



APPLICATION FOR PREAPPROVAL SPECIAL SEISMIC CERTIFICATION OF EQUIPMENT AND COMPONENTS

For Office Use Only

APPLICATION NO.
OSP – 0301 – 10

Check whether application is: NEW RENEWAL

1.0	Haakon Industries, Ltd. <i>Manufacturer</i>	Wade Gomer <i>Manufacturer's Technical Representative</i>
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11851 Dyke Road, Richmond, BC V7A4X8
Mailing Address

604.273.0161
Telephone

wade@haakon.com
E-mail Address

2.0	Custom Air Handling Units <i>Product Name</i>	Air Handling Unit <i>Product Type</i>
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Various (See Attachment)

Product model No (List all unique product identification numbers and/or serial numbers)

General Description:

Air handling unit cabinets w/ internal & external components as outlined in Attachment A.
**Modifications made to test units before/during test and modifications made to address anomalies observed during test shall be incorporated into the production units.*

3.0	Tobolski Watkins Engineering, Inc. <i>Applicant Company Name</i>	Matthew J. Tobolski, Ph.D., S.E. <i>Contact Person</i>
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9246 Lightwave Avenue, San Diego, CA 92123
Mailing Address

858.381.5843
Telephone

mtobolski@tobolskiwatkins.com
E-mail Address

I hereby agree to reimburse the Office of Statewide Health Planning and Development for the actual costs incurred by the department for review.

Signature of Applicant

10/08/12
Date

President & CEO
Title

Tobolski Watkins Engineering, Inc.
Company Name



4.0 Registered Design Professional Preparing the Report

Tobolski Watkins Engineering Inc.

Company Name

Daniel A. Junker, P.E.

Contact Name

C 78406

California License Number

9246 Lightwave Avenue, San Diego, CA 92123

Mailing Address

858.381.5843

Telephone

djunker@tobolskiwatkins.com

E-mail Address

5.0 California Licensed Structural Engineer Review and Acceptance of the Report

Tobolski Watkins Engineering Inc.

Company Name

Matthew J Tobolski, Ph.D., S.E.

Contact Name

S 5648

California License Number

9246 Lightwave Avenue, San Diego, CA 92123

Mailing Address

858.381.5843

Telephone

mtobolski@tobolskiwatkins.com

E-mail Address

6.0 Anchorage Pre-Approval

Anchorage is pre-approved under OPA-
(Separate application for anchorage pre-approval is required)

Anchorage is not Pre-approved

7.0 Certification Method

Testing in accordance with: ICC-ES AC-156 Other (Please Specify):

Analysis

Experience data

Combination of Testing, Analysis, and/or Experience Data (Please Specify):

8.0 Testing Laboratory (if applicable)

Environmental Testing Laboratory, Inc.

Company Name

Paul E. Little

Contact Name

11034 Indian Trail, Dallas, TX 75229

Mailing Address

972.247.9657

Telephone

info@etldallas.com

E-mail:



9.0 Approval Parameters

Design in accordance with ASCE 7-05 Chapter 13: Yes No

- Design Basis of Equipment or Components (F_p/W_p) = **1.87**
- S_{DS} (Spectral response acceleration at short period) = **2.5g**
- a_p (In-structure equipment or component amplification factor) = **2.5**
- R_p (Equipment or component response modification factor) = **6.0**
- I_p (Importance factor) = **1.5**
- z/h (Height factor ratio) = **1.0**
- Equipment or Component fundamental period(s) = **[See Attachment]**
- Building period limits (if any) = **None**
- Overall dimensions and weight (or range thereof) = **[See Attachment]**

Equipment or Components @ grade designed in accordance with ASCE 7-05 Chapter 15: Yes No

- Design Basis of Equipment or Components (V/W) =
- S_{DS} (Spectral response acceleration at short period) =
- S_1 (Spectral response acceleration at 1 second period) =
- R (Response modification coefficient) = **1.0**
- Ω_0 (System overstrength factor) = **1.0**
- C_d (Deflection amplification factor) = **1.0**
- I_p (Importance factor) = **1.5**
- Height to Center of Gravity above base =
- Equipment or Component fundamental period(s) = Sec
- Overall dimensions and weight (or range thereof) =

Tank(s) designed in accordance with ASME BPVC, 2007: Yes No

10.0 List of attachments supporting the special seismic certification of equipment or components:

- Test Report Drawings Manufacturer's Catalog
- Calculations Others (Please Specify): **Attachment A**

11.0 OSHPD Approval (For Office Use Only)


 Signature & Date
Timothy J. Piland, SSE
 Name & Title

August 1, 2013

December 31, 2019

Approval Expiration Date

S_{DS} (g) = 2.5 z/h = 1.0
 Special Seismic Certification Valid Up to

Condition of Approval (if any):



Special Seismic Certification UUT Summary Sheet

TWEI Project No.: 2010-0075-CO-001

Manufacturer: Haakon Industries, Ltd.

Model Line: Custom Air Handling Units

UUT	Unit Description	Report Number	Location	S _{DS}	z/h	I _p
1	AHU Cabinet (0 Walls Removed)*	12346, Rev.0	ETL	2.5	1.0	1.5
2	AHU Cabinet (0, 1, then 2 Walls Removed)*	12346, Rev.0	ETL	2.5	1.0	1.5
3	AHU Cabinet (0, 1, then 2 Walls Removed)*	12346, Rev.0	ETL	2.5	1.0	1.5
4	AHU Cabinet (0 Walls Removed)*	12346, Rev.0	ETL	2.5	1.0	1.5
5	Fan Skid	12346, Rev.0	ETL	2.5	1.0	1.5
6	Fan Skid	12346, Rev.0	ETL	2.5	1.0	1.5
7	Fan Skid	12346, Rev.0	ETL	2.5	1.0	1.5
8	Fan Skid	12346, Rev.0	ETL	2.5	1.0	1.5
9	AHU Cabinet (2 Walls Removed)*	12346, Rev.0	ETL	2.5	1.0	1.5
10						
11						
12						
13						
14						
15						
16						
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19						
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21						
22						
23						
24						
25						
26						

* Note: Wall removal certifies units for use in configurations shown in the attached drawings. The removed walls are the inlet and outlet walls.

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UUT – 1

**UNIT UNDER TEST (UUT)
Summary Sheet**

TWEI Project No.: 2010-0075-CO-001

Manufacturer: Haakon Industries, Ltd.

Model Line: Custom Air Handling Units

Model Number: Test Prototype

Product Construction Summary:
 Tested with four (4) walls in place.
 2" 16 ga SS casing. 20, 22, 18 ga SS standard and thermal/washdown liners. 3-lb insulation. 10, 12 ga SS floor liner. CS C4x5.4 base rail.

Subcomponent Summary:
 Model 122 EPQN fan (2" spring isolators), 24x60 cooling coil, 36" sound attenuator, three inlet hoods, 60x60 Tamco/Ebtron inlet damper.
 Please refer to Product Matrix for component details.

UUT Properties

Weight (lb)	Dimensions (in)			Lowest Natural Frequency (Hz)		
	Depth	Width	Height	Front-Back	Side-Side	Vertical
5,440	96.0	96.0	96.0	7.2	8.1	4.7

UUT Highest Passed Seismic Run Information

Building Code	Test Criteria	S _{DS}	z/h	I _p	A _{FLX-H}	A _{RIG-H}	A _{FLX-V}	A _{RIG-V}
CBC 2010	ICC-ES AC 156	2.5	1.0	1.5	4.0	3.0	1.67	0.67

Test Mounting Details:



Unit mounted to test fixture using ten (10) grade 5 3/4" diameter hex head bolts.

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UUT – 2

UNIT UNDER TEST (UUT) Summary Sheet

TWEI Project No.: 2010-0075-CO-001

Manufacturer: Haakon Industries, Ltd.

Model Line: Custom Air Handling Units

Model Number: Test Prototype

Product Construction Summary:

Tested with four (4), three (3), and two (2) walls in place. Inlet and outlet walls are removed, CS bracing added (see bracing dwg). 4" 16 ga CS casing. 22, 20, 18 ga standard and washdown/thermal GS liners. 22, 20 ga washdown/thermal SS liners. 18 ga washdown/thermal AL liners. 3-lb insulation. 0.1875" & 0.125" AL checkerplate floor liner. 14 ga CS floor liner. 12ga & 0.125" CS checkerplate. CS C8x11.5 base rail.

Subcomponent Summary:

48x48 Ultra Tek Damper. 12x12, 48x48 TA Morrison Damper. (3) 12x12, 46x46, 48x50, 48x48 Greenheck Damper. 47x48 Haakon storm louver. 48x50 Haakon standard louver. Dri-Steem & Nortec steam humidifiers. (4) Stack model 122 MPQN fans. (2) Stack model 365 MPQN fans (2" spring isolators – upgraded to seismic grade isolators after initial isolator fail). 2kW heater. Nema-3R enclosure. Please refer to Product Matrix for component details.

UUT Properties

Weight (lb)	Dimensions (in)			Lowest Natural Frequency (Hz)		
	Depth	Width	Height	Front-Back	Side-Side	Vertical
13,100	115.0	144.5	156.0	4.1	1.7	1.7

UUT Highest Passed Seismic Run Information

Building Code	Test Criteria	S _{DS}	z/h	I _p	A _{FLX-H}	A _{RIG-H}	A _{FLX-V}	A _{RIG-V}
CBC 2010	ICC-ES AC 156	2.5	1.0	1.5	4.0	3.0	1.67	0.67

Test Mounting Details:

TA Morrison damper

Ultratech damper

Haakon storm, Greenheck damper



TA Morrison, Greenheck dampers

Greenheck damper

Haakon standard, Greenheck smoke

Unit mounted to test fixture using ten (10) grade 5 3/4" diameter hex head bolts.

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**UNIT UNDER TEST (UUT)
Summary Sheet**

TWEI Project No.: 2010-0075-CO-001

Manufacturer: Haakon Industries, Ltd.

