ADDENDUM OF SOLICITATION

INVITATION FOR BIDS (IFB #026-001)

ADDENDUM No. 1

Issued: September 5, 2025

IFB No. 026-001 **Title: PRTC Bus Stop and Bus Shelter Construction Services**

Contact: Cynthia Porter Johnson **Email:** cporter-johnson@omniride.com **Phone**: 703-580-6147

This addendum is hereby incorporated into the solicitation documents of the above referenced IFB. The following items are clarifications, corrections, additions, deletions and/or revisions to the IFB, which shall take precedence over the original documents. Bidders must acknowledge receipt of this amendment by returning the signed original with the Bid package prior to the hour and date specified in the solicitation.

DESCRIPTION OF ADDENDUM

The above numbered solicitation is amended as follows:

1. **PRE-BID ATTENDEE LIST, PRESENTATION AND ANSWERS TO SUBMITTED QUESTIONS –** Providing pre-bid meeting attendee list, pre-bid presentation, and a matrix of answers to all submitted questions and attached herewith, **PRTC Bus Stop and Bus Shelter Construction Services.**

2. **SECTION II PROCUREMENT SCHEDULE**
   Revising the PROCUREMENT SCHEDULE to extend the bids due date to Friday, September 19, 2025.

   DELETE: **SECTION II – PROCUREMENT SCHEDULE**

   REPLACE WITH: **REVISED SECTION II – PROCUREMENT SCHEDULE attached herewith**

3. **SECTION III SCOPE OF WORK**
   Revising the SCOPE OF WORK to edit details and include additional Contractor Responsibilities.

   DELETE: **SECTION III – SCOPE OF WORK**

   REPLACE WITH: **REVISED SECTION III – SCOPE OF WORK attached herewith**

4. **ATTACHMENT A1- BRASCO SLIMLINE SERIES INSTALLATION INSTRUCTIONS**
   Providing Brasco Slimline Series Shelter Installation Instructions. **(The documents provided are only for estimating purposes and are not indicative of actual construction documents.)**

   ADD: **BRASCO SLIMLINE SERIES INSTALLATION INSTRUCTIONS attached herewith**

5. **ATTACHMENT A2 – BRASCO STRUCTURAL CALCULATIONS**
   Providing Brasco Structural Calculations. **(The documents provided are only for estimating purposes and are not indicative of actual construction documents.)**

   ADD: **BRASCO STRUCTURAL CALCULATIONS attached herewith**

6. **ATTACHMENT A3 - BRASCO SHELTER TECHNICAL SPECIFICATIONS**
   Providing Brasco Shelter Technical Specifications. **(The documents provided are only for estimating purposes and are not indicative of actual construction documents.)**

   ADD: **BRASCO SHELTER TECHNICAL SPECIFICATIONS attached herewith**

7. **ATTACHMENT A4 – PRTC TENTATIVE BUS STOP AND BUS SHELTER LOCATIONS**
   Providing PRTC Tentative Bus Stop and Bus Shelter Locations.

   ADD: PRTC TENTATIVE BUS STOP and BUS SHELTER LOCATIONS attached herewith

8. **ATTACHMENT B – REVISED PRICING SCHEDULES**
   Providing Revised Pricing Schedules to include an additional line items.

   DELETE: **ATTACHMENT B – PRICING SCHEDULES**

   REPLACE WITH: **ATTACHMENT B REVISED PRICING SCHEDULES attached herewith**

Except as specifically amended herein, all other terms and conditions of this solicitation remain unchanged and in full force and effect.

Bidders must acknowledge receipt of this amendment by returning signed original with the Bid package prior to the hour and date specified in the solicitation. Failure to acknowledge receipt of this Addendum may be grounds to declare your Bid unresponsive.

_____
Company

_____
Address

City_____ State_____ Zip Code_____

Name of Person Authorized to Sign _____
Print

Signature_____ Date_____

Pre-Bid Sign-In Sheet

Solicitation No: IFB No. 026-001

PRTC Bus Stop and Bus Shelter Construction Services

Date: August 19, 2025 Time: 11:00 AM

Location: PRTC Transit Center - Virtual: Zoom Meeting ID: 845 2861 3544

	Name	Company	Phone	Email	In- Person or via Zoom
1.	Mike Domingues	Bright Construction	703-863-9361	mdomingues@brightconstructiongroup.com	Zoom
2.	Doris Lookabill	PRTC	703-580-6153	dlookabill@omniride.com	In- Person
3.	Miranda Hellem	PRTC	703-576-5140	mhellem@omniride.com	Zoom
4.	Cynthia Porter-Johnson	PRTC	703-580-6147	cporter-johnson@omniride.com	In- Person
5.	LaWana Glymph	PRTC	703-580-6158	lglymph@omniride.com	In- Person
6.					
7.					
8.					
9.					
10.					

OMNIRIDE
GET THERE SMARTER

IFB No. 026-001
PRTC Bus Stop and Bus Shelter Construction Services
Pre-Bid Meeting
August 19, 2025

AGENDA

- Introductions
- About PRTC/OmniRide
- Background/Purpose of Project
- Discussion of Scope of Work
- IFB Requirements and Forms
- Timeline
- Questions & Answers

INTRODUCTIONS

PRTC/OmniRide

Miranda Hellem, Facilities Project Manager
Doris Lookabill, Director of Facilities
LaWana Glymph, Contract Specialist
Cynthia Johnson, Mgr. of Grants and Procurement

ABOUT PRTC/OMNIRIDE

Commuter, Metro Express, Local and Paratransit Bus Services

Microtransit

Vanpool Alliance

Rideshare and TDM Programs

Employer Services Program

BACKGROUND/PURPOSE

- PRTC developed its bus shelter program to provide our passengers with amenities and protection from weather while waiting at bus stops.

- PRTC adds bus stops and shelters at various locations based on average daily ridership and service area needs to meet passenger demand.

- PRTC replaces bus shelters that have exceeded their useful life or are no longer structurally safe, when needed.

SCOPE OF WORK

It is the responsibility of the Contractor to review the entirety of the Scope of Work due to its complexity.

Purpose:

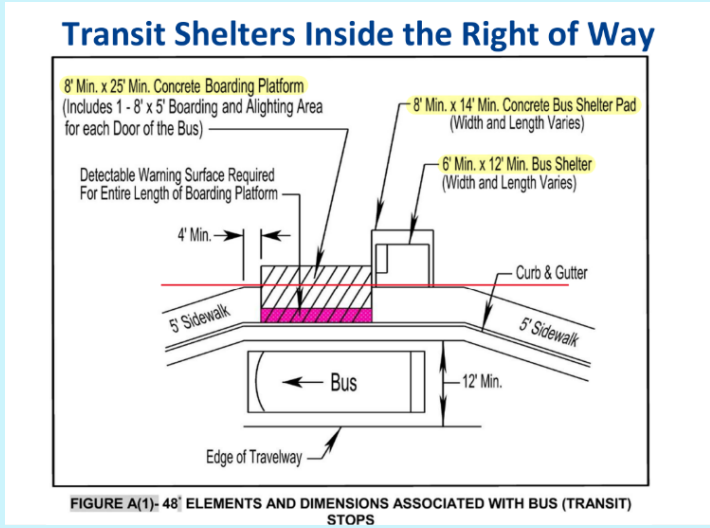
- Construct bus stop boarding platforms per Engineer provided construction documents.
- Construct bus shelter pads per Engineer provided construction plans.
- Construct retaining walls, at locations where necessary, per Engineer provided construction plans.
- The Contractor is responsible for all concrete and soil testing as indicated per construction plans and/or permitting requirements.
- Site preparation and post construction clean-up are required. No dumpsters may be left onsite overnight. The Contractor will coordinate placement with appropriate localities.

SCOPE OF WORK

Existing Bus Stop and Bus Shelters

SCOPE OF WORK

VDOT Site Development Guidelines
(Do not supersede Engineer provided construction documents.)

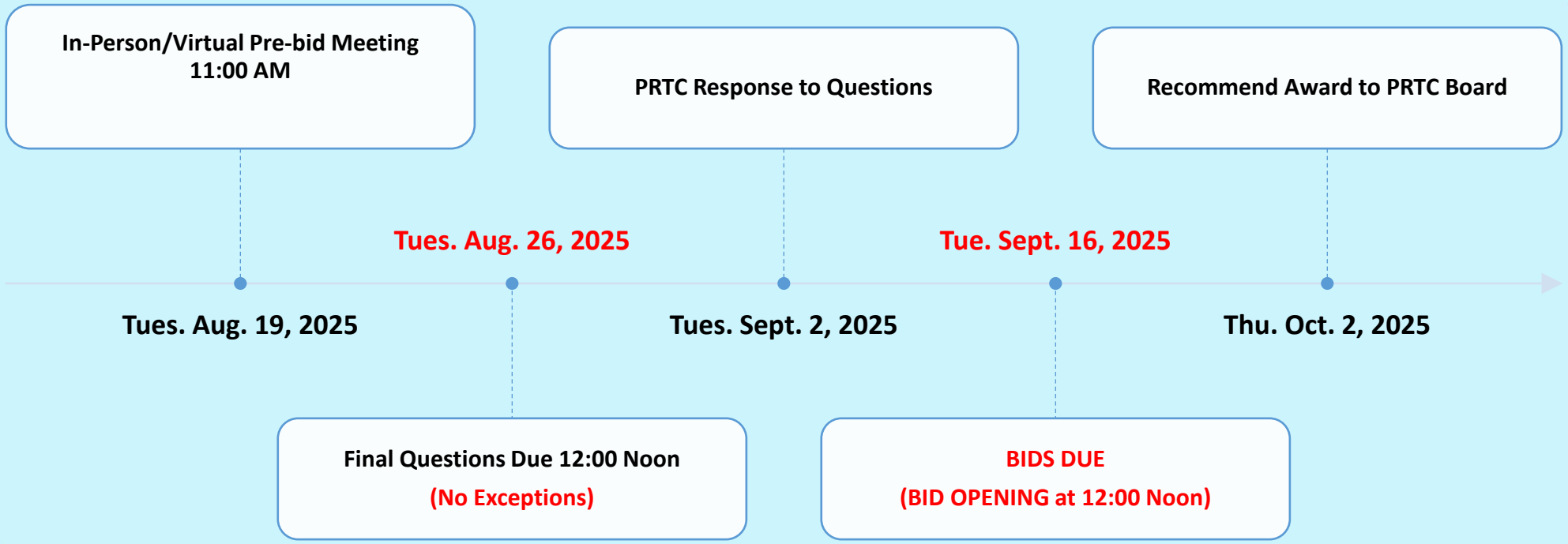


IFB REQUIREMENTS AND FORMS

Failure to provide all the required certifications and documents listed and described in the Invitation for Bids (IFB) may cause the bid to be rejected and be considered non-responsive.

- Pricing Schedule – **Attachment B**
- Reference Form – **Attachment C**
- IFB Submission Form – **Attachment D**
- Insurance Checklist – **Attachment E**
- Federal Transit Administration (FTA)- **Certifications**
- **Addendum(s)**

TIMELINE


In-Person/Virtual Pre-bid Meeting
11:00 AM
PRTC Response to Questions
Recommend Award to PRTC Board
Tues. Aug. 26, 2025
Tue. Sept. 16, 2025
Tues. Aug. 19, 2025
Tues. Sept. 2, 2025
Thu. Oct. 2, 2025
Final Questions Due 12:00 Noon
(No Exceptions)
BIDS DUE
(BID OPENING at 12:00 Noon)

OMNIRIDE

GET THERE SMARTER

Questions?

LaWana Glymph
Contract Specialist
lglymph@omniride.com
703-580-6158

Cynthia Porter Johnson
Mgr. of Grants & Procurement
cporter-johnson@omniride.com
703-580-6147

Question/Clarification	Date Submitted/ Prospective Bidder	Response
1. Can a dump truck be supplemented for a trash bin for hauling.	August 19, 2025/ Bright Construction	This will depend on the approved Maintenance of Traffic (MOT) plan. If allowed, PRTC has no objection.
2. Will shop drawings be required to submit?	August 19, 2025/ Bright Construction	As-builts will be required at the completion of construction and an approved construction plan set will be provided by PRTC.
3. Will an MOT plan be required to perform the work?	August 19, 2025/ Bright Construction	If the limits of disturbance impact traffic, a MOT plan will be required. VDOT requires a MOT plan whenever the limits of disturbance are within the VDOT right-of-way regardless of traffic impacts.
4. Can a retaining wall detail/drawing be provided?	August 19, 2025/ Bright Construction	Retaining walls will not be required for all locations. For sites that do require a retaining wall, a detailed drawing and specifications will be included in construction plan set at the time work is scheduled.
5. Can a list of site addresses be provided?	August 19, 2025/ Bright Construction	A tentative list of site addresses is provided in Addendum #1.

IFB No. 026-001 - PRTC Bus Stop and Bus Shelter Construction Services
PRTC Response to Prospective Bidders' Questions and Requests for Clarifications
September 5, 2025

Question/Clarification	Date Submitted/ Prospective Bidder	Response
6. It seems confusing to have a rate per bus stop and a rate per bus shelter for certain items. These items being 003 and 007 due to the fact that the shelter will not need concrete testing and/or a retaining wall. Can these line items be combined?	August 25, 2025/ Bright Construction	Line items 003 and 007 will not be combined. As outlined in the Scope of Work, bus shelter pads require 28-day concrete testing and are to be a minimum of 8 inches thick, reinforced and classified as structural concrete. The Contractor shall construct retaining walls as indicated on approved construction and site plans.
7. Can a spec of the shelter be provided so the GC can get together an accurate installation price?	August 25, 2025/ Bright Construction	Brasco Slimline Installation instructions, structural calculations and shelter specifications are provided in Addendum #1.
8. Will the GC have to be in charge of installation of site amenities (trash receptacles, signs, etc.) and electrical accessories if needed?	August 25, 2025/ Bright Construction	Yes, the GC will install mounted benches and mounted trash cans as part of the shelter installation. No electrical components exist on this shelter model.
9. What are the minimum dimensional requirements for the bus stop and bus shelter pads? Example 25' L x 8' Wide x 8" Depth	August 26, 2025/ Ashburn Contracting Corporation	Bus stops per Public Right-of-Way Accessibility Guidelines (PROWAG) standards measure 25' L x 8' Wide x 4-6" Depth and consist of loading zones and boarding and alighting areas. In addition to the PROWAG requirements, Bus Shelter pads are structural and will measure 14' L x 8' Wide x 8" Depth. Not all locations will have a bus shelter pad.

IFB No. 026-001 - PRTC Bus Stop and Bus Shelter Construction Services
PRTC Response to Prospective Bidders' Questions and Requests for Clarifications
September 5, 2025

Question/Clarification	Date Submitted/ Prospective Bidder	Response
10. What is the maximum dimensional requirement for the bus stop and bus shelter pads (Length x Width) as Attachment A only provides a minimum (also detail is unclear and appears to be for bus shelter installations)?	August 26, 2025/ Ashburn Contracting Corporation	Guidance for maximum dimensions is provided in Bus Stop diagram included in VDOT's Complete Streets: Bicycle and Pedestrian Facility Guidelines (Attachment A). Estimate should be based on diagram measurements as specified in Brasco Slimline Series Installation instructions, structural calculations and shelter specifications provided in Addendum #1. Also, please refer to dimensions provided in Question #9.
11. Are there any reinforcing requirements for the concrete for the bus stop and bus shelter pads?	August 26, 2025/ Ashburn Contracting Corporation	Bus Shelter pads are to be reinforced concrete. As outlined in the Scope of Work, bus shelter pads are to be a minimum of 8 inches thick, reinforced and classified as structural concrete.
12. If the contractor is required to remove existing bus shelters and amenities/concrete etc. under this contract, how is the contractor to be paid?	August 26, 2025/ Ashburn Contracting Corporation	The Pricing Schedules have been revised to include a line item for Removal and Disposal of existing bus shelters, amenities, concrete, etc. as necessary for construction. The revised Pricing Schedules are included in Addendum #1.
13. What is required to be provided on the As-Built Survey for this project? Will redlines be sufficient or must they be certified by an engineer?	August 26, 2025/ Ashburn Contracting Corporation	Redlines must be approved by the Engineer of Record prior to completion. No changes from original construction plan set will be allowed without PRTC approval.

IFB No. 026-001 - PRTC Bus Stop and Bus Shelter Construction Services
PRTC Response to Prospective Bidders' Questions and Requests for Clarifications
September 5, 2025

Question/Clarification	Date Submitted/ Prospective Bidder	Response
14. What are the dimensional requirements for the Retaining wall that should be included? Could this item be priced in CY since there is no pre-bid information?	August 26, 2025/ Ashburn Contracting Corporation	A cubic yard (CY) price will be sufficient as retaining walls vary in size and materials by location and are not necessary for all locations. The Pricing Schedules have been revised to allow for this pricing.
15. Are items 001 thru 004 to be paid for per pad installed or is this a per task order payment structure?	August 26, 2025/ Ashburn Contracting Corporation	This is not a per task order payment structure. Payment will be based on per pad installation. The Contractor is to provide pricing as outlined in the Pricing Schedule(s).
16. Whom will be installing the bus shelters and amenities for the Bus Shelter Pads? If the Contractor, who is providing the shelters?	August 26, 2025/ Ashburn Contracting Corporation	The contractor will install the shelter and amenities as indicated in the revised Scope of Work and the provided manufacturer instructions. PRTC will provide bus shelters and amenities.
17. What are the material requirements for the Detectable Warning Surface or approved manufacturers? (Brick, Plastic, Metal). What is the approved color?	August 26, 2025/ Ashburn Contracting Corporation	Detectable warning requirements will be in the approved Construction Plan Set and will be in compliance with VDOT and Prince William County Requirements. Contractor is responsible for ensuring that the color is of an approved selection for both agencies.

II. PROCUREMENT SCHEDULE

PRTC anticipates the procurement schedule as shown below. PRTC reserves the right to make changes to the schedule. All such changes shall be made via an addendum to the solicitation. It is the responsibility of each bidder to check PRTC's procurement webpage (https://omniride.com/about/business/procurement/) or eVA, Virginia's online, electronic procurement system (https://mvendor.cgieva.com/Vendor/public/AllOpportunities.jsp) for information concerning this solicitation, including any addenda or notices.

August 6, 2025	**IFB Issued by PRTC**
August 19, 2025	**Pre-bid Conference 11:00 am EST In-Person at the PRTC Transit Center, 14700 Potomac Mills Rd, Woodbridge, VA 22192 and Virtually via Zoom**
August 26, 2025	**Final Questions Due 12:00 Noon EST**
September 2, 2025	**PRTC Response to Questions**
September ~~16~~19, 2025	**BIDS DUE (Bid Opening) 12:00 Noon EST**
October 2, 2025	**Recommend Award to PRTC Board**

III. SCOPE OF WORK

III.1 Purpose

The Potomac and Rappahannock Transportation Commission (PRTC) is seeking a contractor to provide site development and construction services for various bus stop and bus shelter locations, throughout Prince William County, Town of Dumfries, and the Cities of Manassas and Manassas Park. The successful contractor must meet federal compliance requirements for this solicitation.

III.2 Background/Overview

PRTC developed the bus shelter program to provide our passengers with amenities and protection from the elements while waiting for the bus. To ensure that all our bus shelters provide our passengers with a safe waiting area, PRTC selects locations for bus shelter replacements that are beyond their useful life or have been determined to no longer be structurally sound. PRTC will also, at times, select new locations for the placement of a bus shelter based on ridership needs.

PRTC currently has seventy-one (71) bus shelters installed throughout Prince William County, with an additional twenty (20) bus shelters in inventory awaiting installation. PRTC is anticipating site development and construction for approximately twelve (12) bus shelters, and twelve (12) bus stops per fiscal year. However, the number of bus shelters and bus stops needing site development and construction per fiscal year may vary due to many factors including, but not limited to weather, bus service changes, available funding, etc. Site locations vary in design and site plans will be based on Virginia Department of Transportation's (VDOT) "Complete Streets" ~~accessibility~~ guidelines, (Attachment A).

Additionally, to meet the evolving needs of our passengers, the agency, and changes in building codes, there is a need for PRTC to install new bus stops and upgrade existing bus stops throughout the service area.

III.3 General Requirements

A. PRTC requests the contractor to construct bus shelter pads, bench pads, loading zones, and site improvements per site plans and approved construction documents to be provided by PRTC's Engineer of Record. Site plans and Construction Documents will vary by location.

B. The contractor shall construct sidewalks and pathways per Virginia Department of Transportation's (VDOT) "Complete Streets" guidelines, (Attachment A), where indicated on site plans and construction documents.

C. The contractor shall construct retaining walls as indicated on approved construction and site plans. Retaining walls will not be required for all locations.

D. The contractor is responsible for all concrete and soil testing required for the duration of construction. All testing shall be conducted by an ACI/ASCE certified laboratory.

E. The contractor shall remove and dispose of existing bus shelters, amenities, concrete, etc., prior to construction.

F. The contractor shall install bus shelters and amenities such as benches, displays, trash cans, etc. on newly constructed concrete pads per manufacturer instructions as provided in **Attachment A1 (Brasco Slimline Series Installation Instructions)**. **Please Note:** The Brasco Slimline Series Installation Instructions are to be used for estimating purposes only as they are not indicative of actual construction documents.

III.4 Contractor Responsibilities

A. The contractor shall submit a project timeline to be approved by PRTC within seven (7) business days from receipt of Notice to Proceed.

B. All work shall be completed Monday through Friday in accordance with local ordinances for each location.

C. All communication between the contractor and PRTC shall be in writing.

D. The contractor is responsible for all material, supplies, supervision, equipment, transportation, and labor, needed to complete the Project.

E. The contractor is responsible for locating and marking underground utility lines prior to any disturbance at each location.

F. PRTC's Engineer of Record will obtain and provide a copy of all Land Use Permits and Building Permits prior to construction.

G. The contractor is responsible for securely fencing off the work zone to prevent pedestrian access until tasks are completed and the bus shelter and amenities have been installed.

H. The contractor shall contact Prince William County Department of Public Works for approval after all construction and installations have been completed.

I. The contractor will ensure all slopes, widths, and clearances meet the current Americans with Disabilities Act (ADA) and Public Rights-of- Way Access Guidelines (PROWAG) standards. 2021 Virginia Uniform Statewide Building Code (2021 VA USBC) lists 2017 ICC/ANSI A117.1 as the applicable code for accessibility standards.

J. The contractor understands that no modifications can be made to site plan or construction documents without PRTC approval.

K. The contractor shall provide as-built drawings and warranty information at time of completion.

L. The contractor is responsible for the cleaning and removal of all debris in the surrounding work area, caused by construction activities.

M. The contractor shall invoice monthly.

N. The contractor shall be responsible for all required wall inspections for bus stop/shelter locations requiring the construction of a retaining wall.

O. The contractor shall provide a copy of all soil and concrete test reports to PRTC.

P. All work shall be done in a manner of workmanship that shall reflect full capabilities in the required trade and meet industry standards.

INSTALLATION INSTRUCTIONS

SLIMLINE HIP

Brasco INTERNATIONAL

AMERICAN MADE. AMERICAN TRUSTED. SINCE 1993.

32400 Industrial Drive, Madison Heights, MI 48071

(313) 393-0393
INFO@BRASCO.COM
WWW.BRASCO.COM

TABLE OF CONTENTS

SLIMLINE SERIES INSTALLATION INSTRUCTIONS

Brasco INTERNATIONAL

AMERICAN MADE. AMERICAN TRUSTED. SINCE 1993.

32400 Industrial Drive, Madison Heights, MI 48071

(313) 393-0393

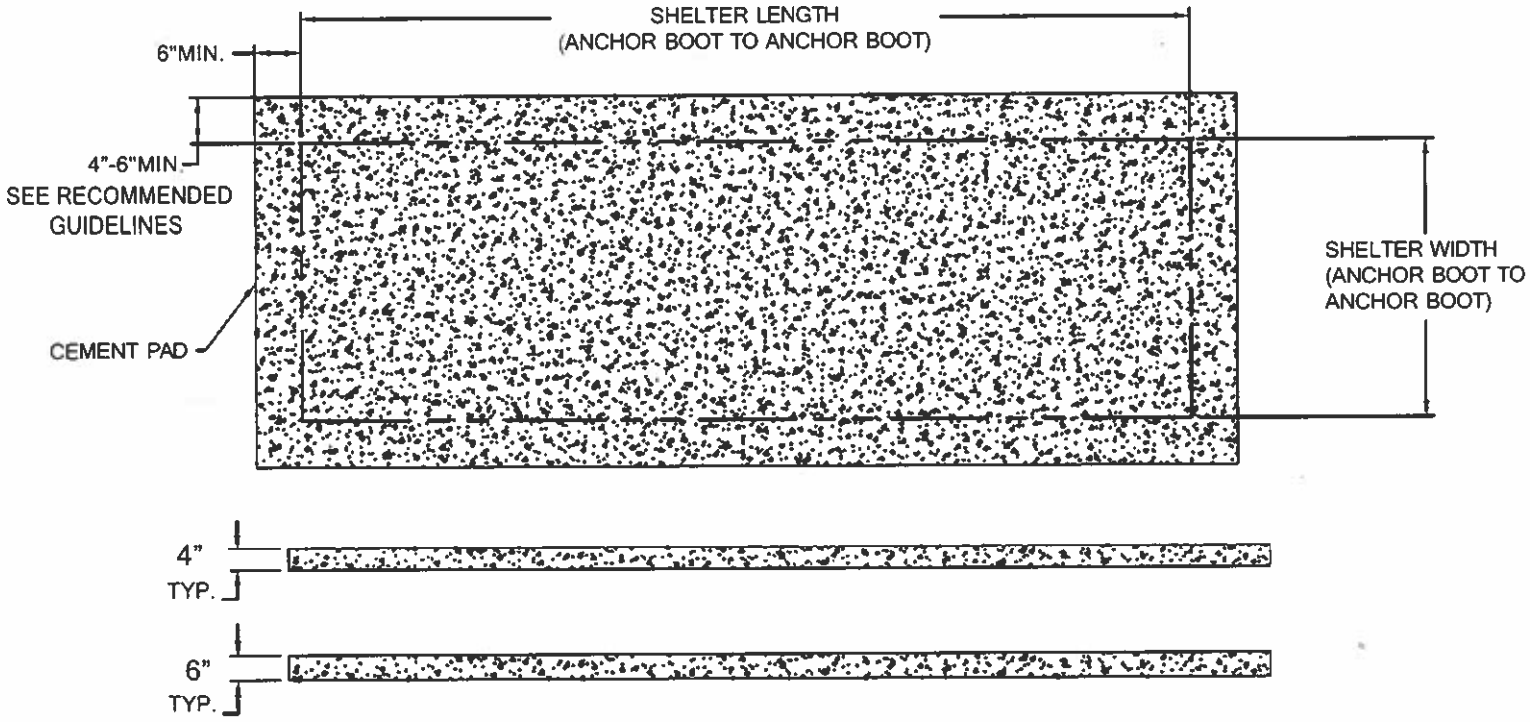
INFO@BRASCO.COM

WWW.BRASCO.COM

Standard Concrete Pad Recommendation

Note: This visual is for reference only. Brasco is not liable for concrete installation instructions unless structural concrete calculations are included with an order. Consult your local building codes for specific concrete pad requirements.

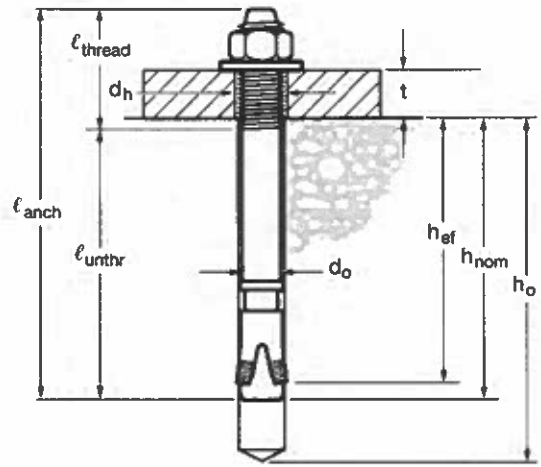
Recommended: Brasco recommends a minimum 4 inch thick, 3000 PSI concrete pad for locations with wind speeds lower than 110 MPH. For locations with wind speeds higher than 110 MPH, Brasco recommends a minimum 6 inch thick, 3000 PSI concrete pad. The concrete pad should allow a minimum of 6 inches around the shelter's perimeter to prevent damage to the pad while anchoring. Concrete may or may not require additional reinforcement.



