned}$$

Assume plate can be ignored  
 past distance, E'' = 5 in  
 (Reduces d, increases T, increases M<sub>t</sub>,  
 reduces M<sub>c</sub>)

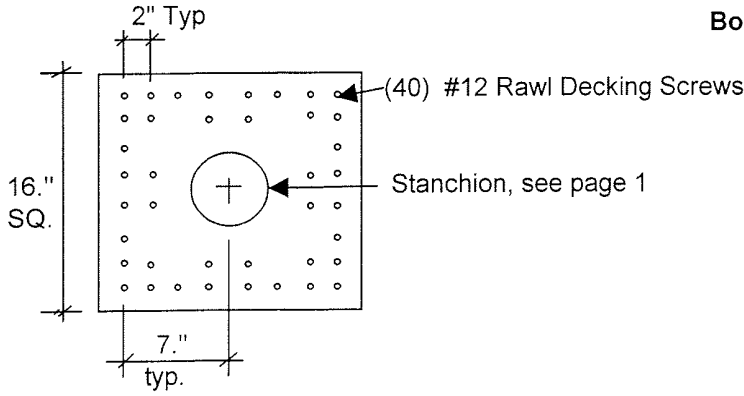
**Plate Bending: Tension side**

$$\begin{aligned}
 X' &= .7071(B-DIA-2E) = 4.15 \text{ in} \\
 M_t &= T1 * X' = 27,082 \text{ in-lbs} \\
 M_{cap} &= t^2(2(X'+1.414*E))/4 * F_u = 37,845 \text{ in-lbs} \\
 \text{Factor of Safety} &= M_{cap}/M_t = 1.40 \geq 1.0 \text{ OK}
 \end{aligned}$$

**Plate Bending: Compression Side**

$$\begin{aligned}
 X' &= .7071(B-DIA)-E''-X/3 = 2.39 \text{ in} \\
 M &= C * X'' = 34,564 \text{ in-lbs} \\
 M_{cap} &= 37,845 \text{ in-lbs} \\
 M_{cap}/M_t &= 1.09 \geq 1.0 \text{ OK}
 \end{aligned}$$

**Metal and Wood Deck Attachment Method**



**Bottom Plate Size:** Thickness 3/8 in  
 Size 16 in

**Bottom Plate:**

**Tension in screws:**

No Screws	X	NX
8	14	112
6	12	72
0	10	0
4	8	32
4	6	24
0	4	0
6	2	12
8	0	0
<b>Sum</b>	<b>36</b>	<b>252</b>

Zx = 252 in<sup>2</sup>  
 T = M/Zx = 263 lbs

E, Anchor Edge Distance = 1 in  
 Tension Capacity #12 Rawl Deck Screw:  
 (in 20 gage steel deck) = 655 lbs  
 (in 5/8" Plywood CD Exterior Grade 2, 5/8" embed min) = 550 lbs

V causes tension in screw by tilting, add T+V

T = 263 lbs  
 V = P/40 = 135 lbs  
 398 lbs

Factor of Safety in 20 ga deck = 1.65 >= 1.0 OK  
 Factor of Safety in plywood deck = 1.38 >= 1.0 OK

