

Metal Roofing – Practical Design

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✓ Learning Outcomes

- Minimum Requirements
- Design Resources
- Low Slope Metal Roofing
- Design Details
- Continuously Insulated (Ci) Systems

Minimum Requirements



- ✓ Requires components to shed water and prevent water due to ice damming from entering the building
- ✓ Code requires minimum fastener type
 - Corrosion resistant, 1/2" into sheathing
- ✓ Slope
 - 3 in 12, unless specifically designed by manufacturer for low slope applications
- ✓ Flashings at various intersections

Minimum Requirements



Metal Roofing in the Building Codes

✓ 9.23.16.1.(1) Required Roof Sheathing

- <Except where the 1-in-50 hourly wind pressure is less than 0.8kPa and the seismic spectral response acceleration S_a (0.2), is less than or equal to 0.70,> continuous lumber or panel-type roof sheathing shall be installed to support the roofing.
 - All locations in BC fall below the wind pressure requirement.
 - What About Seismic

Minimum Requirements



Metal Roofing in the Building Codes

- ✓ Most areas along the south coastline fall within the seismic area requiring full sheathing, including Squamish and out to Chilliwack.

Minimum Requirements



Metal Roofing in the Building Codes

✓ 9.26.13 – Sheet Metal Roofing

- Thickness
 - Sheet metal roofing shall be not less than:
 - 0.33 mm thick galvanized steel, (roughly 29 gauge)
 - 0.46 mm thick copper,
 - 0.46 mm thick zinc, or
 - 0.48 mm thick aluminum.
- Support
 - <Except as provided in Sentence 9.23.16.1.(1),> where sheet metal roofing is not supported by roof decking but spans between spaced supports, the panels shall be designed to support the specified *live loads* for the roof.

Minimum Requirements



- ✓ What else is in the building code?
 - Only other assistance in the building code is a reference to the SMACNA Architectural Sheet Metal Manual with respect to flashing design.
- ✓ So in essence as long as you put a 29 Gauge thick sheet metal onto a fully supported roof it meets code, right?

Minimum Requirements



Metal Roofing in the Building Codes

- ✓ What about the “designed for specified *Live Load*” comment in part 9?
 - This is specifically in the event of the roof not having sheathing and the metal needing to act as the sheathing.
- ✓ However, in the structural portion of the code the roof will still need to be designed to meet the specified live loads that each component will be anticipated to need to accommodate.
 - This is to design the type, size, and frequency of clips and drag load fasteners.

Minimum Requirements



Metal Roofing in the Building Codes

- ✓ Clip spacing is determined based on the wind uplift requirements of the metal roof.

- *RCABC manual require 2' o/c for clips

This is a standard guide and not for design purposes.

- ✓ Similar to flat roofs there are various zones that require potential fastener pattern increases

- ✓ With pitched roofs there are six (6) zones with the difference being overhangs.