AMERICAN MADE. AMERICAN TRUSTED. SINCE 1993.
32400 Industrial Drive, Madison Heights, MI 48071
(313) 393-0393
INFO@BRASCO.COM
WWW.BRASCO.COM

Standard Expansion Anchor Guidelines

Expansion Anchor Installed:



Expansion Anchor Technical Reference Chart:

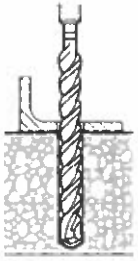
Setting Information	Symbol	Units	Nominal anchor diameter d_a														
Nominal bit diameter	d_{bit}	in.	3/8			1/2				5/8				3/4			
Minimum nominal embedment	h_{nom}	in.	2-5/16			2-3/8		3-5/8		3-9/16		4-7/16		4-5/16		5-9/16	
		(mm)	(59)			(60)		(91)		(91)		(113)		(110)		(142)	
Effective minimum embedment	h_{ef}	in.	2			2		3-1/4		3-1/8		4		3-3/4		4-3/4	
		(mm)	(51)			(51)		(83)		(79)		(102)		(95)		(121)	
Min. hole depth	h_o	in.	2-5/8			2-5/8		4		3-3/4		4-3/4		4-5/8		5-3/4	
		(mm)	(67)			(67)		(102)		(95)		(121)		(117)		(146)	
Min. thickness of fixture[1]	t_{min}	in.	1/8			1/8		n/a		1/8		n/a		1/8		n/a	
		(mm)	(3)			(3)				(3)				(3)			
Max. thickness of fixture	t_{max}	in.	2-1/4			4		2-3/4		5-5/8		4-3/4		4-5/8		5-5/8	
		(mm)	(57)			(101)		(70)		(143)		(121)		(117)		(92)	
Installation torque	T_{inst}	ft-lb	25			40				60				110			
		(Nm)	(34)			(54)				(81)				(149)			
Fixture hole diameter	d_h	in.	7/16			9/16				11/16				13/16			
		(mm)	(11.1)			(14.3)				(17.5)				(20.6)			
Available anchor lengths	ℓ_{anch}	in.	3	3-3/4	5	3-3/4	4-1/2	5-1/2	7	4-3/4	6	8-1/2	10	5-1/2	8	10	
		(mm)	(76)	(95)	(127)	(95)	(114)	(140)	(178)	(121)	(152)	(216)	(254)	(140)	(203)	(254)	
Threaded length including dog point	ℓ_{thread}	in.	7/8	1-5/8	2-7/8	1-5/8	2-3/8	3-3/8	4-7/8	1-1/2	2-3/4	5-1/4	6-3/4	1-1/2	4	6	
		(mm)	(22)	(41)	(73)	(41)	(60)	(86)	(178)	(38)	(70)	(133)	(171)	(38)	(102)	(152)	
Unthreaded length	ℓ_{unthr}	in.	2-1/8			2-1/8				3-1/4				4			
		(mm)	(54)			(54)				(83)				(102)			

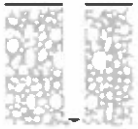
Minimum thickness of fixture is a concern only when the anchor is installed at the minimum nominal embedment. When KWIK Bolt TZ anchors are installed at this embedment, the anchor threading ends near the surface of the concrete. If the fixture is sufficiently thin, it could be possible to run the nut to the bottom of the threading during application of installation torque. If fixtures are thin, it is recommended that embedment be increased accordingly.

Anchoring Expansion Anchors into Concrete

Step 1: Prepping the Concrete

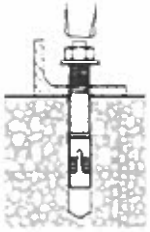
Using the anchor boot as a template, mark hole locations and move anchor boot out of the way. Drill a hole the same diameter as the expansion anchor to a minimum depth of 1/2" deeper than the anchor will penetrate to allow debris to fall during installation.





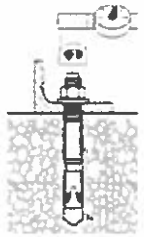
Step 2: Prepping the Hole

Clean debris from holes using a wire brush, vacuum, or compressed air.



Step 3: Anchor Installation

Align anchor boot with prepped holes in the concrete. Make sure the nut on the expansion anchor is threaded to the top of the threaded rod to prevent damage to the threads. Insert expansion anchor through the base plate and into the hole in the concrete. Hit the expansion anchor with sharp blows until the washers are snug against the base plates.



Step 4: Secure the Anchor Boot

Tighten the nut to the recommended installation torque. Reference "Expansion Anchor Technical Reference Chart," the above.

Before You Begin

Please read through the installation instructions in full before proceeding with the installation. Depending on the quantity of shelters and amenities ordered, the shipment will be crated by like items (walls together, roofs together, hardware boxes together) unless otherwise stated on your order.

Part and Hardware Verification

Prompt inspection of the crate(s) is required when receiving shipment. Crated contents must be checked for freight damage and/or missing items. Each shipment will include a crate index which lists crate sizes and materials packaged in each crate. Any visible damage that occurred in transit must be noted on the Bill of Lading (BOL) and acknowledged by the carrier, prior to the truck leaving the site.

Each order comes with a hardware box containing all fasteners and anchor bolts necessary for installation. Verify all hardware is accounted for against the packing list provided at receipt of shipment.

If you have any questions or concerns about your order please contact Brasco International at (313) 393-0393.

Suggested Tools

- Drill Motor
- ¼" Drill Bit
- #11 Drill Bit
- 8" x ½" Masonry Drill Bits
- 5/8" and ¾" Socket and Wrench
- HD Drill Motor or Hammer Drill
- Cordless Drill
- Air Compressor
- Steel Hammer
- Dead Blow Hammer or Mallet
- Bubble Level, Line/String Level
- Minimum 6 Foot Step Ladder
- Rivet Gun
- Tape Measure
- Torque Wrench
- 60" Bar Clamps
- Generator or Other Power Source
- Shop Vac or Broom For Clean Up

Hardware Reference Key

F1044 - #14 x 1" S.S. Hex Head Tek Screw
For mounting columns to anchor boots and Flat Pan roof attachment

F1045 - 3/16" x 1/4" Aluminum Pop Rivet
For mounting all wall segments together

F1047 - 1/4" x 1/4" Aluminum Dome Head Drive Rivet
For attaching roof assembly to the shelter frame

MS005- Rivet Setting Tool
For tapping rivets into place

F1048 - 1/4" x 3/8" Aluminum Flat Head Drive Rivet
For mounting sash frame to shelter frame columns

F1022 - 1/2" Wedge Anchor
F1062 - 1/2-13 S.S. Hex Nut
F1054 - 1/2" S.S. Flat Washer and
F1058 - 1/2" S.S. Lock Washer
Anchor bolt assembly for mounting shelter to concrete pad

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SHELTER DRAWING - PLACEHOLDER PAGE

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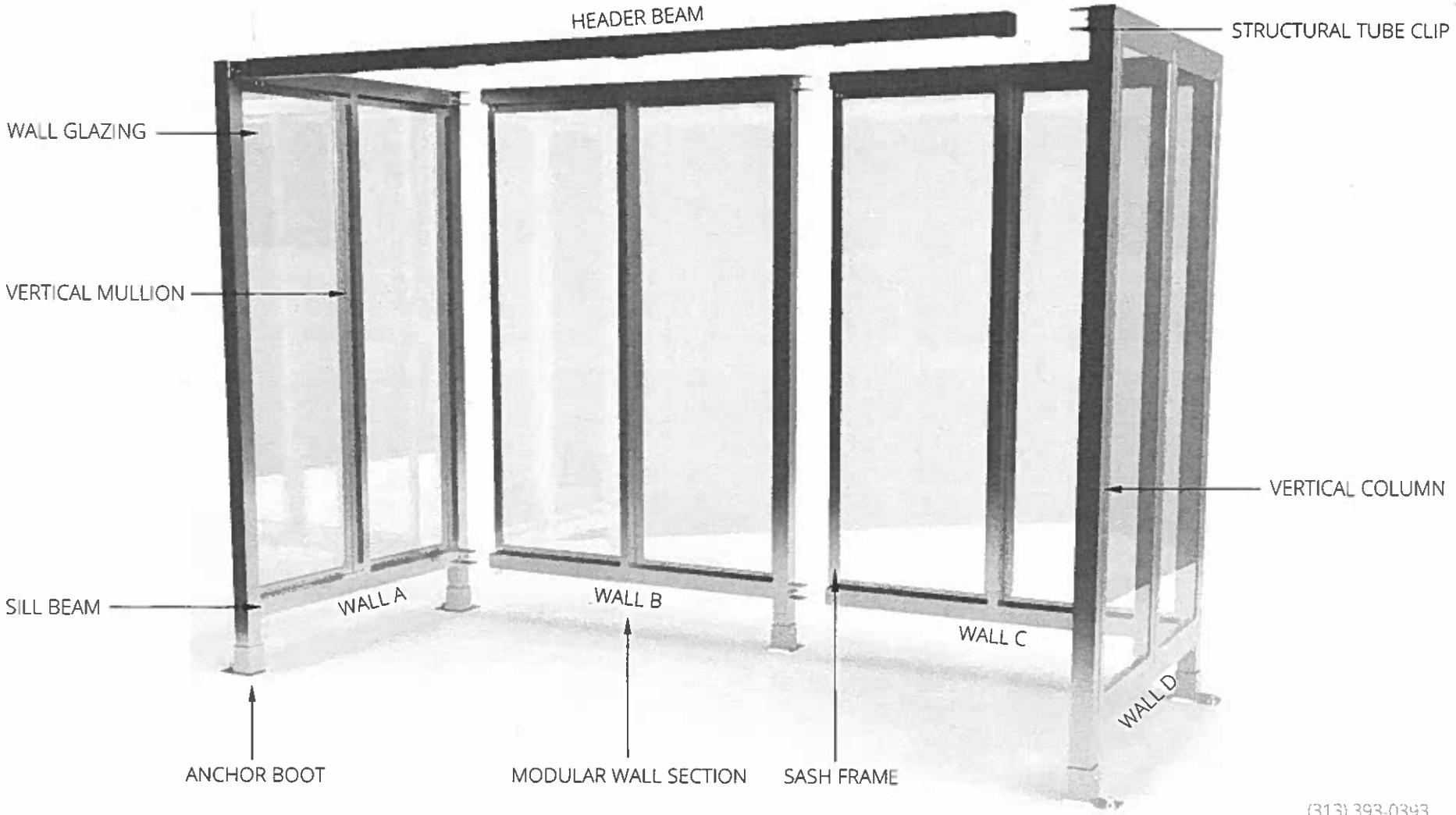
Shelter Assembly Overview

Slimline Series Shelters consist of pre-glazed modular sections which mechanically attach together with the hardware supplied by Brasco in the shipments hardware box(s). Below is a standard shelter layout with three sides and an open front. Each order is unique and may have a different layout than seen below. Note common Slimline shelter components shown below. Reference page 4 for your orders specific shelter drawing(s).



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Anchor Boot Placement

Begin by setting each vertical column into an anchor boot.

Place single flange anchor boots (shown in Figure 1) on front and rear center columns.

Place corner double flange anchor boots (shown in Figure 2) on the left and right rear corner columns.

Note: Position the anchor boot flange away from shelter.

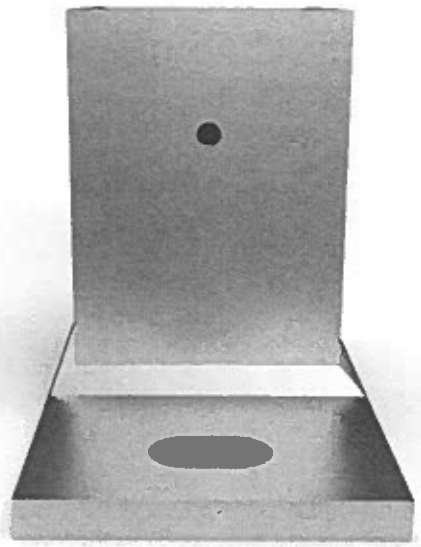

FIGURE 1: SINGLE FLANGE ANCHOR BOOT

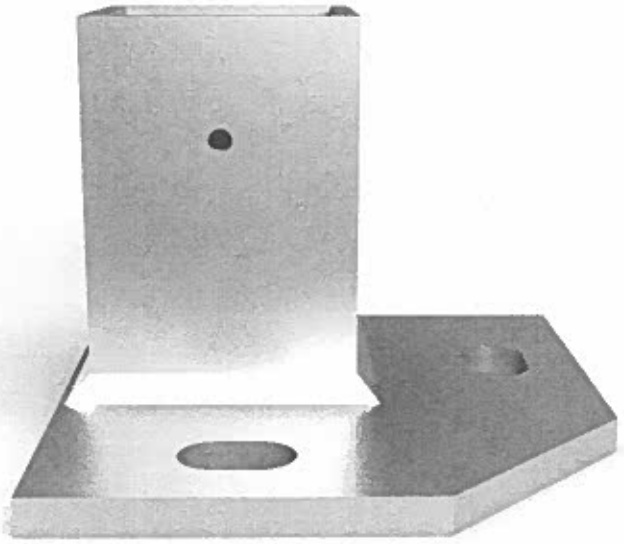

FIGURE 2: DOUBLE FLANGE ANCHOR BOOT

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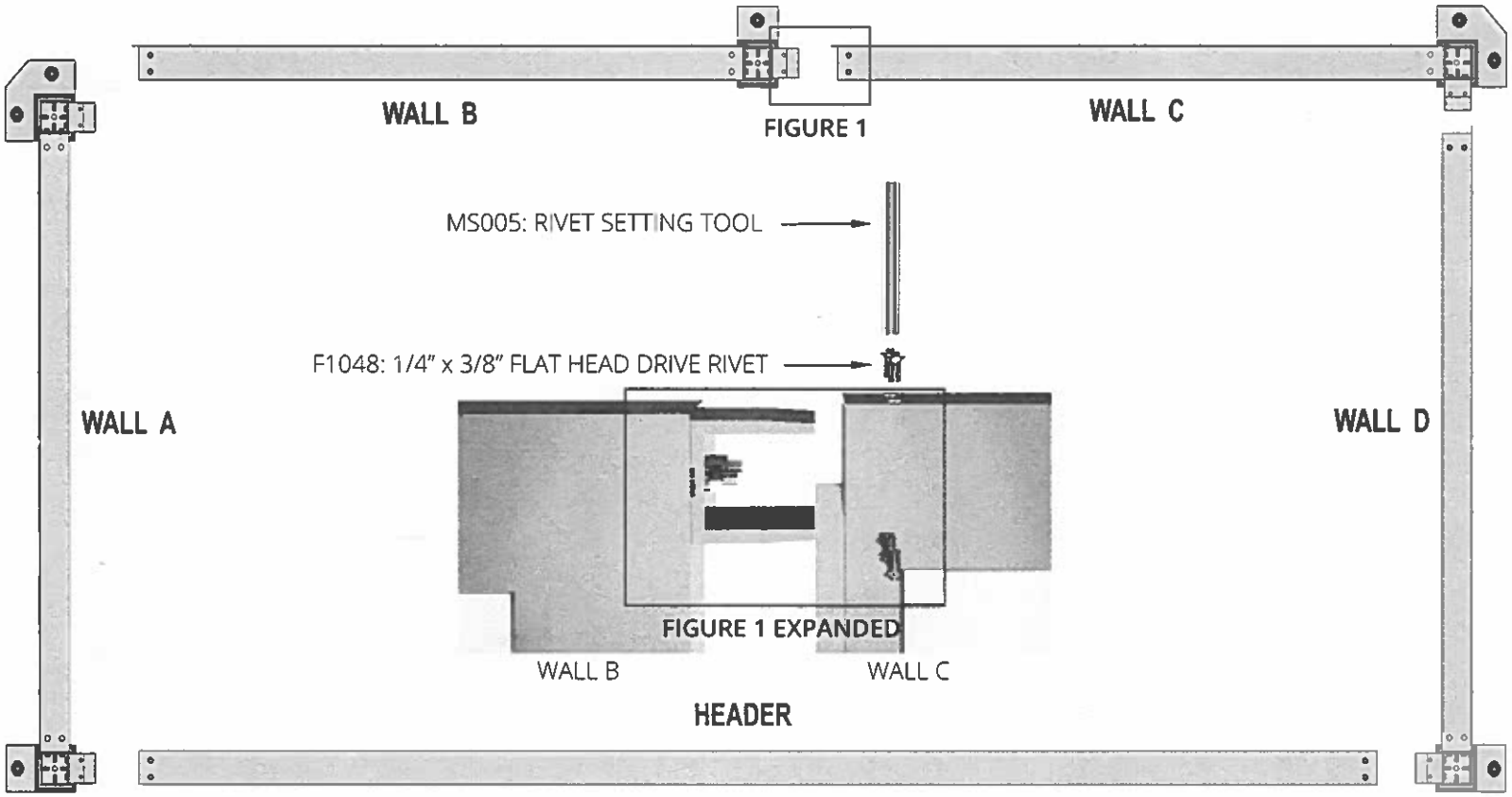
Wall Connections

Starting with the left side wall "A" and left rear wall "B", insert the horizontal header and sill tubes into the corresponding 2-1/2" structural tube clips until the wall sections are fully engaged. Fully engaged wall sections will have sash framing covering the edge of the column which will be secured using method illustrated on "Wall Glazing Connections" page.

Using the Drive Rivet Setting Tool (MS005), place 1/4" x 3/8" Flat Head Drive Rivet (F1048) into pre-drilled holes located on the structural tube clips.

Once the 1/4" x 3/8" Flat Head Drive Rivet is engaged, remove the Drive Rivet Setting Tool and strike the Drive Rivet with a sharp hammer strike until the pin is flush with the head of the fastener.

Repeat this process to connect the remaining wall sections, front header beam, and any cross brace connections.



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Wall Glazing Attachment

After securing the structural tube clips to the corresponding header and sill beams, use the prepped holes in the pre-glazed wall sash framing as a template to drill through the wall of the columns using a #11 (0.191") drill bit for each of the five (5) pop rivet locations.

Insert a 3/16" x 1/4" Aluminum Pop Rivet (F1045) into each hole and secure using a hand tool or pneumatic rivet gun.

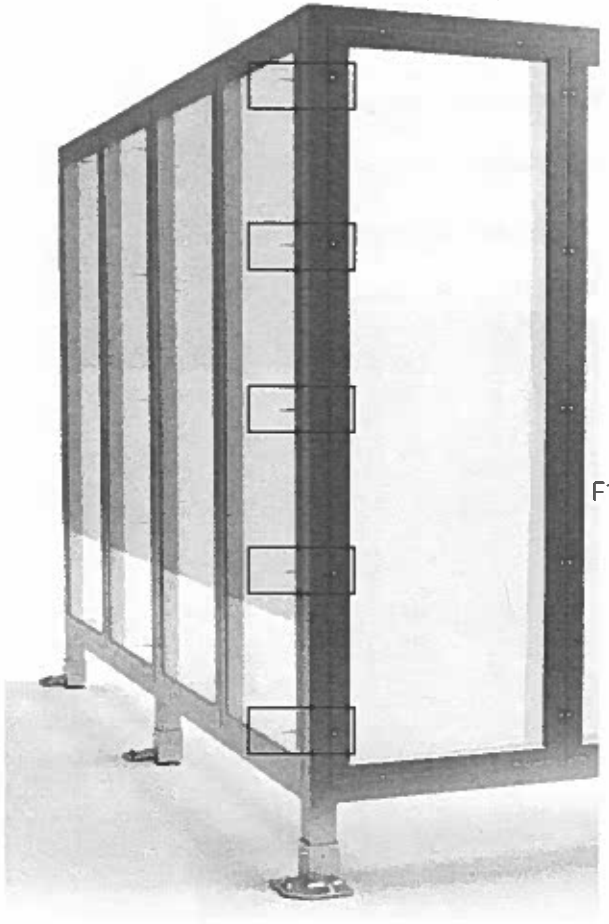

FIGURE 2

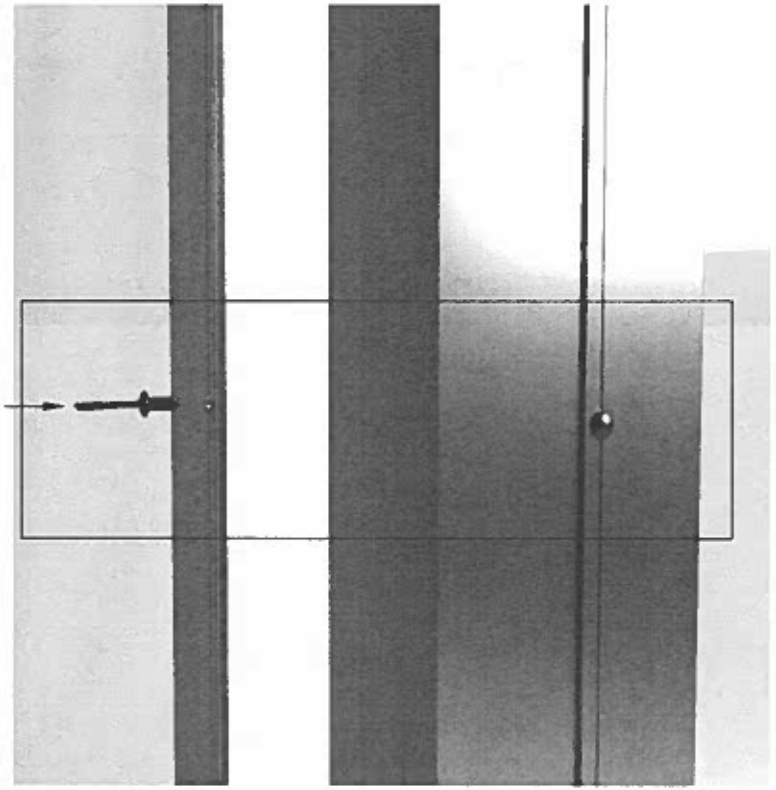

FIGURE 2 EXPANDED

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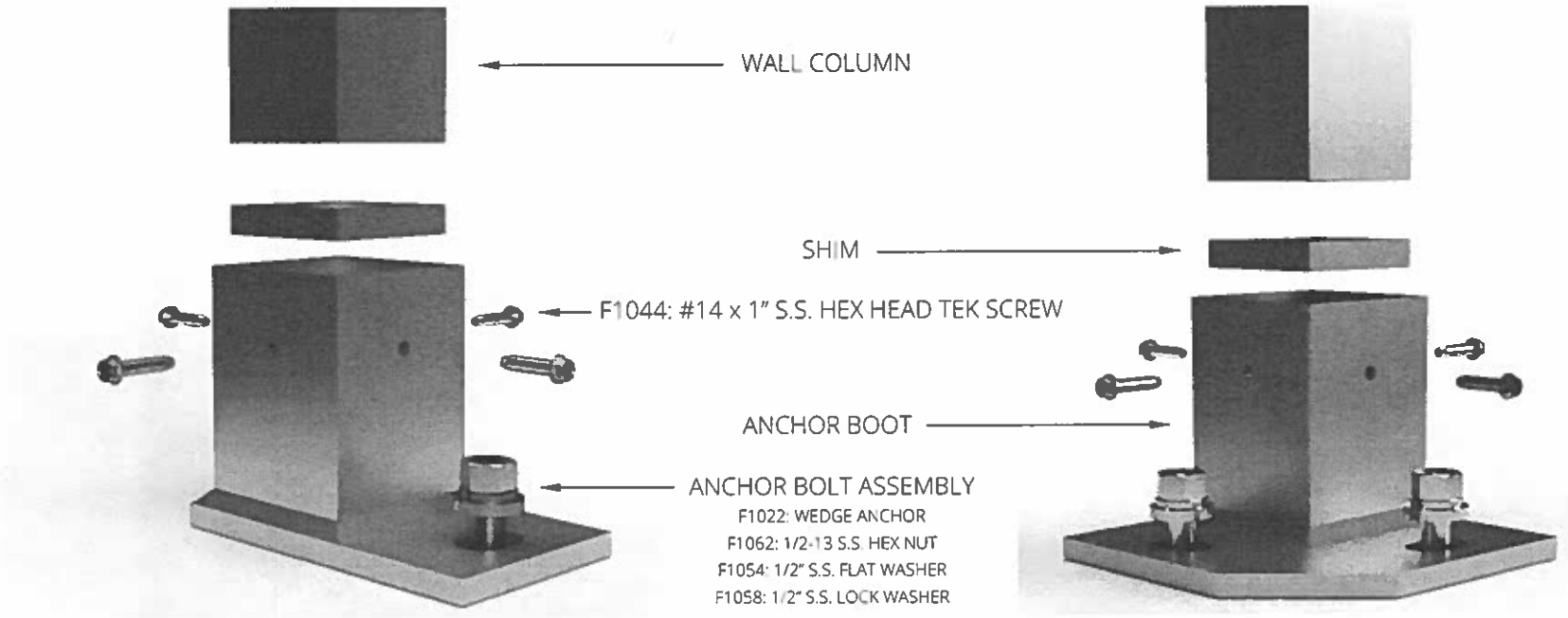
Anchoring and Shimming

Make sure all wall sections are plumb and square prior to securing anchor bolts to the concrete pad. Using the shims provided, insert shim into anchor boot to pitch shelter 1/4" to the rear to allow for proper drainage of the integral gutter fascia system.

Once proper pitch is achieved, transfer and drill 1/4" holes through the prepped anchor boot into the vertical columns. Secure anchor boots to columns using four (4) #14 x 1" S.S. Hex Head Tek Scews (F1044).

Follow our anchor bolt attachment guide on page 2 to anchor shelter to concrete pad.



SINGLE FLANGE ANCHORING DETAIL

DOUBLE FLANGE ANCHORING DETAIL

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Hip Roof Installation

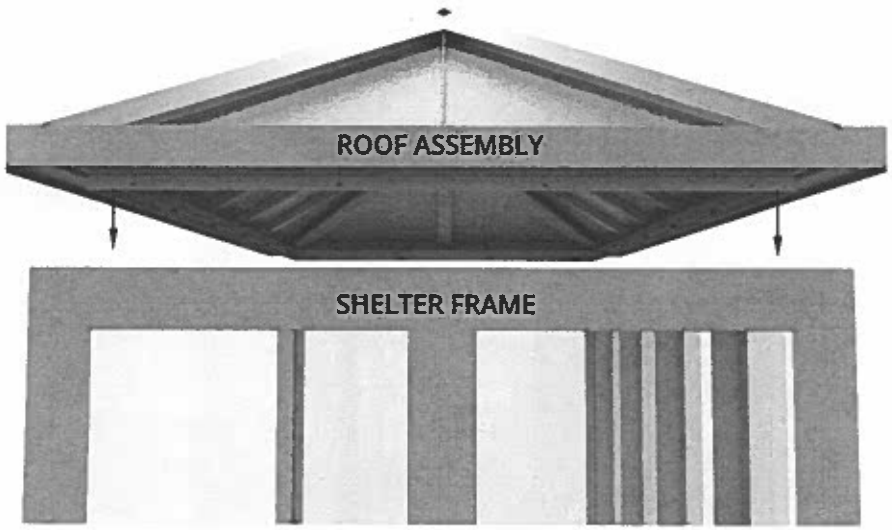
Make sure top of header beams are clean and clear of debris.

With drain holes towards rear of shelter, carefully set pre-assembled roof onto secured shelter frame.

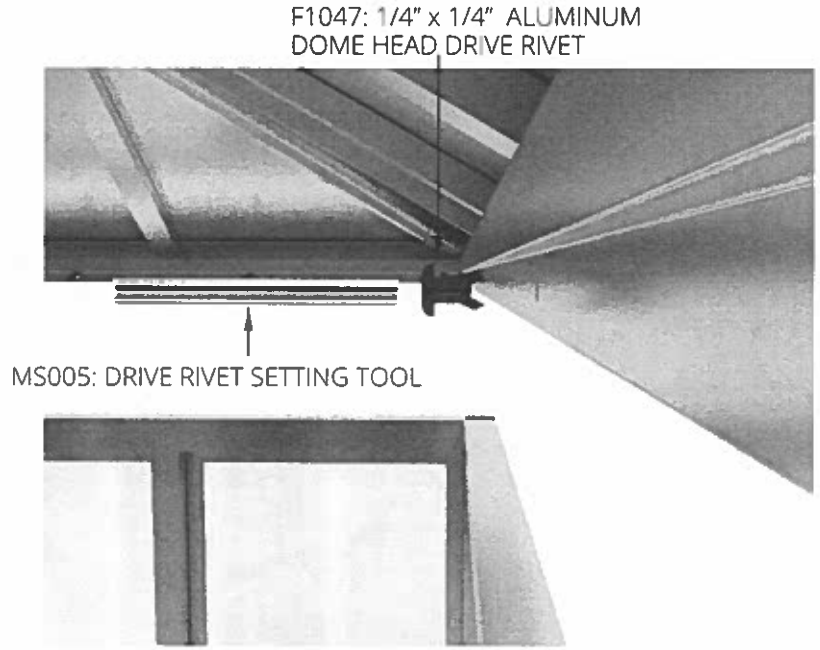
Using the prepped holes in the fascia as a template, transfer holes to the perimeter of the header tubes using 1/4" drill bit.

Insert 1/4" x 1/4" Dome Head Rivet (F1047) into the Drive Rivet Setting Tool (MS005) and tap into each hole using a hammer.

Remove Drive Rivet Setting Tool and use sharp blows to secure the Dome Head Rivets until the pin is flush with the head of the fastener.



SIDE ELEVATION
Carefully set roof assembly onto shelter frame with the integral gutter weep holes towards the rear of the shelter.



INTERNAL ELEVATION
Using the prepped holes in the fascia, transfer holes throughout the header beam. Secure with F1047 using MS005 setting tool.