**Plate Bending:**

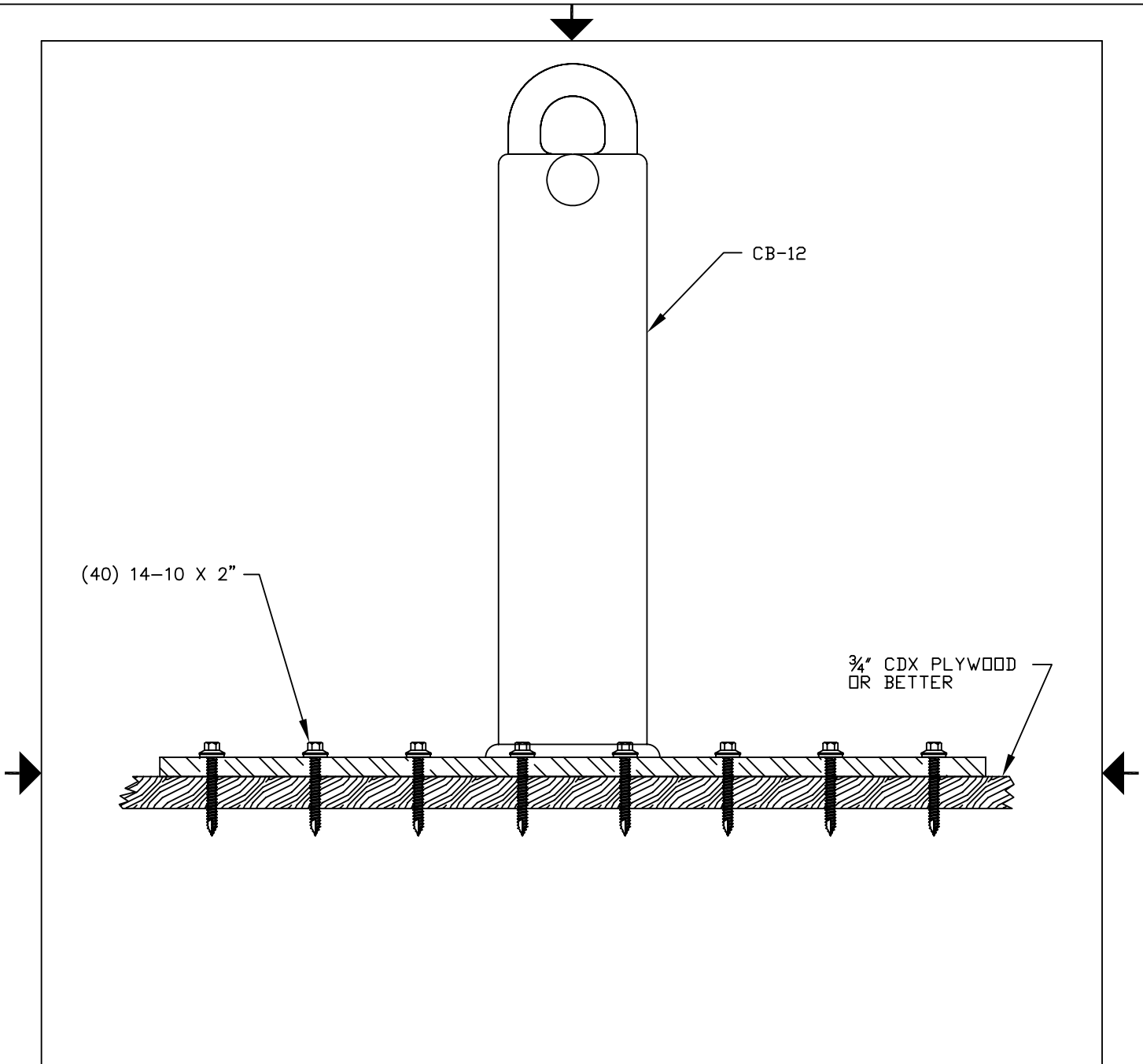
Tension Side

M = No. Screws x tension x Distance to pipe =

8	*	398	*	5.31	=	16,894	in-lbs	
6	*	341	*	3.31	=	6,772	in-lbs	
0	*	243	*	1.31	=	-	in-lbs	
							<u>23,665</u>	in-lbs