Minimum Requirements



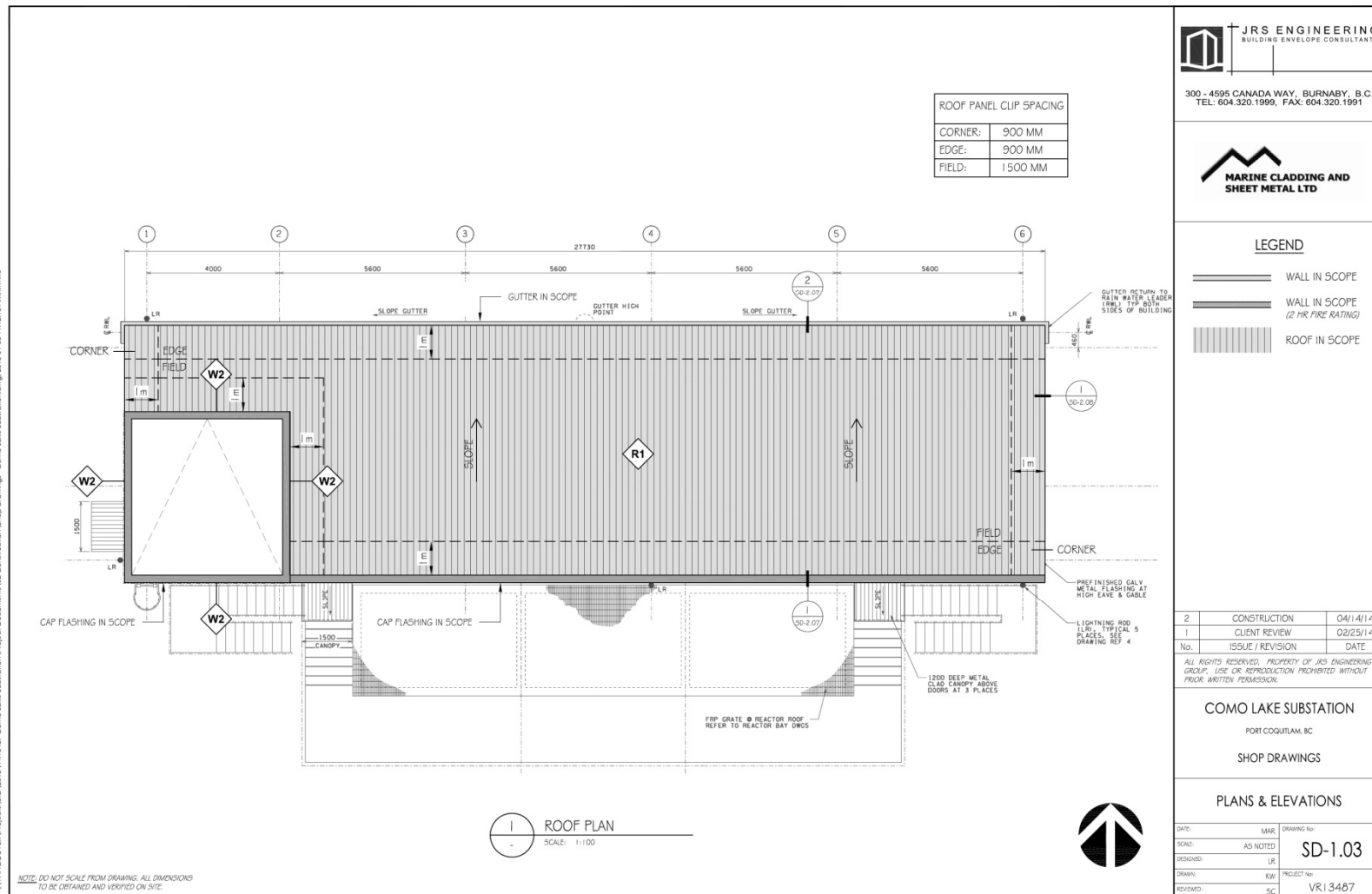
Metal Roofing in the Building Codes

- ✓ Drag load fastener requirements are based on the snow load for the project.

- ✓ Longer panels typically require increased fastener frequency.

*RCABC manual require 2 drag load screws per panel

This is a standard guide and not for design purposes.



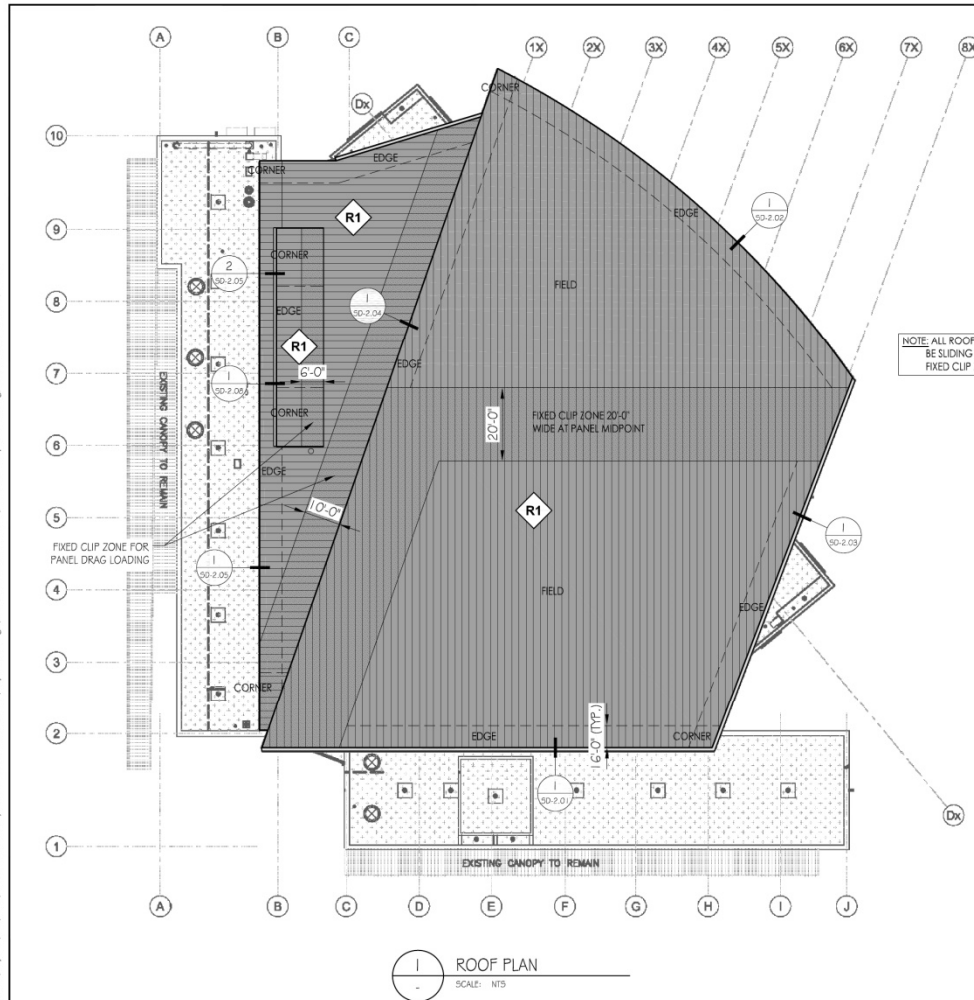
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NOTE: DO NOT SCALE FROM DRAWING. ALL DIMENSIONS TO BE OBTAINED AND VERIFIED ON SITE.