Model Line: Custom Air Handling Units

Model Number: Test Prototype

Product Construction Summary:

Tested with four (4), three (3), and two (2) walls in place. Inlet and outlet walls are removed, longitudinal CS & AL bracing added in place of removed walls (see bracing dwg).
2" 12 ga AL casing. 22, 20, 18 ga standard and washdown/thermal GS liner. 22, 20, 18 ga washdown/thermal SS liner. 18 ga standard and washdown/thermal AL liner. 6-lb insulation. 14 ga steel floor liner. 0.1875, 0.125" AL checkerplate. 12 ga, 0.125" CS checkerplate. CS C12x20.7 base rail.

Subcomponent Summary:

Angled, Type 8, HEPA filter racks. 84" sound attenuator. 18, 24, 30, 36, & 42" UV lights. (6) 42"x110" cooling coils. 60" stratification eliminators. 60" bellmouth transition. Nema-1 enclosure.
Please refer to Product Matrix for component details.

UUT Properties

Weight (lb)	Dimensions (in)			Lowest Natural Frequency (Hz)		
	Depth	Width	Height	Front-Back	Side-Side	Vertical
13,100	120.0	240.0	156.0	11.6	9.3	6.9

UUT Highest Passed Seismic Run Information

Building Code	Test Criteria	S _{DS}	z/h	I _p	A _{FLX-H}	A _{RIG-H}	A _{FLX-V}	A _{RIG-V}
CBC 2010	ICC-ES AC 156	2.5	1.0	1.5	4.0	3.0	1.67	0.67

Test Mounting Details:



Unit mounted to test fixture using ten (10) grade 5 3/4" diameter hex head bolts.

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**UNIT UNDER TEST (UUT)
Summary Sheet**

TWEI Project No.: 2010-0075-CO-001

Manufacturer: Haakon Industries, Ltd.

Model Line: Custom Air Handling Units

Model Number: Test Prototype

Product Construction Summary:

Tested with four (4) walls in place.
2" 16 ga CS casing. CS C6x8.2 base rail.

Subcomponent Summary:

(3) EPQN model 122 fans (1" spring isolators). (2) EPFN model 402 fans (2" spring isolators). Nema-3R enclosure.
Please refer to Product Matrix for component details.

UUT Properties

Weight (lb)	Dimensions (in)			Lowest Natural Frequency (Hz)		
	Depth	Width	Height	Front-Back	Side-Side	Vertical
13,810	118.0	120.0	144.0	6.0	2.5	3.2

UUT Highest Passed Seismic Run Information

Building Code	Test Criteria	S _{DS}	z/h	I _p	A _{FLX-H}	A _{RIG-H}	A _{FLX-V}	A _{RIG-V}
CBC 2010	ICC-ES AC 156	2.5	1.0	1.5	4.0	3.0	1.67	0.67

Test Mounting Details:



Unit mounted to test fixture using ten (10) grade 5 3/4" diameter hex head bolts.

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UNIT UNDER TEST (UUT) Summary Sheet

TWEI Project No.: 2010-0075-CO-001

Manufacturer: Haakon Industries, Ltd.

Model Line: Custom Air Handling Units

Model Number: Test Prototype

Product Construction Summary:

Subcomponent Summary:

EPF model 122 fan. BC SWSI model 122 fan. BC SWSI model 600 fan. EPQN model 122 (vertical) fan. (all 2" spring isolators)
Please refer to Product Matrix for component details.

UUT Properties

Weight (lb)	Dimensions (in)			Lowest Natural Frequency (Hz)		
	Depth	Width	Height	Front-Back	Side-Side	Vertical
6,540	141.0	110.0	140.0	5.7	1.9	2.5

UUT Highest Passed Seismic Run Information

Building Code	Test Criteria	S _{Ds}	z/h	I _p	A _{FLX-H}	A _{RIG-H}	A _{FLX-V}	A _{RIG-V}
CBC 2010	ICC-ES AC 156	2.5	1.0	1.5	4.0	3.0	1.67	0.67

Test Mounting Details:



Unit mounted to test fixture using ten (10) grade 5 3/4" diameter hex head bolts.

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**UNIT UNDER TEST (UUT)
Summary Sheet**

TWEI Project No.: 2010-0075-CO-001

Manufacturer: Haakon Industries, Ltd.

Model Line: Custom Air Handling Units

Model Number: Test Prototype

Product Construction Summary:

Subcomponent Summary:
EPQ model 660 fan (4" spring isolators).
Please refer to Product Matrix for component details.

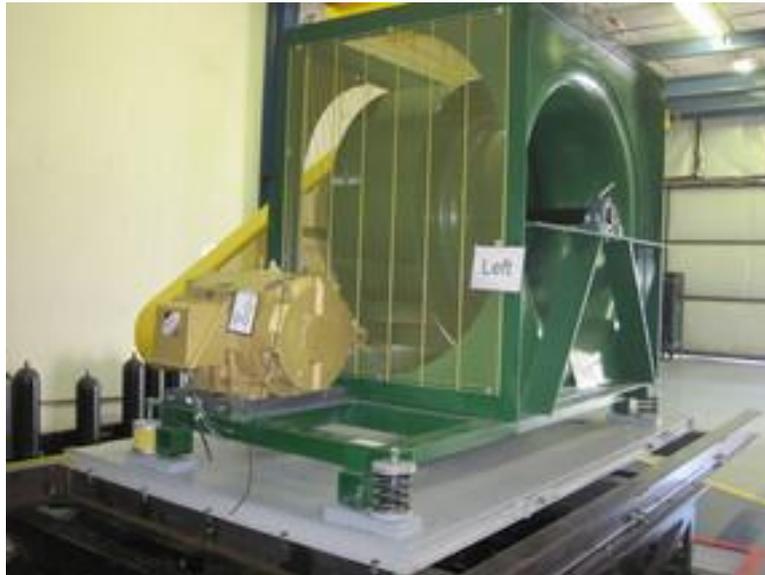
UUT Properties

Weight (lb)	Dimensions (in)			Lowest Natural Frequency (Hz)		
	Depth	Width	Height	Front-Back	Side-Side	Vertical
5,910	84.0	146.0	135.0	3.9	2.6	1.8

UUT Highest Passed Seismic Run Information

Building Code	Test Criteria	S _{DS}	z/h	I _p	A _{FLX-H}	A _{RIG-H}	A _{FLX-V}	A _{RIG-V}
CBC 2010	ICC-ES AC 156	2.5	1.0	1.5	4.0	3.0	1.67	0.67

Test Mounting Details:



Unit mounted to test fixture using ten (10) grade 5 3/4" diameter hex head bolts.

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**UNIT UNDER TEST (UUT)
Summary Sheet**

TWEI Project No.: 2010-0075-CO-001

Manufacturer: Haakon Industries, Ltd.

Model Line: Custom Air Handling Units

Model Number: Test Prototype

Product Construction Summary:

Subcomponent Summary:
EPQN Model 542 fan (2" spring isolators). BAF DWDI model 122 fan (1" spring isolators).
Please refer to Product Matrix for component details.

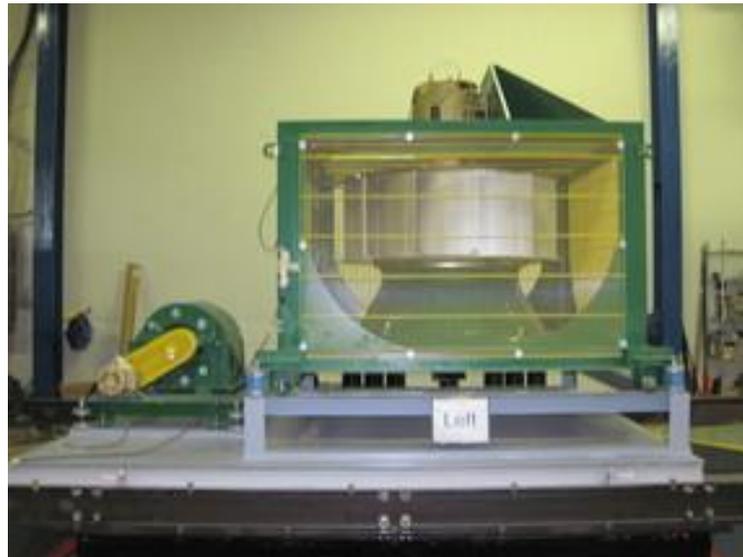
UUT Properties

Weight (lb)	Dimensions (in)			Lowest Natural Frequency (Hz)		
	Depth	Width	Height	Front-Back	Side-Side	Vertical
5,050	132.0	118.0	80.0	9.0	2.4	2.8

UUT Highest Passed Seismic Run Information

Building Code	Test Criteria	S _{Ds}	z/h	I _p	A _{FLX-H}	A _{RIG-H}	A _{FLX-V}	A _{RIG-V}
CBC 2010	ICC-ES AC 156	2.5	1.0	1.5	4.0	3.0	1.67	0.67

Test Mounting Details:



Unit mounted to test fixture using ten (10) grade 5 3/4" diameter hex head bolts.

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**UNIT UNDER TEST (UUT)
Summary Sheet**

TWEI Project No.: 2010-0075-CO-001

Manufacturer: Haakon Industries, Ltd.

Model Line: Custom Air Handling Units

Model Number: Test Prototype

Product Construction Summary:

Subcomponent Summary:
BC DWDI model 660 fan (2" spring isolators).
Please refer to Product Matrix for component details.

UUT Properties

Weight (lb)	Dimensions (in)			Lowest Natural Frequency (Hz)		
	Depth	Width	Height	Front-Back	Side-Side	Vertical
11,000	138.0	130.0	153.0	4.2	4.2	2.5

UUT Highest Passed Seismic Run Information

Building Code	Test Criteria	S _{DS}	z/h	I _p	A _{FLX-H}	A _{RIG-H}	A _{FLX-V}	A _{RIG-V}
CBC 2010	ICC-ES AC 156	2.5	1.0	1.5	4.0	3.0	1.67	0.67

Test Mounting Details:



Unit mounted to test fixture using ten (10) grade 5 3/4" diameter hex head bolts.