M<sub>cap</sub> = Z<sub>x</sub> X Fu = 0.56 \* 58,000 = 32,625 in-lbs

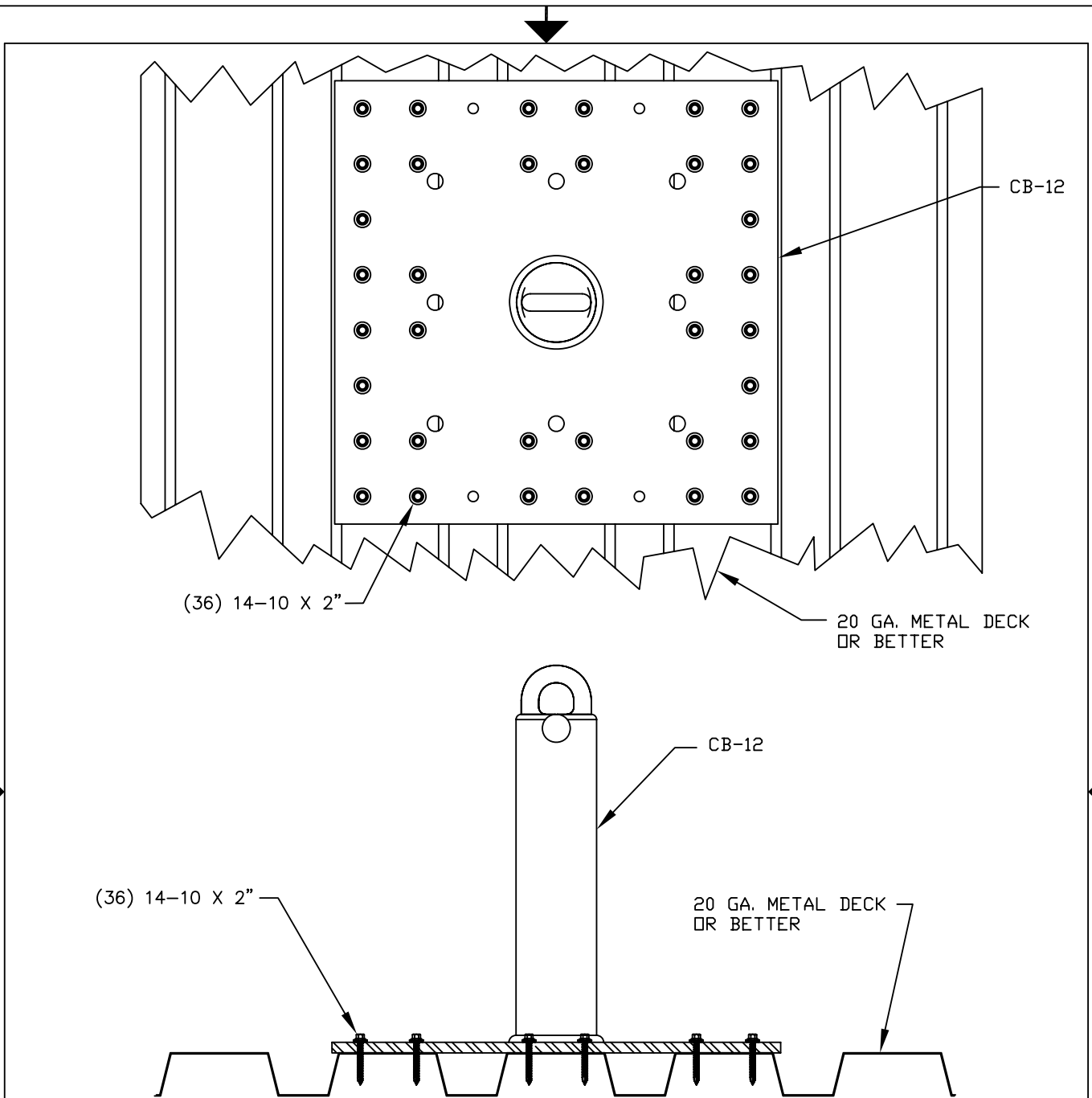
Factor of Safety = M<sub>cap</sub>/M = 32,625 / 23,665 = 1.38 >= 1.0 OK



**NOTES:**

1. Secure the CB-12 anchor to 3/4" CDX wood decking or better.
2. Use all 40 of the 14-10 X 2" screws provided and all of the 3/8" diameter holes provided in the CB-12 base plate.
3. The fasteners must be installed into a structure capable of resisting a 5000 lb. load.