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MARINE CLADDING AND SHEET METAL LTD

LEGEND

R1 SCOPE OF WORK

2	CONSTRUCTION REVISION	08/06/14
2	CONSTRUCTION	06/26/14
1	CLIENT REVIEW	04/23/14
No.	ISSUE / REVISION	DATE

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SHOP DRAWINGS

GENERAL NOTES

DATE:	DATE:	DRAWING No:
SCALE:	AS NOTED	SD-1.01
DESIGNED:	LR	
DRAWN:	KJM	PROJECT No:
REVIEWED:	SC	VR13279



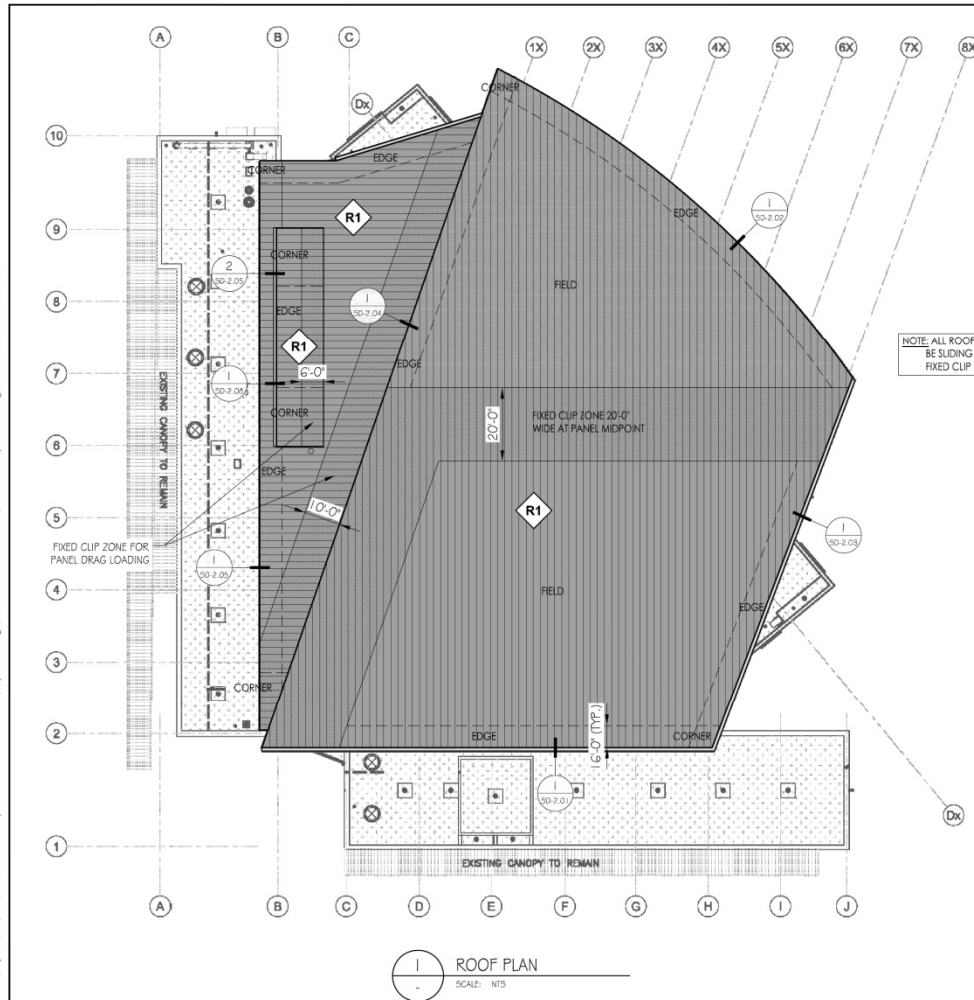
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✓ Thermal Expansion

- To detail the eave drip edge clip thermal expansion must be determined.
- For every 10' of length the metal will expand roughly 0.08" per 100 degrees Fahrenheit.
- In Burnaby this works out to about 0.12" per 10' length on dark colour pitched metal roofs
- How much can be expected on previous example?
 - Roof is roughly 180' long ~ 2.17"