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JOB NO.	VA0823	**SHEET NO.**	
CALCULATED BY	MRD	**DATE**	8/16/24
CHECKED BY	RFM	**DATE**	8/16/24

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STRUCTURAL CALCULATIONS

FOR

Brasco 7452 PRTC

Prince William County, VA

Digitally signed by Ryan McNabb
Location: Profile No. VA0823 Exp 11.30.2024
Reason: I have reviewed this document
Contact Info: I have reviewed this document in sufficient depth to accept full responsibility for its contents and to ensure code compliance. The provided document has been electronically signed and sealed by Ryan McNabb, P.E. Printed copied of this document are not considered signed and sealed
Date: 2024.08.17 10:55:10-04'00'

Design Codes:

2021 Virginia Uniform Statewide Building Code: (2021 VUSBC)
2021 Virginia Construction Code: Part I of the VUSBC (2021 VCC)
Handicapped Accessibility: 2010 ADA Standards for Accessible Design – 9/15/2010 (2010 ADA Standards) for the Prototype Bus Shelter and mounting floor slab.
o Accessibility Guidelines for Pedestrian Facilities in the Public Right of Way: Public Rights-of-Way Accessibility Guidelines – 7/26/2011 (PROWAG). Required for the site adaptation approaches to the Prototype Bus Shelter.
Per CPSM 4.2.2, including 4.2.2.8: accessible facilities must be provided at the completion of construction. Additionally, per CPSM 4.2.2.8; all areas and spaces normally occupied by employees or the public in state-owned buildings, individually or shared, shall be fully accessible.
Per CPSM, 2021, Rev 0-7/15/2021

Structural Design Data :

Roof Live Load, per VUSBC 1603.1.2; 20 psf
Floor Live Load, per VUSBC 1603.1.1; 100 psf
Ground Snow Load Data, per VUSBC 1603.1.3; 65 psf
Wind Design Data, per VUSBC 1603.1.4 – Wind Speed (mph); (Ultimate Wind Speed) 115 mph
Wind Exposure Category; C
Risk Category, per VUSBC 1604.5; II
Seismic Design Category B Seismic Site Class D
Soil bearing requirements 1500 psf
VUSBC Construction Type; IIB
(Use) Group(s) per VUSBC; U
Building Gross Floor Area 40 SF
Building Area (per VUSBC definition) 40 SF
Height of Building; 8 ft
Number of Stories; 1 Story
Wall Safety Glass, per E1300-12AE1, VCC 2404, and VCC 2015
Aluminum Structural Members, per Aluminum Design Manual ADM1-2015, VCC 2002, and VCC 2015

The following calculations have been prepared by me or under my direct supervision

Design Codes:

2021 Virginia Uniform Statewide Building Code: (2021 VUSBC)
2021 Virginia Construction Code: Part I of the VUSBC (2021 VCC)
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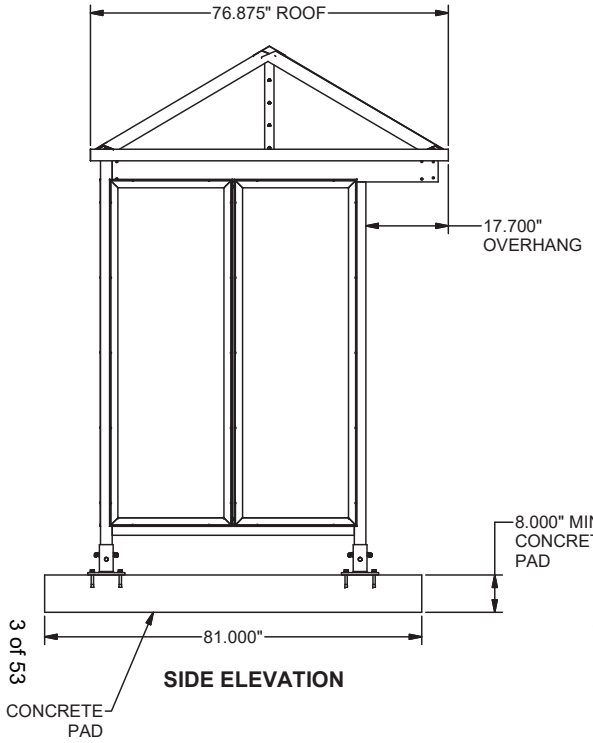
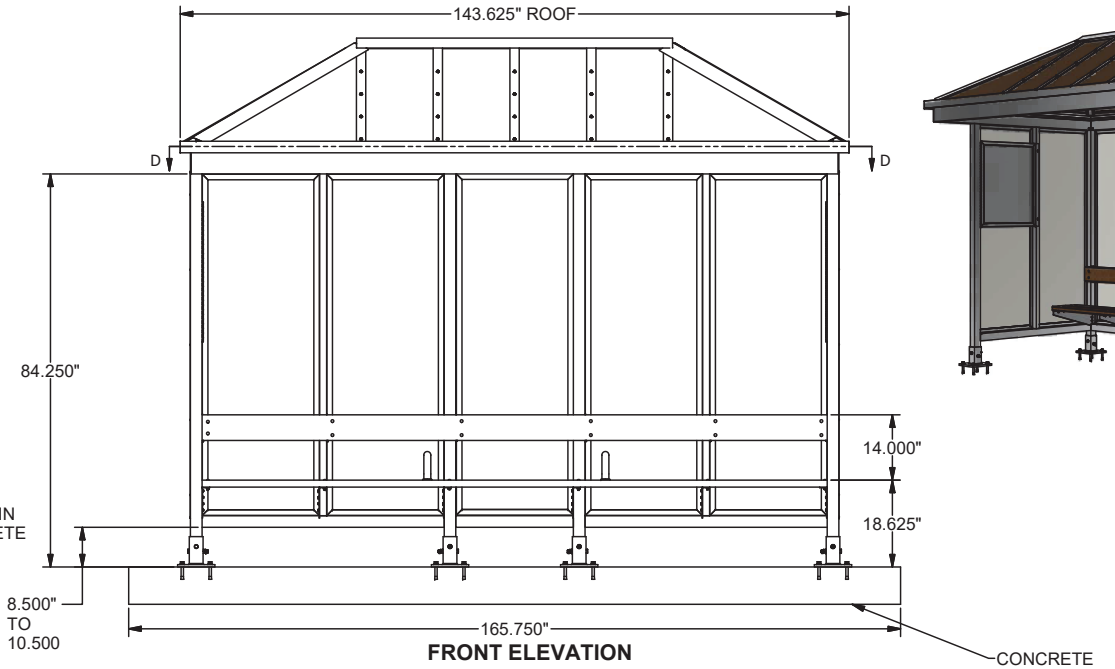
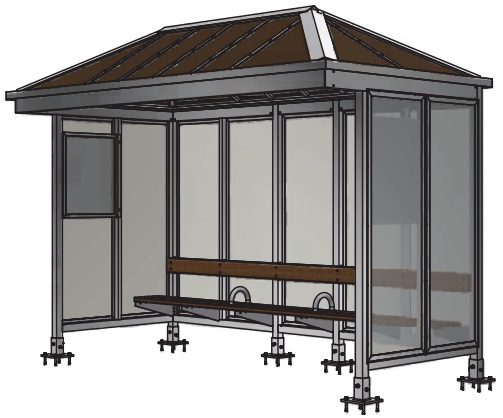
CUSTOMER:		DESIGNER:	CHECKER:
POTOMAC & RAPPAHANNOCK TRANSP		CMP	KY
PROJECT:		DATE:	DATE:
SLIMLINE SHELTER ASSEMBLY		08-07-24	08-07-24
MODEL:	JOB #:	SHEET:	REVISION:
SL-0612-C-0-HI-PC-TG	7452	000	A

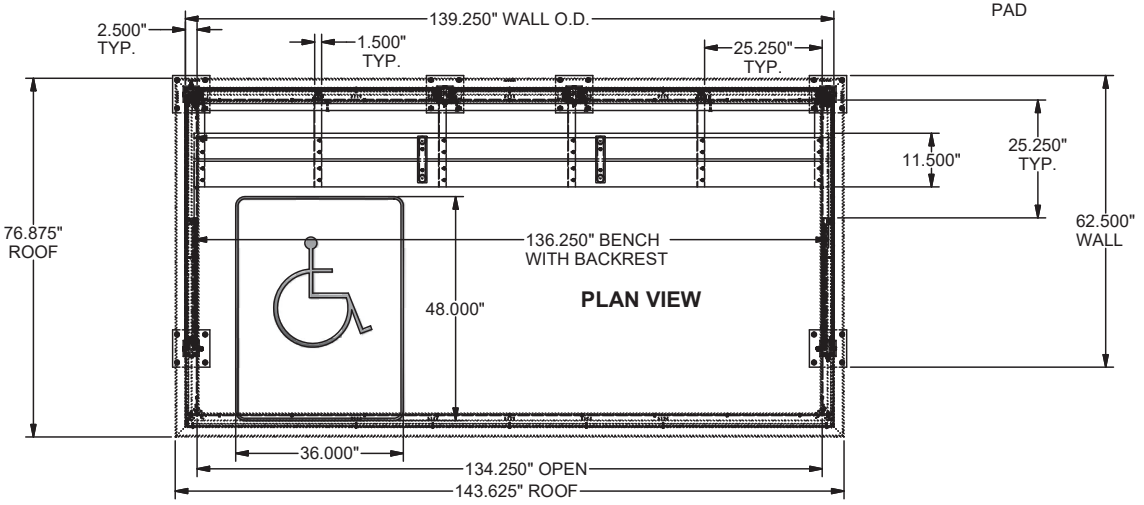


SIDE ELEVATION



FRONT ELEVATION





PLAN VIEW

QUANTITY (3) SHELTERS THUS
SPECIFICATIONS:

- DARK BRONZE ANODIZED ALUMINUM STRUCTURE
- 1/4" CLEAR POLYCARBONATE WALL PANELS
- STANDING SEAM HIP ROOF WITH INTEGRAL GUTTER SYSTEM
- HIP ROOF WITH BRONZE STRUCTURED POLYCARBONATE GLAZING AND 2 1/2" FASCIA WITH INTEGRAL GUTTER
- SOLAR LIGHTING PACKAGE WITH 90W SOLAR PANEL, BATTERIES, SOLAR CONTROLLER VENTED PLS BOX ENCLOSURE AND 5W LED LIGHT
- 12' WALL MOUNTED BENCH WITH HDPE BENCH SLATS AND BACK REST
- 24" X 30" SCHEDULE HOLDER

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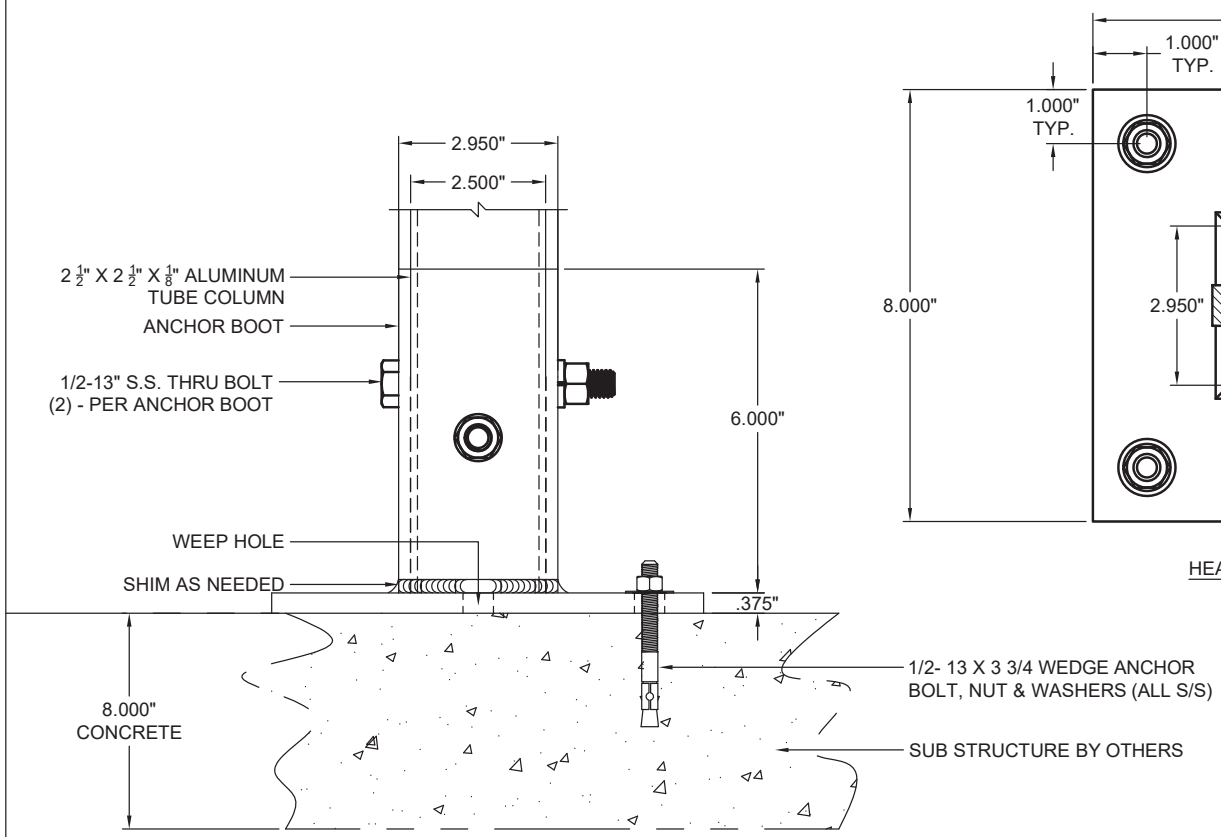
PROJECT:		DATE:	DATE:
SLIMLINE SHELTER ASSEMBLY		08-07-24	08-07-24
MODEL:	JOB #	SHEET:	REVISION:
SL-0612-C-0-HI-PC-TG	7452	001	A



HEAVY ANCHOR BOOT

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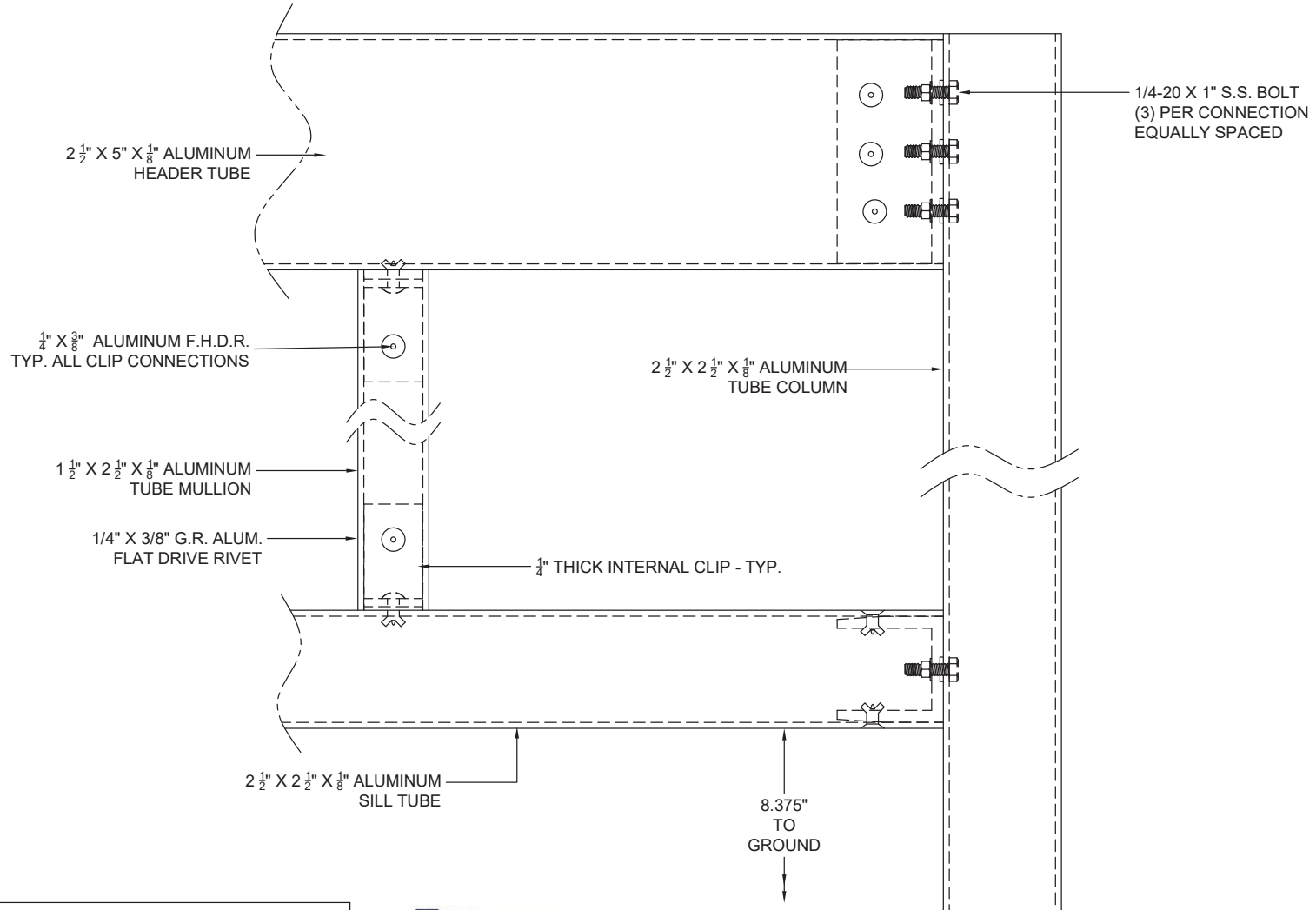
Tel (610) 320 2100

SIGNED:_____ DATE:_____

CUSTOMER:	BRASCO			ENGINEER:	CMP
PROJECT:	STANDARD ANCHOR BOOT DETAIL			DATE:	04-04-24
MODEL:	SLIMLINE SERIES	JOB #	7452	SHEET #:	002



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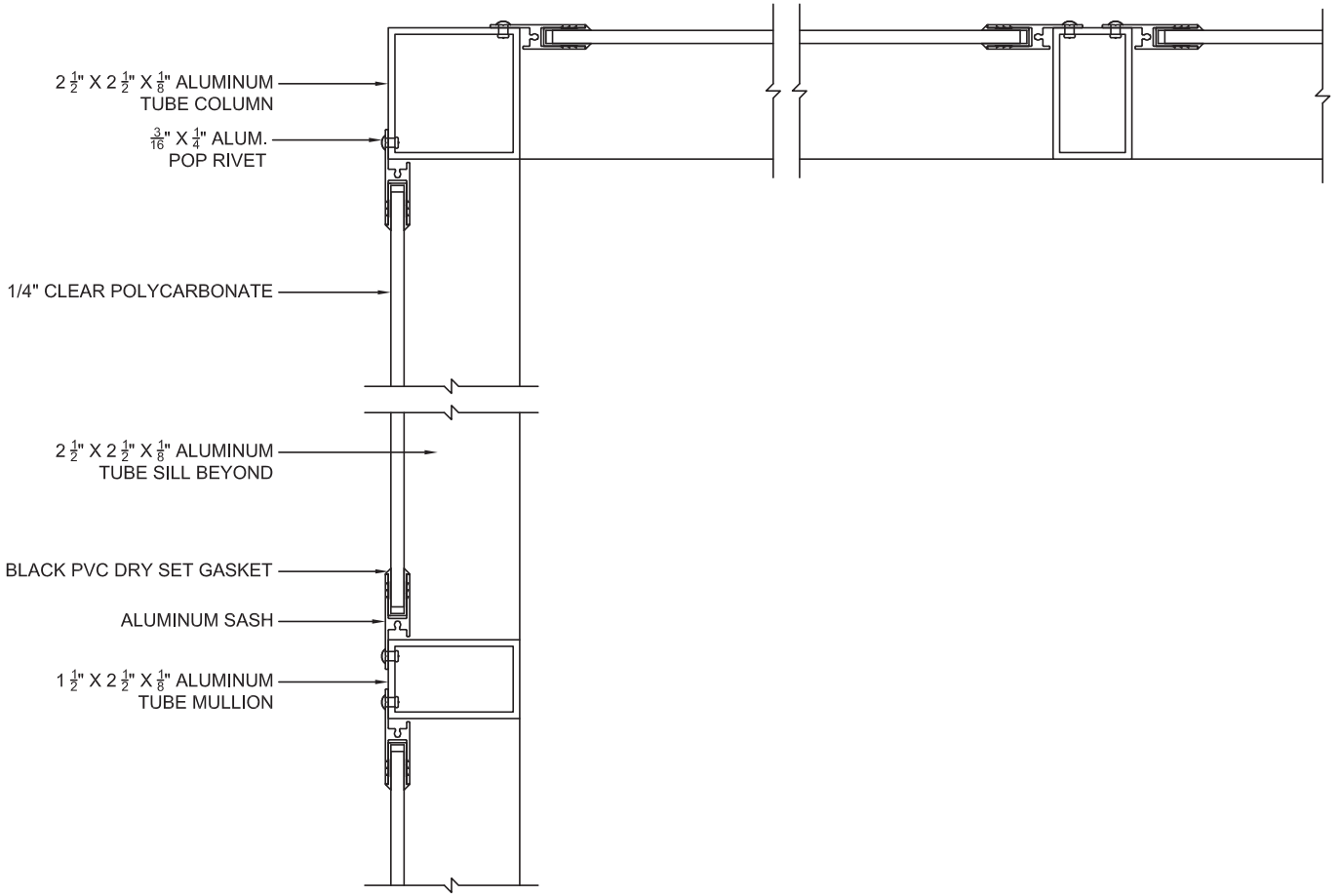
PROJECT:	STANDARD WALL CONNECTION DETAILS (5" HEADER)			DATE:	04-04-24
MODEL:	SLIMLINE SERIES	JOB #	7452	SHEET #:	003



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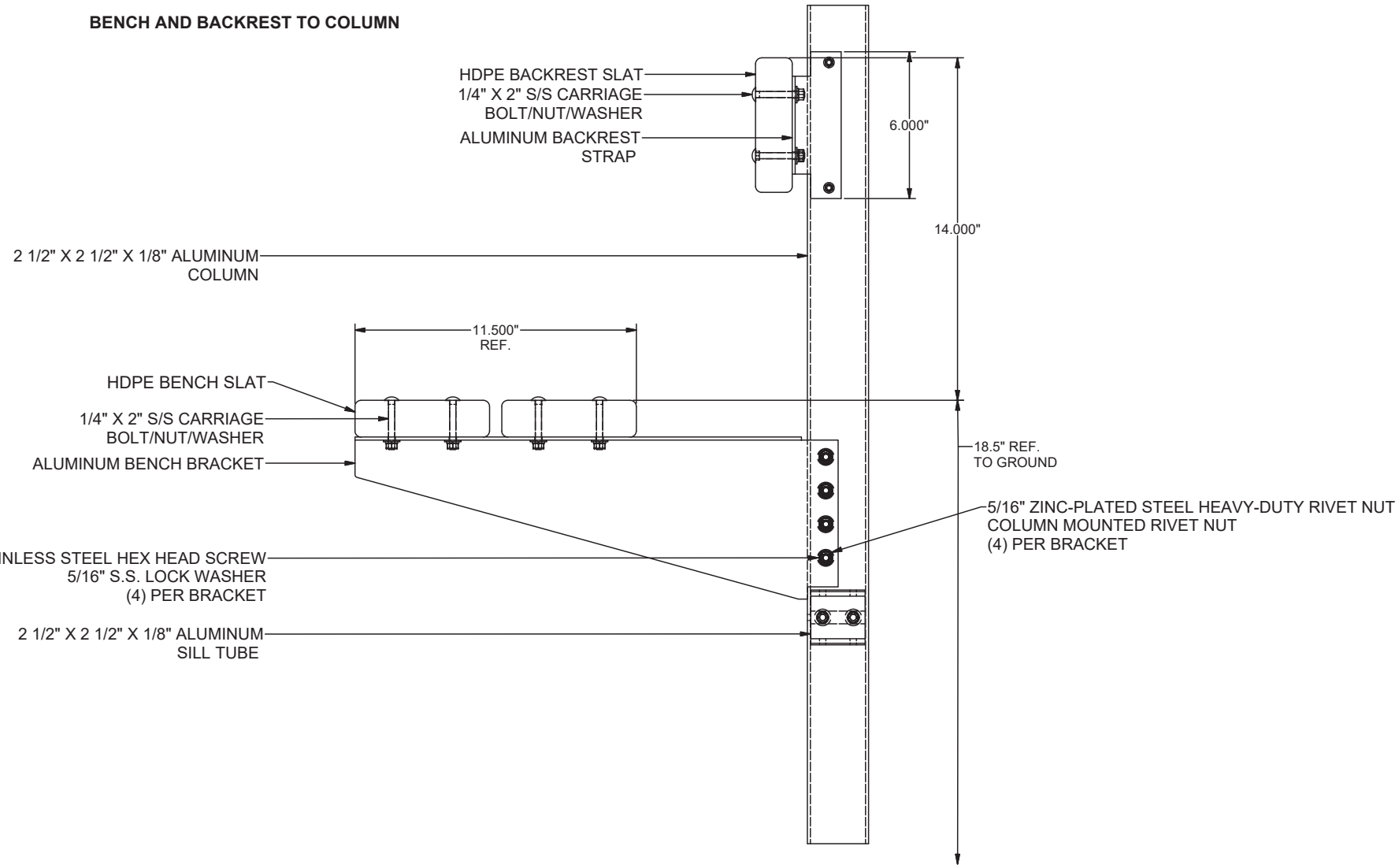
Tel (610) 320-2100

SIGNED:_____ DATE:_____

CUSTOMER:	BRASCO			ENGINEER:	CMP
PROJECT:	WINDOW GLAZING DETAILS - 1/4" GLASS - FACE MOUNT			DATE:	04-04-24
MODEL:	SLIMLINE SERIES	JOB #	7452	SHEET #:	004

BENCH AND BACKREST TO COLUMN



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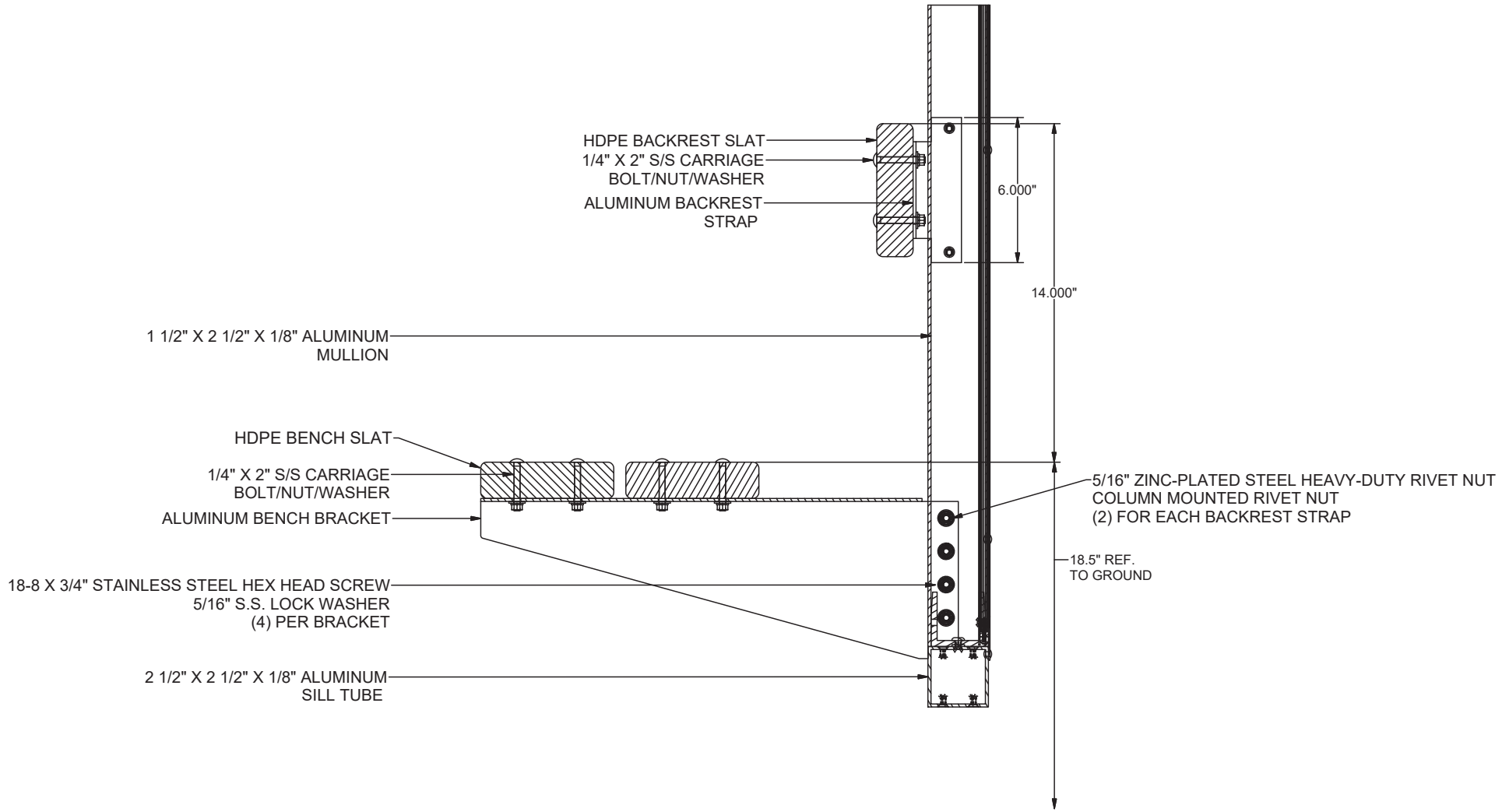
PROJECT:		DATE:	DATE:
SLIMLINE SHELTER		04-04-24	04-04-24
MODEL:	JOB #: 7452	SHEET: 005	REVISION: A



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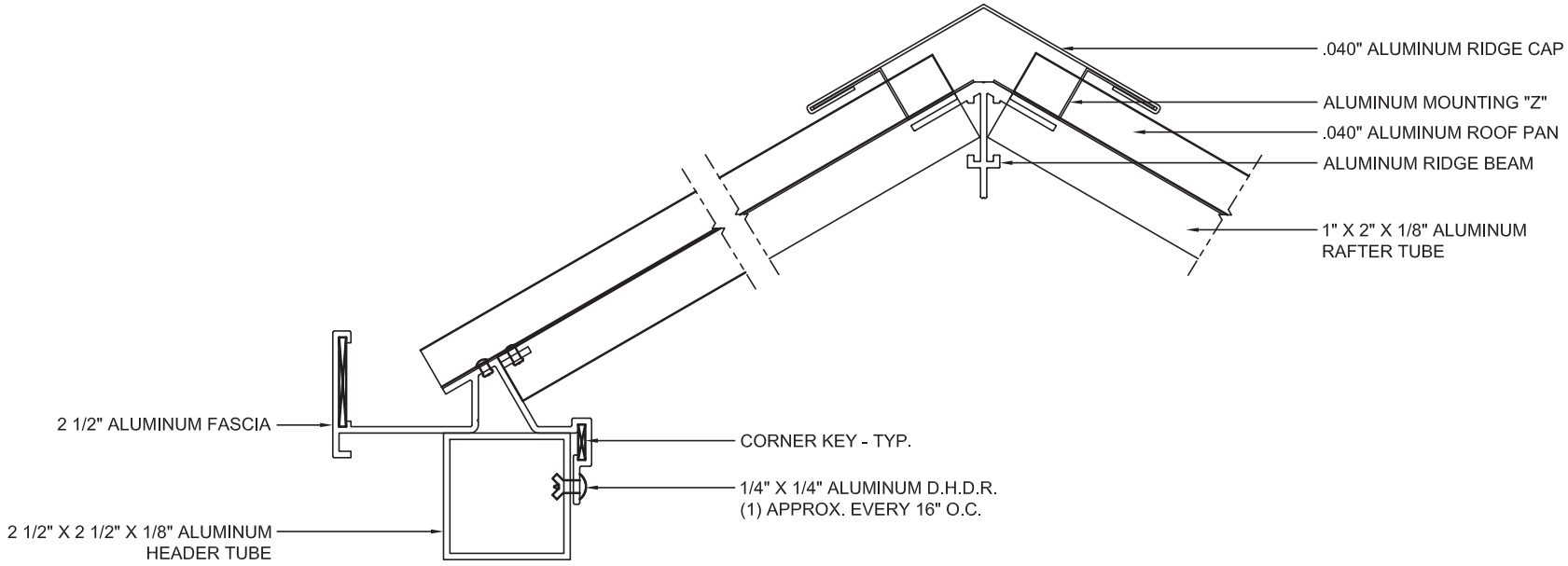
POTOMAC & RAPPAHANNOCK TRANSP.		CMP	KY
PROJECT:		DATE:	DATE:
SLIMLINE SHELTER		04-04-24	04-04-24
MODEL:	JOB # 7452	SHEET: 006	REVISION: A



