



STRUCTURAL CALCULATIONS

USU Salt Lake City Campus Remodel

Project No. 22010

920 W. Levoy Drive

Taylorsville, Utah

PREPARED FOR:

Method Studio

PROJECT DESIGN CRITERIA



General Project Information

Project Name: USU Salt Lake City Campus Remodel
Street Address: 920 W. Levo Drive
City, State: Taylorsville, Utah

Client Name: Method Studio
Governing Code: International Building Code (2018)
Risk Category: Risk Category II (All Others)

Project Description:

Evaluation of existing roof for new REPLACEMENT mechanical units

Structural Loads and Criteria

LIVE LOADS	WIND LOADS	SEISMIC LOADS
Roof Live Load: 20 psf	Wind Speed: 105 mph	Site Classification: Site Class-D (Default)
Floor Live Load:	Wind Exposure: Exposure C (All Others)	Short Period (Ss): 1.493 g
Flat Roof Snow Load: 18 psf	Enclosure: Enclosed	Long Period (S1): 0.525 g
Misc. Load: N/A	Analysis Method: Directional	Design Category: D

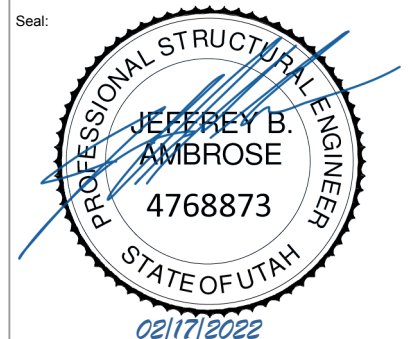
Structural Material Properties

SOILS	MASONRY	CONCRETE
Soil Type: Site Class-D (Default)	Compression (f'm): N/A	Compression (f'c): N/A
Bearing: 1500 psf	Mortar Type: N/A	Steel Reinforcing: N/A
Sliding: 0.45	Grout: N/A	w/c ratio: N/A
Short Term Increase: 33%	CMU Type: N/A	Air Content: N/A
STEEL	WOOD	LATERAL FORCE RESISTING SYSTEM
Beams: A992	Sawn Lumber: N/A	Ordinary reinforced masonry shear walls
Columns: A992	Glulam Lumber: N/A	R-Factor: 2.00
Plates: A36	Sheathing: N/A	Omega (Wo): 2.50
Anchor Bolts: N/A	All Thread: N/A	Amplification (Cd): 1.75

Calculation Set Table of Contents

General Design Criteria: G1-G5
Engineering Design: E1-E9
Structural Sketches: D5/S001

Seal:



This signed engineering seal is intended only for this single project and applies only to the project scope as listed above. This seal only applies to the attached calculation set for this project and applies to no other documentation or aspects of the project.

SNOW LOADING

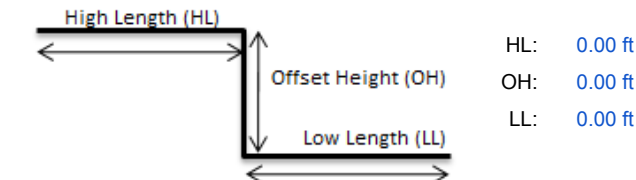
USU Salt Lake City Campus Remodel



Designation:	County: Salt Lake
Risk Category: Risk Category II (All Others)	Elevation: 4300 ft
Roof Exposure: Fully Exposed	Ground Snow Load: 29 psf
Terrain Category: Exposure C (All Others)	Roof Slope: 0 deg
Roof Thermal Type: All Other Structures	Roofing Material: All Others
Load Type: Utah Snow Load Study	W (ft)
[[Utah Ground Snow Load Map]]	

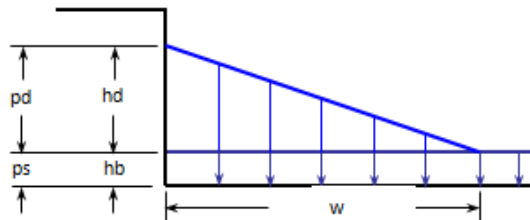
Ground Snow Load (pg):	29 psf	Height of Snow Drift (hd):	-1.50 ft
Exposure Factor (Ce):	0.90 Table 7.3-1	Roof Slope Run for $y=1$ (S):	#DIV/0!
Thermal Factor (Ct):	1.00 Table 7.3-2		
Importance Factor (I):	1.00 Table 1.5-2		
Flat Roof Snow Load (pf):	18 psf Equation 7.3-1		
Sloped Roof Factor (Cs):	1.00 Figure 7-2		
Sloped Roof Snow Load (ps):	18 psf Equation 7.4-1		
Snow Density (g):	17.8 pcf Equation 7.7-1		