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**UNIT UNDER TEST (UUT)
Summary Sheet**

TWEI Project No.: 2010-0075-CO-001

Manufacturer: Haakon Industries, Ltd.

Model Line: Custom Air Handling Units

Model Number: Test Prototype

Product Construction Summary:
2" 16 ga CS casing. CS C6x8.2 base rail.

Subcomponent Summary:
Evaporative Humidifier. Nema-1 enclosure.
Please refer to Product Matrix for component details.

UUT Properties

Weight (lb)	Dimensions (in)			Lowest Natural Frequency (Hz)		
	Depth	Width	Height	Front-Back	Side-Side	Vertical
3,500	120.0	120.0	129.0	6.1	>33	5.9

UUT Highest Passed Seismic Run Information

Building Code	Test Criteria	S _{DS}	z/h	I _p	A _{FLX-H}	A _{RIG-H}	A _{FLX-V}	A _{RIG-V}
CBC 2010	ICC-ES AC 156	2.5	1.0	1.5	4.0	3.0	1.67	0.67

Test Mounting Details:



Unit mounted to test fixture using ten (10) grade 5 3/4" diameter hex head bolts.

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Table 2

Special Seismic Certification Certified Product Matrix

TWEI Project No.: 2010-0075-CO-001

Manufacturer: Haakon Industries, Ltd.

Model Line: Custom Air Handling Units – E-Series Plenum Fans (**HORIZONTAL BELT DRIVE**)

Certified Product Construction Summary:
CS Airfoil Wheels. Heavy Gauge Continuously Welded CS Frame.

Certified Options Summary:
EPF: 9-Bladed Wheel in Arrangement 3, 3HA, 3SM; **EPQ:** 12-Bladed Wheel in Arrangement 3, 3HA, 3SM;
Additional Options: Variable Inlet Vanes, Inlet Screen, Inlet Collar, Belt Guard, Protective Enclosure, Piezometer Ring

Certified Mounting Summary:
All Plenum fans to be mounted on 1, 2, or 4" spring vibration isolators to AHU floor (see UUT summaries for what was tested).

Building Code: CBC 2010 **Seismic Certification Limits:** $S_{DS} = 2.5g$ $z/h = 1.0$ $I_p = 1.5$

Model Line	Model	Dimension (in)			Weight (lb)	Notes	UUT	
		Depth	Width	Height				
Haakon EPF, EPQ	122				94	3,3HA Classes I & II Available	5 ¹	
	150				117			
	165				135		3,3HA	
		182				188	3,3HA,3SM Classes I, II, & III Available	
		200				213		
		222				272		
		245				317		
		270				478		
		300				587		
		330				732		
		365				923		
		402				1096		
		445				1551		
		490				1776		
		542				2183		
		600				2365	3,3SM	
		660				2932	3,3SM	6 ²

- EPF, Arrangement 3HA, Class I, Steel Wheel
- EPQ, Arrangement 3SM, Class III, Steel Wheel

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Table 3

Special Seismic Certification Certified Product Matrix

TWEI Project No.: 2010-0075-CO-001

Manufacturer: Haakon Industries, Ltd.

Model Line: Custom Air Handling Units – E-Series Plenum Fans (**HORIZONTAL DIRECT DRIVE**)

Certified Product Construction Summary:
Aluminum Airfoil Wheels. Heavy Gauge Continuously Welded Steel Frame.

Certified Options Summary:
EPFN: 9-Bladed Wheel in Arrangement 4; **EPQN:** 12-Bladed Wheel in Arrangement 4;

Additional Options: Variable Inlet Vanes, Inlet Screen, Inlet Collar, Belt Guard, Protective Enclosure, Piezometer Ring

Certified Mounting Summary:
All Plenum fans to be mounted on 1, 2, or 4" spring vibration isolators to AHU floor (see UUT summaries for what was tested).

Building Code: IBC 2009/CBC 2010 **Seismic Certification Limits:** $S_{DS} = 2.5g$ $z/h = 1.0$ $I_p = 1.5$

Model Line	Model	Dimension (in)			Weight (lb)	Notes	UUT
		Depth	Width	Height			
Haakon EPFN, EPQN	122				94	Classes I & II Available	4 ¹
	150				117		
	165				135		
	182				188		
	200				213		
	222				272		
	245				317	Classes I, II, & III Available	
	270				478		
	300				587		
	330				732		
	365				923		
	402				1096		

- EPQN, Arrangement 4, Class I, Aluminum Wheel, Stacked Three (3) High.
- EPFN, Arrangement 4, Class III, Aluminum Wheel, Stacked Two (2) High.

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Table 4

Special Seismic Certification Certified Product Matrix

TWEI Project No.: 2010-0075-CO-001

Manufacturer: Haakon Industries, Ltd.

Model Line: Custom Air Handling Units – E-Series Plenum Fans (**VERTICAL DIRECT DRIVE**)

Certified Product Construction Summary:
Aluminum Airfoil Wheels. Heavy Gauge Continuously Welded Steel Frame.

Certified Options Summary:
EPQN: 12-Bladed Wheel in Arrangement 4;

Additional Options: Variable Inlet Vanes, Inlet Screen, Inlet Collar, Belt Guard, Protective Enclosure, Piezometer Ring

Certified Mounting Summary:
All Plenum fans to be mounted on 1, 2, or 4" spring vibration isolators to AHU floor (see UUT summaries for what was tested).

Building Code: IBC 2009/CBC 2010 **Seismic Certification Limits:** $S_{DS} = 2.5g$ $z/h = 1.0$ $I_p = 1.5$

Model Line	Model	Dimension (in)			Weight (lb)	Notes	UUT
		Depth	Width	Height			
Haakon EPQN	122				94	4 Classes I & II Available	1 ¹
	150				117		
	165				135		
	182				188	4 Classes I, II, & III Available	
	200				213		
	222				272		
	245				317		
	270				478		
	300				587		
	330				732		
	365				923		
	402				1096		
	445				1551		
	490				1776		
	542				2183		

- EPQN, Mounted on top of stand on isolators, Aluminum Wheel, Class II
- EPQN, Mounted on top of stand on isolators, Aluminum Wheel, Class III

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Table 6

Special Seismic Certification Certified Product Matrix

TWEI Project No.: 2010-0075-CO-001

Manufacturer: Haakon Industries, Ltd.

Model Line: Custom Air Handling Units - BC SWSI

Certified Product Construction Summary:
Steel wheel with flat single thickness blades, solid welded to the rim and back plate. Fan housing constructed of carbon sheet metal

Certified Options Summary:
Horizontal fan; up, down, and horizontal discharge rotations; belt drive motor; duct outlet connection; slip-on outlet joint connection; SWSI arrangements 9; expansion bearing for high temperature airstreams; parallel and opposed blade dampers; Class I, II, III, IV wheel

Certified Mounting Summary:
Floor mount spring isolators

Building Code: CBC 2010 **Seismic Certification Limits:** $S_{DS} = 2.5g$ $z/h = 1.0$ $I_p = 1.5$

Model Line	Model	Dimension (in)			Weight (lb)	Notes	UUT
		Depth	Width	Height			
Twin City BC SWSI	122					Arrangement 9, Class IV, BC	5
	135						
	150						
	165						
	182						
	200						
	222						
	245						
	270						
	300						
	330						
	365						
	402						
	445						
	490						
	542						
	600						Arrangement 9, Class I, BC

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Table 7

Special Seismic Certification Certified Product Matrix

TWEI Project No.: 2010-0075-CO-001

Manufacturer: Haakon Industries, Ltd.

Model Line: Custom Air Handling Units - BC / BAF DWDI

Certified Product Construction Summary:

Steel wheel with flat single thickness blades, solid welded to the rim and back plate. Fan housing constructed of carbon sheet metal

Certified Options Summary:

Horizontal fan; up, down, and horizontal discharge rotations; belt drive motor; duct outlet connection; slip-on outlet joint connection; DWDI arrangement 3; expansion bearing for high temperature airstreams; parallel and opposed blade dampers; Class I, II wheel

Certified Mounting Summary:

Floor mount spring isolators

Building Code: CBC 2010

Seismic Certification Limits:

$S_{DS} = 2.5g$

$z/h = 1.0$

$I_p = 1.5$

Model Line	Model	Dimension (in)			Weight (lb)	Notes	UUT
		Depth	Width	Height			
Twin City BC / BAF DWDI	122				139	Airfoil, Downblast, class I BAF	7
	135				159		
	150				193		
	165				222		
	182				248		
	200				344		
	222				451		
	245				509		
	270				639		
	300				895		
	330				1015		
	365				1352		
	402				1690		
	445				2100		
	490				2310		
	542				2946		
	600				4150	Airfoil Top Horizontal	
	660				5300	Arrangement 3, Class II, BC	8

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Table 10

Special Seismic Certification Certified Product Matrix

TWEI Project No.: 2010-0075-CO-001

Manufacturer: Haakon Industries, Ltd.

Model Line: Custom Air Handling Units – Dampers & Louvers

Certified Product Construction Summary:

Louvers are constructed of aluminum. Dampers are constructed of aluminum, except Greenheck are galvanized steel. Haakon standard and Storm Louvers included in certification.

Certified Options Summary:

See "Sensors" Table for available air monitoring systems to be used with dampers.

Certified Mounting Summary:

Mounted in equipment.

Building Code: IBC 2009/CBC 2010

Seismic Certification Limits:

$S_{DS} = 2.5g$

$z/h = 1.0$

$I_p = 1.5$

Model Line	Model	Dimension (in)			Weight (lb)	Notes	UUT
		Depth	Width	Height			
Tamco/Ebtron Dampers		18.0	60.0	60.0			1
		4.0	12.0	12.0			2
TA Morrison Dampers		...					
		4.0	48.0	48.0			2
		...					
		4.0	60.0	60.0			
Greenheck Dampers (Air Monitoring)	AMD-42	12.0	12.0	12.0			2
		...					
		12.0	46.0	46.0			2
		...					
Greenheck Dampers		5.0	12.0	12.0			2,2
		...					
		5.0	48.0	48.0		VCD-33 (control damper)	2
		5.0	48.0	50.0		SMD-401 (smoke damper)	2
		...					
Haakon Louvers		2.0	12.0	12.0			
		...					
		4.0	47.0	48.0		Storm	2
		4.0	48.0	50.0		Standard	2
		...					
Ultra Tek Dampers		4.0	48.0	48.0			2
		...					