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CUSTOMER:	BRASCO			ENGINEER:	CMP
				DATE:	04-04-24
PROJECT:	STANDING SEAM HIP ROOF DETAIL			CHECKER:	KY
				DATE:	04-04-24
MODEL:	SLIMLINE SERIES	JOB #	7452	SHEET #:	007

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O: 610.320.2100

Code Search

Code: VUSBC 2021

Occupancy:

Occupancy Group = U Utility & Miscellaneous

Risk Category & Importance Factors:

Risk Category =	II
Wind Factor =	1.00
Snow Factor	1.00
Seismic Importance factor =	1.00

Type of Construction:

Fire Rating:

Roof =	0.0 hr
Floor =	0.0 hr

Building Geometry:

Roof angle (θ)	7.00 / 12	30.3 deg
Building length	12.0 ft	
Least width	6.4 ft	
Mean Roof Ht (h)	8.0 ft	
Parapet ht above grd	0.0 ft	
Minimum parapet ht	0.0 ft	
hb for Elevated bldg	0.0 ft	

Live Loads:

Roof
0 to 200 sf: 17 psf
200 to 600 sf: 20.4 - 0.017Area, but not less than 12 psf
over 600 sf: 12 psf

Floor:

Typical Floor

Partitions N/A

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O: 610.320.2100

JOB TITLE	Brasco 7452 PRTC		
JOB NO.	VA0823	**SHEET NO.**	
CALCULATED BY	MRD	**DATE**	8/16/24
CHECKED BY		**DATE**	

Wind Loads : ASCE 7 - 22

Ultimate Wind Speed	115 mph
Nominal Wind Speed	89.1 mph
Risk Category	II
Exposure Category	C
Enclosure Classif.	Partially Open Building
Internal pressure	+/-0.18
Bldg Directionality (Kd)	0.85
Kh MWFRS<=60	0.851
Kh all other	0.851
Type of roof	Hip

Topographic Factor (Kzt)

Topography		Flat
Hill Height	(H)	80.0 ft
Half Hill Length (Lh)		100.0 ft
Actual H/Lh	=	0.80
Use H/Lh	=	0.50
Modified Lh	=	160.0 ft
From top of crest: x =		50.0 ft
Bldg up/down wind?		downwind

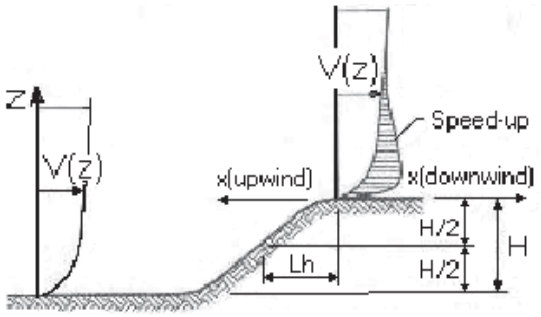
H/Lh= 0.50 K_1 = 0.000

x/Lh = 0.31 K_2 = 0.792

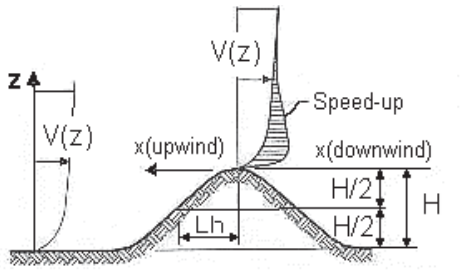
z/Lh = 0.09 K_3 = 1.000

At Mean Roof Ht:

$Kzt = (1+K_1K_2K_3)^2$ = 1.00



ESCARPMENT



2D RIDGE or 3D AXISYMMETRICAL HILL

Gust Effect Factor

h =	8.0 ft
B =	6.4 ft
/z (0.6h) =	15.0 ft

Flexible structure if natural frequency < 1 Hz (T > 1 second).

If building h/B>4 then may be flexible and should be investigated.

h/B = 1.25

G = 0.85 Using rigid structure default

Rigid Structure

$\bar{e}$ =	0.20
ℓ =	500 ft
z_{min} =	15 ft
c =	0.20
g_Q, g_v =	3.4
L_z =	427.1 ft
Q =	0.96
I_z =	0.23
G =	**0.91** use G = 0.85

Flexible or Dynamically Sensitive Structure

Natural Frequency (η_1) =	0.7 Hz			
Damping ratio (β) =	0.01			
/b =	0.660			
/α =	0.156			
Vz =	98.4			
N_1 =	3.04			
R_n =	0.069			
R_h =	0.846	η =	0.262	h = 8.0 ft
R_B =	0.874	η =	0.209	
R_L =	0.492	η =	1.314	
g_R =	4.104			
R =	1.975			

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Wind Loads - MWFRS all h (Except for Open Buildings)

Base pressure (qh) =	28.8 psf	Kh =	0.851	GCpi =	+/-0.18
(Kd qh) =	**24.5 psf**	Bldg dim parallel to ridge =	12.0 ft	G =	0.85
Roof Angle (θ) =	30.3 deg	Bldg dim normal to ridge =	6.4 ft	qi = qh	
Roof tributary area:		h =	8.0 ft		
Wind normal to ridge =(h/2)*L:	48 sf	ridge ht =	8.9 ft		
Wind parallel to ridge =(h/2)*L:	26 sf				

Ultimate Wind Surface Pressures (psf)

Surface	Wind Normal to Ridge L/B = 0.53 Cp	q_hGC_p	h/L = 1.25 w/+q_iGC_{pi}	w/-q_hGC_{pi}	Wind Parallel to Ridge Dist.*	L/B = 1.88 Cp	q_hGC_p	h/L = 0.67 w/ +q_iGC_{pi}	w/ -q_hGC_{pi}
Windward Wall (WW)	0.80	16.7	see table below			0.80	16.7	see table below	
Leeward Wall (LW)	-0.50	-10.4	-14.8	-6.0		-0.33	-6.8	-11.2	-2.4
Side Wall (SW)	-0.70	-14.6	-19.0	-10.2		-0.70	-14.6	-19.0	-10.2
Leeward Roof (LR)	-0.60	-12.5	-16.9	-8.1		Included in windward roof			
Neg Windward Roof pressure	-0.29	-6.1	-10.5	-1.7	0 to h/2*	-1.03	-21.5	-25.9	-17.1
Pos/min Windward Roof press.	0.20	4.2	-0.2	8.6	h/2 to h*	-0.83	-17.4	-21.8	-12.9
					h to 2h*	-0.57	-11.8	-16.2	-7.4
					Min press.	-0.18	-3.7	-8.2	0.7

*Horizontal distance from windward edge

Windward roof overhangs : 16.7 psf (upward : add to qhGCp windward roof pressure)

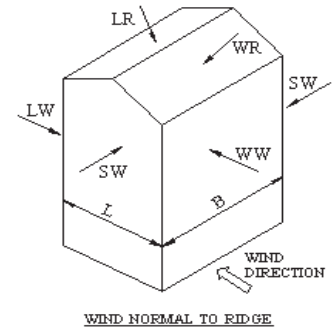
Parapet

z	Kz	Kzt	Kdqp (psf)
0.0 ft	0.851	1.00	0.0

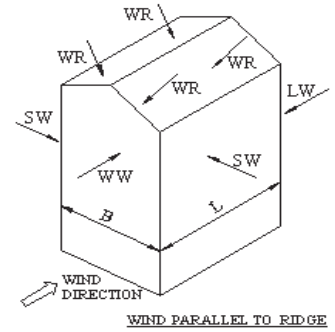
Windward parapet: 0.0 psf (GCpn = +1.5)
Leeward parapet: 0.0 psf (GCpn = -1.0)

Windward Wall Pressures at "z" (psf)

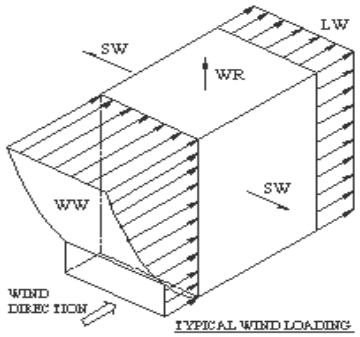
	z	Kz	Kzt	Windward Wall q_zGC_p	w/+q_iGC_{pi}	w/-q_hGC_{pi}	Combined WW + LW Wind Normal to Ridge	Wind Parallel to Ridge
h=	0 to 15'	0.85	1.00	16.7	12.2	21.1	27.1	23.4



WIND NORMAL TO RIDGE



WIND PARALLEL TO RIDGE



TYPICAL WIND LOADING

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Ultimate Wind Pressures

Wind Loads - Components & Cladding : h ≤ 60'

Base pressure (qh) =	28.8 psf	Kh =	0.851	~~100.0 ft~~	~~30.0 ft~~
(Kd qh) =	**24.5 psf**	h =	8.0 ft	~~100.0 ft~~	
Minimum parapet ht =	0.0 ft	a =	3.0 ft	~~100.0 ft~~	
Roof Angle (θ) =	30.3 deg	GCpi =	+/-0.18		
Type of roof =	Hip	Kd qi = Kd qh =	24.5 psf		

Roof

	GCp +/- Gcpi				Surface Pressure (psf)				User input	
Area	10 sf	50 sf	100 sf	500 sf	10 sf	50 sf	100 sf	500 sf	38 sf	77 sf
Negative Zone 1	-1.60	-1.15	-0.96	-0.96	-39.1	-28.3	-23.6	-23.6	-30.1	-25.3
Negative Zone 2	-2.14	-1.44	-1.14	-1.14	-52.5	-35.4	-28.0	-28.0	-38.3	-30.8
Negative Zone 3	-2.25	-1.50	-1.18	-1.18	-55.2	-36.8	-28.9	-28.9	-39.9	-31.9
Positive All Zones	0.88	0.60	0.48	0.48	21.6	16.0	16.0	16.0	16.0	16.0
Overhang Zone 3 @zone 4	-3.17	-2.30	-1.92	-1.80	-77.7	-56.3	-47.1	-44.1	-60.0	-50.6
Overhang Zone 3 @zone 5	-3.47	-2.48	-2.05	-1.80	-85.1	-60.6	-50.1	-44.1	-64.8	-54.1

Overhang pressures in the table above assume an internal pressure coefficient (Gcpi) of 0.0
Overhang soffit pressure equals adj wall pressure (which includes internal pressure of 4.4 psf)

Parapet

Kd qp = 0.0 psf

	Surface Pressure (psf)							User input
Solid Parapet Pressure	10 sf	20 sf	50 sf	100 sf	200 sf	500 sf	500 sf	50 sf
CASE A:	0.0	0.0	0.0	0.0	0.0	0.0		0.0
Zone 3	0.0	0.0	0.0	0.0	0.0	0.0		0.0
	0.0	0.0	0.0	0.0	0.0	0.0		0.0
CASE B: Interior zone :	0.0	0.0	0.0	0.0	0.0	0.0		0.0
Corner zone :	0.0	0.0	0.0	0.0	0.0	0.0		0.0

Walls

	GCp +/- GCpi				Surface Pressure at h				User input	
Area	10 sf	100 sf	200 sf	500 sf	10 sf	100 sf	200 sf	500 sf	17 sf	200 sf
Negative Zone 4	-1.28	-1.10	-1.05	-0.98	-31.4	-27.0	-25.7	-24.0	-30.4	-25.7
Negative Zone 5	-1.58	-1.23	-1.12	-0.98	-38.7	-30.0	-27.4	-24.0	-36.7	-27.4
Positive Zone 4 & 5	1.18	1.00	0.95	0.88	28.9	24.6	23.3	21.6	27.9	23.3

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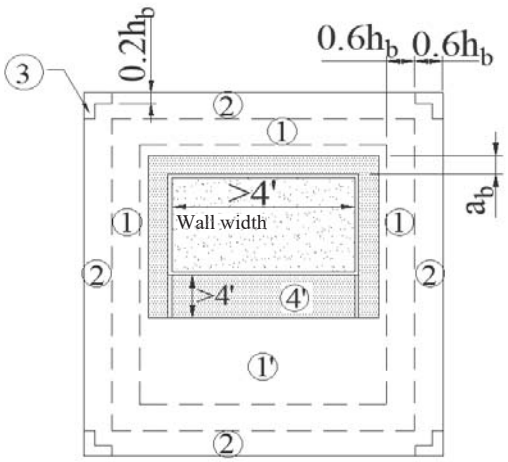
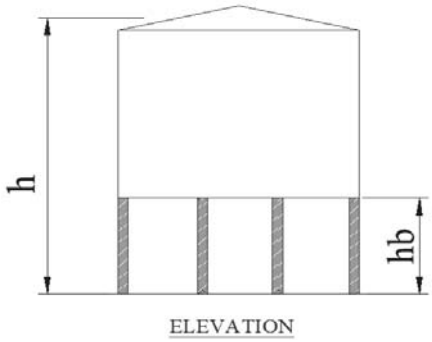
Bottom Horizontal Surface of Elevated Buildings

Base pressure (qh) =	0.85	h =	8.0 ft	0.2hb =	0.00
(Kd qh) =	**24.5 psf**	hb =	0.0 ft	0.6hb =	0.00
Wall width =	5.0 ft			ab =	0.00

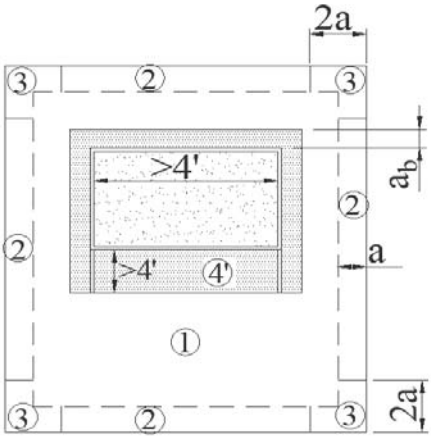
	GCp				Surface Pressure (psf)				User input	
Area	10 sf	100 sf	500 sf	1000 sf	10 sf	100 sf	500 sf	1000 sf	38 sf	77 sf
Negative Zone 1	-1.70	-1.29	-1.00	-1.00	-46.0	-36.0	-28.9	-28.9	-40.2	-37.1
Negative Zone 1'	-0.90	-0.90	-0.55	-0.40	-26.5	-26.5	-17.9	-16.0	-26.5	-26.5
Negative Zone 2	-2.30	-1.77	-1.40	-1.40	-60.7	-47.8	-38.7	-38.7	-53.2	-49.2
Negative Zone 3	-3.20	-2.14	-1.40	-1.40	-82.8	-56.8	-38.7	-38.7	-67.7	-59.8
Positive Zones 1-3	0.30	0.20	0.20	0.20	16.0	16.0	16.0	16.0	16.0	16.0
Negative Zone 4'	-0.99	-0.83	-0.72	-0.72	-28.7	-24.8	-22.0	-22.0	-26.4	-25.2
Positive Zone 4'	0.90	0.74	0.63	0.63	26.5	22.6	19.8	19.8	24.2	23.0

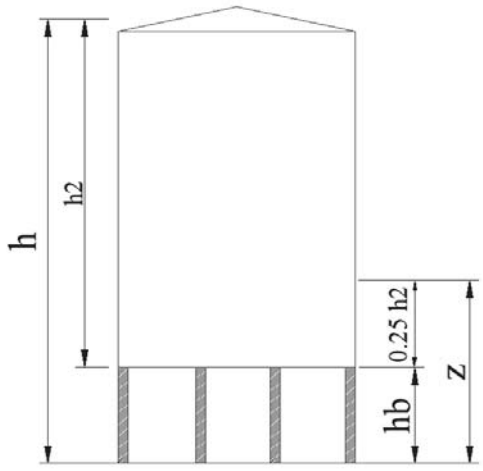
Negative pressures are downward





Building Bottom Plan: h ≤ 60' and alternate design 60'<h<90'





Building Bottom Plan: h> 60 feet

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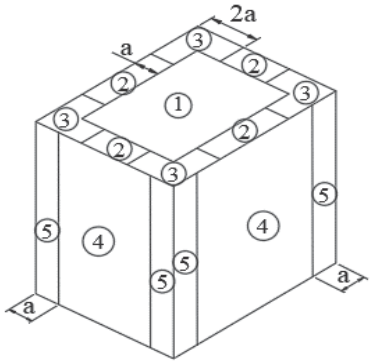
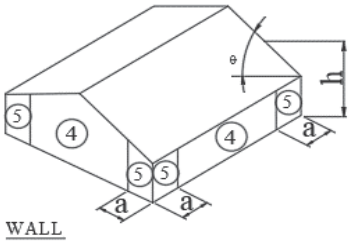
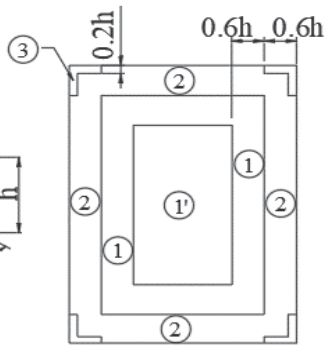
Location of C&C Wind Pressure Zones - ASCE 7-22



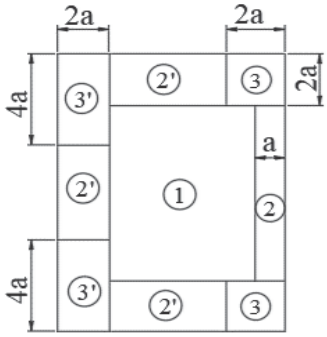
Roofs w/ θ ≤ 10°
and all walls
h > 60'



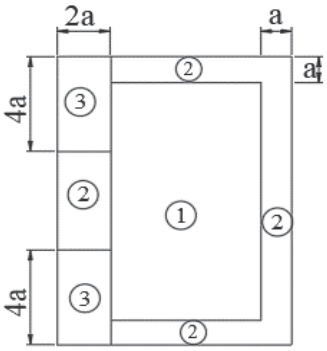
Walls h ≤ 60'
& alt design h<90'



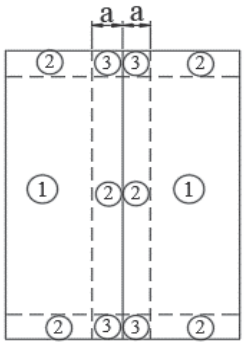
Multispan Gable & Sawtooth ≤ 10°
& Gable θ ≤ 7 degrees &
Monoslope ≤ 3 degrees
h ≤ 60' & alt design h<90'



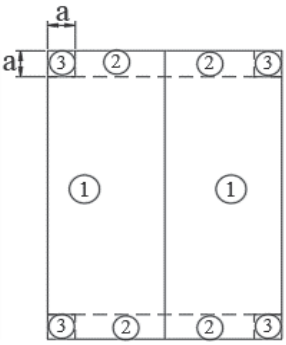
Monoslope roofs
3° < θ ≤ 10°
h ≤ 60' & alt design h<90'



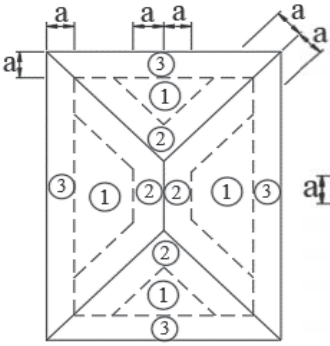
Monoslope roofs
10° < θ ≤ 30°
h ≤ 60' & alt design h<90'



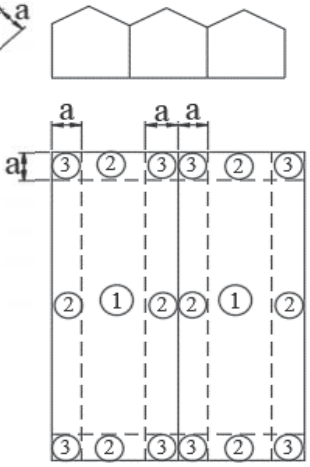
Gable 7° < θ ≤ 27°



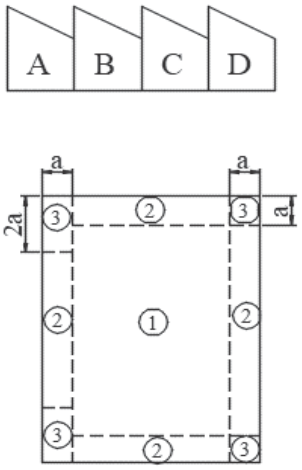
Gable 27° < θ ≤ 45°



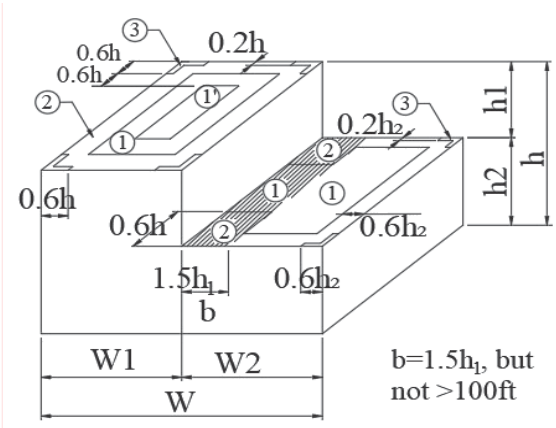
Hip 7° < θ ≤ 45°

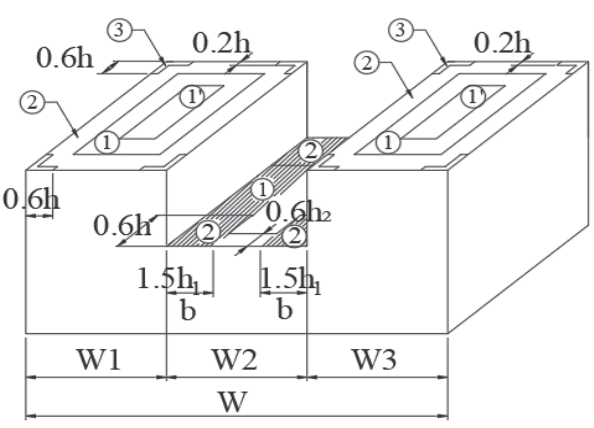


Multispan gable 10° < θ ≤ 45°
h ≤ 60' & alt design h<90'



Sawtooth 10° < θ ≤ 45°
h ≤ 60' & alt design h<90'





Stepped roofs θ ≤ 3°
h ≤ 60' & alt design h<90'

Note: The hatched area indicates where roof positive pressures are equal to the adjacent wall positive pressure.

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Snow Loads : ASCE 7 - 22

Ultimate Snow Forces

Roof slope		=	30.3 deg
Horiz. eave to ridge dist (W)		=	3.2 ft
Roof length parallel to ridge (L)		=	12.0 ft
Type of Roof			Hip and gable w/ rafters
Ground Snow Load	Pg	=	65.0 psf
Risk Category		=	II
Snow Factor		=	1.0
Roof R value	Rroof	=	30
Thermal Factor	Ct	=	1.200
Exposure Factor	Ce	=	1.0
Pf = 0.7*Ce*Ct*I*Pg		=	53.2 psf
Unobstructed Slippery Surface			yes
Sloped-roof Factor	Cs	=	0.72
Balanced Snow Load		=	**38.4 psf**
Rain on Snow Surcharge Angle			0.06 deg
Code Maximum Rain Surcharge			8.0 psf
Rain on Snow Surcharge		=	0.0 psf
Ps plus rain surcharge		=	38.4 psf
Minimum Snow Load	Pm	=	0.0 psf
Uniform Roof Design Snow Load		=	**38.4 psf**

Near ground level surface balanced snow load = **65.0 psf**

NOTE: Alternate spans of continuous beams shall be loaded with half the design roof snow load so as to produce the greatest possible effect - see code for loading diagrams and exceptions for gable roofs

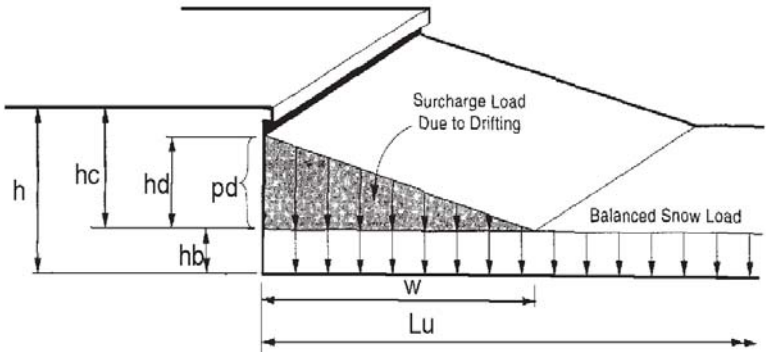
Unbalanced Snow Loads - for Hip & Gable roofs only

Winter Wind Parameter W2 = 0.45

Required if slope is between 7 on 12	=	30.26 deg
and 2.38 deg	=	2.38 deg **Unbalanced snow loads must be applied**
Windward snow load	=	0.0 psf
Leeward snow load	=	65.0 psf = Pg

Snow Drift 1 - Against roof projections, parapets, etc

Up or downwind fetch	lu	=	2.0 ft
Projection height	h	=	1.0 ft
Projection width/length	lp	=	0.0 ft
Snow density	γ	=	22.5 pcf
Balanced snow height	hb	=	1.71 ft
	hd	=	0.72 ft
	hc	=	-0.71 ft
hc/hb <0.2 = -0.4	**lp <15', drift not req'd**		
Drift height (hc)		=	0.00 ft
Drift width	w	=	-5.70 ft
Surcharge load:	pd = γ*hd	=	**0.0 psf**
Balanced Snow load:		=	38.4 psf
			38.4 psf



Note: If bottom of projection is at least 2 feet above hb then snow drift is not required.