Roof Step Drifting Design



Step Height (hc):	-1.0 ft
Flat Roof Snow Depth (hb):	1.0 ft
Drift Height (hd):	0.0 ft
Drift Load (pd):	-18 psf
Drift Length (w):	-8.2 ft

Leeward Drift Controls----->

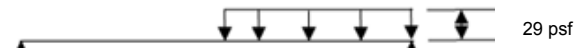


Unbalanced Snow Design

Snow Load

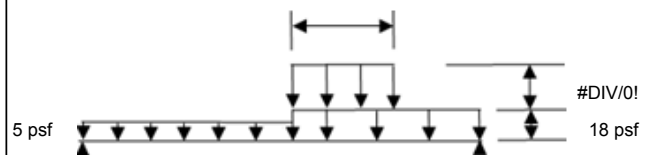
Unbalanced $W < 20$ ft
with roof rafter system

NOT REQUIRED



Unbalanced Ot

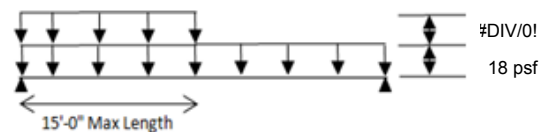
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Sliding Snow Design

Loading on Lower Roof Section

Sliding Snow Load



Balanced Snow Load

PROJECT LOADING CRITERIA

USU Salt Lake City Campus Remodel



ROOF LOADING					
DEAD LOADS			LIVE LOADS		
Roof System:	1.00 psf	Membrane System	Roof Live Load:	20.00 psf	
Roof Insulation:	1.20 psf	3" Rigid insulation	Flat Roof Snow Load:	18.00 psf	
Roof Deck Collateral:	1.80 psf		Sloped Roof Snow Load:	18.27 psf	
Roof Deck:	3.00 psf	Steel roof deck	Roof Wind Load:	0.00 psf	
Elec/Mech/Piping:	5.00 psf		Elevation:	4300 ft	
Ceiling Finishes:	3.00 psf	Acoustical Ceiling System			
Misc Collateral:	10.00 psf	Original Ballast (now removed)			
Other:					
Roof Joists:	3.00 psf		Total Roof Decking DEAD Load:	7.00 psf	
Roof Girders:	2.00 psf		Total Roof Joist DEAD Load:	28.00 psf	
			Total Roof Girder DEAD Load:	30.00 psf	
TOTAL LOAD:	30.00 psf				
TOTAL MODEL LOAD:	25.00 psf	<- When self weight is calculated by software.			
			TOTAL ROOF SEISMIC MASS:	30.00 psf	
FLOOR LOADING					
DEAD LOADS			LIVE LOADS		
Floor Finishes:	0.00 psf	NONE	Floor Live Load:		
Deflected Concrete:			Floor Partition Load:		
Floor Deck Collateral:			Is Live Load a Storage Load:		
Floor Decking:	0.00 psf	NONE	Floor Corridor Load:		
Elec/Mech/Piping:			Construction Live Load:		
Ceiling Finishes:	0.00 psf	NONE			
Misc Collateral:					
Other:			Pre-Composite DEAD:	0.00 psf	
Floor Joists:			Pre-Composite LIVE:		
Floor Girders:			Superimposed DEAD:	0.00 psf	
			Superimposed LIVE:	0.00 psf	
TOTAL LOAD:	0.00 psf				
TOTAL MODEL LOAD:	0.00 psf	<- When SW+Deck is calculated by software.			
			TOTAL FLOOR SEISMIC MASS:	0.00 psf	
WALL LOADING					
DEAD LOADS					
WALL TYPE 1			TOTAL WALL WEIGHT: 0.00 psf		
Exterior Finish:	0.00 psf	NONE	Wall Height:	0.00 ft	
Insulation:	0.00 psf	NONE	Total Wall Mass:	0 plf	
Structure:	0.00 psf	NONE			
Interior Finish:	0.00 psf	NONE			
Other:					
WALL TYPE 2			TOTAL WALL WEIGHT: 0.00 psf		
Exterior Finish:	0.00 psf	NONE	Wall Height:	0.00 ft	
Insulation:	0.00 psf	NONE	Total Wall Mass:	0 plf	
Structure:	0.00 psf	NONE			
Interior Finish:	0.00 psf	NONE			
Other:					