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Table 11

Special Seismic Certification Certified Product Matrix

TWEI Project No.: 2010-0075-CO-001

Manufacturer: Haakon Industries, Ltd.

Model Line: Custom Air Handling Units – Filters

Certified Product Construction Summary:

Component construction specific to vendor and model line identified below. Filter racks available in Stainless or galvanized steel.

Certified Options Summary:

N/A.

Certified Mounting Summary:

Filter panels listed below to be installed in SS or Galv filter rack constructed per Haakon typical details.

Building Code: IBC 2009/CBC 2010

Seismic Certification Limits:

$S_{DS} = 2.5g$

$z/h = 1.0$

$I_p = 1.5$

Model Line	Model	Dimension (in)			Weight (lb)	Notes	UUT
		Depth	Width	Height			
Haakon Filter Rack	Angled Filter Rack	Filter rack extends width and height of cabinet dimensions.				SS & Galv	3
	HEPA Filter Rack					SS & Galv	3
	Universal Filter Rack					SS & Galv	3
American Air Filter	Biocell VXL	12.0	24.0	12.0			3
		...					
	DriPak 2000	12.0	24.0	24.0			3
		...					
		36.0	24.0	24.0			3
	Varicel	12.0	12.0	20.0			3
		...					
	Megacel I	36.0	24.0	24.0			3
		...					
	AmAir 1100	1.0	10.0	10.0			3
		...					
		4.0	25.0	29.0			3
	Perfect Pleat Ultra	0.75	9.5	9.5			3
		...					
		2.0	24.5	24.5			3

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Table 12

**Special Seismic Certification
Certified Product Matrix**

TWEI Project No.: 2010-0075-CO-001

Manufacturer: Haakon Industries, Ltd.

Model Line: Custom Air Handling Units – Filters

Certified Product Construction Summary:
Component construction specific to vendor and model line identified below.

Certified Options Summary:
N/A.

Certified Mounting Summary:
Filter panels listed below to be installed in SS or Galv filter rack constructed per Haakon typical details.

Building Code: IBC 2009/CBC 2010 **Seismic Certification Limits:** $S_{DS} = 2.5g$ $z/h = 1.0$ $I_p = 1.5$

Model Line	Model	Dimension (in)			Weight (lb)	Notes	UUT
		Depth	Width	Height			
Camfil Farr	Hi-Flo ES	12.0	20.0	12.0			3
		...					
	Durafil ES	30.0	24.0	24.0			3
		12.0	12.0	20.0			3
	Riga-Flo ph	...					
		12.0	12.0	24.0			3
	30/30	12.0	12.0	12.0			3
		...					
	ap-eleven	12.0	24.0	12.0			3
		1.0	10.0	10.0			3
	AP-Thirteen	...					
		4.0	25.0	29.0			3
		1.0	16.0	12.0			3
		...					
		4.0	24.5	24.5			3
		1.75	19.38	15.38			3
	...						
	3.75	25.0	25.0			3	

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Table 17

**Special Seismic Certification
Certified Product Matrix**

TWEI Project No.: 2010-0075-CO-001

Manufacturer: Haakon Industries, Ltd.

Model Line: Custom Air Handling Units – Electrical Components

Certified Product Construction Summary:

Component construction specific to vendor and model line identified below.

Certified Options Summary:

Indoor or outdoor (NEMA 1 or NEMA 3R).

Certified Mounting Summary:

Mounted in equipment.

Building Code: IBC 2009/CBC 2010

Seismic Certification Limits:

$S_{DS} = 2.5g$

$z/h = 1.0$

$I_p = 1.5$

Model Line	Model	Dimension (in)			Weight (lb)	Notes	UUT
		Depth	Width	Height			
Hoffman	Enclosures	2.0	2.0	4.0		16ga steel	2,9
					...		
		12.0	36.0	60.0		16ga steel	2,3,4
ABB Disconnect	16A						2
				...			
	400A						2
ABB Contactor	9A						2
				...			
	110A						2
ABB Overload	1A						2
				...			
	110A						2
ABB MPP	1A						2
				...			
	110A						2
Feraz Shawmut/ Mersen Fuses	1A						2
				...			
	400A						2
Feraz Shawmut/ Mersen Distribution Blocks	175A						2
				...			
	380A						2
Square D Transformers	75VA						2
				...			
	2kVA						2

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Table 18

Special Seismic Certification Certified Product Matrix

TWEI Project No.: 2010-0075-CO-001

Manufacturer: Haakon Industries, Ltd.

Model Line: Custom Air Handling Units – Electrical Components

Certified Product Construction Summary:

Component construction specific to vendor and model line identified below.

Certified Options Summary:

N/A.

Certified Mounting Summary:

Mounted in equipment.

Building Code: IBC 2009/CBC 2010

Seismic Certification Limits:

$S_{DS} = 2.5g$

$z/h = 1.0$

$I_p = 1.5$

Model Line	Model	Dimension (in)			Weight (lb)	Notes	UUT
		Depth	Width	Height			
Square D Circuit Breaker	15A						2
	...						
Eaton / Cutler Hammer Relays	20A						2
	6V						2
Leviton Light Switch	240V						2
	CSB1-20L						2
Leviton Receptacle	...						
	011-7599-I						2
Carel Controller	PCO3						2
Belimo Actuators	AF-24						2
	NF-24						2
	LF-24						2
ABB ACH550 VFD	1HP						2
	...						
	150HP						2

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Table 19

Special Seismic Certification Certified Product Matrix

TWEI Project No.: 2010-0075-CO-001

Manufacturer: Haakon Industries, Ltd.

Model Line: Custom Air Handling Units – Electrical Components

Certified Product Construction Summary:

Component construction specific to vendor and model line identified below.

Certified Options Summary:

N/A.

Certified Mounting Summary:

Mounted in equipment.

Building Code: IBC 2009/CBC 2010

Seismic Certification Limits:

$S_{DS} = 2.5g$

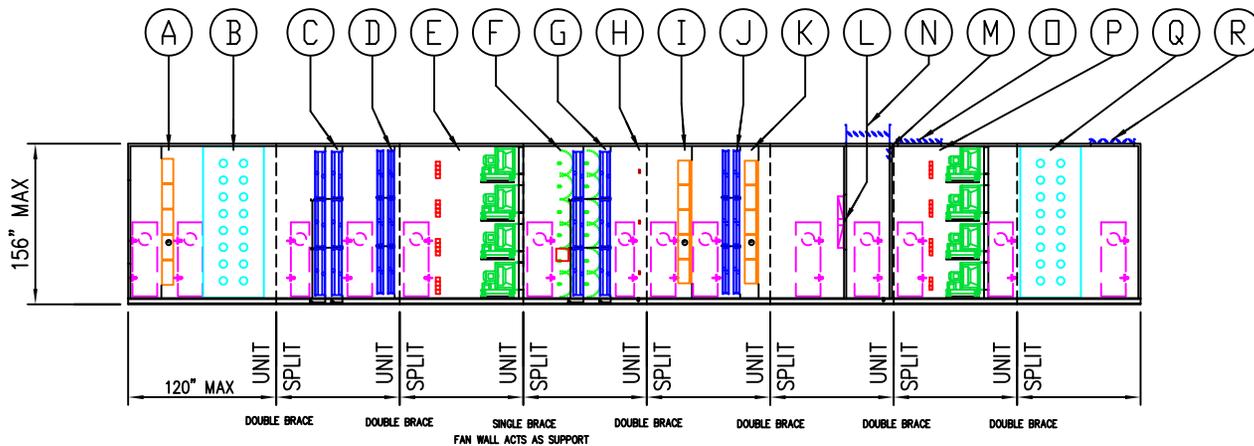
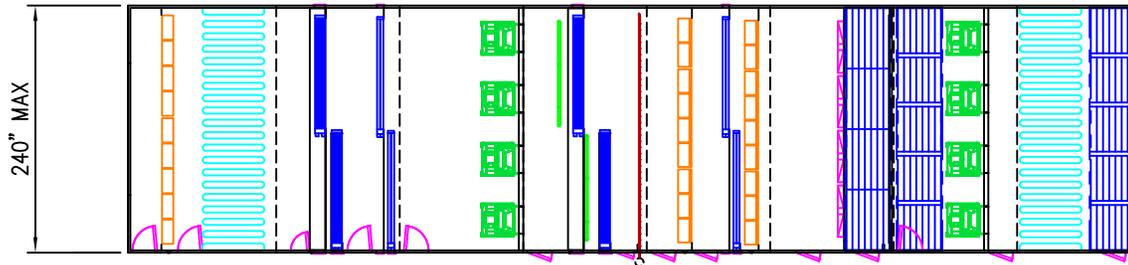
$z/h = 1.0$

$I_p = 1.5$

Model Line	Model	Dimension (in)			Weight (lb)	Notes	UUT
		Depth	Width	Height			
ABB ACS150 VFD	1HP						2
Greystone Current Switches	CS Series					500 mA	2
						1 A	2
Greystone Current Switches	SC Series					500 mA	2
Greystone Transducer	ETP-9500					20 mA	2
Greystone CO2 Detector	CDD1A						2
Greystone Current Sensor	CS Series						2
Greystone Current Sensor	SC Series						2
Greystone Freezestat	LC300						2
Greystone Humidity Transducer	RH200						2
Greystone Humidity Transmitter	RH110						2
	RH210						2
	RH310						2
Greystone Pressure Switch	AFS-222						2
	AFS-262						2
	AFS460						2

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- (A) FILTERS
- (B) SOUND ATTENUATOR
- (C) WATER COIL
- (D) WATER COIL
- (E) FAN
- (F) UV LIGHTS
- (G) COOLING COIL
- (H) HUMIDIFIER
- (I) FILTERS
- (J) WATER COIL
- (K) FILTERS
- (L) STRATIFICATION ELIMINATORS
- (M) DAMPER
- (N) DAMPERS
- (O) DAMPERS
- (P) FAN
- (Q) SOUND ATTENUATOR
- (R) DAMPER



See DOUBLE FRAME - SIDE WALLS, SINGLE FRAME - SIDE WALLS, AND SPLIT FRAME DETAILS for clarification on the location of all seismic bracing. Internal walls such as fan bulkheads and internal damper walls are considered seismic bracing when located at a unit split which is consistent with UUT's tested.