METAL PANEL CLIP SPACING	
ZONE (SEE PLAN)	CLIP SPACING
FIXED	24"
CORNER	20"
EDGE	36"
FIELD	48"
WALL	PER Z-GIRT SPACING

NOTE: ALL ROOF PANEL CLIPS TO BE SLIDING CLIPS EXCEPT IN FIXED CLIP ZONES

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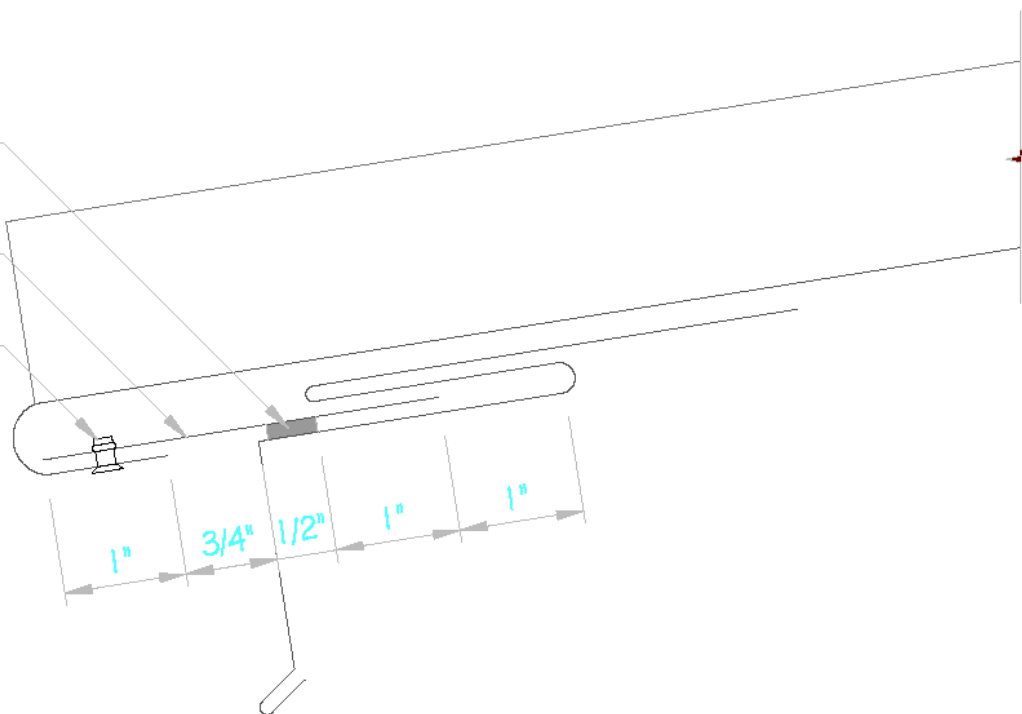
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BUTYL TO HOLD FLASHING IN PLACE