IBC 2018 SEISMIC DESIGN & LOADING

USU Salt Lake City Campus Remodel



Section 11.4-Seismic Ground Motions

Short Period Map Acceleration (Ss): 1.49 g TL: 8.00 s

1-Sec Period Map Acceleration (S1): 0.53 g

Site Class: Site Class-D (Default)

Soil Modification (Fa): 1.20

Soil Modification (Fv): 1.78

Design Spectral Accelerations

SDS: 1.19 g

SD1: 0.62 g

Use Exception (11.4.8): Exception 2

Section 11.5-Importance and Occupancy

Risk Category: Risk Category II (All Others)

Importance (I): 1.00

Section 11.6-Seismic Design Category

Design Category: D

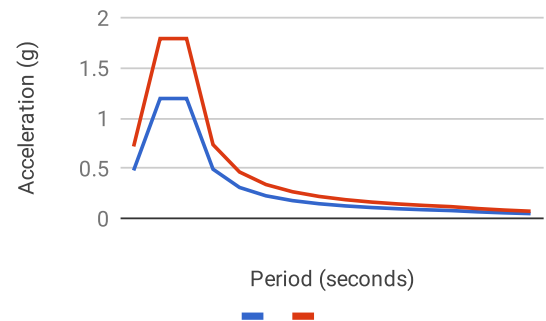
Section 12.2-Structural System

Framing System: A-Bearing Wall Systems

Lateral System: Ordinary reinforced masonry shear walls

R	Wo	CD
2.00	2.50	1.75

Site Response Spectra



Section 12.3-Redundancy Factor

Building Design: Regular, w/ 2-Bays of perimeter framing ea.side

Redundancy-r: 1.00

Section 12.8-Equivalent Lateral Force

Fundamental Period (T): 0.00 s

Seismic Coefficient (Cs): 0.597

Base Shear (Qe): 0.00 kips

Base Shear (E): 0.00 kips

Amplified Base Shear (WoQe): 0 kips

Section 12.8.3: Vertical Distribution of Seismic Forces

of Diaphragm Levels: 1

Period Factor-k: 1.00

Diaphragm / Floor Level	Story Height	Height abv Base	Diaphragm Area	Diaphragm Weight	Perimeter Wall Length	Perimeter Wall Wt.	Seismic Wt (kips)	Force @ Floor Lvl	Story Shear	Diaphragm Force
ROOF		0 ft		30 psf			0 kips	#DIV/0!	#DIV/0!	#DIV/0!
BASE		0 ft					0 kips	#DIV/0!	#DIV/0!	#DIV/0!
TOTALS		0 ft	0 ft2	#DIV/0!			0.00 kips	#DIV/0!	#DIV/0!	

SEISMIC DESIGN OF NON-STRUCTURAL ANCHORAGE

USU Salt Lake City Campus Remodel



Nonstructural Component Classification - Table 13.5-1 + 13.6-1

Architectural Component: [Choose Component - Table 13.5-1](#)

Mechanical Component: [Air-side HVAC, AHU, Air conditioning units](#)

Nonstructural Component Importance Factor ASCE 7 - 13.1.3

Occupancy Category: [Risk Category II \(All Others\)](#)

Component Required to function for Lifesafety after earthquake, including fire protection sprinkler N

Component contains hazardous materials: N

Component is in or attached to an Occupancy Category IV structure AND it is needed for continued operation of the facility or its failure could impart in the continued operation of the facility. N

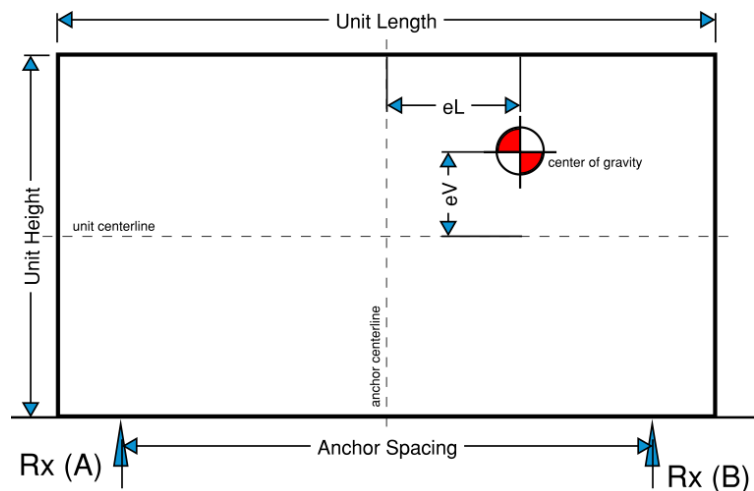
Equipment Geometry & Information

*Anchor Spacing must be symmetrical

Unit Length: 8.00 ft
Unit Height: 5.00 ft
Anchor Spacing: 8.00 ft
Unit Weight: 2750 lbs
Offset (eL): 0.00 ft
Offset (eV): 0.00 ft
Total # of Anchors: 4