PROJECT

OSHPD CERTIFICATION PH I

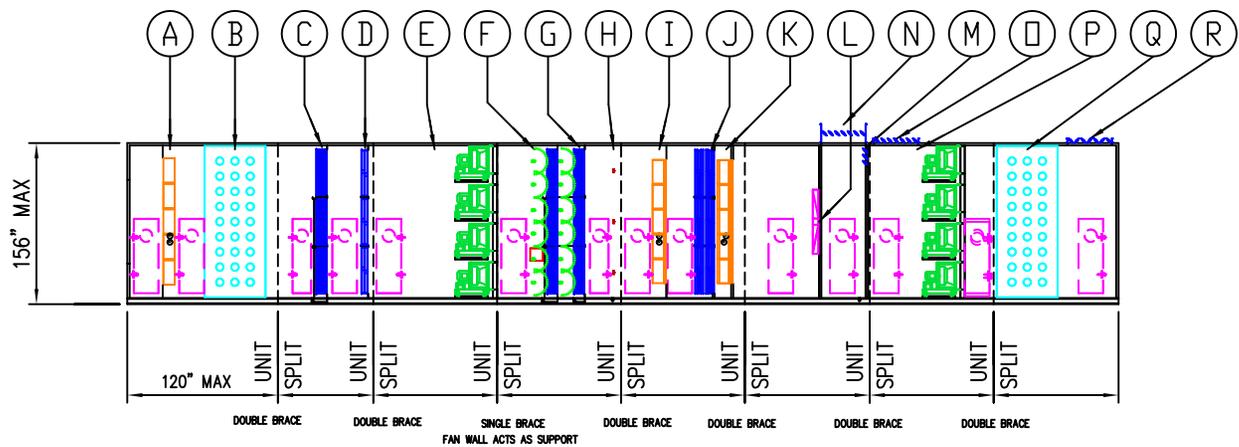
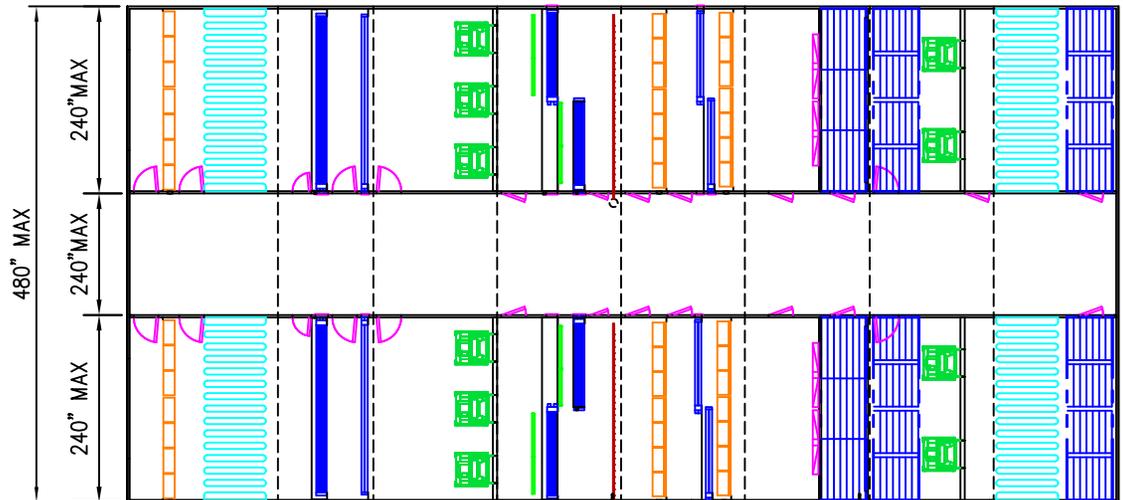
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JOB NO. 5913 DRAWN BY WG
 TAG 0870/2013 OCT 10/12

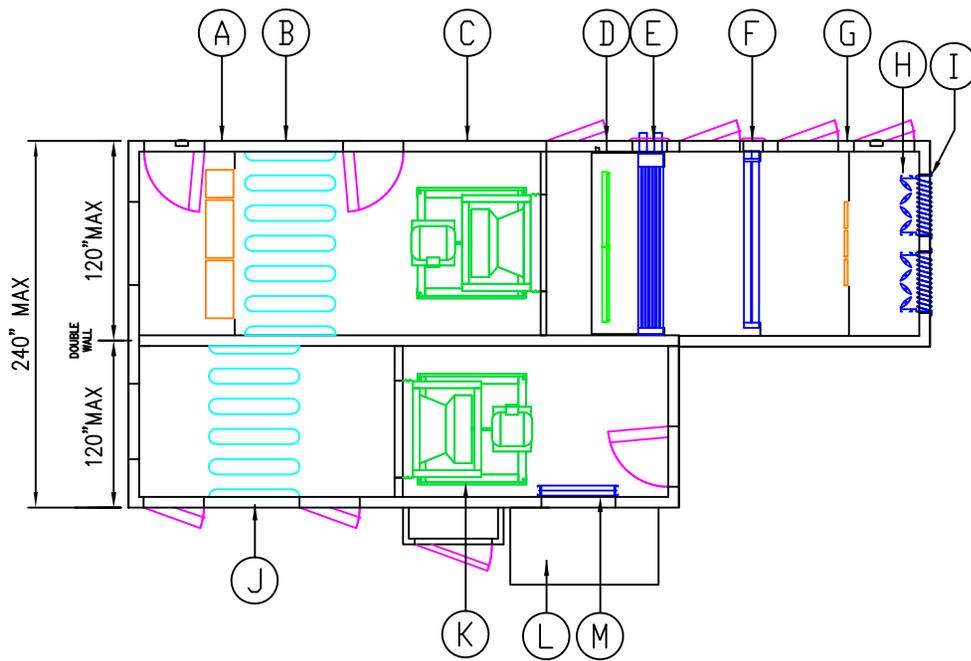
OSP-0301-10

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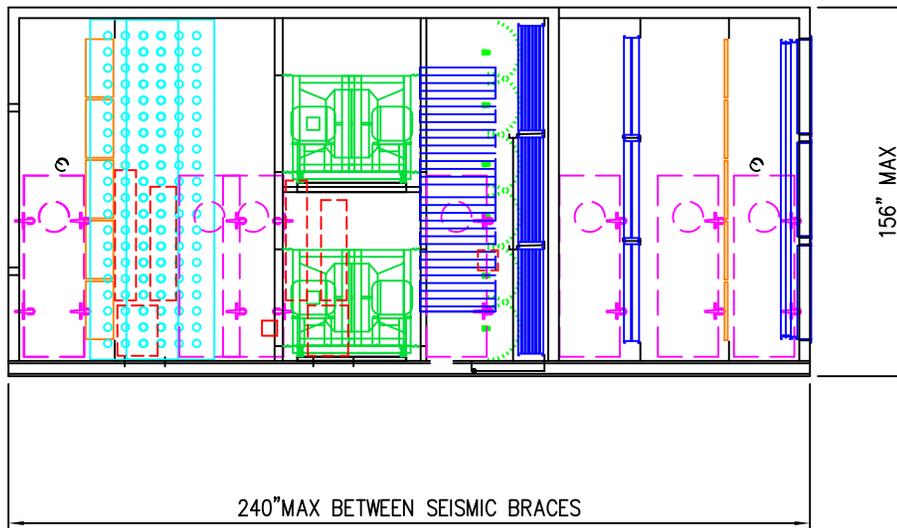


- (A) FILTERS
- (B) SOUND ATTENUATOR
- (C) WATER COIL
- (D) WATER COIL
- (E) FAN
- (F) UV LIGHTS
- (G) COOLING COIL
- (H) HUMIDIFIER
- (I) FILTERS
- (J) WATER COIL
- (K) FILTERS
- (L) STRATIFICATION ELIMINATORS
- (M) DAMPER
- (N) DAMPERS
- (O) DAMPERS
- (P) FAN
- (Q) SOUND ATTENUATOR
- (R) DAMPER

See DOUBLE FRAME - SIDE WALLS, SINGLE FRAME - SIDE WALLS, AND SPLIT FRAME DETAILS for clarification on the location of all seismic bracing. Internal walls such as fan bulkheads and internal damper walls are considered seismic bracing when located at a unit split which is consistent with UUT's tested.