INSTALLATION INSTRUCTIONS			TITLE CB SERIES ROOF ANCHOR			
DESIGNED BY:	B. WOODYARD	1992	DWG NO. CB-12			
DRAWN BY:	PHIL GOMES	07/28/2004			A	NEW
CHECKED BY:	M. VOLLMER	CHECKED DATE	SCALE: NONE	SHEET: 1		
APPD BY:	M. VOLLMER	APPROVED DATE				



**NOTES:**

1. Secure the CB-12 anchor to 20 GA. or thicker metal decking.
2. Metal decking must have a 1-½ inch minimum valley depth.
3. It is recommended that all 40 of the provided 14-10 X 2 inch fasteners or equivalent be used to secure the CB-12 anchor to the deck but a minimum of 36 "must" be used.
4. Longer screws may be required in areas where a void exists under the plate and a 2" fastener cannot penetrate the decking by ¼ inch or more after installation.
5. The fasteners must be installed into a structure capable of resisting a 5,000 lb. load.

INSTALLATION INSTRUCTIONS			TITLE CB SERIES ROOF ANCHOR			
DESIGNED BY:	B. WOODYARD	1992	DWG NO. CB-12			
DRAWN BY:	PHIL GOMES	07/28/2004			SCALE: NONE	A
CHECKED BY:	M. VOLLMER	07/18/2005			SHEET: 1	
APPD BY:	M. VOLLMER	07/18/2005				

1/2" HILTI HAS-E ROD  
SHOWN FOR REFERENCE

2000 PSI CONCRETE  
OR BETTER

3-1/2" MINIMUM  
EMBEDMENT

CB-12

**NOTES:**

1. Secure the CB-12 anchor to 2000 psi concrete or better.
2. Use all 8 of the 3/16" diameter holes provided.
3. Use 1/2" diameter anchor bolts with an ultimate tensile strength of 6000 lbs. or higher. All anchor bolts must be embedded a minimum of 3-1/2".
4. Hilti HIT HY-150/HIT-ICE adhesive using HAS-E rods are shown for reference. Use an equivalent or superior system when substituting.
5. Severe weather installations/conditions must be taken into consideration when selecting anchor bolts for installing CB-12 anchors.
6. Always follow the anchor bolt manufacturer's installation instructions for minimum concrete thickness and torque requirements.