Seismic Parameters:

SDS: 1.19
z (ht of anchor from Ground): 20.00 ft
h (overall ht of building): 20.00 ft



SEISMIC ANALYSIS

ap: 2.5
Rp: 6.0
Wp: 2750 lb
Ip: 1.00
z/h: 1.00

Fp: 1642 lb
Fp min: 985 lb
Fp max: 5255 lb
E: 1642 lb

SHEAR ANALYSIS

Total Shear: 1,642
Anchor Shear: 411

OVERTURNING ANALYSIS

Mu: 4,106

Positive E (to right)

Rx (A): 724
Rx (B): 1,888

(-) Means Uplift

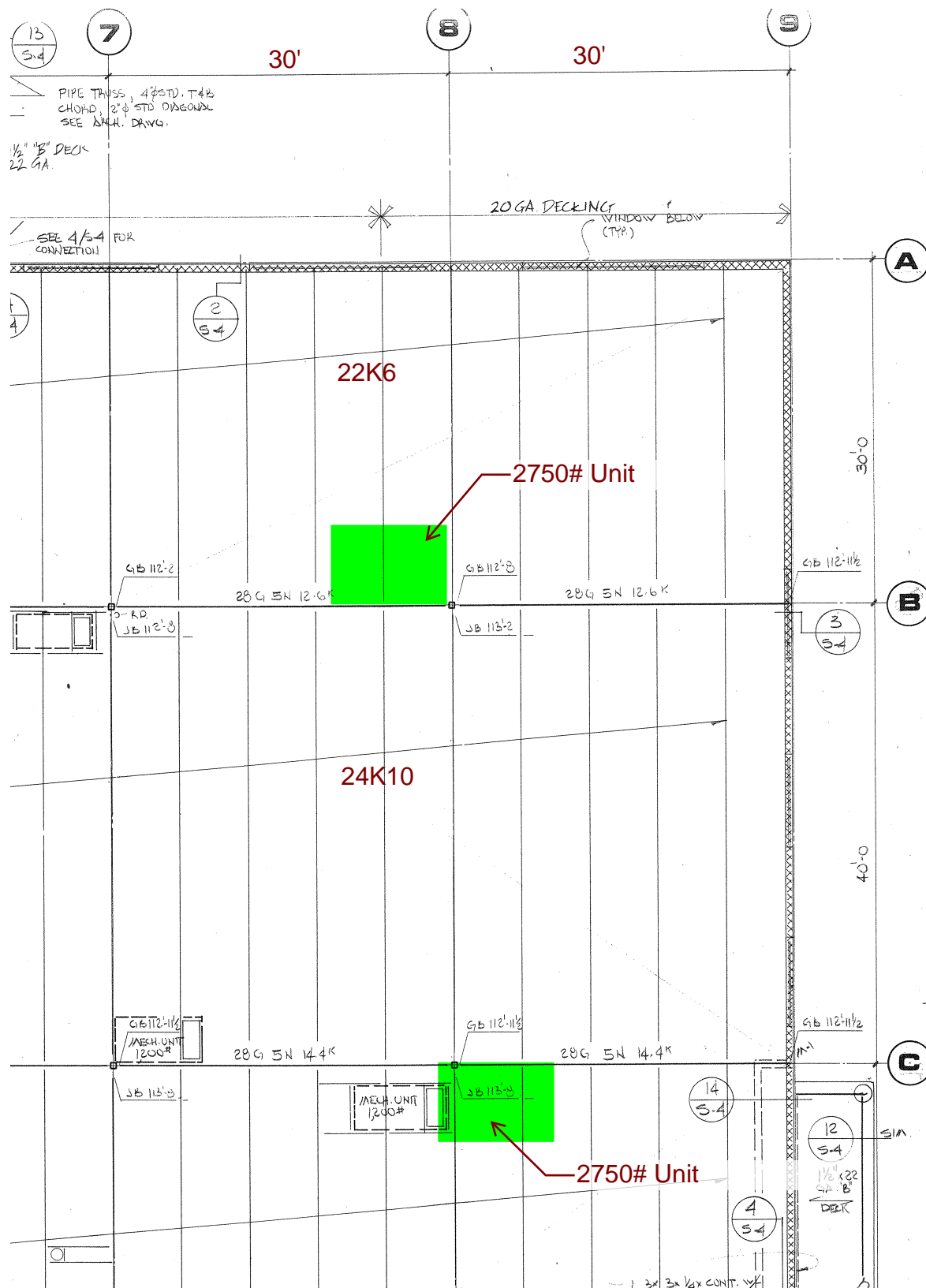
Negative E (to left)