- (A) FILTERS
- (B) SOUND ATTENUATOR
- (C) FAN
- (D) UV LIGHTS
- (E) WATER COIL
- (F) WATER COIL
- (G) FILTER
- (H) DAMPER
- (I) LOUVER
- (J) SOUND ATTENUATOR
- (K) FAN
- (L) HOOD
- (M) DAMPER

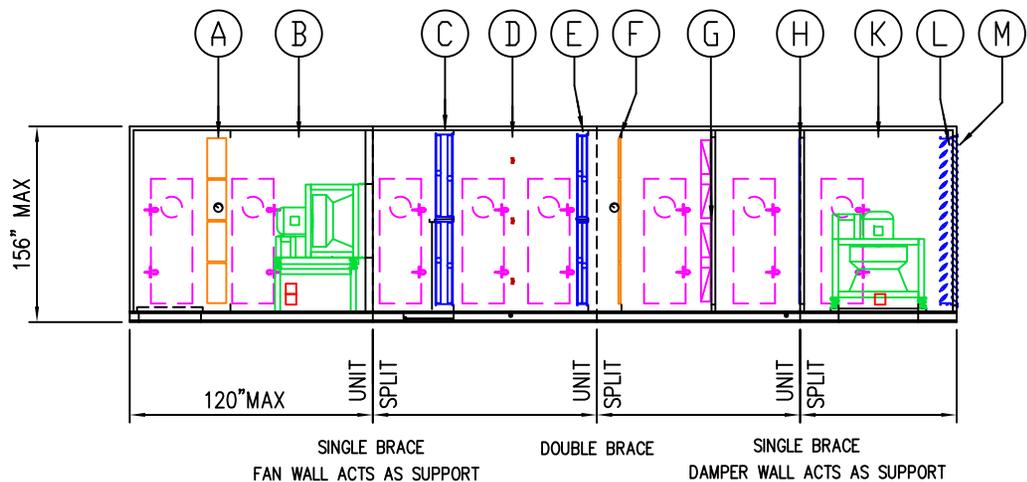
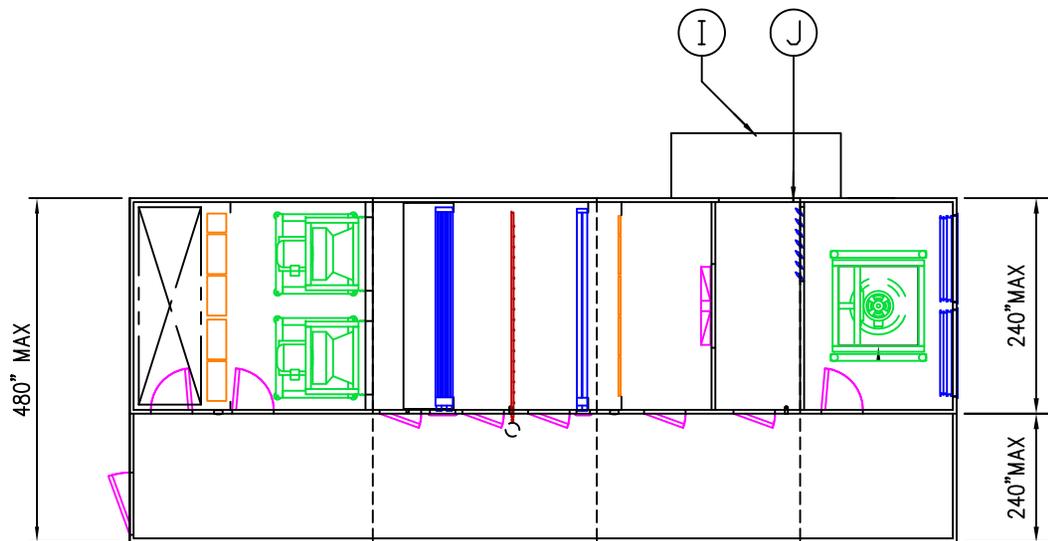


See DOUBLE FRAME - SIDE WALLS, SINGLE FRAME - SIDE WALLS, AND SPLIT FRAME DETAILS for clarification on the location of all seismic bracing. Internal walls such as fan bulkheads and internal damper walls are considered seismic bracing when located at a unit split which is consistent with UUT's tested.

PROJECT

OSHPD CERTIFICATION PH I

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- (A) FILTERS
- (B) FANS
- (C) WATER COIL
- (D) HUMIDIFIER
- (E) WATER COIL
- (F) FILTERS
- (G) STRATIFICATION ELIMINATORS
- (H) DAMPERS
- (I) HOODS
- (J) DAMPERS
- (K) FAN
- (L) DAMPERS
- (M) LOUVERS

See DOUBLE FRAME - SIDE WALLS, SINGLE FRAME - SIDE WALLS, AND SPLIT FRAME DETAILS for clarification on the location of all seismic bracing. Internal walls such as fan bulkheads and internal damper walls are considered seismic bracing when located at a unit split which is consistent with UUT's tested.

PROJECT

OSHPD CERTIFICATION PH I

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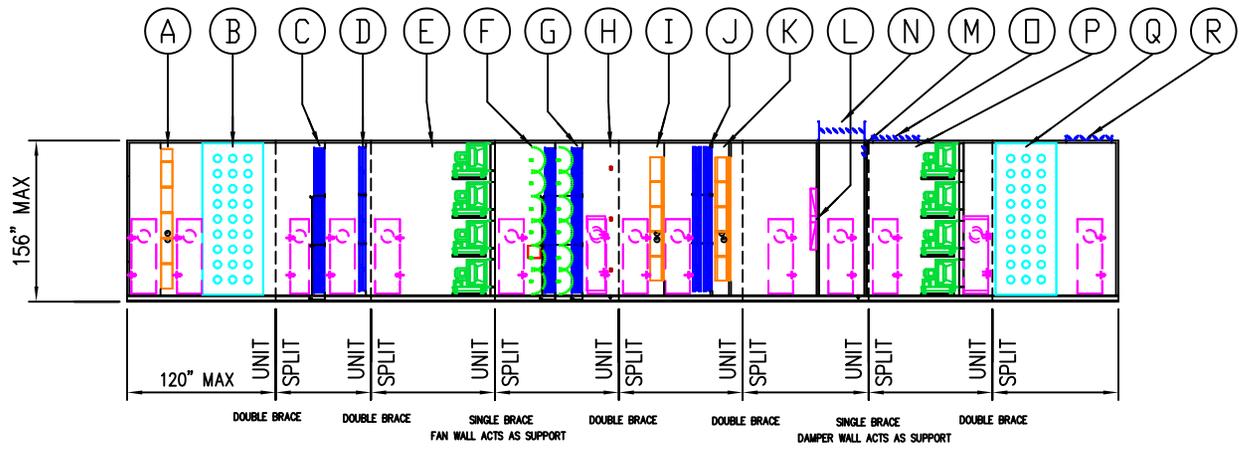
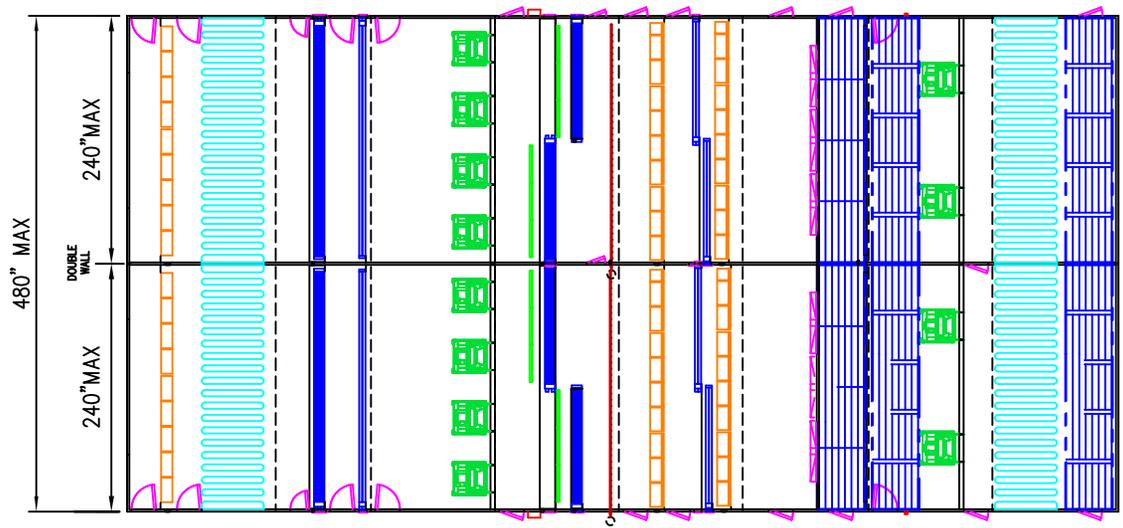