20 GA. GALVALUME

RIVET UNDERSIDE OF PANEL
HEM TO FLAT STOCK
(2) PER PANEL

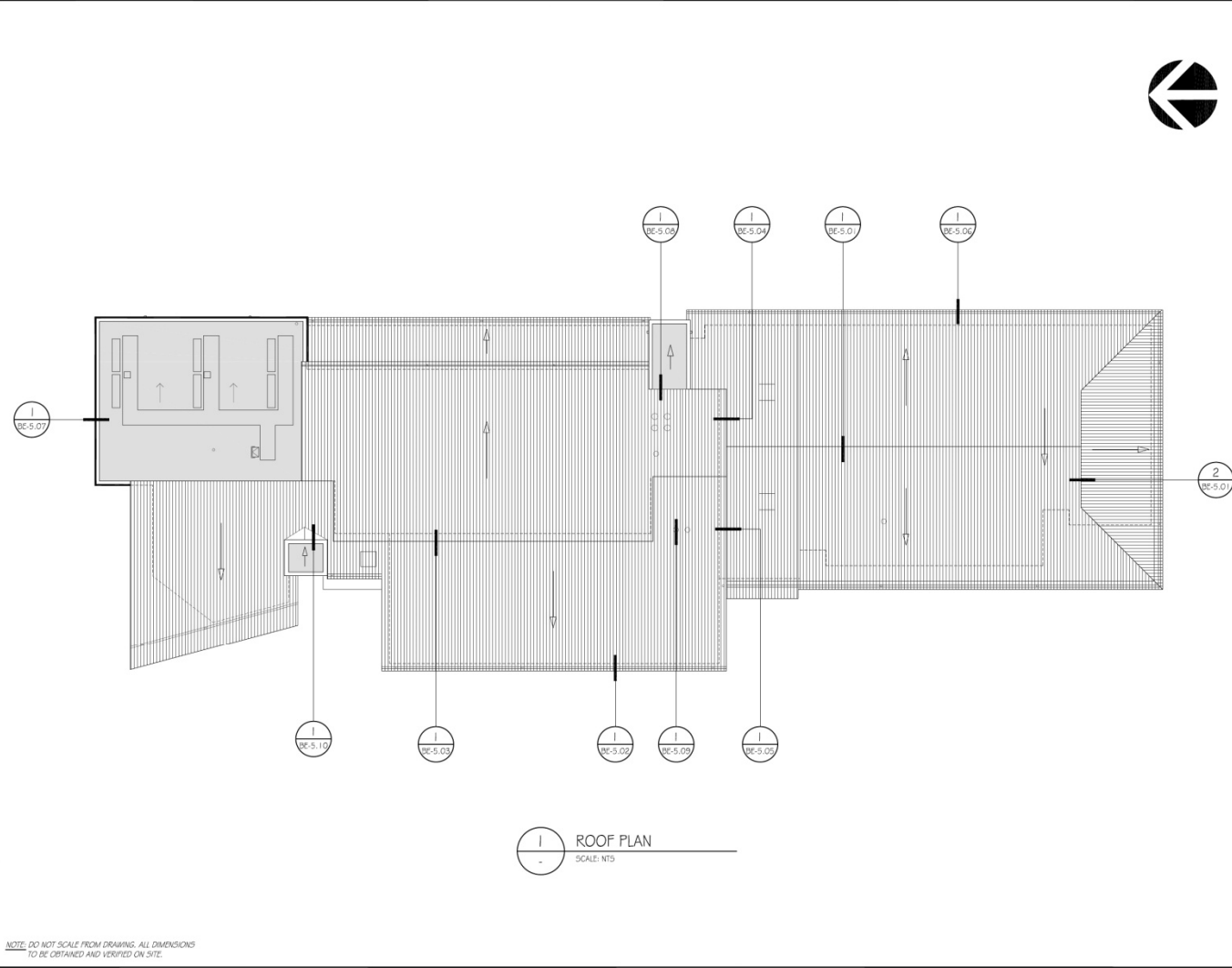


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MAINLINE ROOFING CO. LTD.
 255 HODGSON ROAD WILLIAMS LAKE, BC

LEGEND

LOW-SLOPED ROOF

SLOPED METAL ROOF BY MAINLINE

CORRUGATED METAL CLADDING BY MAINLINE

△	REVISION 1	09/17/10
2	CONSTRUCTION	09/09/10
1	PRELIMINARY REVIEW	08/27/10
No.	ISSUE / REVISION	DATE

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NORTHWEST COMMUNITY COLLEGE
 SMITHERS, BC