INSTALLATION INSTRUCTIONS

TITLE  
CB SERIES  
ROOF ANCHOR

**GUARDIAN**  
FALL PROTECTION

DESIGNED BY: B. WOODYARD 1992

DRAWN BY: PHIL GOMES 07/28/2004

CHECKED BY: M. VOLLMER CHECKED DATE

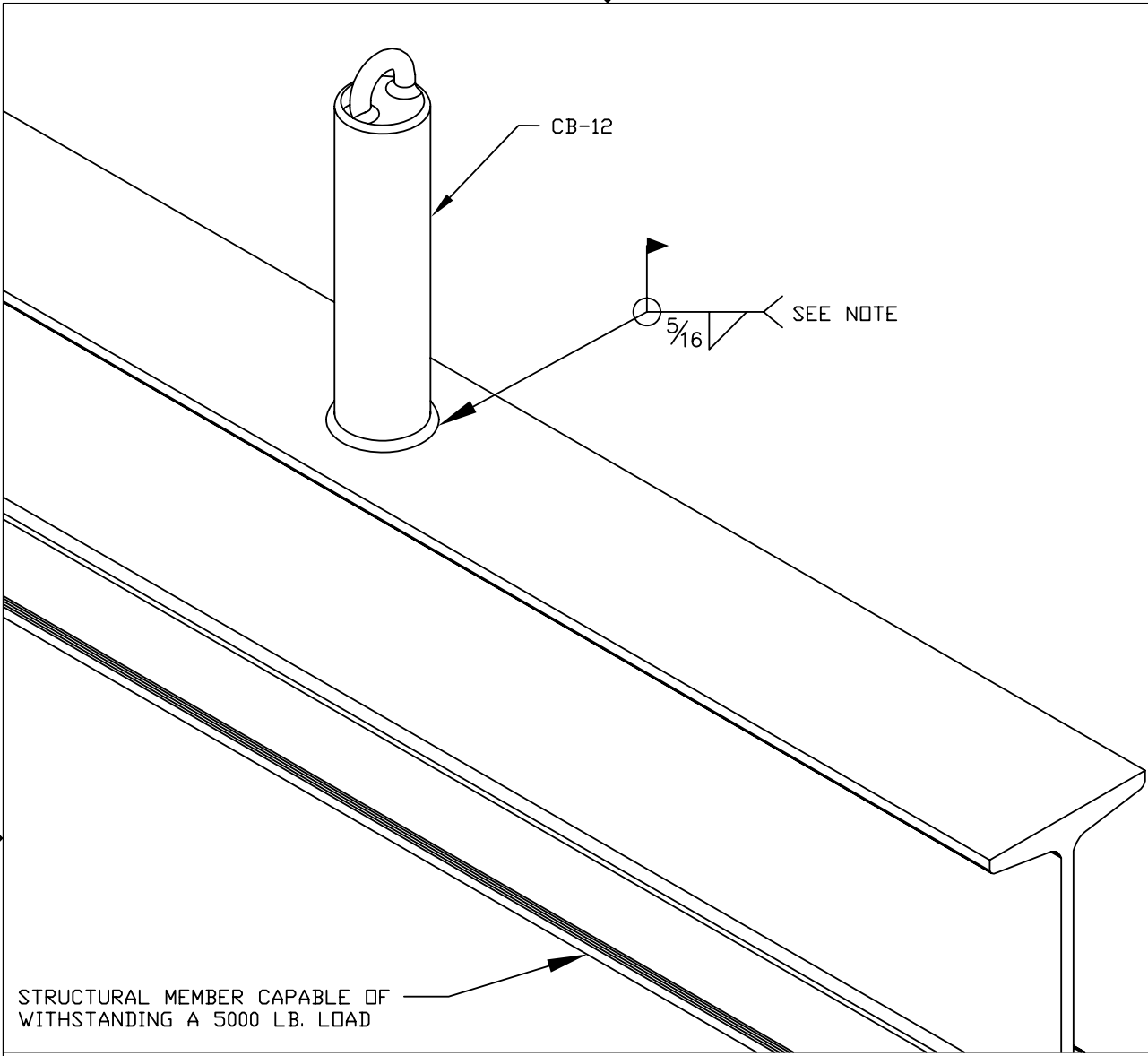
APPD BY: M. VOLLMER APPROVED DATE

DWG NO.  
CB-12

SCALE: NONE

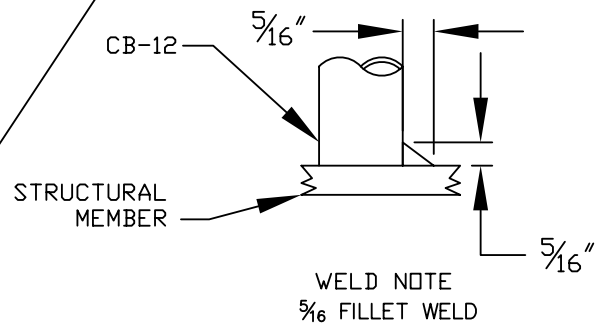
SIZE	REV
A	NEW

SHEET: 1



**NOTES:**

1. Weld CB-12 to a structural member capable of resisting a 5,000 lb. load using a 5/16" fillet weld.
2. All welding shall be performed by a certified welder using E-70xx rod or wire feed.
3. Prep galvanized areas per AWS D19.0 prior to welding.
4. Touch-up galvanized area after welding per ASTM A780.