Snow Drift 2- Against roof projections, parapets, etc

Up or downwind fetch	lu	=	0.0 ft
Projection height	h	=	0.0 ft
Projection width/length	lp	=	0.0 ft
Snow density	γ	=	22.5 pcf
Balanced snow height	hb	=	1.71 ft
	hd	=	0.00 ft
	hc	=	-1.71 ft
hc/hb <0.2 = -1.0	**lp <15', drift not req'd**		
Drift height (hc)		=	0.00 ft
Drift width	w	=	-13.70 ft
Surcharge load:	pd = γ*hd	=	**0.0 psf**
Balanced Snow load:		=	38.4 psf
			38.4 psf

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Seismic Loads: ASCE 7-22 Strength Level Forces

Risk Category : II
Importance Factor (Ie) : 1.00
Site Class : D

Ss (0.2 sec) = 0.16 g
S1 (1.0 sec) = 0.04 g

Site specific ground motion analysis performed:

Sms = 0.200 S_{DS} = 0.133 Design Category = A
Sm1 = 0.092 S_{D1} = 0.061 Design Category = A

Seismic Design Category = **A**
Redundancy Coefficient ρ = 1.30
Number of Stories: 1

Structure Type: All other building systems
Horizontal Struct Irregularities: No plan Irregularity
Vertical Structural Irregularities: No vertical Irregularity
Flexible Diaphragms: Yes
Building System: **Structural steel systems not specifically detailed for seismic resistance**
Seismic resisting system: **Structural steel systems not specifically detailed for seismic resistance**
System Structural Height Limit: **Height not limited**
Actual Structural Height (hn) = 8.0 ft

DESIGN COEFFICIENTS AND FACTORS

Response Modification Coefficient (R) = 3
Over-Strength Factor (Ωo) = 2.5
Deflection Amplification Factor (Cd) = 3

To = 0.2(Sd1/Sds) = 0.092
Ts = Sd1/Sds = 0.460
Long Period Transition Period (TL) = 8 sec

S_{DS} = 0.133
S_{D1} = 0.061

Seismic Load Effect (E) = Eh +/-Ev = ρ Q_E +/- 0.2S_{DS} D = 1.3Qe +/- 0.000D Q_E = horizontal seismic force
Special Seismic Load Effect (Em) = Emh +/- Ev = Ωo Q_E +/- 0.2S_{DS} D = &G40&"Qe 0.027D D = dead load

ALLOWABLE STORY DRIFT

Structure Type: All other structures

Allowable story drift Δa = 0.020hsx where hsx is the story height below level x

PERMITTED ANALYTICAL PROCEDURES

Index Force Analysis - Minimum lateral force Fx = 0.01Wx at each floor level

Model & Seismic Response Analysis - Permitted (see code for procedure)

Equivalent Lateral-Force (ELF) Analysis - Permitted

Building period coef. (C_T) = 0.020 Cu = 1.70
Approx fundamental period (Ta) = $C_T h_n^x$ = 0.095 sec x= 0.75 Tmax = CuTa = 0.162 sec
User calculated fundamental period = T = 0.095 sec

Method 2:
Seismic response coef. (Cs) = SdsI/R = 0.044
need not exceed Cs = Sd1 I /RT = 0.215
but not less than Cs = 0.044Sds*I = 0.010
USE Cs = 0.044

Design Base Shear V = 0.044W

Method 1:
Enter Sa = 0.133
Seismic response coef. (Cs) = SaI/R = 0.044
but not less than Cs = 0.044Sds*I = 0.010
Cs = 0.044

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CHECKED BY		**DATE**	

Design Loads:

D =	8	psf	2	psf pan
Lr =	20	psf		
S =	65	psf		
W =	27.1	psf MWFRS wall	-36.7	psf C&C wall
	8.6	psf MWFRS + roof	16.0	psf C&C Roof +
	-25.9	psf MWFRS - roof	-39.9	psf C&C Roof -
L =	100	psf		

Aluminium Type:

6061-T6

F_y = 35,000 psi

E = 10,100,000 psi

Roof Load Combinations:

D+Lr =	28.0 psf	D+Lr =	22 psf	Pan
D+0.7S =	53.5 psf	D+0.7S =	48 psf	
D+0.6W =	13.1 psf	D+0.6W =	11.6 psf	
D+0.75Lr+0.45W =	26.9 psf	D+0.75Lr+0.45W =	24.2 psf	
D+0.525S+0.45W =	46.0 psf	D+0.525S+0.45W =	43.3 psf	
0.6D+0.6W=	-10.8 psf	0.6D+0.6W=	-22.8 psf	
D+L =	108.0 psf			

Pan:

L =	3.20 ft	Positive Fy=	4204 psi	OK
Trib Width =	1.33 ft	Negative Fy =	24837 psi	OK
Positive Bending Mmax =	81.2 ft-lb	Limit =	0.641 in	L/60 for total load (Table 1604.3)
Negative Bending Mmax =	38.9 ft-lb	Limit =	0.214 in	L/180 for wind
Vmax =	101.4 lb			
I =	0.03 in^4	Positive D =	0.512 in	OK
ybot =	0.08 in	Negative D =	0.196 in	OK
ytop =	0.93 in			
Sbot =	0.38 in^3	Section =	0.040" Pan	
Stop =	0.03 in^3			

Rafter:

L =	3.20 ft	Fy =	20,722 psi	OK
Trib Width =	3.20 ft			
		Limit =	0.214 in	L/180
Mmax =	219.8 ft-lb	D =	0.077 in	OK
Vmax =	274.5 lb			
I =	0.105 in^4	Section =	1x2x0.125	
y =	0.5 in			
S =	0.21 in^3			

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Vertical Mullion:

H =	6.31 ft	Fy = 1.65M/S =	3107 psi		OK
W =	2.23 ft				
D =	0 psf	D+0.6W =	-22.0 psf		
WIND =	-36.7 psf	Uniform Load =	-49 plf		
Mmax =	245 lb-ft	Limit =	0.421 in		L/180
I =	1.95 in^4	D =	0.037 in		OK
y =	1.25 in				
S =	1.56 in^3	Section =	1.5"x2.5"x.125		

Bench Bracket:

L =	1.50 ft	Fy =	5,749 psi		OK
Trib Width =	2.10 ft				
Trib Length =	0.96 ft				
		Limit =	0.075 in		L/240
Mmax =	217.8 ft-lb	D =	0.012 in		OK
Vmax =	217.8 lb				
I =	2.25 in^4	Section =	1/8" Bracket		
y =	3 in				
S =	0.75 in^3				

Bench Bracket Connection:

Designation =	5/16" S.S. fasteners				
M =	218 ft-lb				
V =	218 lb				
# fasteners =	4				
Applied V/conn =	607 lb	Allowable V/conn =	660 lb		OK

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Front Header:

	L =	11.44 ft		Fy =	23312 psi	OK
	Trib Width =	3.20 ft				
				Limit =	1.144 in	L/120
Vertical	Mmax =	2802.2 ft-lb		D =	1.098 in	OK
	Vmax =	705.6 lb				
	I =	5.95 in^4				
	y =	2.50 in		Section =	2.5x5x.125	
	S =	2.38 in^3				

Horizontal NO HORIZONTAL LOAD --> NO LATERAL LOAD APPLIED

Rear Header:

	L =	4.33 ft		Section =	2.5x5x.125	
	Trib Width Vert =	3.20 ft				
	Trib Width Horiz =	3.50 ft				
Vertical	Mmax =	402.2 ft-lb		Fy =	2677 psi	OK
	Vmax =	371.3 lb				
	I =	5.95 in^4				
	y =	2.00 in		Limit =	0.289 in	L/180
	S =	2.98 in^3		D =	0.023 in	OK
Horizontal	Mmax =	222.4 ft-lb		Fy =	2752 psi	OK
	Vmax =	205.3 lb				
	I =	2.00 in^4				
	y =	1.25 in				
	S =	1.60 in^3				

Interaction = 0.74 <= 1 OK

Side Beam

	L =	4.75 ft		Fy =	9722 psi	OK
	a=	1.66 ft				
	P=	705.6 lb				
				Limit =	0.317 in	L/180
Vertical	Mmax =	1168.6 ft-lb		D =	0.119 in	OK
	Vmax =	951.6 lb				
	I =	5.95 in^4		Section =	2.5x5x.125	
	y =	2.5 in				
	S =	2.38 in^3				
Horizontal	Mmax =	267.2 ft-lb		Fy =	3306 psi	OK
	Vmax =	225.0 lb				
	I =	2.00 in^4				
	y =	1.25 in				
	S =	1.60 in^3				

Interaction = 0.37 <= 1 OK

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Corner Column

2.5x2.5x.125

Height =	7.01	ft			
Trib Width =	2.38	ft			
Trib Depth =	2.25	ft			
Defl Limit =	L/170	=	0.49	in	
DL =	0	psf			
WL =	14	psf			
w_{total} =	33	plf			
End Rxn's =	210	lbs			
Moment =	811	ft-lb	=	9736	in-lb
					Provided OK?
Sx >=	0.5	in^3	0.90	in^3	OK
Ix >=	0.2	in^4	1.12	in^4	OK
Axial Force =	617	lb			
Moment M_x =	811	lb-ft			
Moment M_y =	692	lb-ft			

k =	1.2		F_{ex} =	36890	psi
L_x =	3.50521	ft	λ =	52	
L_y =	3.50521	ft	F_{cy} =	35,000	psi
r_x =	0.971	in	B_c =	35272	
r_y =	0.971	in	D_c =	208	
kL/r_x =	52		C_c =	69	
kL/r_y =	52		λ_1 =	1	
			λ_2 =	69	

Limit State =	INELASTIC BUCKLING				
F_c =	21708	psi			
A_g =	1.2	in^2			
P_{nc} =	15656	lb			
F_b =	21212	psi			
S_{xc} =	0.90	in^3			
M_{nx} =	1584	lb-ft			
S_{yc} =	0.90	in^3			
M_{ny} =	1584	lb-ft			
Interaction	0.99	<=	1	OK	

Corner Base Plate Design:

P =	617	lb	Area =	24.1	ft^2
Bearing Area =	36.0	in^2			
f_{brg} =	17	psi	OK	t =	0.16 in
F_{brg} =	1,000	psi	Actual t =	0.375	in OK

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Middle Column

2.5x2.5x.125

Height =	7.01	ft			
Trib Width =	3.22	ft			
Trib Depth =	0.00	ft			
Defl Limit =	L/170	=	0.49	in	
DL =	0	psf			
WL =	14	psf			
w_{total} =	45	psf			
End Rxn's =	317	lbs			
Moment =	1112	ft-lb	=	13339	in-lb
					Provided OK?
Sx >=	0.6	in^3	0.90	in^3	OK
Ix >=	0.2	in^4	1.12	in^4	OK
Axial Force =	790	lb			
Moment M_x =	1112	lb-ft			
Moment M_y =	0	lb-ft			

k =	1.2		F_{ex} =	9222.46	psi
L_x =	7.01042	ft	λ =	104	
L_y =	7.01042	ft	F_{cy} =	35,000	psi
r_x =	0.971	in	B_c =	35272	
r_y =	0.971	in	D_c =	208	
kL/r_x =	104		C_c =	69	
kL/r_y =	104		λ_1 =	1	
			λ_2 =	69	

Limit State =	ELASTIC BUCKLING		
F_c =	7839.09	psi	
A_g =	1.2	in^2	
P_{nc} =	5653.65	lb	
F_b =	21212	psi	
S_{xc} =	0.90	in^3	
M_{nx} =	1584	lb-ft	
S_{yc} =	0.90	in^3	
M_{ny} =	1584	lb-ft	

Interaction	0.84	<=	1	OK

Base Plate Design:

P =	790	lb	Area =	7.6	ft^2	
Bearing Area =	21.0	in^2				
f_{brg} =	38	psi	OK	t =	0.24	in
F_{brg} =	1,000	psi		Actual t =	0.375	in OK

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Anchor Shoe Design:

Anchor Shoe thickness =	0.225 in	Allowable Bearing =	684 lb Shoe/Column	#14 Tek screws	
# fasteners/shoe =	4	Allowable Bearing =	1271 lb Fastener		
Uplift =	625 lb	Allowable Shear =	334 lb Fastener	OK	
Shear/bolt to plate interaction =	78 lb				
Moment =	13339 lb-in	Fy =	11790 psi	OK	
Shear =	349 lb	Fv =	273 psi	OK	
Top of shoe bearing on column =	635 psi	OK			
I =	2.80 in^4				
y =	1.50 in	Section =	3x3x0.1875 Tube		
S =	1.87 in^3				
A =	2.11 in^2				

Weld Design:

			Filler Material
Fsuwl =	0.277	k/in/16	Governs Weld
Sw =	2	16ths	
Fweld =	0.555	k/in	
Max F =	0.629	k	
Weld L needed =	1.2	in	
Weld L prov =	3	in	OK

Connection of Vertical Mullion to Header:

P =	155 lb	
# of Rivets =	1	1/4" Rivets
Shear per Rivet =	155 lb	
Allowable =	333.9 lb	OK

Connection of Header to Column:

P =	706 lb	
# of Bolts =	2	1/4" Bolts
Shear per Bolt =	353 lb	
Allowable =	364 lb	OK

Anchor Check Maximum Loads:

Front Column:

Fx =	691 lb
Fy =	27 lb
Fz =	0 lb

Rear Corner Column:

Fx =	290 lb
Fy =	-1213 lb
Fz =	161 lb

Rear Center Column:

Fx =	0 lb
Fy =	50 lb
Fz =	286 lb

Project Title:
Engineer:
Project ID:
Project Descr:

General Footing

Project File: calcs.ec6

DESCRIPTION: SLAB

Code References

Calculations per VUSBC 2021
Load Combinations Used : IBC 2021

General Information

Material Properties

f'c : Concrete 28 day strength	=	4.0	ksi
fy : Rebar Yield	=	60.0	ksi
Ec : Concrete Elastic Modulus	=	3,122.0	ksi
Concrete Density	=	145.0	pcf
φ Values Flexure	=	0.90	
Shear	=	0.750	

Analysis Settings

Min Steel % Bending Reinf.	=	
Min Allow % Temp Reinf.	=	0.00180
Min. Overturning Safety Factor	=	1.0 : 1
Min. Sliding Safety Factor	=	1.0 : 1
Add Ftg Wt for Soil Pressure	:	Yes
Use ftg wt for stability, moments & shears	:	Yes
Add Pedestal Wt for Soil Pressure	:	No
Use Pedestal wt for stability, mom & shear	:	No

Soil Design Values

Allowable Soil Bearing	=	1.50	ksf
Soil Density	=	110.0	pcf
Increase Bearing By Footing Weight	=	No	
Soil Passive Resistance (for Sliding)	=	250.0	pcf
Soil/Concrete Friction Coeff.	=	0.30	

Increases based on footing Depth

Footing base depth below soil surface	=	0.6670	ft
Allow press. increase per foot of depth	=		ksf
when footing base is below	=		ft

Increases based on footing plan dimension

Allowable pressure increase per foot of depth	=	ksf
when max. length or width is greater than	=	ft

Dimensions

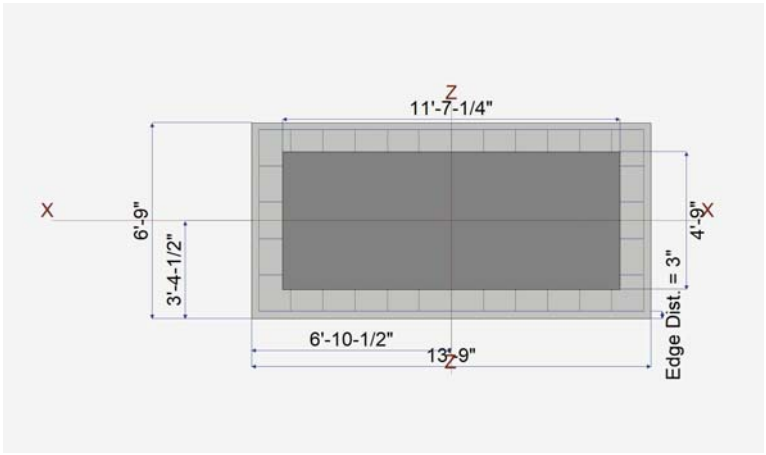
Width parallel to X-X Axis	=	13.750 ft
Length parallel to Z-Z Axis	=	6.750 ft
Footing Thickness	=	8.0 in

Pedestal dimensions...

px : parallel to X-X Axis	=	139.250 in
pz : parallel to Z-Z Axis	=	57.0 in
Height	=	0.3750 in

Rebar Centerline to Edge of Concrete...

at Bottom of footing	=	3.0 in



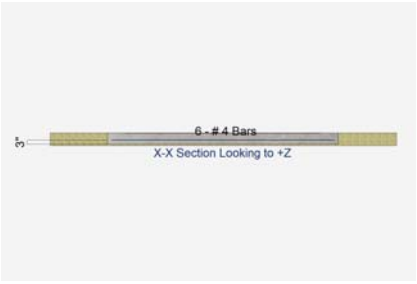
Reinforcing

Bars parallel to X-X Axis			
Number of Bars	=		6.0
Reinforcing Bar Size	=	#	4
Bars parallel to Z-Z Axis			
Number of Bars	=		13.0
Reinforcing Bar Size	=	#	4

Bandwidth Distribution Check (ACI 15.4.4.2)

Direction Requiring Closer Separation

	Bars along Z-Z Axis
# Bars required within zone	65.9 %
# Bars required on each side of zone	34.1 %



Applied Loads

		D	Lr	L	S	W	E	H	
P : Column Load	=	3.676							k
OB : Overburden	=								ksf
M-xx	=					7.354			k-ft
M-zz	=					2.997			k-ft
V-x	=					0.8550			k
V-z	=					2.098			k

General Footing

LIC# : KW-06016543, Build:20.23.08.30 UZMAN ENGINEERING (c) ENERCALC INC 1983-2023

DESCRIPTION: SLAB

DESIGN SUMMARY

Design OK

	Min. Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.1243	Soil Bearing	0.1865 ksf	1.50 ksf	+D+0.60W about X-X axis
PASS	4.841	Overturning - X-X	5.291 k-ft	25.615 k-ft	+0.60D+0.60W
PASS	24.199	Overturning - Z-Z	2.156 k-ft	52.178 k-ft	+0.60D+0.60W
PASS	5.170	Sliding - X-X	0.5130 k	2.652 k	+0.60D+0.60W
PASS	2.416	Sliding - Z-Z	1.259 k	3.042 k	+0.60D+0.60W
PASS	n/a	Uplift	0.0 k	0.0 k	No Uplift
PASS	0.009378	Z Flexure (+X)	0.03653 k-ft/ft	3.895 k-ft/ft	+1.20D+W
PASS	0.008183	Z Flexure (-X)	0.03188 k-ft/ft	3.895 k-ft/ft	+1.40D
PASS	0.01494	X Flexure (+Z)	0.06179 k-ft/ft	4.136 k-ft/ft	+1.20D+W
PASS	0.006698	X Flexure (-Z)	0.02771 k-ft/ft	4.136 k-ft/ft	+1.40D
PASS	0.007676	1-way Shear (+X)	0.7282 psi	94.868 psi	+1.20D+W
PASS	0.006694	1-way Shear (-X)	0.6350 psi	94.868 psi	+1.40D
PASS	0.01327	1-way Shear (+Z)	1.259 psi	94.868 psi	+1.20D+W
PASS	0.005915	1-way Shear (-Z)	0.5611 psi	94.868 psi	+1.40D
PASS	0.007008	2-way Punching	0.8260 psi	117.867 psi	+1.40D

Detailed Results

Soil Bearing

Rotation Axis & Load Combination...	Gross Allowable	Xecc (in)	Zecc (in)	Actual Soil Bearing Stress @ Location Bottom, -Z	Top, +Z	Left, -X	Right, +X	Actual / Allow Ratio
X-X, D Only	1.50	n/a	0.0	0.1363	0.1363	n/a	n/a	0.091
X-X, +D+0.60W	1.50	n/a	5.019	0.08612	0.1865	n/a	n/a	0.124
X-X, +D+0.450W	1.50	n/a	3.765	0.09866	0.1739	n/a	n/a	0.116
X-X, +0.60D+0.60W	1.50	n/a	8.366	0.03161	0.1319	n/a	n/a	0.088
X-X, +0.60D	1.50	n/a	0.0	0.08177	0.08177	n/a	n/a	0.055
Z-Z, D Only	1.50	0.0	n/a	n/a	n/a	0.1363	0.1363	0.091
Z-Z, +D+0.60W	1.50	2.046	n/a	n/a	n/a	0.1263	0.1463	0.098
Z-Z, +D+0.450W	1.50	1.534	n/a	n/a	n/a	0.1288	0.1438	0.096
Z-Z, +0.60D+0.60W	1.50	3.409	n/a	n/a	n/a	0.07174	0.09181	0.061
Z-Z, +0.60D	1.50	0.0	n/a	n/a	n/a	0.08177	0.08177	0.055

Overturning Stability

Rotation Axis & Load Combination...	Overturning Moment	Resisting Moment	Stability Ratio	Status
X-X, D Only	None	0.0 k-ft	Infinity	OK
X-X, +D+0.60W	5.291 k-ft	42.691 k-ft	8.069	OK
X-X, +D+0.450W	3.968 k-ft	42.691 k-ft	10.758	OK
X-X, +0.60D+0.60W	5.291 k-ft	25.615 k-ft	4.841	OK
X-X, +0.60D	None	0.0 k-ft	Infinity	OK
Z-Z, D Only	None	0.0 k-ft	Infinity	OK
Z-Z, +D+0.60W	2.156 k-ft	86.964 k-ft	40.331	OK
Z-Z, +D+0.450W	1.617 k-ft	86.964 k-ft	53.775	OK
Z-Z, +0.60D+0.60W	2.156 k-ft	52.178 k-ft	24.199	OK
Z-Z, +0.60D	None	0.0 k-ft	Infinity	OK

Sliding Stability

All units k

Force Application Axis Load Combination...	Sliding Force	Resisting Force	Stability Ratio	Status
X-X, D Only	0.0 k	4.170 k	No Sliding	OK
X-X, +D+0.60W	0.5130 k	4.170 k	8.129	OK
X-X, +D+0.450W	0.3848 k	4.170 k	10.839	OK
X-X, +0.60D+0.60W	0.5130 k	2.652 k	5.170	OK
X-X, +0.60D	0.0 k	2.652 k	No Sliding	OK
Z-Z, D Only	0.0 k	4.559 k	No Sliding	OK
Z-Z, +D+0.60W	1.259 k	4.559 k	3.622	OK

General Footing

LIC# : KW-06016543, Build:20.23.08.30 UZMAN ENGINEERING (c) ENERCALC INC 1983-2023

DESCRIPTION: SLAB

All units k

Sliding Stability

Force Application Axis Load Combination...	Sliding Force	Resisting Force	Stability Ratio	Status
Z-Z, +D+0.450W	0.9441 k	4.559 k	4.829	OK
Z-Z, +0.60D+0.60W	1.259 k	3.042 k	2.416	OK
Z-Z, +0.60D	0.0 k	3.042 k	No Sliding	OK

Footing Flexure

Flexure Axis & Load Combination	Mu k-ft	Side	Tension Surface	As Req'd in^2	Gvrn. As in^2	Actual As in^2	Phi*Mn k-ft	Status
X-X, +1.40D	0.02771	+Z	Bottom	0.1728	AsMin	0.1891	4.136	OK
X-X, +1.40D	0.02771	-Z	Bottom	0.1728	AsMin	0.1891	4.136	OK
X-X, +1.20D	0.02375	+Z	Bottom	0.1728	AsMin	0.1891	4.136	OK
X-X, +1.20D	0.02375	-Z	Bottom	0.1728	AsMin	0.1891	4.136	OK
X-X, +1.20D+0.50W	0.04277	+Z	Bottom	0.1728	AsMin	0.1891	4.136	OK
X-X, +1.20D+0.50W	0.004726	-Z	Bottom	0.1728	AsMin	0.1891	4.136	OK
X-X, +1.20D+W	0.06179	+Z	Bottom	0.1728	AsMin	0.1891	4.136	OK
X-X, +1.20D+W	0.01430	-Z	Top	0.1728	AsMin	0.1891	4.136	OK
X-X, +0.90D+W	0.05585	+Z	Bottom	0.1728	AsMin	0.1891	4.136	OK
X-X, +0.90D+W	0.02023	-Z	Top	0.1728	AsMin	0.1891	4.136	OK
X-X, +0.90D	0.01781	+Z	Bottom	0.1728	AsMin	0.1891	4.136	OK
X-X, +0.90D	0.01781	-Z	Bottom	0.1728	AsMin	0.1891	4.136	OK
Z-Z, +1.40D	0.03188	-X	Bottom	0.1728	AsMin	0.1778	3.895	OK
Z-Z, +1.40D	0.03188	+X	Bottom	0.1728	AsMin	0.1778	3.895	OK
Z-Z, +1.20D	0.02732	-X	Bottom	0.1728	AsMin	0.1778	3.895	OK
Z-Z, +1.20D	0.02732	+X	Bottom	0.1728	AsMin	0.1778	3.895	OK
Z-Z, +1.20D+0.50W	0.02272	-X	Bottom	0.1728	AsMin	0.1778	3.895	OK
Z-Z, +1.20D+0.50W	0.03193	+X	Bottom	0.1728	AsMin	0.1778	3.895	OK
Z-Z, +1.20D+W	0.01811	-X	Bottom	0.1728	AsMin	0.1778	3.895	OK
Z-Z, +1.20D+W	0.03653	+X	Bottom	0.1728	AsMin	0.1778	3.895	OK
Z-Z, +0.90D+W	0.01128	-X	Bottom	0.1728	AsMin	0.1778	3.895	OK
Z-Z, +0.90D+W	0.02970	+X	Bottom	0.1728	AsMin	0.1778	3.895	OK
Z-Z, +0.90D	0.02049	-X	Bottom	0.1728	AsMin	0.1778	3.895	OK
Z-Z, +0.90D	0.02049	+X	Bottom	0.1728	AsMin	0.1778	3.895	OK

One Way Shear

Load Combination...	Vu @ -X	Vu @ +X	Vu @ -Z	Vu @ +Z	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.40D	0.64 psi	0.64 psi	0.56 psi	0.56 psi	0.64 psi	94.87 psi	0.01	OK
+1.20D	0.54 psi	0.54 psi	0.48 psi	0.48 psi	0.54 psi	94.87 psi	0.01	OK
+1.20D+0.50W	0.45 psi	0.64 psi	0.09 psi	0.87 psi	0.87 psi	94.87 psi	0.01	OK
+1.20D+W	0.36 psi	0.73 psi	0.30 psi	1.26 psi	1.26 psi	94.87 psi	0.01	OK
+0.90D+W	0.22 psi	0.59 psi	0.42 psi	1.14 psi	1.14 psi	94.87 psi	0.01	OK
+0.90D	0.41 psi	0.41 psi	0.36 psi	0.36 psi	0.41 psi	94.87 psi	0.00	OK

Two-Way "Punching" Shear

All units k

Load Combination...	Vu	Phi*Vn	Vu / Phi*Vn	Status
+1.40D	0.83 psi	117.87 psi	0.007008	OK
+1.20D	0.71 psi	117.87 psi	0.006007	OK
+1.20D+0.50W	0.71 psi	117.87 psi	0.006007	OK
+1.20D+W	0.71 psi	117.87 psi	0.006007	OK
+0.90D+W	0.53 psi	117.87 psi	0.004505	OK
+0.90D	0.53 psi	117.87 psi	0.004505	OK

Project Title:
Engineer:
Project ID:
Project Descr:

Steel Bolt Group Analysis

Project File: calcs.ec6

DESCRIPTION: BENCH BRACKET

Code References

Calculations per VUSBC 2021
Load Combination Set : IBC 2021

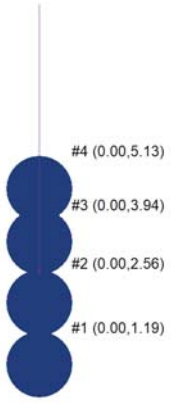
Centroid & Eccentricity

Bolt Group Centroid...

X Distance	0.000 in
Y Distance	3.206 in

Load Eccentricity from C.

Y Distance	0.045 in
X Distance	0.000 in
Total Moment	0.00 k-in



Bolt Locations

Bolt #1	X Location =	0.00 in	Y Location =	1.19 in
Bolt #2	X Location =	0.00 in	Y Location =	2.56 in
Bolt #3	X Location =	0.00 in	Y Location =	3.94 in
Bolt #4	X Location =	0.00 in	Y Location =	5.13 in

Applied Loads

	Dead Load	L : Live Load	Lr : Roof Live	S : Snow	W : Wind	E : Seismic	H : Earth	
Load Magnitude		0.218		0.000	0.000	0.000	0.000	k
Application Angle	0.00	270.00	0.00	0.00	0.00	0.00	0.00	deg CCV
Horiz Dist from Datur	0.00	in						
Vert Dist from Datum	3.25	in						

	Dead Load	L : Live Load	Lr : Roof Live	S : Snow	W : Wind	E : Seismic	H : Earth	
Load Magnitude		0.218		0.000	0.000	0.000	0.000	k-ft

Maximum Bolt Shear Forces

Bolt #	Load Combination	Bolt Dist. From C.B.G X	Bolt Dist. From C.B.G Y	Direct Shear Force X	Direct Shear Force Y	Moment	Torsional Shear Force X	Torsional Shear Force Y	Final Shea	
Bo	L Only	0.000 in	-2.018 in	0.000 k	-0.055 k	0.22 k-ft	0.604 k		k	**0.607k**
Bo	L Only	0.000 in	-0.643 in	0.000 k	-0.055 k	0.22 k-ft	0.192 k		k	**0.200k**
Bo	L Only	0.000 in	0.733 in	0.000 k	-0.055 k	0.22 k-ft	-0.219 k		k	**0.226k**
Bo	L Only	0.000 in	1.928 in	0.000 k	-0.055 k	0.22 k-ft	-0.577 k		k	**0.580k**

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Design:	VA0823 Front Column	Date:	8/16/2024
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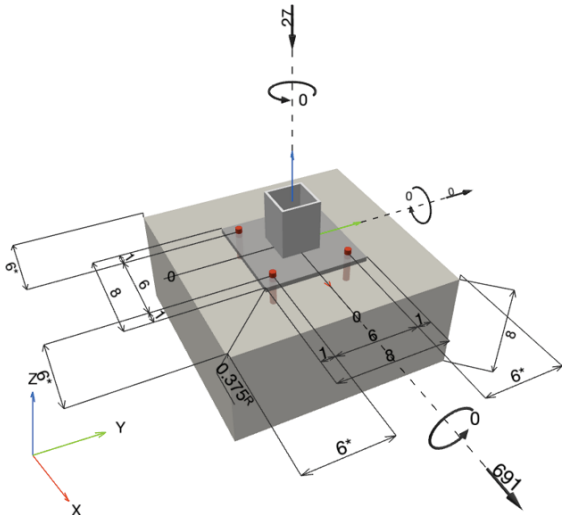
Specifier's comments:

1 Input data

Anchor type and diameter:	**Kwik Bolt TZ2 - SS 316 1/2 (2) hnom1**
Item number:	2210264 KB-TZ2 1/2x3 3/4 SS316
Specification text:	Hilti KB-TZ2 stud anchor with 2.5 in embedment, 1/2 (2) hnom1, Stainless steel, installation per ESR-4266
Effective embedment depth:	$h_{ef,act}$ = 2.000 in., h_{nom} = 2.500 in.
Material:	AISI 316
Evaluation Service Report:	ESR-4266
Issued I Valid:	12/1/2023 | 12/1/2025
Proof:	Design Method ACI 318-19 / Mech
Stand-off installation:	e_b = 0.000 in. (no stand-off); t = 0.375 in.
Anchor plate[R]:	l_x x l_y x t = 8.000 in. x 8.000 in. x 0.375 in.; (Recommended plate thickness: not calculated)
Profile:	Square HSS (AISC), HSS3X3X.1875; (L x W x T) = 3.000 in. x 3.000 in. x 0.188 in.
Base material:	cracked concrete, 4000, f_c' = 4,000 psi; h = 8.000 in.
Installation:	**hammer drilled hole, Installation condition: Dry**
Reinforcement:	tension: not present, shear: not present; no supplemental splitting reinforcement present edge reinforcement: none or < No. 4 bar

[R] - The anchor calculation is based on a rigid anchor plate assumption.