Rx (A): 1,888
Rx (B): 724

(-) Means Uplift

MAX ANCHOR DESIGN

Max Tu: None
Max Vu: 411



SIMPLE SPAN - BEAM DESIGN

Joist 1 (Supporting RTU 1)



DESIGN CRITERIA

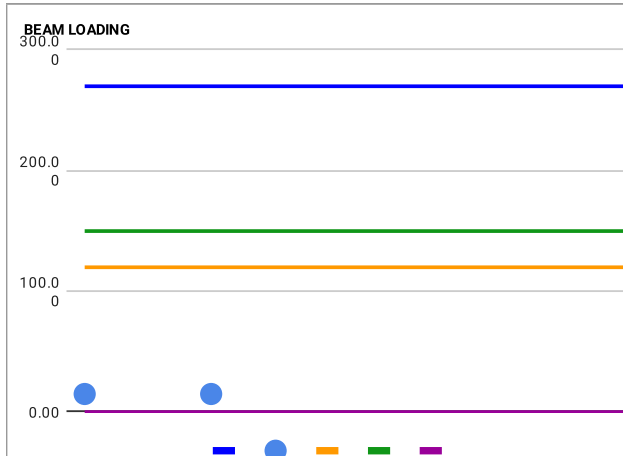
Length (ft): 30.00

Deflect (L/x): 240

SPACING: 6.00

DL: 20.00

LL 25.00

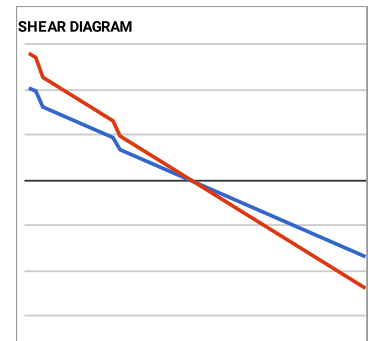


DISTRIBUTED	LOAD 1	LOAD 2	LOAD 3
Start Location	0.00		
End Location	30.00		
Dead Load Start	120		
Dead Load End	120		
Live/Snow Start	150		
Live/Snow End	150		
EQ/W Start			
EQ/W End			

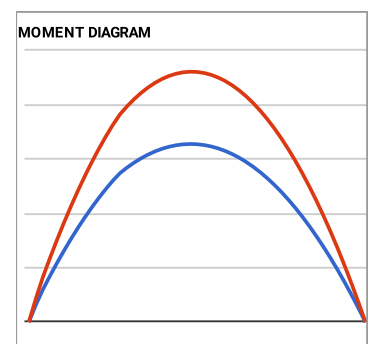
POINT LOADS	LOAD 1	LOAD 2	LOAD 3
Location	1.00	8.00	
Dead Load	708	497	
Live/Snow Load			
EQ/W Load			

Be sure to use the same units throughout, either plf and pounds or klf and kips. Never mix the two. For the Design Options to properly work, be sure to use PLF and POUNDS.

REACTIONS	DL	LL	EQ/W	SERVICE	DESIGN
LEFT:	2849	2250	0	5,099	7,019
RIGHT:	1956	2250	0	4,206	5,947
FORCES	DL	LL	EQ/W	SERVICE	DESIGN
MAX SHEAR:	2849	2250	0	5,099	7,019
MAX MOMENT:	15943	16875	0	32,762	46,053
EQUIV (PLF)	DL	LL	EQ/W	SERVICE	DESIGN
SHEAR:	190	150	0	340	468
MOMENT:	142	150	0	291	409



STEEL SECTION	CONCRETE SECTION	WOOD SECTION
Type: NO DESIGN	Width (in):	Width (in):
Trial Section:	Depth (in):	Depth (in):
Max Depth:	f'c (psi):	Member Type: Choose
FyZx min: 614	Bar Size (#):	Wood Type: Choose
Ix min: 122	Min Depth: #DIV/0!	Wood Grade: Choose
phi Mn: #N/A	phi Mn: #N/A	phi Mn: 0
Mn Interaction: #N/A	Mn Interaction: #N/A	Mn Interaction: #DIV/0!
Deflection (L/x): #N/A	Deflection (L/x): #DIV/0!	Deflection (L/x): #DIV/0!
Deflection: #N/A	Deflection: #DIV/0!	Deflection: #DIV/0!
SECTION : #N/A	SECTION: #N/A	SECTION: 0x0 - Choose