INSTALLATION INSTRUCTIONS

TITLE  
CB SERIES  
ROOF ANCHOR



DESIGNED BY: B. WOODYARD 1992

DRAWN BY: PHIL GOMES 01/27/2005

CHECKED BY: M. VOLLMER CHECKED DATE

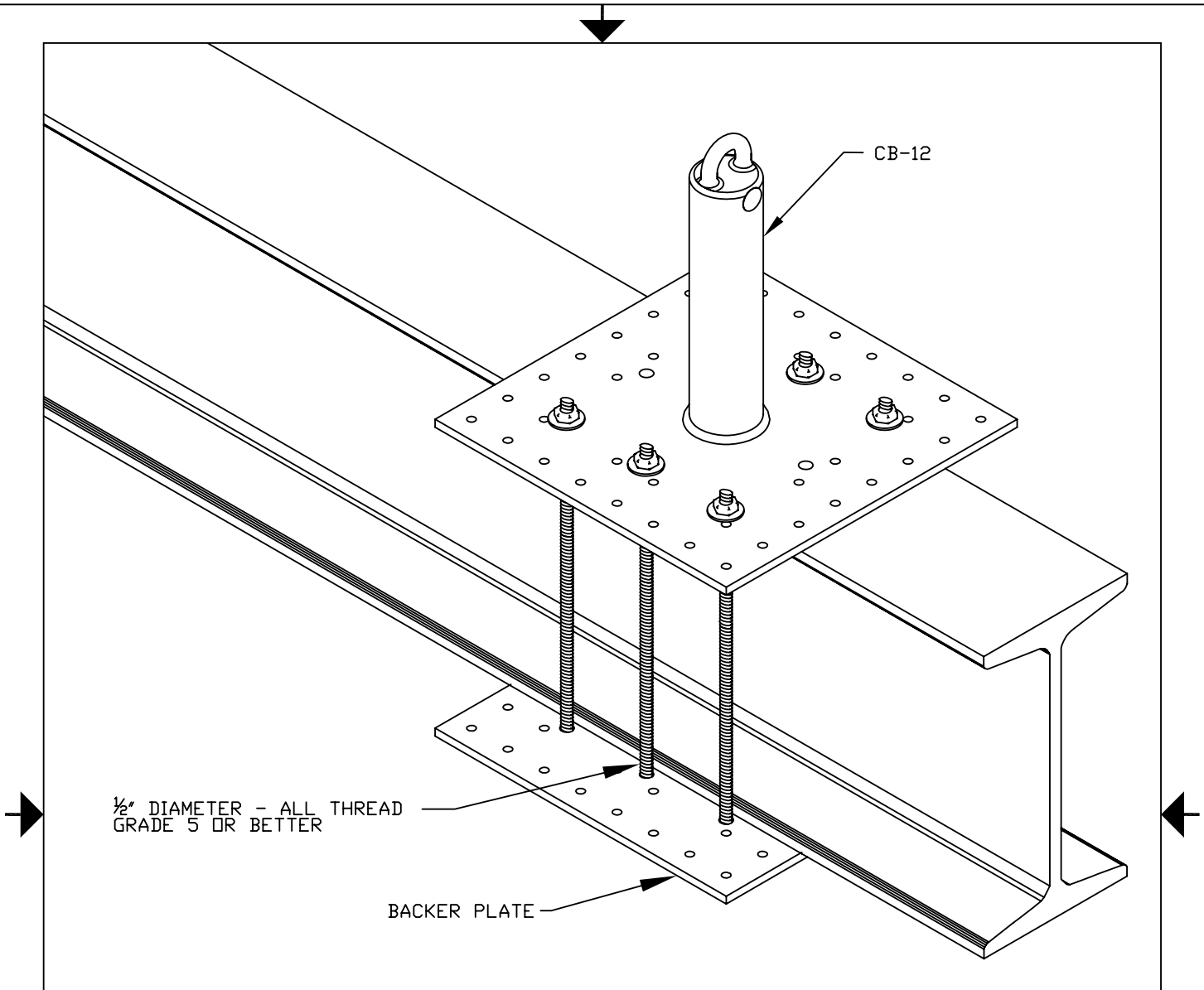
APPD BY: M. VOLLMER APPROVED DATE

DWG NO.  
CB-12 WELDMENT

SCALE: NONE

SIZE	REV
A	NEW

SHEET: 1



**NOTES:**

1. Secure the CB-12 anchor to a structural member capable of resisting a 5000 lb. load.
2. Use at least 6 of the  $\frac{9}{16}$ " holes provided to attach the CB-12.
3. Use  $\frac{1}{2}$ " diameter, Grade 5 All Thread or better.

INSTALLATION INSTRUCTIONS			TITLE CB SERIES ROOF ANCHOR			
DESIGNED BY:	B. WOODYARD	1992	DWG NO. CB-12			
DRAWN BY:	PHIL GOMES	09/16/2004			A	NEW
CHECKED BY:	M. VOLLMER	CHECKED DATE	SCALE: NONE		SHEET: 1	
APPD BY:	M. VOLLMER	APPROVED DATE				