Geometry [in.] & Loading [lb, in.lb]



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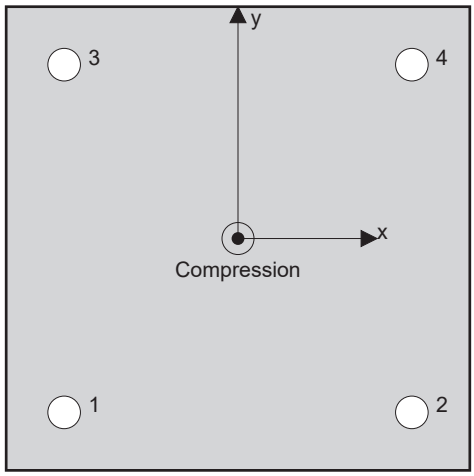
1.1 Design results

Case	Description	Forces [lb] / Moments [in.lb]	Seismic	Max. Util. Anchor [%]
1	Load case: Design loads	N = -27; V_x = 691; V_y = 0; M_x = 0; M_y = 0; M_z = 0;	no	19

2 Load case/Resulting anchor forces



Anchor reactions [lb]
Tension force: (+Tension, -Compression)

Anchor	Tension force	Shear force	Shear force x	Shear force y
1	0	173	173	0
2	0	173	173	0
3	0	173	173	0
4	0	173	173	0

max. concrete compressive strain:	0.00 [‰]
max. concrete compressive stress:	0 [psi]
resulting tension force in (x/y)=(-/-):	0 [lb]
resulting compression force in (x/y)=(0.000/0.000):	27 [lb]

Anchor forces are calculated based on the assumption of a rigid anchor plate.

3 Tension load

	Load N_{ua} [lb]	Capacity ϕ N_n [lb]	Utilization $\beta_N = N_{ua}/\phi$ N_n	Status
Steel Strength*	N/A	N/A	N/A	N/A
Pullout Strength*	N/A	N/A	N/A	N/A
Concrete Breakout Failure**	N/A	N/A	N/A	N/A

* highest loaded anchor **anchor group (anchors in tension)

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4 Shear load

	Load V_{ua} [lb]	Capacity ϕ V_n [lb]	Utilization $\beta_V = V_{ua}/\phi$ V_n	Status
Steel Strength*	173	5,426	4	OK
Steel failure (with lever arm)*	N/A	N/A	N/A	N/A
Pryout Strength**	691	8,515	9	OK
Concrete edge failure in direction x+**	691	3,706	19	OK

* highest loaded anchor **anchor group (relevant anchors)

4.1 Steel Strength

V_{sa} = ESR value refer to ICC-ES ESR-4266
ϕ $V_{steel} \geq V_{ua}$ ACI 318-19 Table 17.5.2

Variables

$A_{se,V}$ [in.^{2}]	f_{uta} [psi]
0.10	120,404

Calculations

V_{sa} [lb]
8,348

Results

V_{sa} [lb]	ϕ_{steel}	ϕ V_{sa} [lb]	V_{ua} [lb]
8,348	0.650	5,426	173

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4.2 Pryout Strength

$V_{cpg} = k_{cp} \left[\left(\frac{A_{Nc}}{A_{Nc0}} \right) \psi_{ec,N} \psi_{ed,N} \psi_{c,N} \psi_{cp,N} N_b \right]$ ACI 318-19 Eq. (17.7.3.1b)

$\phi V_{cpg} \geq V_{ua}$ ACI 318-19 Table 17.5.2

A_{Nc} see ACI 318-19, Section 17.6.2.1, Fig. R 17.6.2.1(b)

$A_{Nc0} = 9 h_{ef}^2$ ACI 318-19 Eq. (17.6.2.1.4)

$\psi_{ec,N} = \left(\frac{1}{1 + \frac{2 e'_N}{3 h_{ef}}} \right) \leq 1.0$ ACI 318-19 Eq. (17.6.2.3.1)

$\psi_{ed,N} = 0.7 + 0.3 \left(\frac{c_{a,min}}{1.5 h_{ef}} \right) \leq 1.0$ ACI 318-19 Eq. (17.6.2.4.1b)

$\psi_{cp,N} = \text{MAX}\left(\frac{c_{a,min}}{c_{ac}}, \frac{1.5 h_{ef}}{c_{ac}} \right) \leq 1.0$ ACI 318-19 Eq. (17.6.2.6.1b)

$N_b = k_c \lambda_a \sqrt{f'_c} h_{ef}^{1.5}$ ACI 318-19 Eq. (17.6.2.2.1)

Variables

k_{cp}	h_{ef} [in.]	$e_{c1,N}$ [in.]	$e_{c2,N}$ [in.]	$c_{a,min}$ [in.]
1	2.000	0.000	0.000	6.000

$\psi_{c,N}$	c_{ac} [in.]	k_c	λ_a	f'_c [psi]
1.000	5.500	17	1.000	4,000

Calculations

A_{Nc} [in.^{2}]	A_{Nc0} [in.^{2}]	$\psi_{ec1,N}$	$\psi_{ec2,N}$	$\psi_{ed,N}$	$\psi_{cp,N}$	N_b [lb]
144.00	36.00	1.000	1.000	1.000	1.000	3,041

Results

V_{cpg} [lb]	$\phi_{concrete}$	ϕV_{cpg} [lb]	V_{ua} [lb]
12,164	0.700	8,515	691

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4.3 Concrete edge failure in direction x+

$V_{cbg} = \left(\frac{A_{Vc}}{A_{Vc0}}\right) \psi_{ec,V} \psi_{ed,V} \psi_{c,V} \psi_{h,V} \psi_{parallel,V} V_b$ ACI 318-19 Eq. (17.7.2.1b)

$\phi V_{cbg} \geq V_{ua}$ ACI 318-19 Table 17.5.2

A_{Vc} see ACI 318-19, Section 17.7.2.1, Fig. R 17.7.2.1(b)

$A_{Vc0} = 4.5 c_{a1}^2$ ACI 318-19 Eq. (17.7.2.1.3)

$\psi_{ec,V} = \left(\frac{1}{1 + \frac{e'_v}{1.5c_{a1}}}\right) \leq 1.0$ ACI 318-19 Eq. (17.7.2.3.1)

$\psi_{ed,V} = 0.7 + 0.3\left(\frac{c_{a2}}{1.5c_{a1}}\right) \leq 1.0$ ACI 318-19 Eq. (17.7.2.4.1b)

$\psi_{h,V} = \sqrt{\frac{1.5c_{a1}}{h_a}} \geq 1.0$ ACI 318-19 Eq. (17.7.2.6.1)

$V_b = \left(7\left(\frac{l_e}{d_a}\right)^{0.2} \sqrt{d_a}\right) \lambda_a \sqrt{f'_c} c_{a1}^{1.5}$ ACI 318-19 Eq. (17.7.2.2.1a)

Variables

c_{a1} [in.]	c_{a2} [in.]	e_{cV} [in.]	$\psi_{c,V}$	h_a [in.]
5.333	6.000	0.000	1.000	8.000

l_e [in.]	λ_a	d_a [in.]	f'_c [psi]	$\psi_{parallel,V}$
2.000	1.000	0.500	4,000	1.000

Calculations

A_{Vc} [in.^{2}]	A_{Vc0} [in.^{2}]	$\psi_{ec,V}$	$\psi_{ed,V}$	$\psi_{h,V}$	V_b [lb]
144.00	128.00	1.000	0.925	1.000	5,088

Results

V_{cbg} [lb]	$\phi_{concrete}$	ϕV_{cbg} [lb]	V_{ua} [lb]
5,294	0.700	3,706	691

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5 Warnings

- The anchor design methods in PROFIS Engineering require rigid anchor plates per current regulations (AS 5216:2021, ETAG 001/Annex C, EOTA TR029 etc.). This means load re-distribution on the anchors due to elastic deformations of the anchor plate are not considered - the anchor plate is assumed to be sufficiently stiff, in order not to be deformed when subjected to the design loading. PROFIS Engineering calculates the minimum required anchor plate thickness with CBFEM to limit the stress of the anchor plate based on the assumptions explained above. The proof if the rigid anchor plate assumption is valid is not carried out by PROFIS Engineering. Input data and results must be checked for agreement with the existing conditions and for plausibility!
- Condition A applies where the potential concrete failure surfaces are crossed by supplementary reinforcement proportioned to tie the potential concrete failure prism into the structural member. Condition B applies where such supplementary reinforcement is not provided, or where pullout or pryout strength governs.
- Refer to the manufacturer's product literature for cleaning and installation instructions.
- For additional information about ACI 318 strength design provisions, please go to https://submittals.us.hilti.com/PROFISAnchorDesignGuide/
- Hilti post-installed anchors shall be installed in accordance with the Hilti Manufacturer's Printed Installation Instructions (MPII). Reference ACI 318-19, Section 26.7.

Fastening meets the design criteria!

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6 Installation data

Profile: Square HSS (AISC), HSS3X3X.1875; (L x W x T) = 3.000 in. x 3.000 in. x 0.188 in.

Hole diameter in the fixture: d_f = 0.562 in.

Plate thickness (input): 0.375 in.

Recommended plate thickness: not calculated

Drilling method: Hammer drilled

Cleaning: Manual cleaning of the drilled hole according to instructions for use is required.

Anchor type and diameter: Kwik Bolt TZ2 - SS 316 1/2 (2) hnom1

Item number: 2210264 KB-TZ2 1/2x3 3/4 SS316

Maximum installation torque: 481 in.lb

Hole diameter in the base material: 0.500 in.

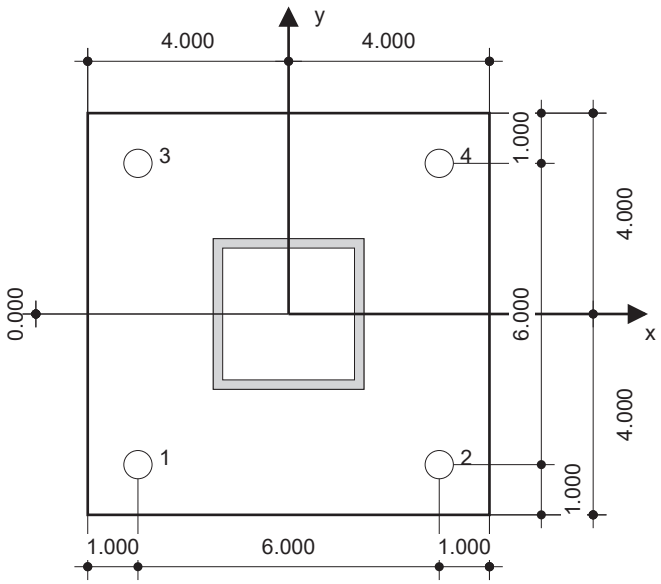
Hole depth in the base material: 2.750 in.

Minimum thickness of the base material: 4.000 in.

Hilti KB-TZ2 stud anchor with 2.5 in embedment, 1/2 (2) hnom1, Stainless steel, installation per ESR-4266

6.1 Recommended accessories

Drilling	Cleaning	Setting
• Suitable Rotary Hammer • Properly sized drill bit	• Manual blow-out pump	• Torque controlled cordless impact tool • Torque wrench • Hammer



Coordinates Anchor [in.]

Anchor	x	y	c_{-x}	c_{+x}	c_{-y}	c_{+y}
1	-3.000	-3.000	6.000	12.000	6.000	12.000
2	3.000	-3.000	12.000	6.000	6.000	12.000
3	-3.000	3.000	6.000	12.000	12.000	6.000
4	3.000	3.000	12.000	6.000	12.000	6.000

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7 Remarks; Your Cooperation Duties

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Design:	VA0823 Rear Corner Column	Date:	8/16/2024
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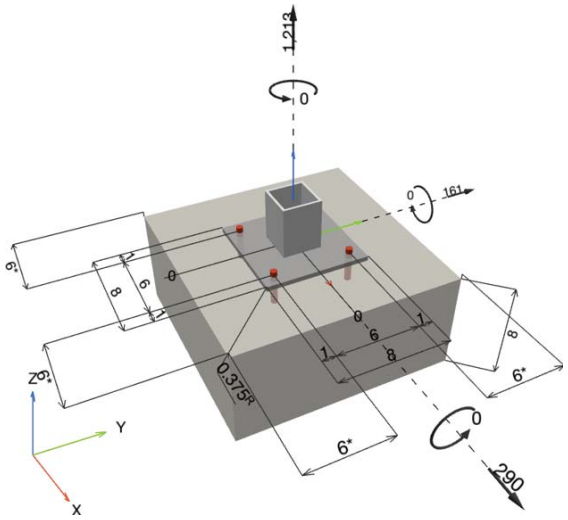
Specifier's comments:

1 Input data

Anchor type and diameter:	**Kwik Bolt TZ2 - SS 316 1/2 (2) hnom1**
Item number:	2210264 KB-TZ2 1/2x3 3/4 SS316
Specification text:	Hilti KB-TZ2 stud anchor with 2.5 in embedment, 1/2 (2) hnom1, Stainless steel, installation per ESR-4266
Effective embedment depth:	$h_{ef,act}$ = 2.000 in., h_{nom} = 2.500 in.
Material:	AISI 316
Evaluation Service Report:	ESR-4266
Issued I Valid:	12/1/2023 | 12/1/2025
Proof:	Design Method ACI 318-19 / Mech
Stand-off installation:	e_b = 0.000 in. (no stand-off); t = 0.375 in.
Anchor plate[R]:	l_x x l_y x t = 8.000 in. x 8.000 in. x 0.375 in.; (Recommended plate thickness: not calculated)
Profile:	Square HSS (AISC), HSS3X3X.1875; (L x W x T) = 3.000 in. x 3.000 in. x 0.188 in.
Base material:	cracked concrete, 4000, f_c' = 4,000 psi; h = 8.000 in.
Installation:	**hammer drilled hole, Installation condition: Dry**
Reinforcement:	tension: not present, shear: not present; no supplemental splitting reinforcement present edge reinforcement: none or < No. 4 bar

[R] - The anchor calculation is based on a rigid anchor plate assumption.

Geometry [in.] & Loading [lb, in.lb]



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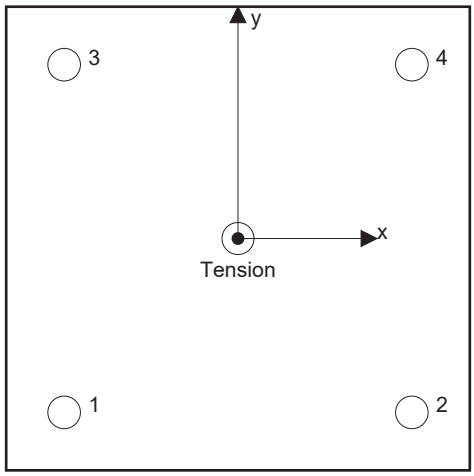
1.1 Design results

Case	Description	Forces [lb] / Moments [in.lb]	Seismic	Max. Util. Anchor [%]
1	Load case: Design loads	N = 1,213; V_x = 290; V_y = 161; M_x = 0; M_y = 0; M_z = 0;	no	16

2 Load case/Resulting anchor forces



Anchor reactions [lb]
Tension force: (+Tension, -Compression)

Anchor	Tension force	Shear force	Shear force x	Shear force y
1	303	83	72	40
2	303	83	72	40
3	303	83	72	40
4	303	83	72	40

max. concrete compressive strain: - [‰]
max. concrete compressive stress: - [psi]
resulting tension force in (x/y)=(0.000/0.000): 1,213 [lb]
resulting compression force in (x/y)=(-/-): 0 [lb]

Anchor forces are calculated based on the assumption of a rigid anchor plate.

3 Tension load

	Load N_{ua} [lb]	Capacity ϕ N_n [lb]	Utilization $\beta_N = N_{ua}/\phi$ N_n	Status
Steel Strength*	303	8,906	4	OK
Pullout Strength*	N/A	N/A	N/A	N/A
Concrete Breakout Failure**	1,213	7,907	16	OK

* highest loaded anchor **anchor group (anchors in tension)

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3.1 Steel Strength

N_{sa} = ESR value refer to ICC-ES ESR-4266
$\phi\ N_{sa} \geq N_{ua}$ ACI 318-19 Table 17.5.2

Variables

$A_{se,N}$ [in.^{2}]	f_{uta} [psi]
0.10	120,404

Calculations

N_{sa} [lb]
11,875

Results

N_{sa} [lb]	ϕ_{steel}	$\phi\ N_{sa}$ [lb]	N_{ua} [lb]
11,875	0.750	8,906	303

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3.2 Concrete Breakout Failure

$N_{cbg} = \left(\frac{A_{Nc}}{A_{Nc0}}\right) \psi_{ec,N}\ \psi_{ed,N}\ \psi_{c,N}\ \psi_{cp,N}\ N_b$ ACI 318-19 Eq. (17.6.2.1b)

$\phi\ N_{cbg} \geq N_{ua}$ ACI 318-19 Table 17.5.2

A_{Nc} see ACI 318-19, Section 17.6.2.1, Fig. R 17.6.2.1(b)

$A_{Nc0} = 9\ h_{ef}^2$ ACI 318-19 Eq. (17.6.2.1.4)

$\psi_{ec,N} = \left(\frac{1}{1 + \frac{2\ e'_N}{3\ h_{ef}}}\right) \leq 1.0$ ACI 318-19 Eq. (17.6.2.3.1)

$\psi_{ed,N} = 0.7 + 0.3\left(\frac{c_{a,min}}{1.5h_{ef}}\right) \leq 1.0$ ACI 318-19 Eq. (17.6.2.4.1b)

$\psi_{cp,N} = \text{MAX}\left(\frac{c_{a,min}}{c_{ac}}, \frac{1.5h_{ef}}{c_{ac}}\right) \leq 1.0$ ACI 318-19 Eq. (17.6.2.6.1b)

$N_b = k_c\ \lambda_a\ \sqrt{f'_c}\ h_{ef}^{1.5}$ ACI 318-19 Eq. (17.6.2.2.1)

Variables

h_{ef} [in.]	$e_{c1,N}$ [in.]	$e_{c2,N}$ [in.]	$c_{a,min}$ [in.]	$\psi_{c,N}$
2.000	0.000	0.000	6.000	1.000

c_{ac} [in.]	k_c	λ_a	f'_c [psi]
5.500	17	1.000	4,000

Calculations

A_{Nc} [in.^{2}]	A_{Nc0} [in.^{2}]	$\psi_{ec1,N}$	$\psi_{ec2,N}$	$\psi_{ed,N}$	$\psi_{cp,N}$	N_b [lb]
144.00	36.00	1.000	1.000	1.000	1.000	3,041

Results

N_{cbg} [lb]	$\phi_{concrete}$	$\phi\ N_{cbg}$ [lb]	N_{ua} [lb]
12,164	0.650	7,907	1,213

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4 Shear load

	Load V_{ua} [lb]	Capacity ϕ V_n [lb]	Utilization $\beta_V = V_{ua}/\phi$ V_n	Status
Steel Strength*	83	5,426	2	OK
Steel failure (with lever arm)*	N/A	N/A	N/A	N/A
Pryout Strength**	332	8,515	4	OK
Concrete edge failure in direction y+**	332	3,706	9	OK

* highest loaded anchor **anchor group (relevant anchors)

4.1 Steel Strength

V_{sa} = ESR value refer to ICC-ES ESR-4266
ϕ $V_{steel} \geq V_{ua}$ ACI 318-19 Table 17.5.2

Variables

$A_{se,V}$ [in.^{2}]	f_{uta} [psi]
0.10	120,404

Calculations

V_{sa} [lb]
8,348

Results

V_{sa} [lb]	ϕ_{steel}	ϕ V_{sa} [lb]	V_{ua} [lb]
8,348	0.650	5,426	83

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4.2 Pryout Strength

$V_{cpg} = k_{cp} \left[\left(\frac{A_{Nc}}{A_{Nc0}} \right) \psi_{ec,N} \psi_{ed,N} \psi_{c,N} \psi_{cp,N} N_b \right]$ ACI 318-19 Eq. (17.7.3.1b)

$\phi V_{cpg} \geq V_{ua}$ ACI 318-19 Table 17.5.2

A_{Nc} see ACI 318-19, Section 17.6.2.1, Fig. R 17.6.2.1(b)

$A_{Nc0} = 9 h_{ef}^2$ ACI 318-19 Eq. (17.6.2.1.4)

$\psi_{ec,N} = \left(\frac{1}{1 + \frac{2 e'_N}{3 h_{ef}}} \right) \leq 1.0$ ACI 318-19 Eq. (17.6.2.3.1)

$\psi_{ed,N} = 0.7 + 0.3 \left(\frac{c_{a,min}}{1.5 h_{ef}} \right) \leq 1.0$ ACI 318-19 Eq. (17.6.2.4.1b)

$\psi_{cp,N} = \text{MAX}\left(\frac{c_{a,min}}{c_{ac}}, \frac{1.5 h_{ef}}{c_{ac}} \right) \leq 1.0$ ACI 318-19 Eq. (17.6.2.6.1b)

$N_b = k_c \lambda_a \sqrt{f'_c} h_{ef}^{1.5}$ ACI 318-19 Eq. (17.6.2.2.1)

Variables

k_{cp}	h_{ef} [in.]	$e_{c1,N}$ [in.]	$e_{c2,N}$ [in.]	$c_{a,min}$ [in.]
1	2.000	0.000	0.000	6.000

$\psi_{c,N}$	c_{ac} [in.]	k_c	λ_a	f'_c [psi]
1.000	5.500	17	1.000	4,000

Calculations

A_{Nc} [in.^{2}]	A_{Nc0} [in.^{2}]	$\psi_{ec1,N}$	$\psi_{ec2,N}$	$\psi_{ed,N}$	$\psi_{cp,N}$	N_b [lb]
144.00	36.00	1.000	1.000	1.000	1.000	3,041

Results

V_{cpg} [lb]	$\phi_{concrete}$	ϕV_{cpg} [lb]	V_{ua} [lb]
12,164	0.700	8,515	332

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4.3 Concrete edge failure in direction y+

$V_{cbg} = \left(\frac{A_{Vc}}{A_{Vc0}}\right) \Psi_{ec,V} \Psi_{ed,V} \Psi_{c,V} \Psi_{h,V} \Psi_{parallel,V} V_b$ — ACI 318-19 Eq. (17.7.2.1b)

$\phi V_{cbg} \geq V_{ua}$ — ACI 318-19 Table 17.5.2

A_{Vc} see ACI 318-19, Section 17.7.2.1, Fig. R 17.7.2.1(b)

$A_{Vc0} = 4.5 c_{a1}^2$ — ACI 318-19 Eq. (17.7.2.1.3)

$\Psi_{ec,V} = \left(\frac{1}{1 + \frac{e'_v}{1.5c_{a1}}}\right) \leq 1.0$ — ACI 318-19 Eq. (17.7.2.3.1)

$\Psi_{ed,V} = 0.7 + 0.3\left(\frac{c_{a2}}{1.5c_{a1}}\right) \leq 1.0$ — ACI 318-19 Eq. (17.7.2.4.1b)

$\Psi_{h,V} = \sqrt{\frac{1.5c_{a1}}{h_a}} \geq 1.0$ — ACI 318-19 Eq. (17.7.2.6.1)

$V_b = \left(7\left(\frac{l_e}{d_a}\right)^{0.2} \sqrt{d_a}\right) \lambda_a \sqrt{f'_c} c_{a1}^{1.5}$ — ACI 318-19 Eq. (17.7.2.2.1a)

Variables

c_{a1} [in.]	c_{a2} [in.]	e_{cV} [in.]	$\Psi_{c,V}$	h_a [in.]
5.333	6.000	0.000	1.000	8.000

l_e [in.]	λ_a	d_a [in.]	f'_c [psi]	$\Psi_{parallel,V}$
2.000	1.000	0.500	4,000	1.000

Calculations

A_{Vc} [in.^{2}]	A_{Vc0} [in.^{2}]	$\Psi_{ec,V}$	$\Psi_{ed,V}$	$\Psi_{h,V}$	V_b [lb]
144.00	128.00	1.000	0.925	1.000	5,088

Results

V_{cbg} [lb]	$\phi_{concrete}$	ϕV_{cbg} [lb]	V_{ua} [lb]
5,294	0.700	3,706	332

5 Combined tension and shear loads, per ACI 318-19 section 17.8

β_N	β_V	ζ	Utilization $\beta_{N,V}$ [%]	Status
0.153	0.089	5/3	7	OK

$\beta_{NV} = \beta_N^{\zeta} + \beta_V^{\zeta} <= 1$

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6 Warnings

- The anchor design methods in PROFIS Engineering require rigid anchor plates per current regulations (AS 5216:2021, ETAG 001/Annex C, EOTA TR029 etc.). This means load re-distribution on the anchors due to elastic deformations of the anchor plate are not considered - the anchor plate is assumed to be sufficiently stiff, in order not to be deformed when subjected to the design loading. PROFIS Engineering calculates the minimum required anchor plate thickness with CBFEM to limit the stress of the anchor plate based on the assumptions explained above. The proof if the rigid anchor plate assumption is valid is not carried out by PROFIS Engineering. Input data and results must be checked for agreement with the existing conditions and for plausibility!
- Condition A applies where the potential concrete failure surfaces are crossed by supplementary reinforcement proportioned to tie the potential concrete failure prism into the structural member. Condition B applies where such supplementary reinforcement is not provided, or where pullout or pryout strength governs.
- Refer to the manufacturer's product literature for cleaning and installation instructions.
- For additional information about ACI 318 strength design provisions, please go to https://submittals.us.hilti.com/PROFISAnchorDesignGuide/
- Hilti post-installed anchors shall be installed in accordance with the Hilti Manufacturer's Printed Installation Instructions (MPII). Reference ACI 318-19, Section 26.7.

Fastening meets the design criteria!

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7 Installation data

Profile: Square HSS (AISC), HSS3X3X.1875; (L x W x T) = 3.000 in. x 3.000 in. x 0.188 in.

Hole diameter in the fixture: d_f = 0.562 in.

Plate thickness (input): 0.375 in.

Recommended plate thickness: not calculated

Drilling method: Hammer drilled

Cleaning: Manual cleaning of the drilled hole according to instructions for use is required.

Anchor type and diameter: Kwik Bolt TZ2 - SS 316 1/2 (2) hnom1

Item number: 2210264 KB-TZ2 1/2x3 3/4 SS316

Maximum installation torque: 481 in.lb

Hole diameter in the base material: 0.500 in.

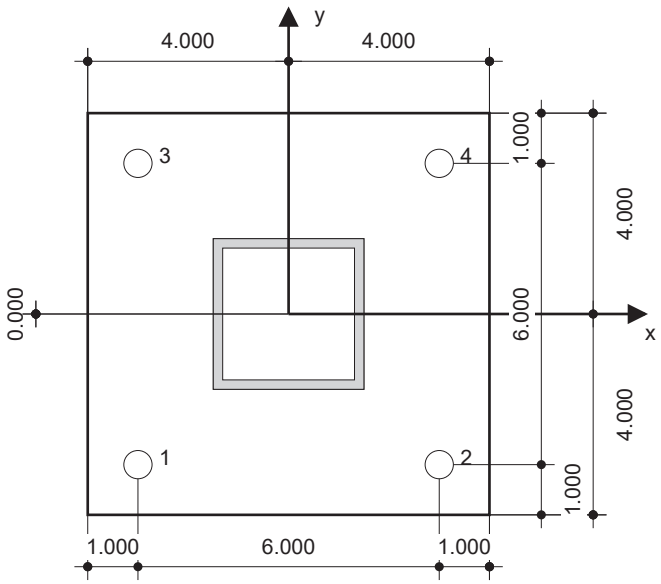
Hole depth in the base material: 2.750 in.

Minimum thickness of the base material: 4.000 in.

Hilti KB-TZ2 stud anchor with 2.5 in embedment, 1/2 (2) hnom1, Stainless steel, installation per ESR-4266

7.1 Recommended accessories

Drilling	Cleaning	Setting
• Suitable Rotary Hammer • Properly sized drill bit	• Manual blow-out pump	• Torque controlled cordless impact tool • Torque wrench • Hammer



Coordinates Anchor [in.]

Anchor	x	y	c_{-x}	c_{+x}	c_{-y}	c_{+y}
1	-3.000	-3.000	6.000	12.000	6.000	12.000
2	3.000	-3.000	12.000	6.000	6.000	12.000
3	-3.000	3.000	6.000	12.000	12.000	6.000
4	3.000	3.000	12.000	6.000	12.000	6.000

8 Remarks; Your Cooperation Duties

- Any and all information and data contained in the Software concern solely the use of Hilti products and are based on the principles, formulas and security regulations in accordance with Hilti's technical directions and operating, mounting and assembly instructions, etc., that must be strictly complied with by the user. All figures contained therein are average figures, and therefore use-specific tests are to be conducted prior to using the relevant Hilti product. The results of the calculations carried out by means of the Software are based essentially on the data you put in. Therefore, you bear the sole responsibility for the absence of errors, the completeness and the relevance of the data to be put in by you. Moreover, you bear sole responsibility for having the results of the calculation checked and cleared by an expert, particularly with regard to compliance with applicable norms and permits, prior to using them for your specific facility. The Software serves only as an aid to interpret norms and permits without any guarantee as to the absence of errors, the correctness and the relevance of the results or suitability for a specific application.
- You must take all necessary and reasonable steps to prevent or limit damage caused by the Software. In particular, you must arrange for the regular backup of programs and data and, if applicable, carry out the updates of the Software offered by Hilti on a regular basis. If you do not use the AutoUpdate function of the Software, you must ensure that you are using the current and thus up-to-date version of the Software in each case by carrying out manual updates via the Hilti Website. Hilti will not be liable for consequences, such as the recovery of lost or damaged data or programs, arising from a culpable breach of duty by you.