SIMPLE SPAN - 5% BEAM EVALUATION

Joist 1 (Supporting RTU 1)



ANALYSIS FROM ORIGINAL CONDITION (paste from original analysis)

REACTIONS	DL	LL	EQ/W	SERVICE	DESIGN
LEFT:	2700	2700	0	5,400	7,560
RIGHT:	2700	2700	0	5,400	7,560
FORCES	DL	LL	EQ/W	SERVICE	DESIGN
MAX SHEAR:	2700	2700	0	5,400	7,560
MAX MOMENT:	20250	20250	0	40,500	56,700
EQUIV (PLF)	DL	LL	EQ/W	SERVICE	DESIGN
SHEAR:	180	180	0	360	504
MOMENT:	180	180	0	360	504

Notes:

Original Deck Load with 30 psf Snow and 10 psf of ballast

ANALYSIS FROM MODIFIED CONDITION (from active analysis)

REACTIONS	DL	LL	EQ/W	SERVICE	DESIGN
LEFT:	2849	2250	0	5,099	7,019
RIGHT:	1956	2250	0	4,206	5,947
FORCES	DL	LL	EQ/W	SERVICE	DESIGN
MAX SHEAR:	2849	2250	0	5,099	7,019
MAX MOMENT:	15943	16875	0	32,762	46,053
EQUIV (PLF)	DL	LL	EQ/W	SERVICE	DESIGN
SHEAR:	190	150	0	340	468
MOMENT:	142	150	0	291	409

Notes:

Roof joist with worst case single joist loading. This is still conservative because about 5 psf in the dead load portion is actually allocated for Mechanical weights (meaning I could pull it out). Plus I am using 25 psf snow load, even though it could be reduced another 5 psf according to the building code. Even if I use a full 30 psf, it is still within tolerance.

5% COMPARISSON FROM ORIGINAL

REACTIONS	DL	LL	EQ/W	SERVICE	DESIGN
LEFT:	105.5%	83.3%	#DIV/0!	94.4%	92.8%
RIGHT:	72.4%	83.3%	#DIV/0!	77.9%	78.7%
FORCES	DL	LL	EQ/W	SERVICE	DESIGN
MAX SHEAR:	105.5%	83.3%	#DIV/0!	94.4%	92.8%
MAX MOMENT:	78.7%	83.3%	#DIV/0!	80.9%	81.2%
EQUIV (PLF)	DL	LL	EQ/W	SERVICE	DESIGN
SHEAR:	105.5%	83.3%	#DIV/0!	94.4%	92.8%
MOMENT:	78.7%	83.3%	#DIV/0!	80.9%	81.2%

JOIST SIZE:	22K6	ACTUAL	STATUS
LL Capacity:	266.00	150.00	OK
TL Capacity:	371.00	339.92	OK

SIMPLE SPAN - BEAM DESIGN

Girder 1 (Supporting RTU 1)



DESIGN CRITERIA

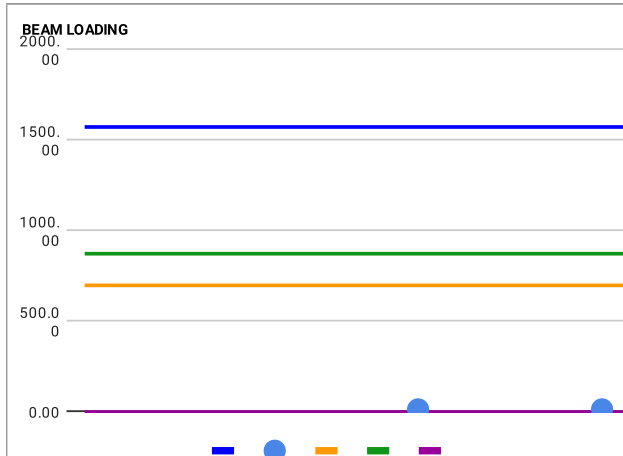
Length (ft): 30.00

Deflect (L/x): 240

SPACING: 35.00

DL: 20.00

LL 25.00

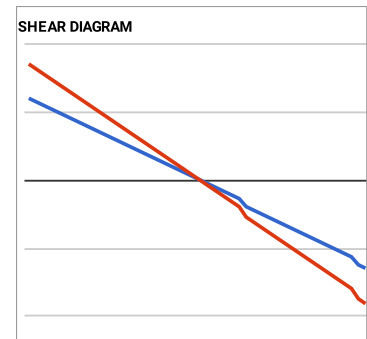


DISTRIBUTED	LOAD 1	LOAD 2	LOAD 3
Start Location	0.00		
End Location	30.00		
Dead Load Start	700		
Dead Load End	700		
Live/Snow Start	875		
Live/Snow End	875		
EQ/W Start			
EQ/W End			