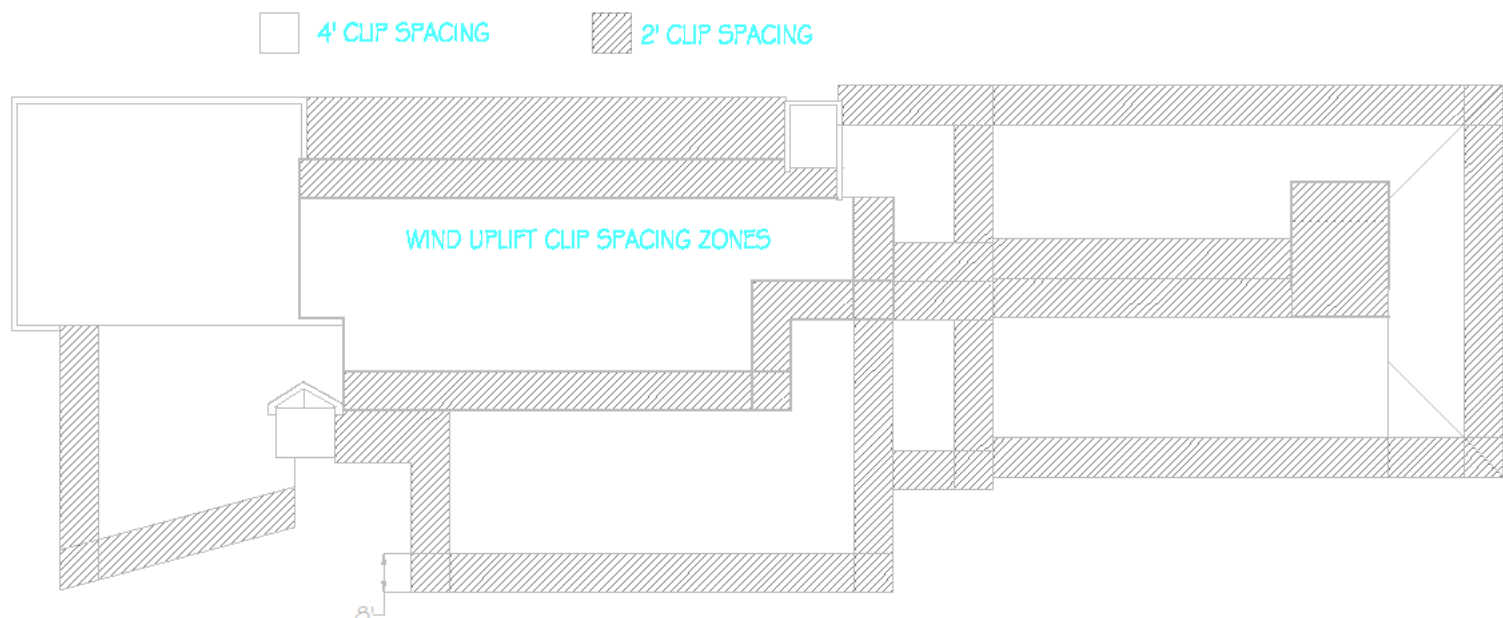
PLANS & ELEVATIONS

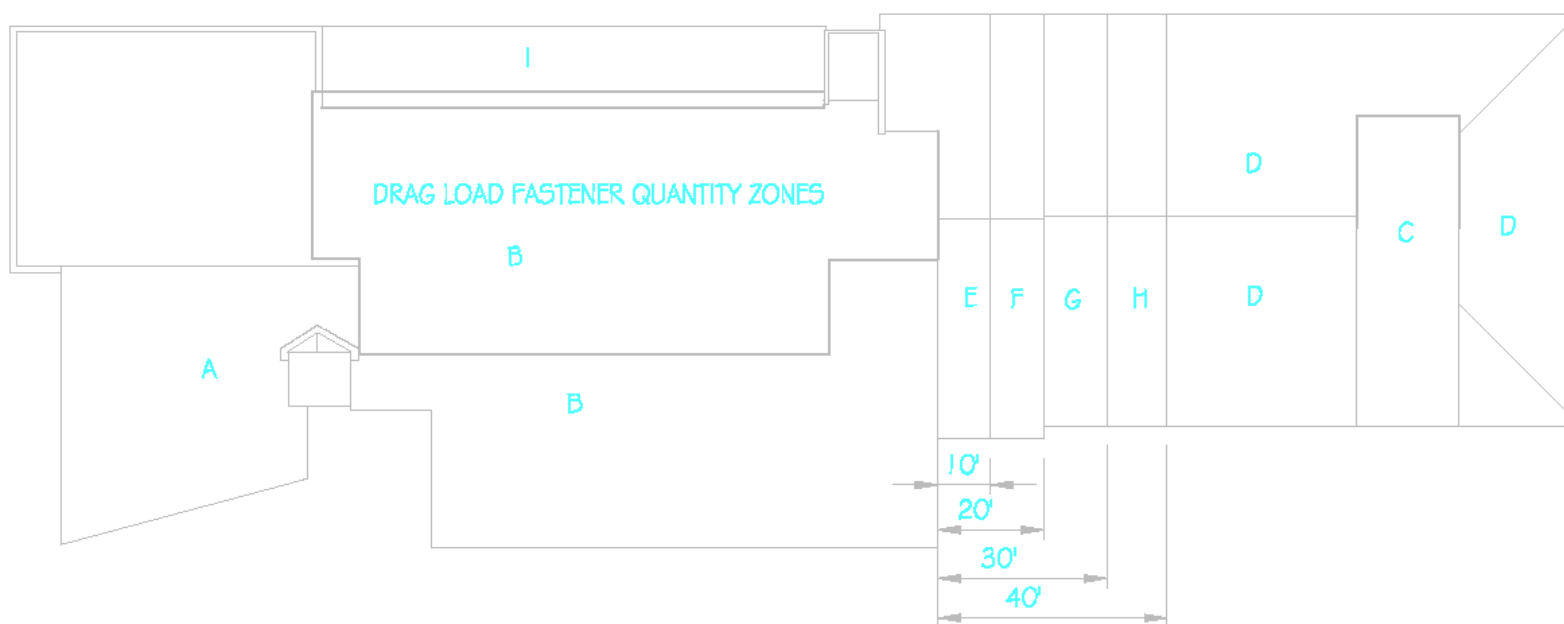
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REVIEWED:	SC	09923A	



SHOP DRAWING FOR NORTHWEST COMMUNITY COLLEGE - ROOF & WALL CLADDING

SMITHERS, BC







UPLIFT FASTENERS AND CLIPS

- 158-FC-22G CLIPS SPACED AT 4' O.C. EXCEPT 8' FROM ANY ROOF RIDGE, RAKE OR EAVE WHERE CLIPS SHALL BE SPACED AT 2' O.C. (SEE DIAGRAM AT TOP RIGHT OF RP-0.02). A CLIP MUST BE LOCATED A MINIMUM OF 6" FROM THE BOTTOM OF EACH PANNEL.
- 3: UPLIFT FASTENERS FROM CLIP TO 2X4 WOOD BLOCKING
#12-14 2" METAL TO WOOD WAFER HEAD FASTENERS
- 4: UPLIFT FASTEMERS FROM 2X4 WOOD BLOCKING TO STEEL DECK
#12-14 TEK WAFER HEAD FASTENERS c/w WASHER SPACED AT 10" O.C. (APPROPRIATE LENGTH TO SUIT FULL PENETRATION OF STRUCTURAL STEEL DECK*)

DRAG LOAD FASTENERS

- 5: #12-14 2.5" TEK GASKETED DRAG LOAD FASTENER QTY PER PANEL WIDTH*

ZONE:	A	B	C	D	E	F	G	H	I
QTY:	4	5	9	6	15	13	11	9	5

*FASTENERS MUST BE LOCATED A MINIMUM OF 1" FROM EACH OTHER AND FROM THE END OF THE PANEL.