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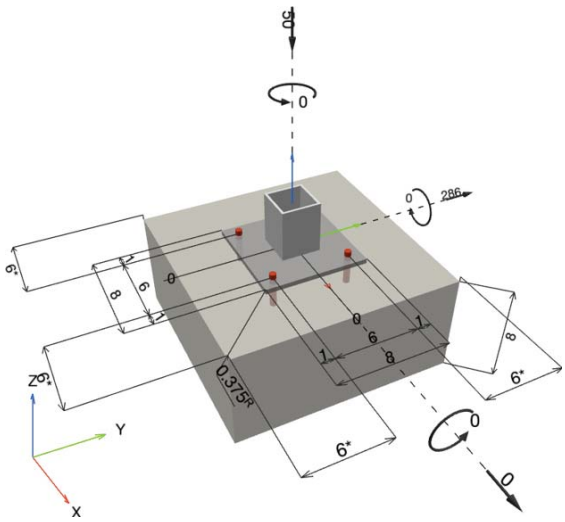
Specifier's comments:

1 Input data

Anchor type and diameter:	**Kwik Bolt TZ2 - SS 316 1/2 (2) hnom1**
Item number:	2210264 KB-TZ2 1/2x3 3/4 SS316
Specification text:	Hilti KB-TZ2 stud anchor with 2.5 in embedment, 1/2 (2) hnom1, Stainless steel, installation per ESR-4266
Effective embedment depth:	$h_{ef,act}$ = 2.000 in., h_{nom} = 2.500 in.
Material:	AISI 316
Evaluation Service Report:	ESR-4266
Issued I Valid:	12/1/2023 | 12/1/2025
Proof:	Design Method ACI 318-19 / Mech
Stand-off installation:	e_b = 0.000 in. (no stand-off); t = 0.375 in.
Anchor plate[R]:	l_x x l_y x t = 8.000 in. x 8.000 in. x 0.375 in.; (Recommended plate thickness: not calculated)
Profile:	Square HSS (AISC), HSS3X3X.1875; (L x W x T) = 3.000 in. x 3.000 in. x 0.188 in.
Base material:	cracked concrete, 4000, f_c' = 4,000 psi; h = 8.000 in.
Installation:	**hammer drilled hole, Installation condition: Dry**
Reinforcement:	tension: not present, shear: not present; no supplemental splitting reinforcement present edge reinforcement: none or < No. 4 bar

[R] - The anchor calculation is based on a rigid anchor plate assumption.

Geometry [in.] & Loading [lb, in.lb]



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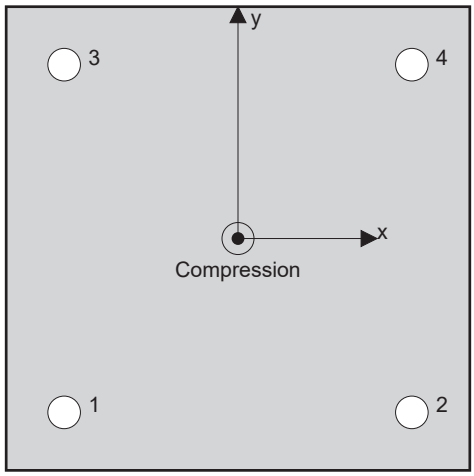
1.1 Design results

Case	Description	Forces [lb] / Moments [in.lb]	Seismic	Max. Util. Anchor [%]
1	Load case: Design loads	N = -50; V_x = 0; V_y = 286; M_x = 0; M_y = 0; M_z = 0;	no	8

2 Load case/Resulting anchor forces



Anchor reactions [lb]
Tension force: (+Tension, -Compression)

Anchor	Tension force	Shear force	Shear force x	Shear force y
1	0	72	0	72
2	0	72	0	72
3	0	72	0	72
4	0	72	0	72

max. concrete compressive strain:	0.00 [‰]
max. concrete compressive stress:	1 [psi]
resulting tension force in (x/y)=(-/-):	0 [lb]
resulting compression force in (x/y)=(0.000/0.000):	50 [lb]

Anchor forces are calculated based on the assumption of a rigid anchor plate.

3 Tension load

	Load N_{ua} [lb]	Capacity ϕ N_n [lb]	Utilization $\beta_N = N_{ua}/\phi$ N_n	Status
Steel Strength*	N/A	N/A	N/A	N/A
Pullout Strength*	N/A	N/A	N/A	N/A
Concrete Breakout Failure**	N/A	N/A	N/A	N/A

* highest loaded anchor **anchor group (anchors in tension)

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4 Shear load

	Load V_{ua} [lb]	Capacity ϕ V_n [lb]	Utilization $\beta_V = V_{ua}/\phi$ V_n	Status
Steel Strength*	72	5,426	2	OK
Steel failure (with lever arm)*	N/A	N/A	N/A	N/A
Pryout Strength**	286	8,515	4	OK
Concrete edge failure in direction y+**	286	3,706	8	OK

* highest loaded anchor **anchor group (relevant anchors)

4.1 Steel Strength

V_{sa} = ESR value refer to ICC-ES ESR-4266
ϕ $V_{steel} \geq V_{ua}$ ACI 318-19 Table 17.5.2

Variables

$A_{se,V}$ [in.^{2}]	f_{uta} [psi]
0.10	120,404

Calculations

V_{sa} [lb]
8,348

Results

V_{sa} [lb]	ϕ_{steel}	ϕ V_{sa} [lb]	V_{ua} [lb]
8,348	0.650	5,426	72

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4.2 Pryout Strength

$V_{cpg} = k_{cp} \left[\left(\frac{A_{Nc}}{A_{Nc0}} \right) \psi_{ec,N} \psi_{ed,N} \psi_{c,N} \psi_{cp,N} N_b \right]$ ACI 318-19 Eq. (17.7.3.1b)

$\phi V_{cpg} \geq V_{ua}$ ACI 318-19 Table 17.5.2

A_{Nc} see ACI 318-19, Section 17.6.2.1, Fig. R 17.6.2.1(b)

$A_{Nc0} = 9 h_{ef}^2$ ACI 318-19 Eq. (17.6.2.1.4)

$\psi_{ec,N} = \left(\frac{1}{1 + \frac{2 e'_N}{3 h_{ef}}} \right) \leq 1.0$ ACI 318-19 Eq. (17.6.2.3.1)

$\psi_{ed,N} = 0.7 + 0.3 \left(\frac{c_{a,min}}{1.5 h_{ef}} \right) \leq 1.0$ ACI 318-19 Eq. (17.6.2.4.1b)

$\psi_{cp,N} = MAX\left(\frac{c_{a,min}}{c_{ac}}, \frac{1.5 h_{ef}}{c_{ac}} \right) \leq 1.0$ ACI 318-19 Eq. (17.6.2.6.1b)

$N_b = k_c \lambda_a \sqrt{f'_c} h_{ef}^{1.5}$ ACI 318-19 Eq. (17.6.2.2.1)

Variables

k_{cp}	h_{ef} [in.]	$e_{c1,N}$ [in.]	$e_{c2,N}$ [in.]	$c_{a,min}$ [in.]
1	2.000	0.000	0.000	6.000

$\psi_{c,N}$	c_{ac} [in.]	k_c	λ_a	f'_c [psi]
1.000	5.500	17	1.000	4,000

Calculations

A_{Nc} [in.^{2}]	A_{Nc0} [in.^{2}]	$\psi_{ec1,N}$	$\psi_{ec2,N}$	$\psi_{ed,N}$	$\psi_{cp,N}$	N_b [lb]
144.00	36.00	1.000	1.000	1.000	1.000	3,041

Results

V_{cpg} [lb]	$\phi_{concrete}$	ϕV_{cpg} [lb]	V_{ua} [lb]
12,164	0.700	8,515	286

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4.3 Concrete edge failure in direction y+

$V_{cbg} = \left(\frac{A_{Vc}}{A_{Vc0}}\right) \psi_{ec,V} \psi_{ed,V} \psi_{c,V} \psi_{h,V} \psi_{parallel,V} V_b$ ACI 318-19 Eq. (17.7.2.1b)

$\phi V_{cbg} \geq V_{ua}$ ACI 318-19 Table 17.5.2

A_{Vc} see ACI 318-19, Section 17.7.2.1, Fig. R 17.7.2.1(b)

$A_{Vc0} = 4.5 c_{a1}^2$ ACI 318-19 Eq. (17.7.2.1.3)

$\psi_{ec,V} = \left(\frac{1}{1 + \frac{e'_v}{1.5c_{a1}}}\right) \leq 1.0$ ACI 318-19 Eq. (17.7.2.3.1)

$\psi_{ed,V} = 0.7 + 0.3\left(\frac{c_{a2}}{1.5c_{a1}}\right) \leq 1.0$ ACI 318-19 Eq. (17.7.2.4.1b)

$\psi_{h,V} = \sqrt{\frac{1.5c_{a1}}{h_a}} \geq 1.0$ ACI 318-19 Eq. (17.7.2.6.1)

$V_b = \left(7\left(\frac{l_e}{d_a}\right)^{0.2} \sqrt{d_a}\right) \lambda_a \sqrt{f'_c} c_{a1}^{1.5}$ ACI 318-19 Eq. (17.7.2.2.1a)

Variables

c_{a1} [in.]	c_{a2} [in.]	e_{cV} [in.]	$\psi_{c,V}$	h_a [in.]
5.333	6.000	0.000	1.000	8.000

l_e [in.]	λ_a	d_a [in.]	f'_c [psi]	$\psi_{parallel,V}$
2.000	1.000	0.500	4,000	1.000

Calculations

A_{Vc} [in.^{2}]	A_{Vc0} [in.^{2}]	$\psi_{ec,V}$	$\psi_{ed,V}$	$\psi_{h,V}$	V_b [lb]
144.00	128.00	1.000	0.925	1.000	5,088

Results

V_{cbg} [lb]	$\phi_{concrete}$	ϕV_{cbg} [lb]	V_{ua} [lb]
5,294	0.700	3,706	286

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5 Warnings

- The anchor design methods in PROFIS Engineering require rigid anchor plates per current regulations (AS 5216:2021, ETAG 001/Annex C, EOTA TR029 etc.). This means load re-distribution on the anchors due to elastic deformations of the anchor plate are not considered - the anchor plate is assumed to be sufficiently stiff, in order not to be deformed when subjected to the design loading. PROFIS Engineering calculates the minimum required anchor plate thickness with CBFEM to limit the stress of the anchor plate based on the assumptions explained above. The proof if the rigid anchor plate assumption is valid is not carried out by PROFIS Engineering. Input data and results must be checked for agreement with the existing conditions and for plausibility!
- Condition A applies where the potential concrete failure surfaces are crossed by supplementary reinforcement proportioned to tie the potential concrete failure prism into the structural member. Condition B applies where such supplementary reinforcement is not provided, or where pullout or pryout strength governs.
- Refer to the manufacturer's product literature for cleaning and installation instructions.
- For additional information about ACI 318 strength design provisions, please go to https://submittals.us.hilti.com/PROFISAnchorDesignGuide/
- Hilti post-installed anchors shall be installed in accordance with the Hilti Manufacturer's Printed Installation Instructions (MPII). Reference ACI 318-19, Section 26.7.

Fastening meets the design criteria!

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6 Installation data

Profile: Square HSS (AISC), HSS3X3X.1875; (L x W x T) = 3.000 in. x 3.000 in. x 0.188 in.

Hole diameter in the fixture: d_f = 0.562 in.

Plate thickness (input): 0.375 in.

Recommended plate thickness: not calculated

Drilling method: Hammer drilled

Cleaning: Manual cleaning of the drilled hole according to instructions for use is required.

Anchor type and diameter: Kwik Bolt TZ2 - SS 316 1/2 (2) hnom1

Item number: 2210264 KB-TZ2 1/2x3 3/4 SS316

Maximum installation torque: 481 in.lb

Hole diameter in the base material: 0.500 in.

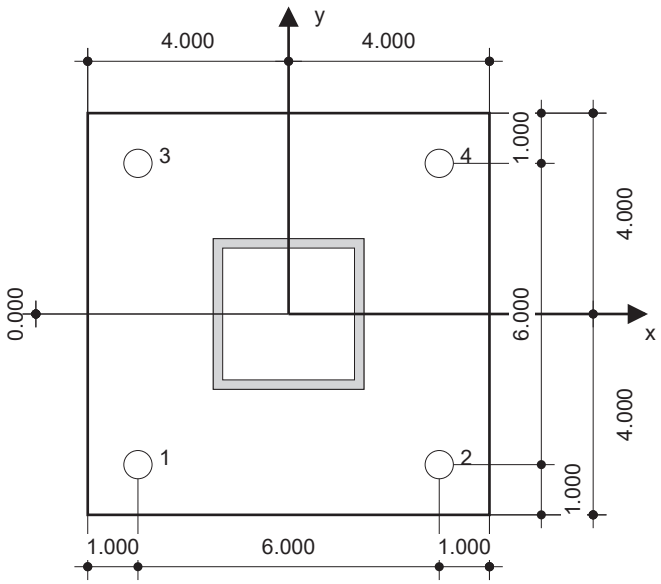
Hole depth in the base material: 2.750 in.

Minimum thickness of the base material: 4.000 in.

Hilti KB-TZ2 stud anchor with 2.5 in embedment, 1/2 (2) hnom1, Stainless steel, installation per ESR-4266

6.1 Recommended accessories

Drilling	Cleaning	Setting
• Suitable Rotary Hammer • Properly sized drill bit	• Manual blow-out pump	• Torque controlled cordless impact tool • Torque wrench • Hammer



Coordinates Anchor [in.]

Anchor	x	y	c_{-x}	c_{+x}	c_{-y}	c_{+y}
1	-3.000	-3.000	6.000	12.000	6.000	12.000
2	3.000	-3.000	12.000	6.000	6.000	12.000
3	-3.000	3.000	6.000	12.000	12.000	6.000
4	3.000	3.000	12.000	6.000	12.000	6.000

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7 Remarks; Your Cooperation Duties

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- You must take all necessary and reasonable steps to prevent or limit damage caused by the Software. In particular, you must arrange for the regular backup of programs and data and, if applicable, carry out the updates of the Software offered by Hilti on a regular basis. If you do not use the AutoUpdate function of the Software, you must ensure that you are using the current and thus up-to-date version of the Software in each case by carrying out manual updates via the Hilti Website. Hilti will not be liable for consequences, such as the recovery of lost or damaged data or programs, arising from a culpable breach of duty by you.

Design Codes:

2021 Virginia Uniform Statewide Building Code: (2021 VUSBC)
2021 Virginia Construction Code: Part I of the VUSBC (2021 VCC)
Handicapped Accessibility: 2010 ADA Standards for Accessible Design – 9/15/2010 (2010 ADA Standards) for the Prototype Bus Shelter and mounting floor slab.
o Accessibility Guidelines for Pedestrian Facilities in the Public Right of Way: Public Rights-of-Way Accessibility Guidelines – 7/26/2011 (PROWAG). Required for the site adaptation approaches to the Prototype Bus Shelter.
Per CPSM 4.2.2, including 4.2.2.8: accessible facilities must be provided at the completion of construction. Additionally, per CPSM 4.2.2.8; all areas and spaces normally occupied by employees or the public in state-owned buildings, individually or shared, shall be fully accessible.
Per CPSM, 2021, Rev 0-7/15/2021

Structural Design Data :

Roof Live Load, per VUSBC 1603.1.2; 20 psf
Floor Live Load, per VUSBC 1603.1.1; 100 psf
Ground Snow Load Data, per VUSBC 1603.1.3; 65 psf
Wind Design Data, per VUSBC 1603.1.4 – Wind Speed (mph); (Ultimate Wind Speed) 115 mph
Wind Exposure Category; C
Risk Category, per VUSBC 1604.5; II
Seismic Design Category B Seismic Site Class D
Soil bearing requirements 1500 psf
VUSBC Construction Type; IIB
(Use) Group(s) per VUSBC; U
Building Gross Floor Area 40 SF
Building Area (per VUSBC definition) 40 SF
Height of Building; 8 ft
Number of Stories; 1 Story
Wall Safety Glass, per E1300-12AE1, VCC 2404, and VCC 2015
Aluminum Structural Members, per Aluminum Design Manual ADM1-2015, VCC 2002, and VCC 2015

COMMONWEALTH OF VIRGINIA
RYAN McNABB
Lic. No. 0402062202
PROFESSIONAL ENGINEER

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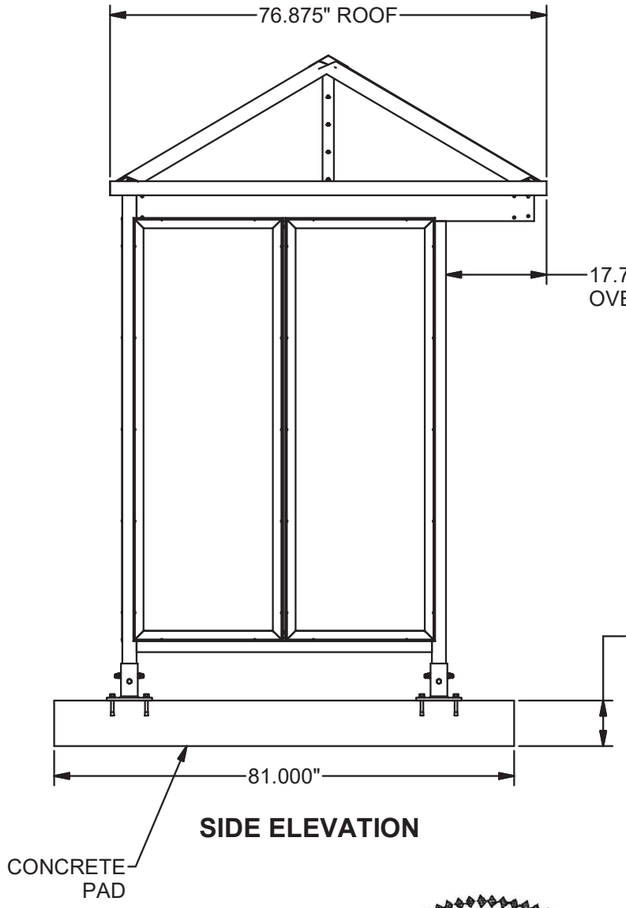
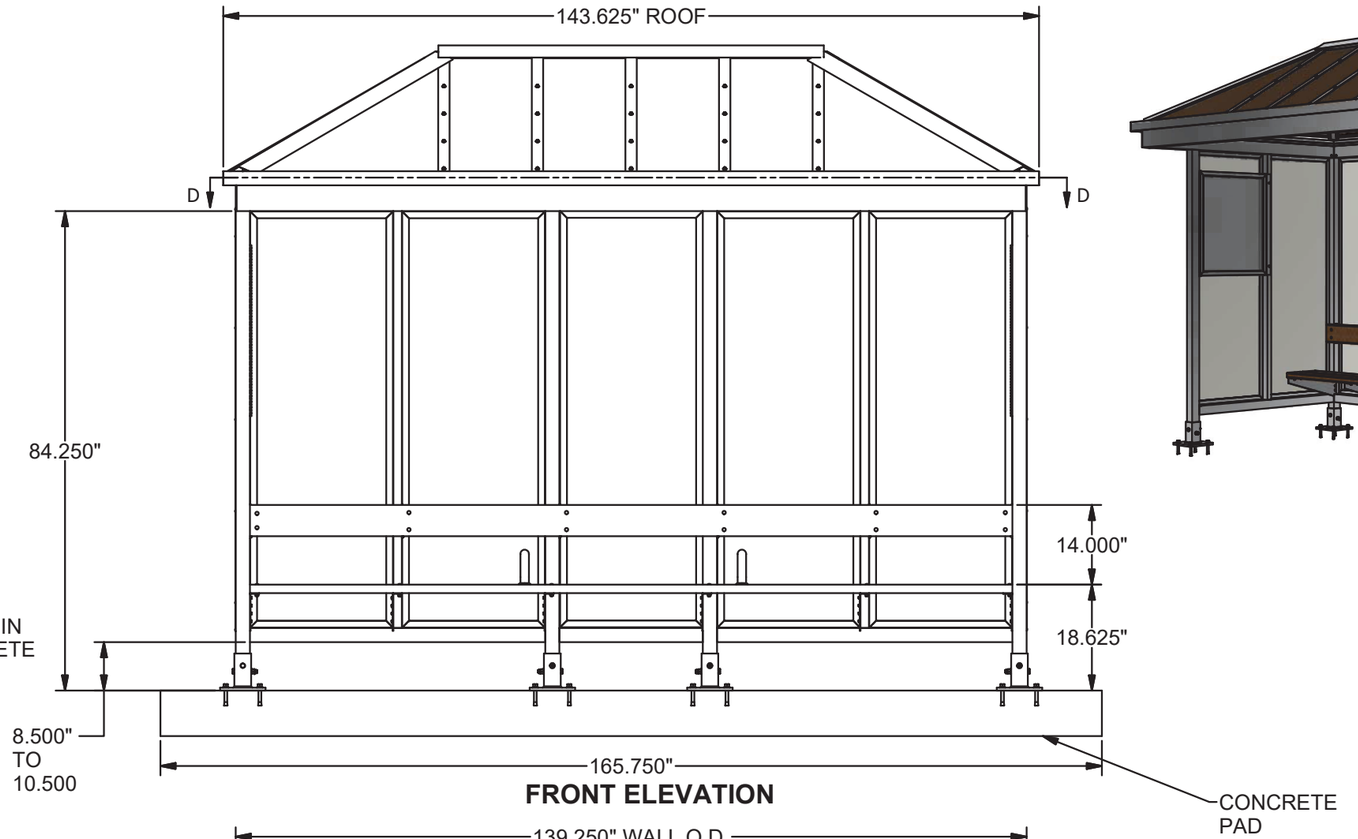
1–800–893–3665 WWW.BRASCO.COM

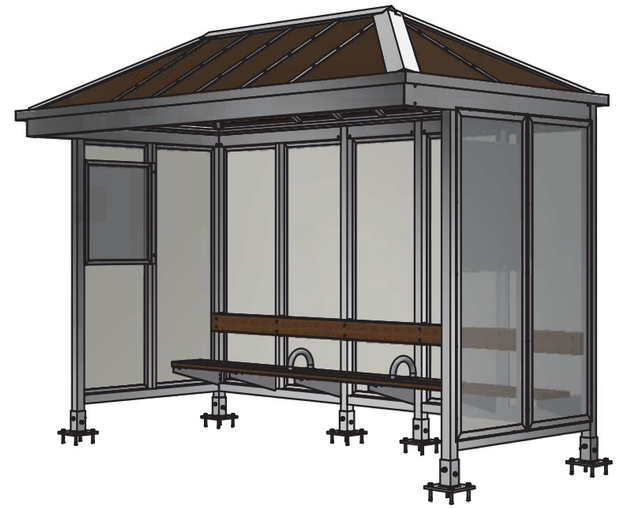
CUSTOMER:		DESIGNER:	CHECKER:
POTOMAC & RAPPAHANNOCK TRANSP		CMP	KY
PROJECT:		DATE:	DATE:
SLIMLINE SHELTER ASSEMBLY		08-07-24	08-07-24
MODEL:	JOB #	SHEET:	REVISION:
SL-0612-C-0-HI-PC-TG	7452	000	A

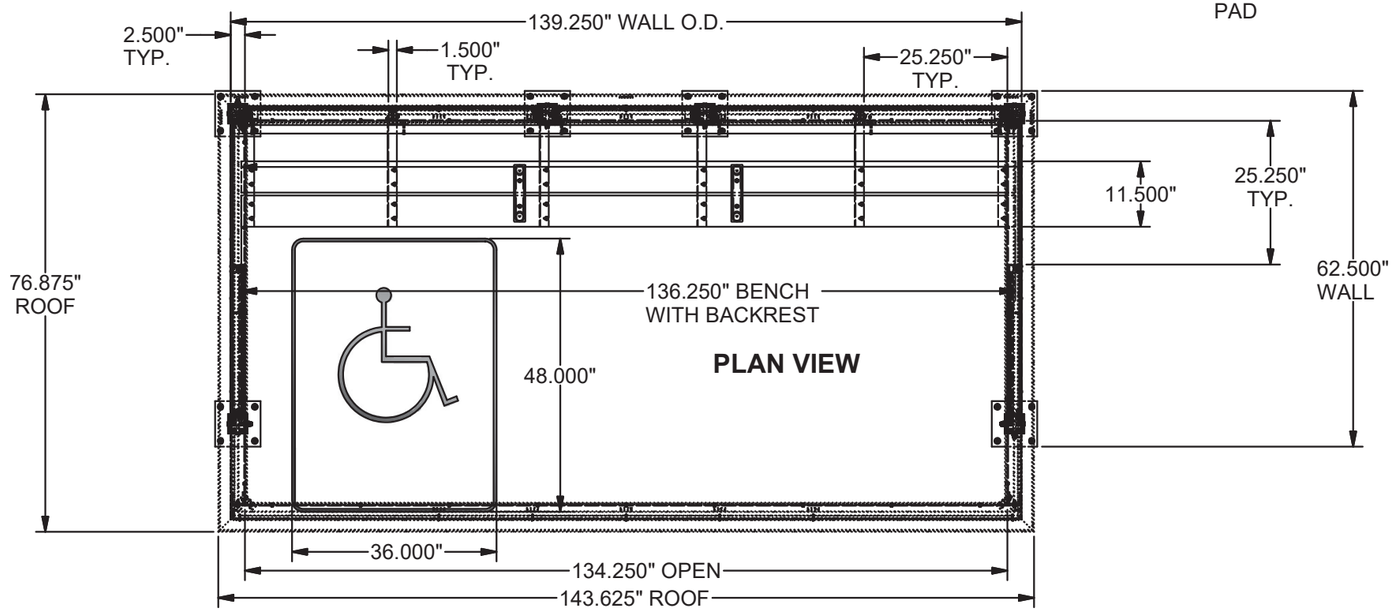


SIDE ELEVATION



FRONT ELEVATION





PLAN VIEW

COMMONWEALTH OF VIRGINIA
RYAN McNABB
Lic. No. 0402062202
PROFESSIONAL ENGINEER

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QUANTITY (3) SHELTERS THUS SPECIFICATIONS:

- DARK BRONZE ANODIZED ALUMINUM STRUCTURE
- 1/4" CLEAR POLYCARBONATE WALL PANELS
- STANDING SEAM HIP ROOF WITH INTEGRAL GUTTER SYSTEM
- HIP ROOF WITH BRONZE STRUCTURED POLYCARBONATE GLAZING AND 2 1/2" FASCIA WITH INTEGRAL GUTTER
- SOLAR LIGHTING PACKAGE WITH 90W SOLAR PANEL, BATTERIES, SOLAR CONTROLLER VENTED PLS BOX ENCLOSURE AND 5W LED LIGHT
- 12' WALL MOUNTED BENCH WITH HDPE BENCH SLATS AND BACK REST
- 24" X 30" SCHEDULE HOLDER

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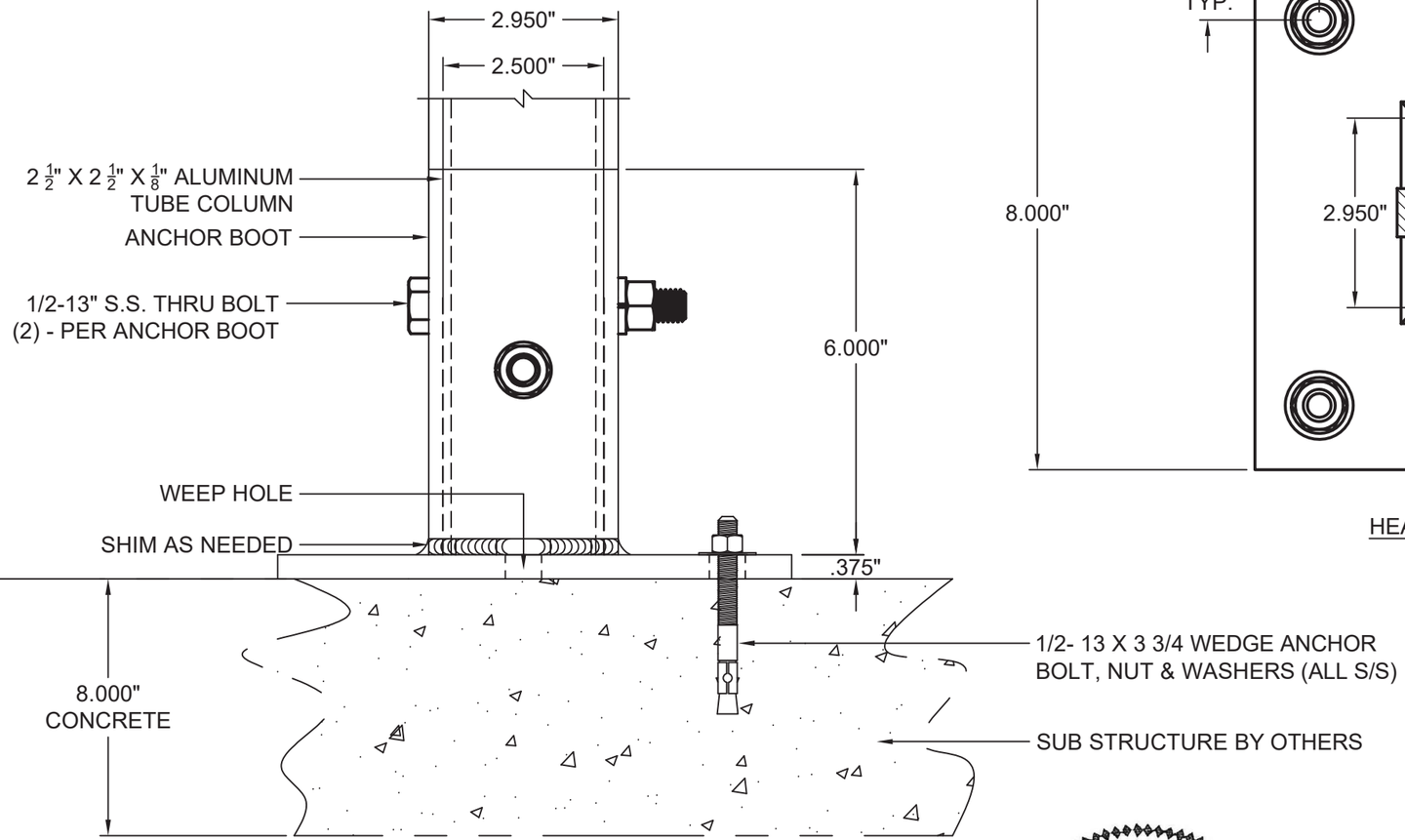
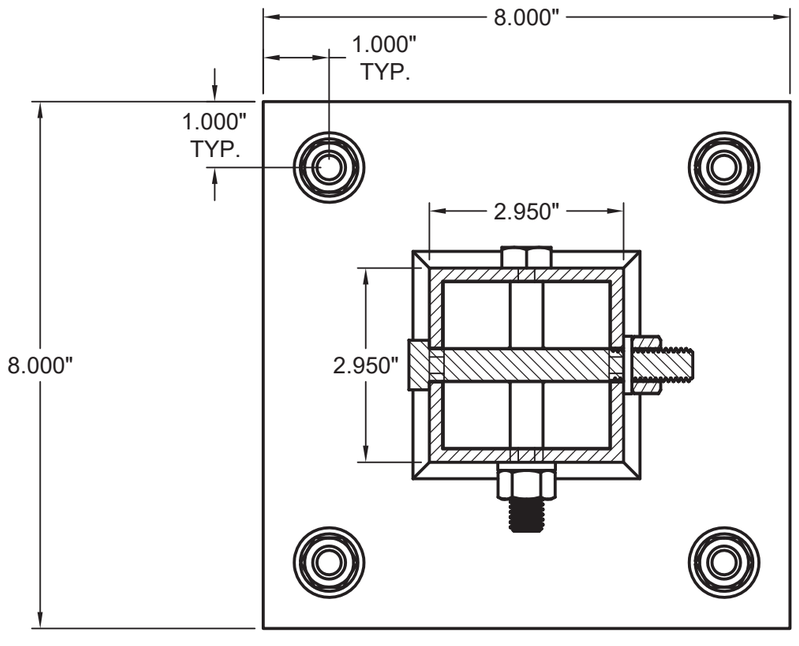
CUSTOMER:		DESIGNER:	CHECKER:
POTOMAC & RAPPAHANNOCK TRANSP		CMP	KY
PROJECT:		DATE:	DATE:
SLIMLINE SHELTER ASSEMBLY		08-07-24	08-07-24
MODEL:	JOB #	SHEET:	REVISION:
SL-0612-C-0-HI-PC-TG	7452	001	A