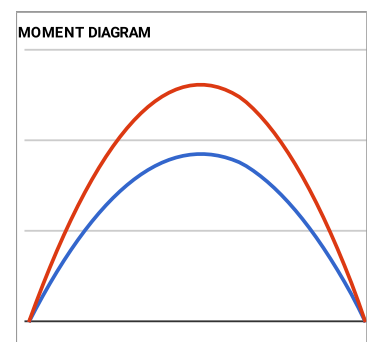
POINT LOADS	LOAD 1	LOAD 2	LOAD 3
Location	19.00	29.00	
Dead Load	1375	1375	
Live/Snow Load			
EQ/W Load			

Be sure to use the same units throughout, either plf and pounds or klf and kips. Never mix the two. For the Design Options to properly work, be sure to use PLF and POUNDS.

REACTIONS	DL	LL	EQ/W	SERVICE	DESIGN
LEFT:	11050	13125	0	24,175	34,260
RIGHT:	12700	13125	0	25,825	36,240
FORCES	DL	LL	EQ/W	SERVICE	DESIGN
MAX SHEAR:	12700	13125	0	25,825	36,240
MAX MOMENT:	87207	98438	0	185,474	261,900
EQUIV (PLF)	DL	LL	EQ/W	SERVICE	DESIGN
SHEAR:	847	875	0	1,722	2,416
MOMENT:	775	875	0	1,649	2,328



STEEL SECTION	CONCRETE SECTION	WOOD SECTION
Type: NO DESIGN	Width (in):	Width (in):
Trial Section:	Depth (in):	Depth (in):
Max Depth:	f'c (psi):	Member Type: Choose
FyZx min: 3492	Bar Size (#):	Wood Type: Choose
Ix min: 691	Min Depth: #DIV/0!	Wood Grade: Choose
phi Mn: #N/A	phi Mn: #N/A	phi Mn: 0
Mn Interaction: #N/A	Mn Interaction: #N/A	Mn Interaction: #DIV/0!
Deflection (L/x): #N/A	Deflection (L/x): #DIV/0!	Deflection (L/x): #DIV/0!
Deflection: #N/A	Deflection: #DIV/0!	Deflection: #DIV/0!
SECTION : #N/A	SECTION: #N/A	SECTION: 0x0 - Choose



SIMPLE SPAN - 5% BEAM EVALUATION

Girder 1 (Supporting RTU 1)



ANALYSIS FROM ORIGINAL CONDITION (paste from original analysis)

REACTIONS	DL	LL	EQ/W	SERVICE	DESIGN
LEFT:	15750	15750	0	31,500	44,100
RIGHT:	15750	15750	0	31,500	44,100
FORCES	DL	LL	EQ/W	SERVICE	DESIGN
MAX SHEAR:	15750	15750	0	31,500	44,100
MAX MOMENT:	118125	118125	0	236,250	330,750
EQUIV (PLF)	DL	LL	EQ/W	SERVICE	DESIGN
SHEAR:	1050	1050	0	2,100	2,940
MOMENT:	1050	1050	0	2,100	2,940

Notes:

Original Deck Load with 30 psf Snow and 10 psf of ballast

ANALYSIS FROM MODIFIED CONDITION (from active analysis)

REACTIONS	DL	LL	EQ/W	SERVICE	DESIGN
LEFT:	11050	13125	0	24,175	34,260
RIGHT:	12700	13125	0	25,825	36,240
FORCES	DL	LL	EQ/W	SERVICE	DESIGN
MAX SHEAR:	12700	13125	0	25,825	36,240
MAX MOMENT:	87207	98438	0	185,474	261,900
EQUIV (PLF)	DL	LL	EQ/W	SERVICE	DESIGN
SHEAR:	847	875	0	1,722	2,416
MOMENT:	775	875	0	1,649	2,328

Notes:

Roof girder with worst case loading as it is carrying the full unit. This is still conservative because about 5 psf in the dead load portion is actually allocated for Mechanical weights (meaning I could pull it out). Plus I am using 25 psf snow load, even though it could be reduced another 5 psf according to the building code. Even if I use a full 30 psf, it is still within tolerance.