- 6: #14-14 TEK WAFER HEAD FASTENER (APPROPRIATE LENGTH TO FULLY PENETRATE STEEL DECK*, OR PENETRATE INTO T&G DECK BY 2". QUANTITY BY ZONE AS PER ABOVE.











FASTENER SPACING ALONG PANEL (WIND UPLIFT)

> 7:12	
CORNERS	5-3/16"
SIDES	10-3/8"
FIELD	25-15/16"
EDGE DIST. ZONE	14'-0"

DRAW LOAD FASTENERS

PANEL LENGTH	ROOF SLOPE		
	6:12	4:12	3:12
1' - 10'	3	2	2
11' - 20'	6	4	3
21' - 30'	9	6	4
31' - 40'	11	8	5
41' - 50'		10	
51' - 60'		11	
61' - 70'		13	



*Specific to Specific Project

Design Resources



- ✓ Building Codes
- ✓ RCI Courses
 - Metal Roofing - 2 day course
- ✓ Industry Manuals
 - SMACNA Architectural Sheet Metal Manual
 - SMACNA Architectural Sheet Metal Inspection Manual
 - NRCA Metal Panel and SPF Roof Systems—2012
 - RCABC Roofing Practices Manual
- ✓ Industry Manufacturers

Low Slope Metal



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Low Slope Metal



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Low Slope or Curved Metal Roof Systems



- ✓ Specialty testing needs to be performed on the panel to determine the performance of the metal panel under low slope and curved conditions.
- ✓ ASTM E 2140 (09) - Standard Test Method for Water Penetration of Metal Roof Panel Systems by Static Water Pressure Head
- ✓ FBC - TAS 114 – Test Procedures for Roof System Assemblies in the High-Velocity Hurricane Zone Jurisdiction