HEAVY ANCHOR BOOT

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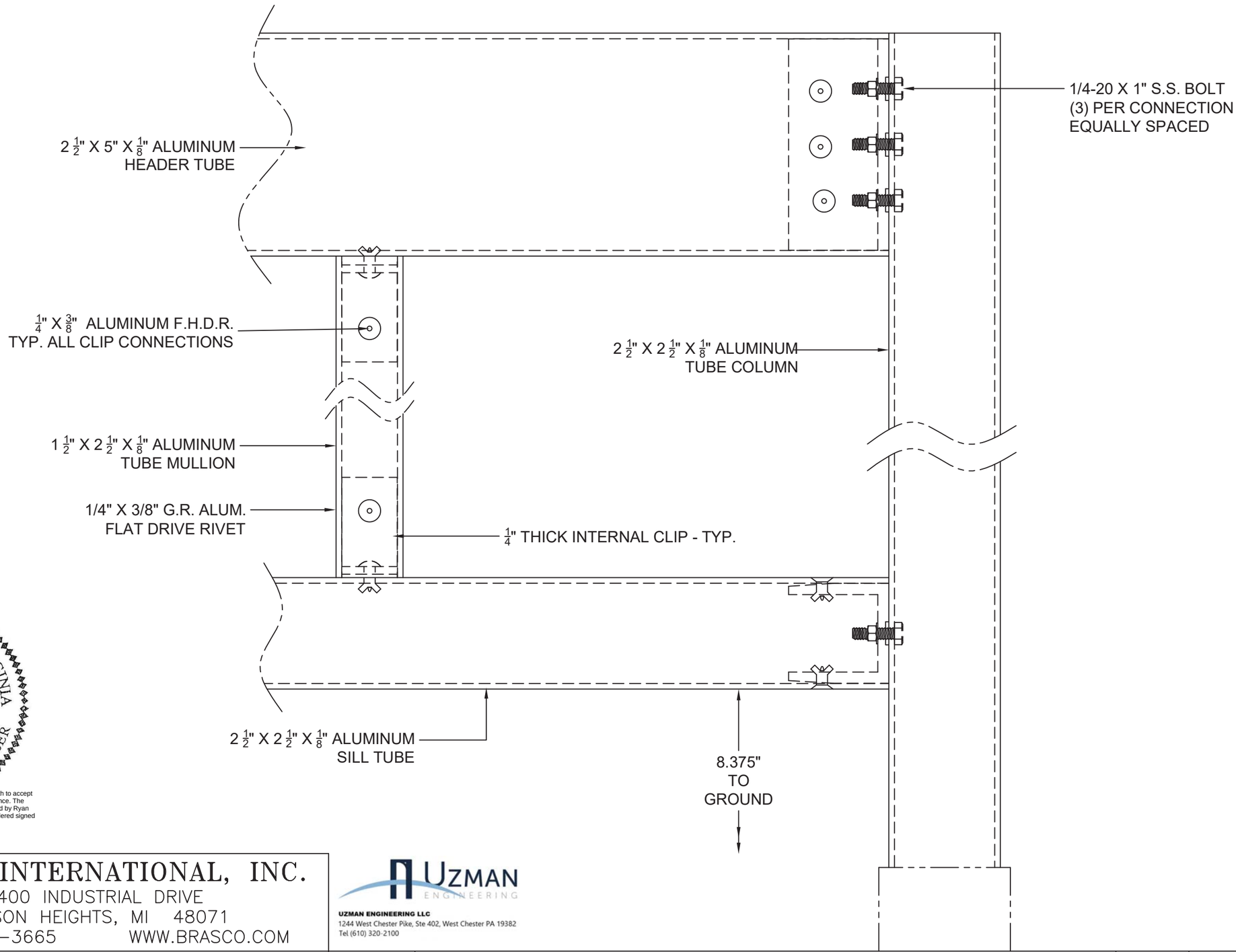
SIGNED:_____ DATE:_____

CUSTOMER:	BRASCO			ENGINEER:	CMP
PROJECT:	STANDARD ANCHOR BOOT DETAIL			DATE:	04-04-24
MODEL:	SLIMLINE SERIES	JOB #	7452	SHEET #:	002



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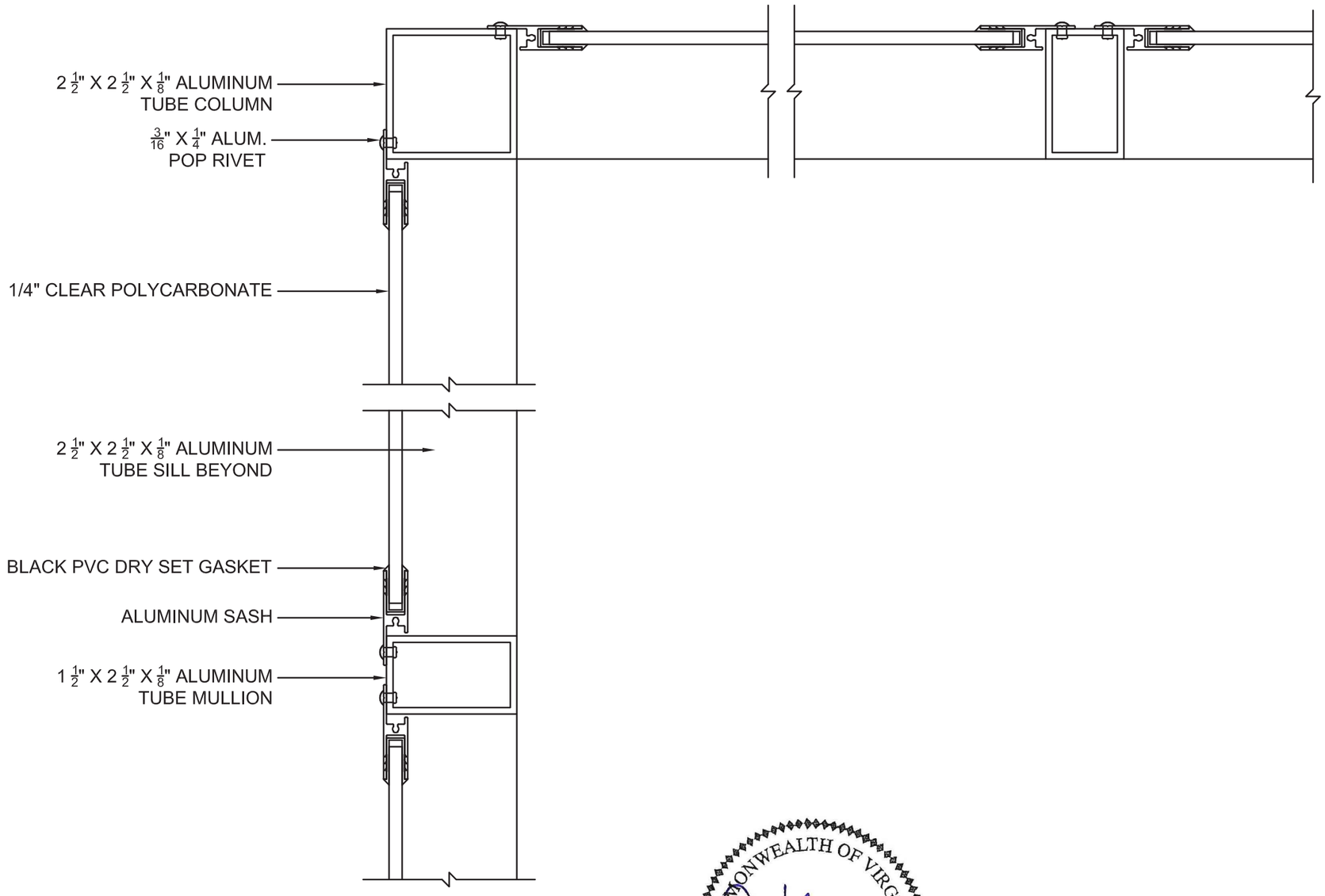
1244 West Chester Pike, Ste 402, West Chester PA 19382
Tel (610) 320-2100

CUSTOMER:	BRASCO			ENGINEER:	CMP
PROJECT:	STANDARD WALL CONNECTION DETAILS (5" HEADER)			DATE:	04-04-24
MODEL:	SLIMLINE SERIES	JOB #	7452	SHEET #:	003



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PROFESSIONAL ENGINEER

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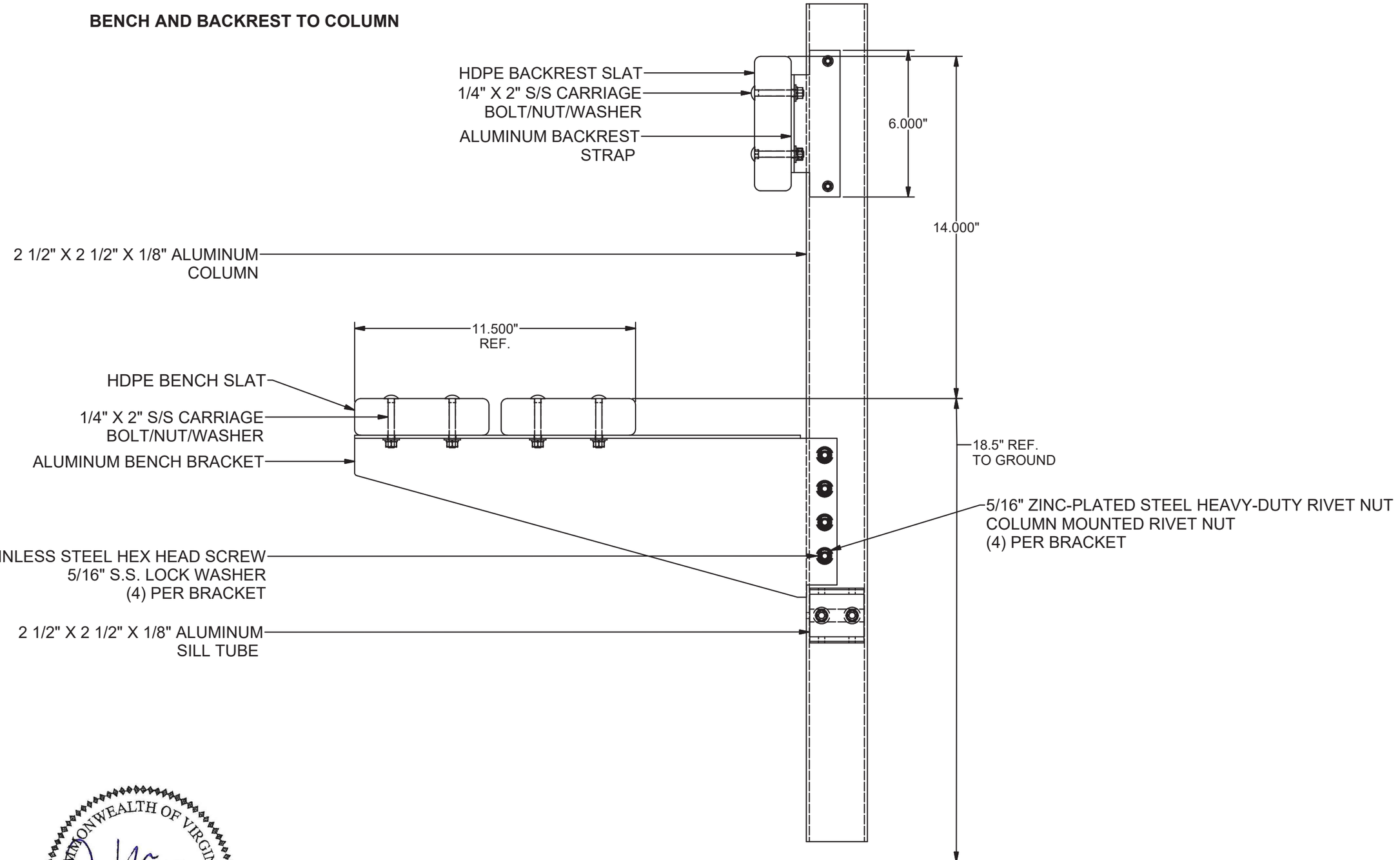
CUSTOMER:	BRASCO			ENGINEER:	CMP
PROJECT:	WINDOW GLAZING DETAILS - 1/4" GLASS - FACE MOUNT			DATE:	04-04-24
MODEL:	SLIMLINE SERIES	JOB #	7452	SHEET #:	004

BENCH AND BACKREST TO COLUMN



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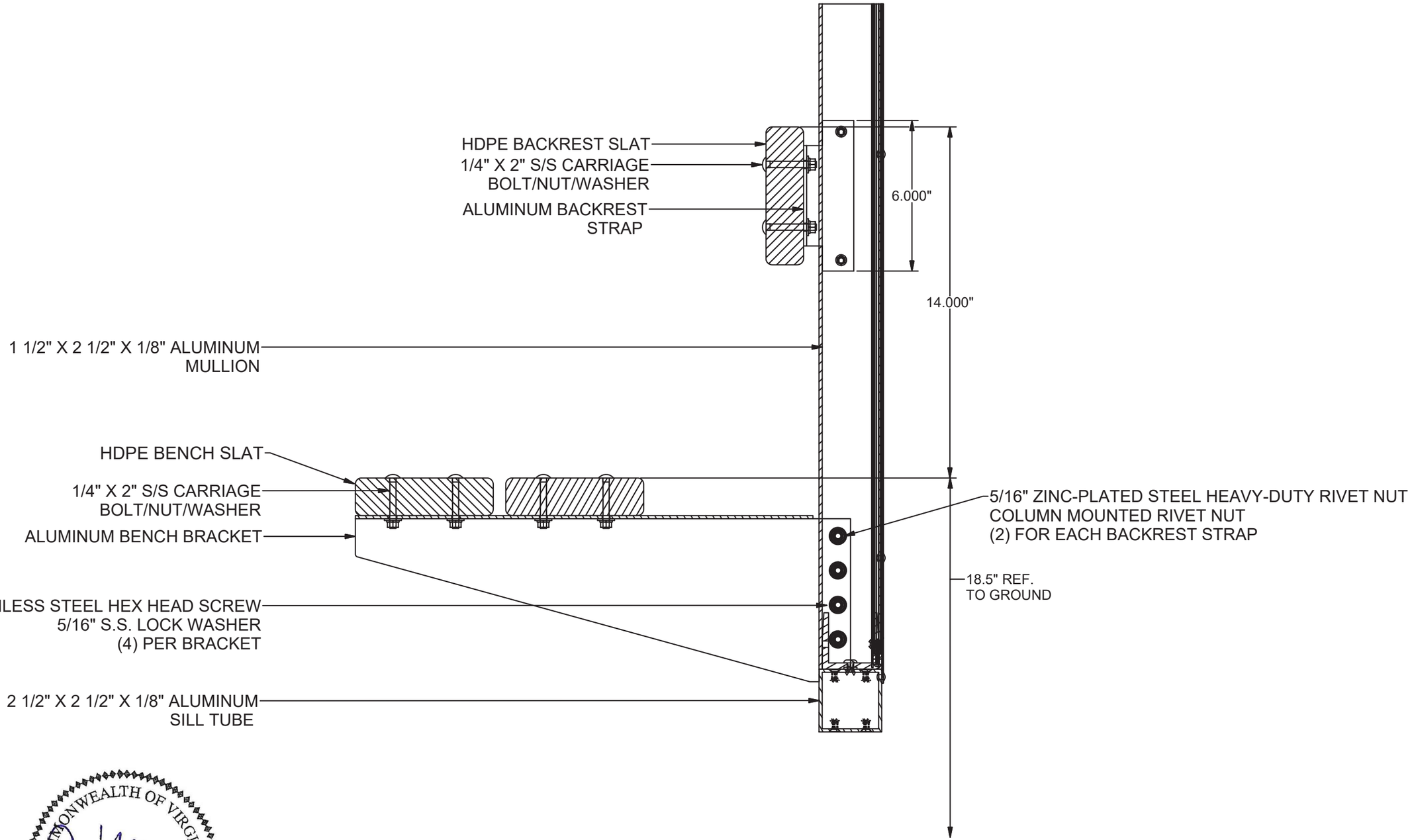
1-800-893-3665 WWW.BRASCO.COM

CUSTOMER:		DESIGNER:	CHECKER:
POTOMAC & RAPPAHANNOCK TRANSP.		CMP	KY
PROJECT:		DATE:	DATE:
SLIMLINE SHELTER		04-04-24	04-04-24
MODEL:	JOB # 7452	SHEET: 005	REVISION: A



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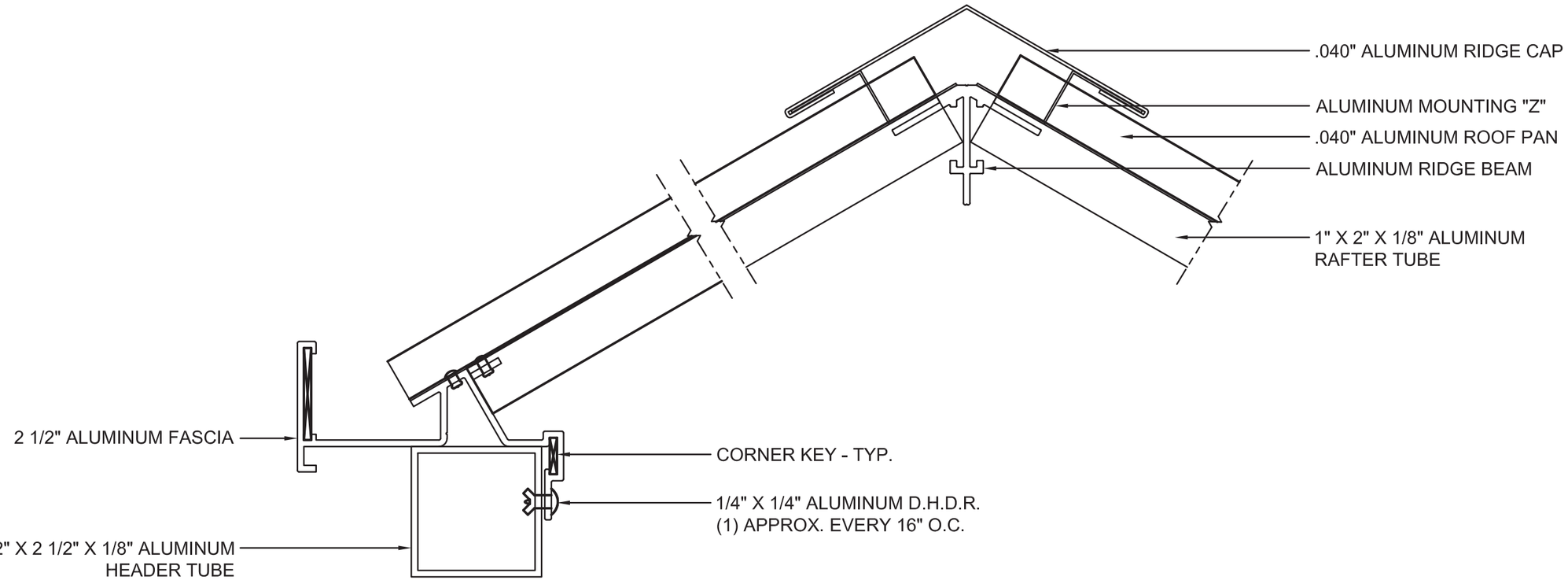
CUSTOMER:		DESIGNER:	CHECKER:
POTOMAC & RAPPAHANNOCK TRANSP.		CMP	KY
PROJECT:		DATE:	DATE:
SLIMLINE SHELTER		04-04-24	04-04-24
MODEL:	JOB # 7452	SHEET: 006	REVISION: A



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CUSTOMER:	BRASCO			ENGINEER:	CMP
				DATE:	04-04-24
PROJECT:	STANDING SEAM HIP ROOF DETAIL			CHECKER:	KY
				DATE:	04-04-24
MODEL:	SLIMLINE SERIES	JOB #	7452	SHEET #:	007

Attachment A4

Tentative Locations for Bus Stops, Bus Stops with Bus Shelters, and Bus Stops with Benches

All locations are tentative until approval is received from Prince William County and/or the Virginia Department of Transportation

Tentative Bus Stop Locations:

1. Minnieville Road (WB) near Smoketown Road
2. Prince William Parkway (EB) near Church Hill Drive
3. Gideon Drive (NB) near Dale Boulevard
4. Dumfries Road (EB) near Talon Drive
5. Dumfries Road (EB) near Van Buren Road

Tentative Bus Stop with Bus Shelter Locations:

1. Minnieville Road (EB) near Smoketown Road
2. Harbor Drive (EB) near Tackett's Mill Drive
3. Williamstown Drive (WB) near Richmond Highway
4. Dale Boulevard (WB) near Barksdale Street
5. Richmond Highway (SB) near Wayside Drive
6. Potomac Town… Festival
7. Dale Boulevard (EB) near Mapledale Avenue
8. Dale Boulevard (EB) near Cloverdale Road
9. Richmond Highway (NB) near Dumfries Road
10. Old Bridge Road(EB) near Wood Hollow Drive
11. Dale Boulevard (EB) at Orangewood Drive
12. Potomac Mills Road (NB) at Potomac Festival Shopping Center
13. 15941 Donald Curtis Drive (Ferlazzo Bldg)

Tentative Bus Stop with Bench Location:

1. Dale Boulevard (EB) near Opal

ATTACHMENT B
REVISED PRICING SCHEDULE
(BASE Year)

PRTC BUS STOP AND BUS SHELTER CONSTRUCTION SERVICES
PRICING SCHEDULE

Pricing shall be based on services outlined in the SOW.

NAME OF BIDDER OR CONTRACTOR:	SOLICITATION NUMBER:
	IFB No. 026-001

SCOPE OF WORK

The Potomac and Rappahannock Transportation Commission (PRTC) is seeking a contractor for site development and construction of various bus stop and bus shelter locations, throughout Prince William County, Town of Dumfries, and the Cities of Manassas and Manassas Park.

BASE YEAR

Contract Line Item No.	Task Description	Unit/Est. Qty	Rate per Bus Stop	Rate per Bus Shelter	Total Cost
001	Mobilization	12			
002	Project Management & Progress Reporting	12			
003	Concrete Testing	12			
004	As-Builts and Close Out Documentation	12			
005	Cast in Place Bus Pad	12			
006	Cast in Place Bus Pad with Bus Shelter Pad	12			
007	Retaining Wall - ***Pricing by Cubic Yard (CY)***	CY			
008	Demo to include Remove/Dispose of Existing Bus Shelters, Amenities, Concrete, etc.	12			
009	Install Bus Shelter and Amenities	12			
				Base Year Total	

Printed Name of Authorized Official: _____

Signature of Authorized Official: _____

Title of Authorized Official: _____

Date: _____

ATTACHMENT B (continued)
REVISED PRICING SCHEDULE
(Option Year 1)

PRTC BUS STOP AND BUS SHELTER CONSTRUCTION SERVICES
PRICING SCHEDULE

Pricing shall be based on services outlined in the SOW.

NAME OF BIDDER OR CONTRACTOR:	SOLICITATION NUMBER:
	IFB No. 026-001

SCOPE OF WORK

The Potomac and Rappahannock Transportation Commission (PRTC) is seeking a contractor for site development and construction of various bus stop and bus shelter locations, throughout Prince William County, Town of Dumfries, and the Cities of Manassas and Manassas Park.

OPTION YEAR 1

Contract Line Item No.	Task Description	Unit/Est. Qty	Rate per Bus Stop	Rate per Bus Shelter	Total Cost
001	Mobilization	12			
002	Project Management & Progress Reporting	12			
003	Concrete Testing	12			
004	As-Builts and Close Out Documentation	12			
005	Cast in Place Bus Pad	12			
006	Cast in Place Bus Pad with Bus Shelter Pad	12			
007	Retaining Wall - ***Pricing by Cubic Yard (CY)***	CY			
008	Demo to include Remove/Dispose of Existing Bus Shelters, Amenities, Concrete, etc.	12			
009	Install Bus Shelter and Amenities	12			
				Option Year 1 Total	

Printed Name of Authorized Official: _____

Signature of Authorized Official: _____

Title of Authorized Official: _____

Date: _____

ATTACHMENT B (continued)
REVISED PRICING SCHEDULE
(Option Year 2)

PRTC BUS STOP AND BUS SHELTER CONSTRUCTION SERVICES
PRICING SCHEDULE

Pricing shall be based on services outlined in the SOW.

NAME OF BIDDER OR CONTRACTOR:	SOLICITATION NUMBER:
	IFB No. 026-001

SCOPE OF WORK

The Potomac and Rappahannock Transportation Commission (PRTC) is seeking a contractor for site development and construction of various bus stop and bus shelter locations, throughout Prince William County, Town of Dumfries, and the Cities of Manassas and Manassas Park.

OPTION YEAR 2

Contract Line Item No.	Task Description	Unit/Est. Qty	Rate per Bus Stop	Rate per Bus Shelter	Total Cost
001	Mobilization	12			
002	Project Management & Progress Reporting	12			
003	Concrete Testing	12			
004	As-Builts and Close Out Documentation	12			
005	Cast in Place Bus Pad	12			
006	Cast in Place Bus Pad with Bus Shelter Pad	12			
007	Retaining Wall - ***Pricing by Cubic Yard (CY)***	CY			
008	Demo to include Remove/Dispose of Existing Bus Shelters, Amenities, Concrete, etc.	12			
009	Install Bus Shelter and Amenities	12			
				Option Year 2 Total	

Printed Name of Authorized Official: _____

Signature of Authorized Official: _____

Title of Authorized Official: _____

Date: _____

ATTACHMENT B (continued)
REVISED PRICING SCHEDULE
(Option Year 3)

PRTC BUS STOP AND BUS SHELTER CONSTRUCTION SERVICES
PRICING SCHEDULE

Pricing shall be based on services outlined in the SOW.

NAME OF BIDDER OR CONTRACTOR:	SOLICITATION NUMBER:
	IFB No. 026-001

SCOPE OF WORK

The Potomac and Rappahannock Transportation Commission (PRTC) is seeking a contractor for site development and construction of various bus stop and bus shelter locations, throughout Prince William County, Town of Dumfries, and the Cities of Manassas and Manassas Park.

Option Year 3

Contract Line Item No.	Task Description	Unit/Est. Qty	Rate per Bus Stop	Rate per Bus Shelter	Total Cost
001	Mobilization	12			
002	Project Management & Progress Reporting	12			
003	Concrete Testing	12			
004	As-Builts and Close Out Documentation	12			
005	Cast in Place Bus Pad	12			
006	Cast in Place Bus Pad with Bus Shelter Pad	12			
007	Retaining Wall - ***Pricing by Cubic Yard (CY)***	CY			
008	Demo to include Remove/Dispose of Existing Bus Shelters, Amenities, Concrete, etc.	12			
009	Install Bus Shelter and Amenities	12			
				Option Year 3 Total	

Printed Name of Authorized Official: _____

Signature of Authorized Official: _____

Title of Authorized Official: _____

Date: _____

ATTACHMENT B (continued)
REVISED PRICING SCHEDULE
(Option Year 4)

PRTC BUS STOP AND BUS SHELTER CONSTRUCTION SERVICES
PRICING SCHEDULE

Pricing shall be based on services outlined in the SOW.

NAME OF BIDDER OR CONTRACTOR:	SOLICITATION NUMBER:
	IFB No. 026-001

SCOPE OF WORK

The Potomac and Rappahannock Transportation Commission (PRTC) is seeking a contractor for site development and construction of various bus stop and bus shelter locations, throughout Prince William County, Town of Dumfries, and the Cities of Manassas and Manassas Park.

Option Year 4

Contract Line Item No.	Task Description	Unit/Est. Qty	Rate per Bus Stop	Rate per Bus Shelter	Total Cost
001	Mobilization	12			
002	Project Management & Progress Reporting	12			
003	Concrete Testing	12			
004	As-Builts and Close Out Documentation	12			
005	Cast in Place Bus Pad	12			
006	Cast in Place Bus Pad with Bus Shelter Pad	12			
007	Retaining Wall - ***Pricing by Cubic Yard (CY)***	CY			
008	Demo to include Remove/Dispose of Existing Bus Shelters, Amenities, Concrete, etc.	12			
009	Install Bus Shelter and Amenities	12			
				Option Year 4 Total	

Printed Name of Authorized Official: _____

Signature of Authorized Official: _____

Title of Authorized Official: _____

Date: _____