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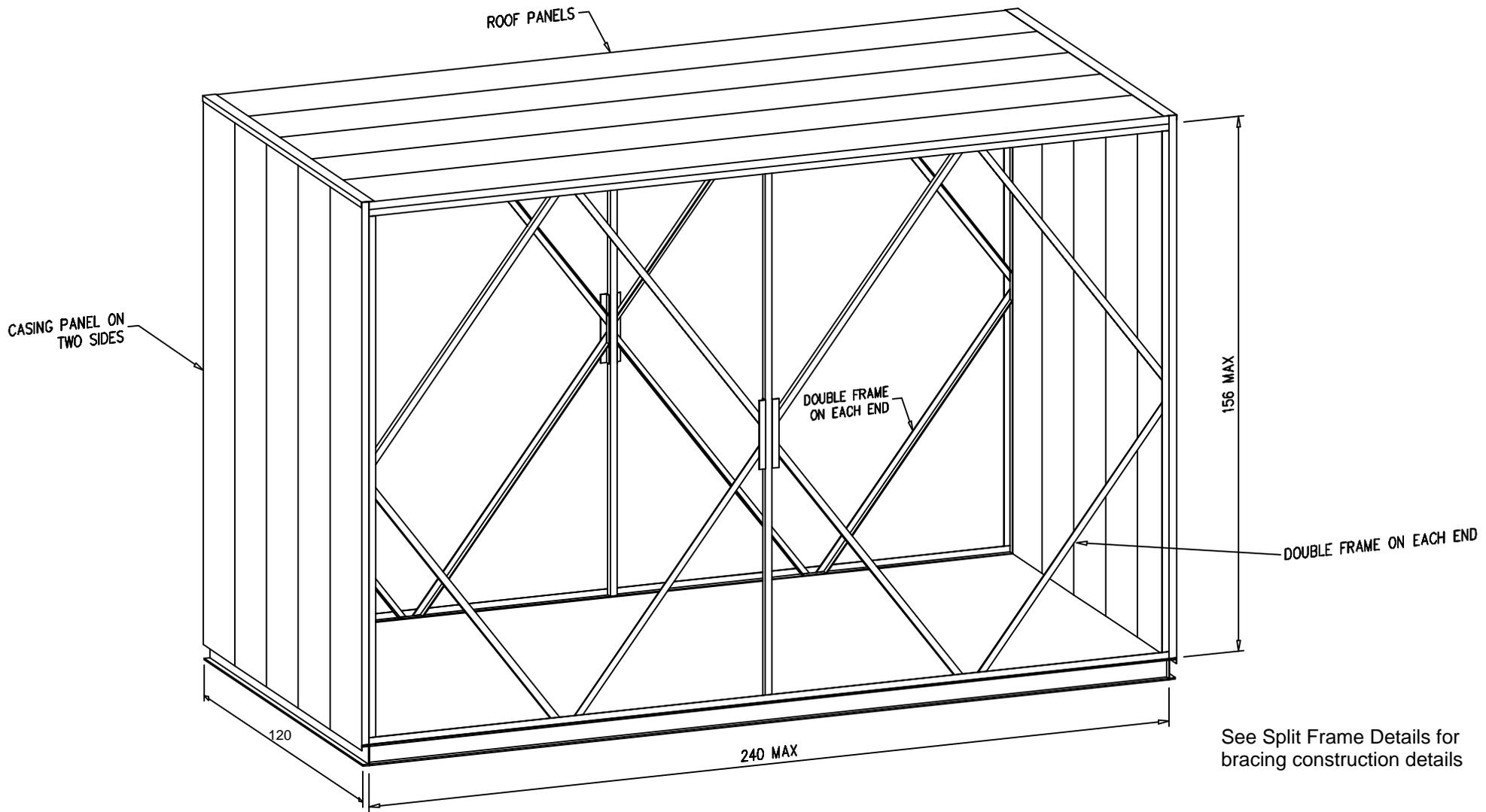
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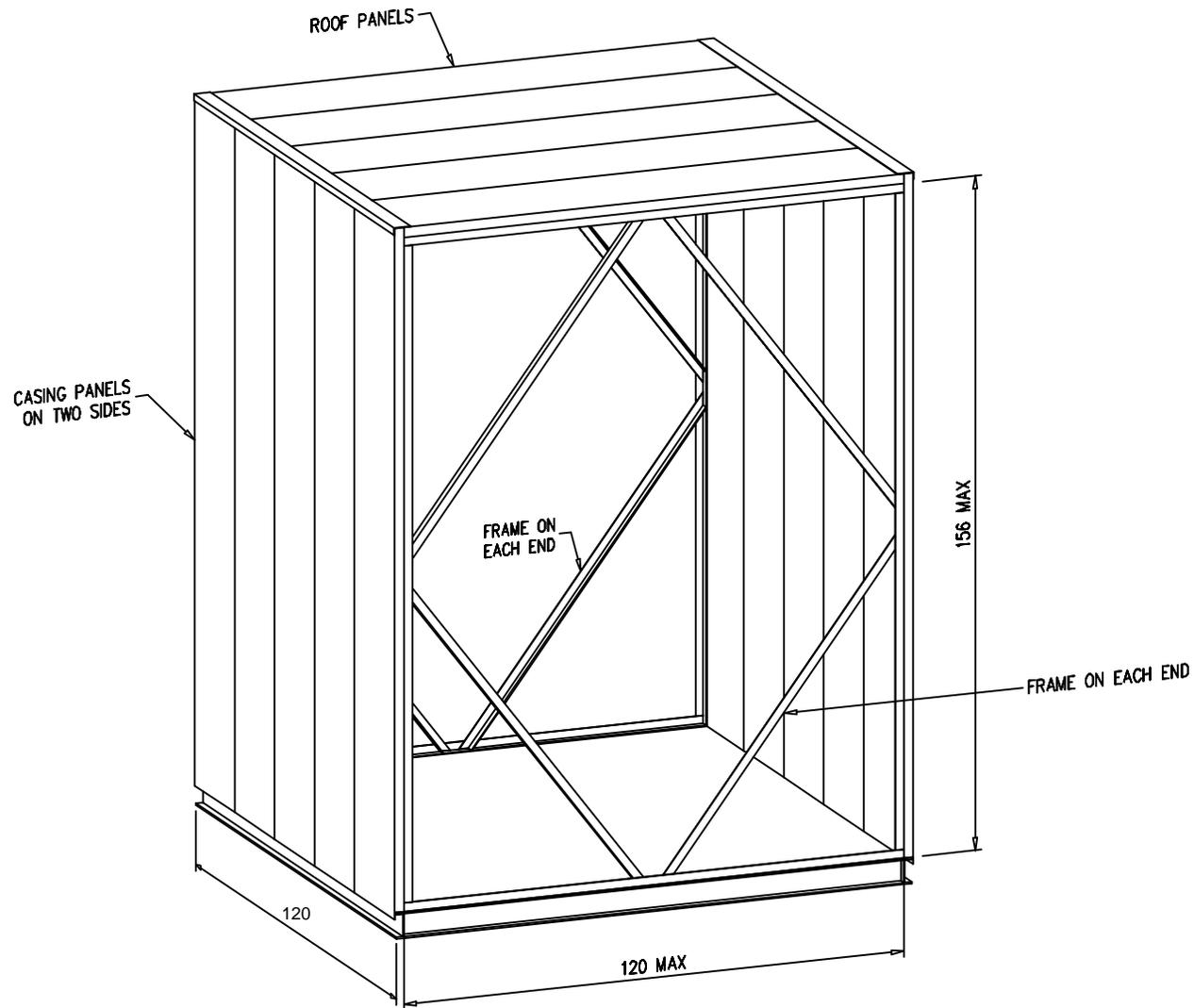
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- (B) SOUND ATTENUATOR
- (C) WATER COIL
- (D) WATER COIL
- (E) FAN
- (F) UV LIGHTS
- (G) WATER COIL
- (H) HUMIDIFIER
- (I) FILTERS
- (J) WATER COIL
- (K) FILTERS
- (L) STRATIFICATION ELIMINATORS
- (M) DAMPER
- (N) DAMPERS
- (O) DAMPERS
- (P) FAN
- (Q) SOUND ATTENUATOR
- (R) DAMPER



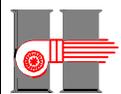
See DOUBLE FRAME - SIDE WALLS, SINGLE FRAME - SIDE WALLS, AND SPLIT FRAME DETAILS for clarification on the location of all seismic bracing. Internal walls such as fan bulkheads and internal damper walls are considered seismic bracing when located at a unit split which is consistent with UUT's tested.



	JOB: OSHPD CERTIFICATION PH I	DWG BY: SNC	DATE: 2013-05-07	Page 40 of 43 Page 40 of 43
	JOB #: 08/01/2013 5913 DOUBLE FRAME - SIDE WALLS	OSP-0301-10 REV: 0		



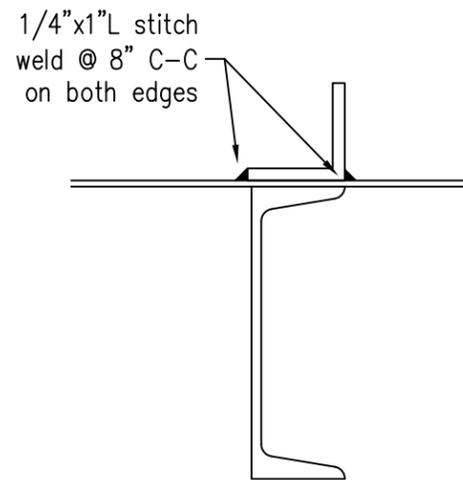
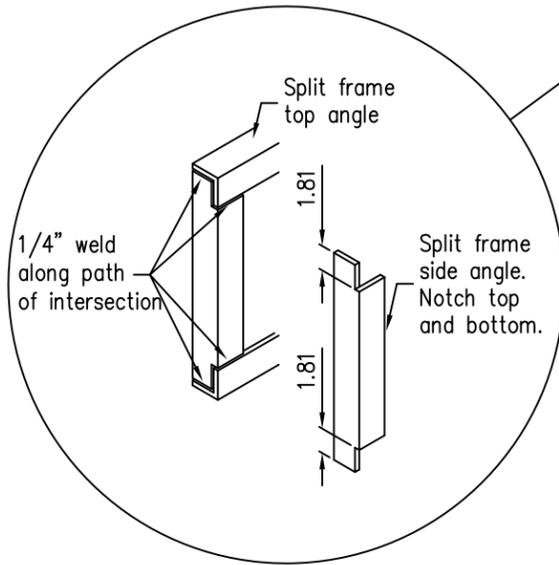
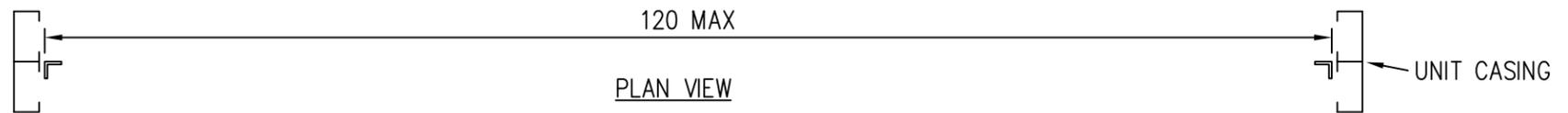
See Split Frame Details for bracing construction details