Design Details



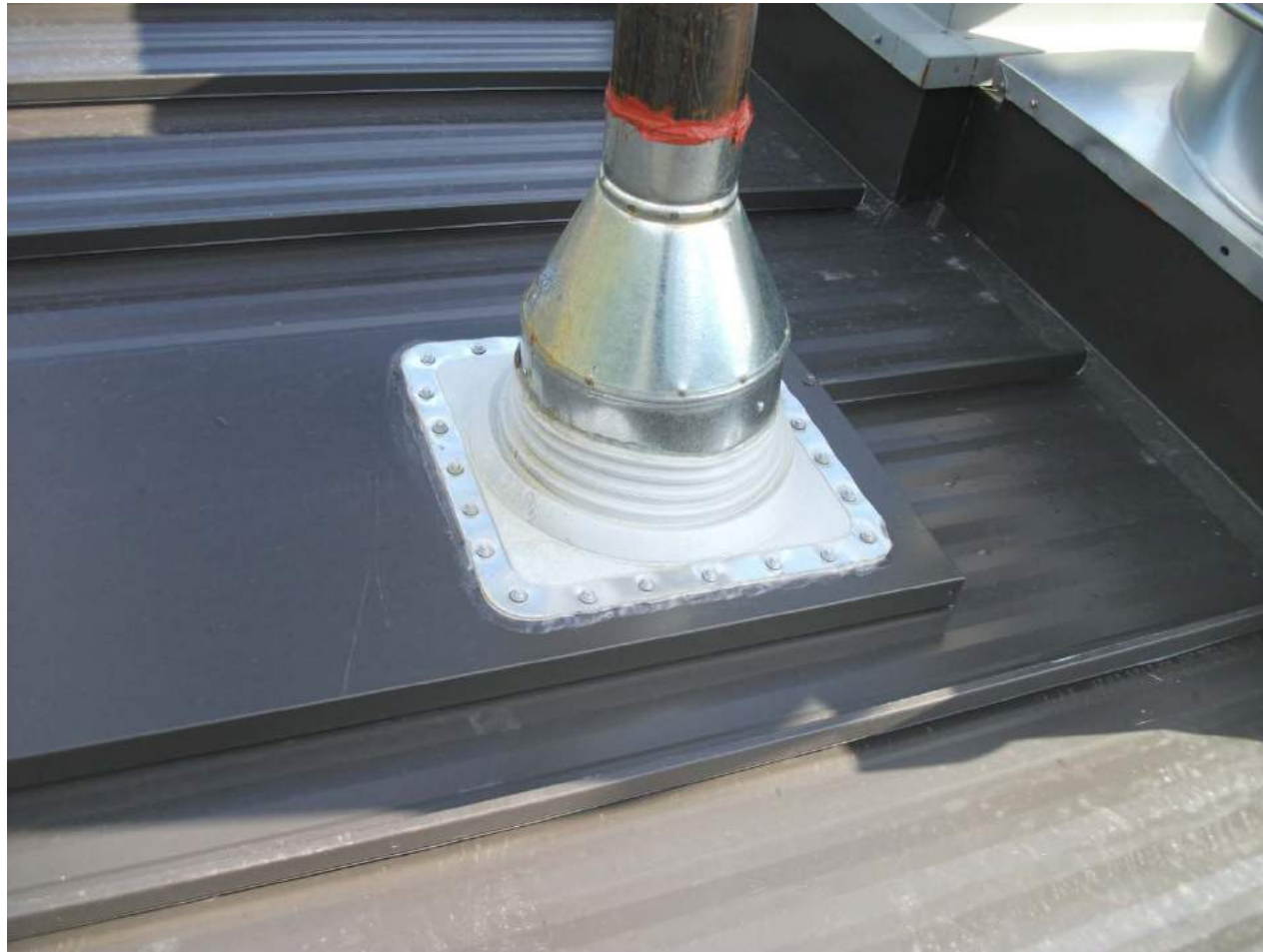
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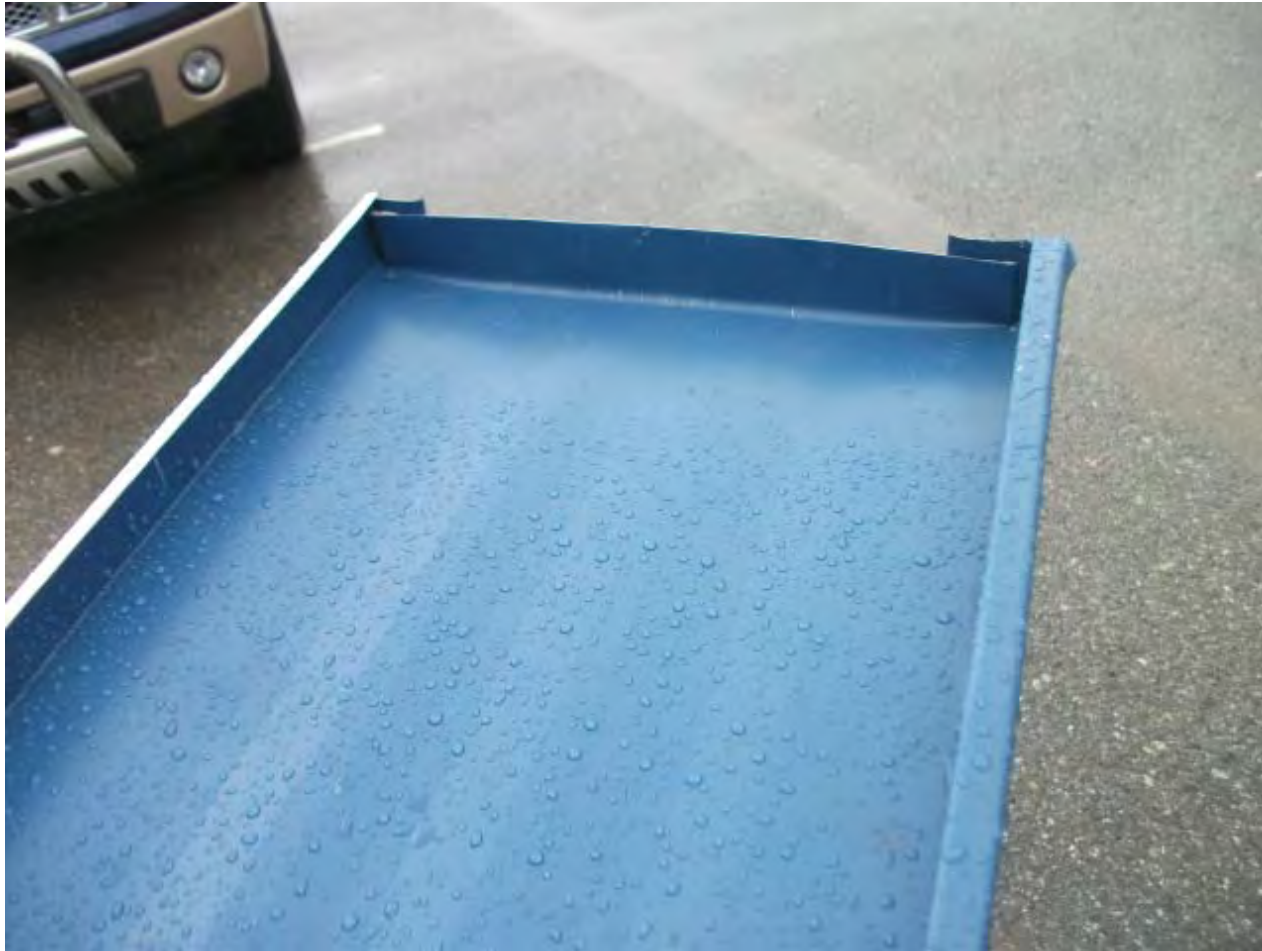
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Continuously Insulated (Ci) Systems



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Continuously Insulated (Ci) Systems



Closure



✓ Topics

- Minimum Requirements
- Design Resources
- Low Slope Metal Roofing
- Design Details
- Continuously Insulated (Ci) Systems

Closure



✓ Thank You