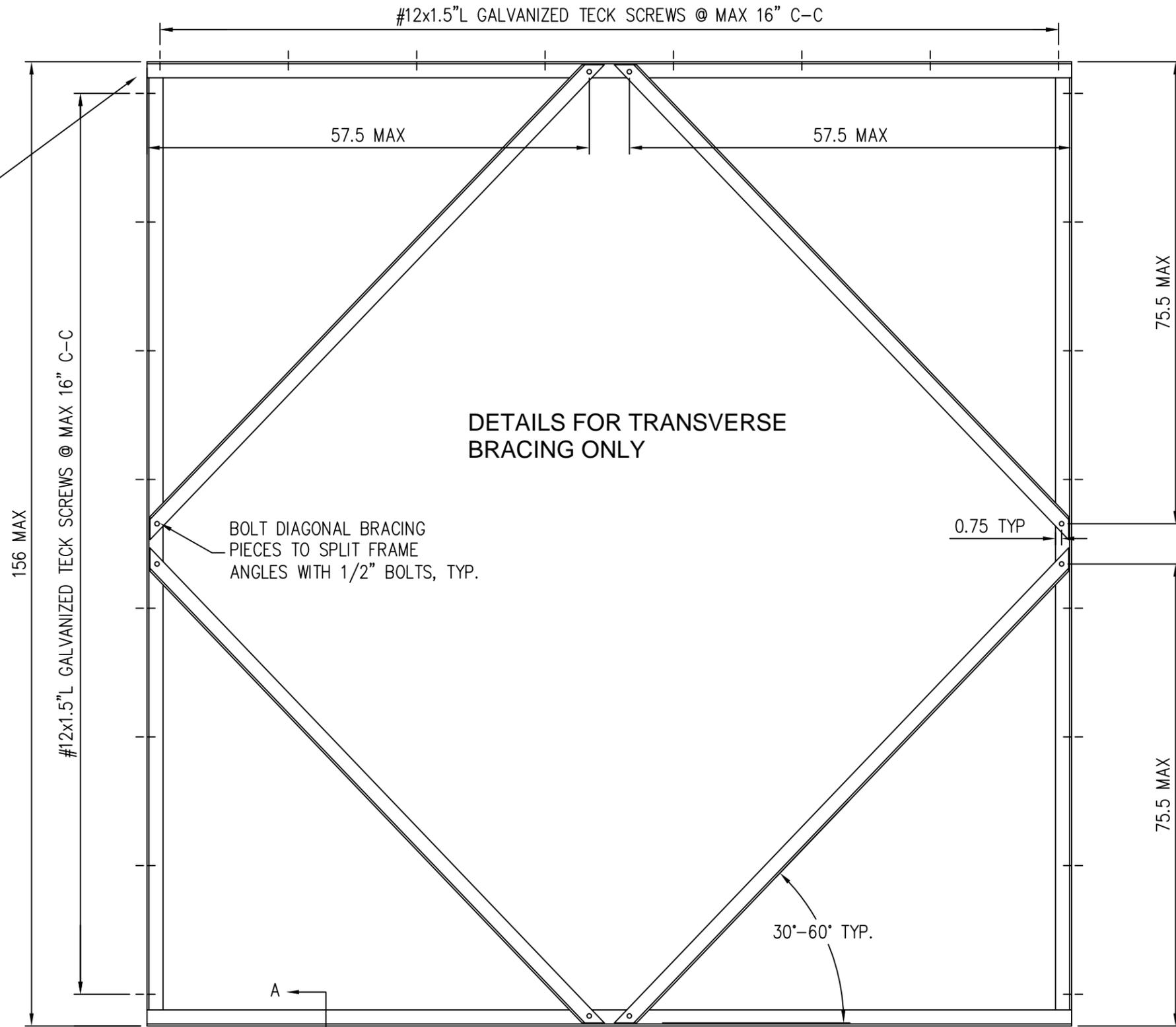
JOB: OSHPD CERTIFICATION PH I
 08/01/2013
 JOB #: 5913 SINGLE FRAME - SIDE WALLS

DWG BY: SNC DATE: 2003-05-07
 OSP-0301-10
 REV: 0

- NOTES:
- split frame to be teck screwed to unit as indicated
 - frame constructed out of 2x2x1/4" angles
 - angles to be welded together as per detail

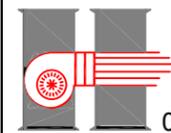


SECTION A-A



ELEVATION VIEW

DETAILS FOR TRANSVERSE BRACING ONLY



JOB: OSHPD CERTIFICATION PH I

FAB TAG : C518

DWG BY: SNC

DATE: 2013-04-15

5913U18SSF01

JOB #: 5913

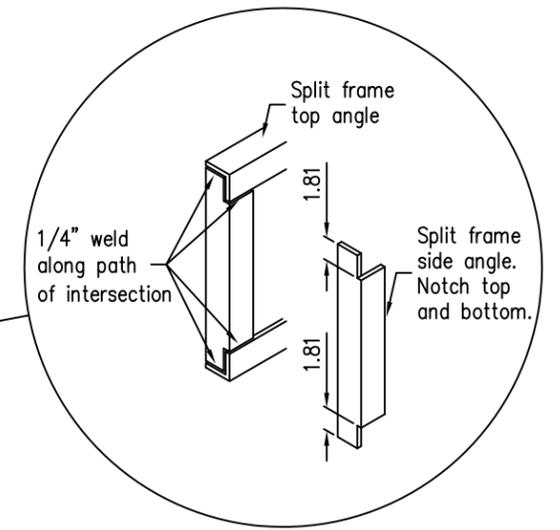
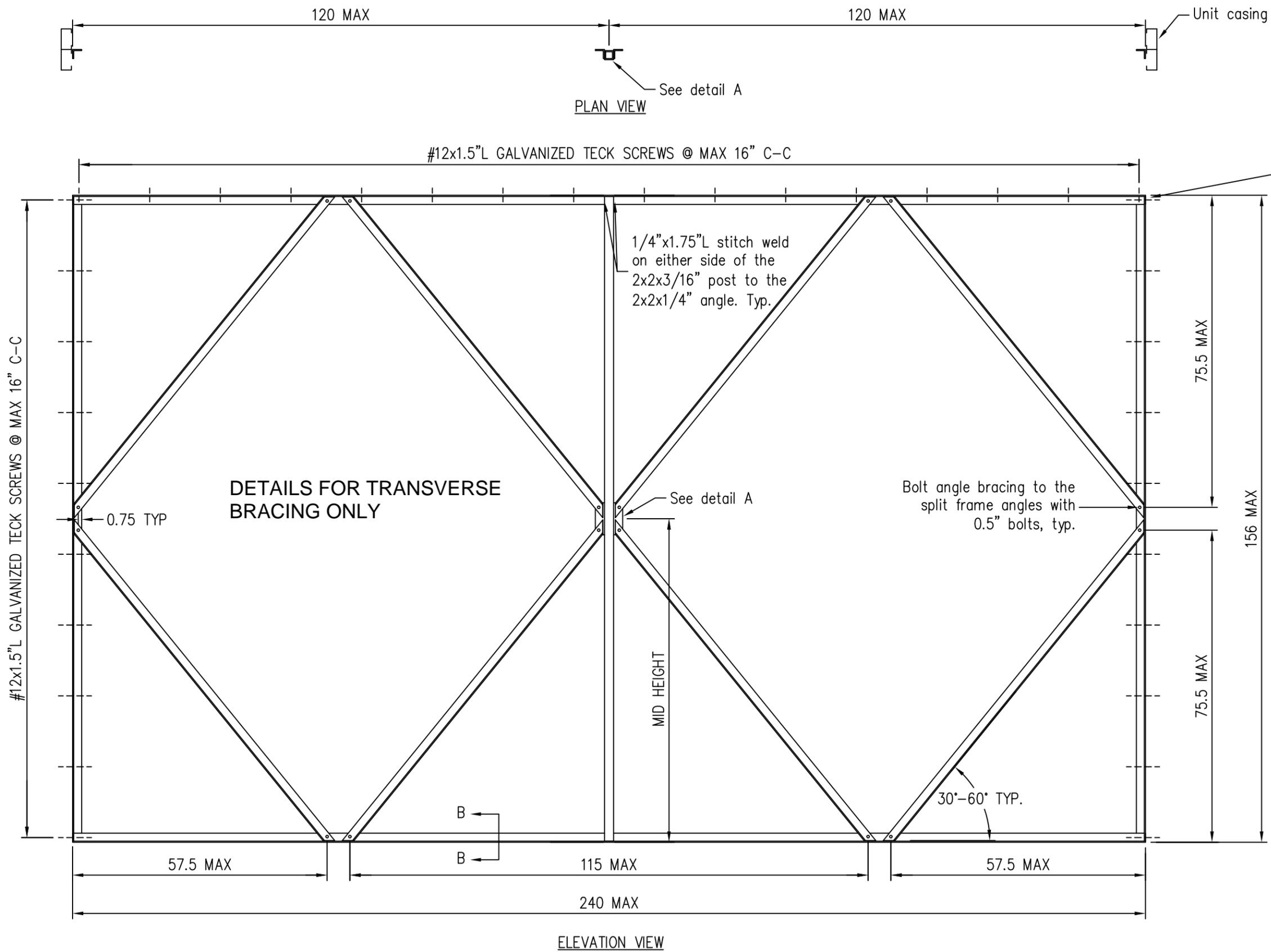
*** SPLIT FRAME DETAILS ***

UNIT TAG:

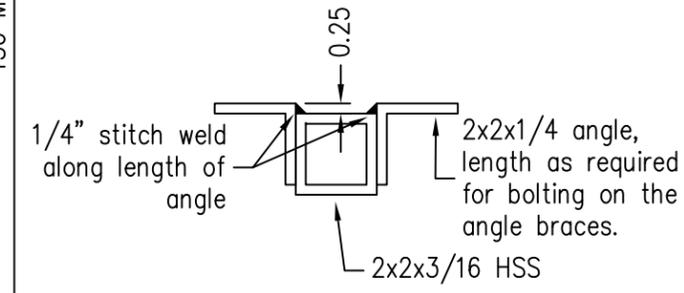
OSP-0301-10

UUT-9

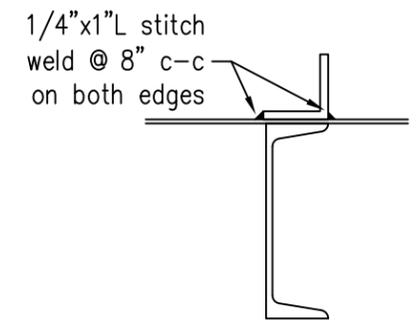
REV: 2



- NOTES:**
- Weld frame together as per details
 - Frame does not need to be painted.
 - Frame constructed of 2x2x0.25 angles and 2x2x3/16 HSS posts.
 - Frame to be teck screwed to unit as shown
 - Bottom angle welded to the floor with 1"L stitch welds @ 8" C-C.



DETAIL A - PLAN VIEW



SECTION B-B

	JOB: OSHPD CERTIFICATION PH I	FAB TAG : C512	DWG BY: SNC	DATE: 2013-04-15	5913U11SSF01
	JOB #: 5913	*** SPLIT FRAME DETAILS ***	UNIT TAG: OSP-0301-10	UUT-3	REV: 2