5% COMPARISSON FROM ORIGINAL

REACTIONS	DL	LL	EQ/W	SERVICE	DESIGN
LEFT:	70.2%	83.3%	#DIV/0!	76.7%	77.7%
RIGHT:	80.6%	83.3%	#DIV/0!	82.0%	82.2%
FORCES	DL	LL	EQ/W	SERVICE	DESIGN
MAX SHEAR:	80.6%	83.3%	#DIV/0!	82.0%	82.2%
MAX MOMENT:	73.8%	83.3%	#DIV/0!	78.5%	79.2%
EQUIV (PLF)	DL	LL	EQ/W	SERVICE	DESIGN
SHEAR:	80.6%	83.3%	#DIV/0!	82.0%	82.2%
MOMENT:	73.8%	83.3%	#DIV/0!	78.5%	79.2%

JOIST SIZE:		ACTUAL	STATUS
LL Capacity:	2,100.00	875.00	OK
TL Capacity:	2,100.00	1,721.67	OK

SIMPLE SPAN - BEAM DESIGN

Joist 1 (Supporting RTU 2)



DESIGN CRITERIA

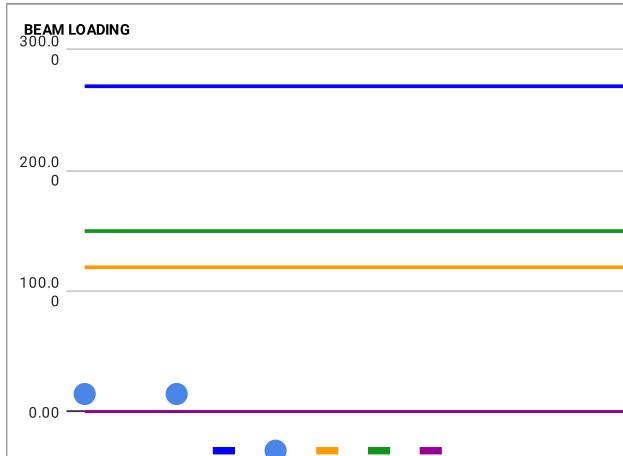
Length (ft): **40.00**

Deflect (L/x): **240**

SPACING: **6.00**

DL: **20.00**

LL: **25.00**

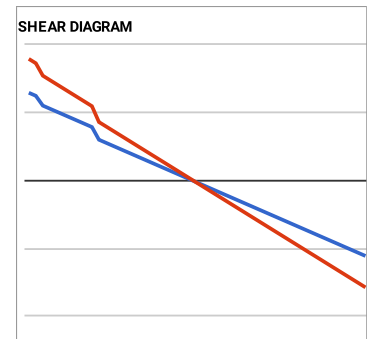


DISTRIBUTED	LOAD 1	LOAD 2	LOAD 3
Start Location	0.00		
End Location	40.00		
Dead Load Start	120		
Dead Load End	120		
Live/Snow Start	150		
Live/Snow End	150		
EQ/W Start			
EQ/W End			

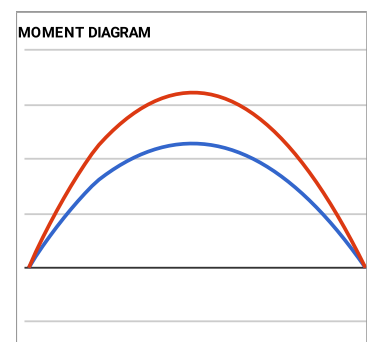
POINT LOADS	LOAD 1	LOAD 2	LOAD 3
Location	1.00	8.00	
Dead Load	497	708	
Live/Snow Load			
EQ/W Load			

Be sure to use the same units throughout, either plf and pounds or klf and kips. Never mix the two. For the Design Options to properly work, be sure to use PLF and POUNDS.

REACTIONS	DL	LL	EQ/W	SERVICE	DESIGN
LEFT:	3451	3000	0	6,451	8,941
RIGHT:	2554	3000	0	5,554	7,865
FORCES	DL	LL	EQ/W	SERVICE	DESIGN
MAX SHEAR:	3451	3000	0	6,451	8,941
MAX MOMENT:	27171	30000	0	57,115	80,517
EQUIV (PLF)	DL	LL	EQ/W	SERVICE	DESIGN
SHEAR:	173	150	0	323	447
MOMENT:	136	150	0	286	403



STEEL SECTION	CONCRETE SECTION	WOOD SECTION
Type: NO DESIGN	Width (in):	Width (in):
Trial Section:	Depth (in):	Depth (in):
Max Depth:	f'c (psi):	Member Type: Choose
FyZx min: 1074	Bar Size (#):	Wood Type: Choose
Ix min: 284	Min Depth: #DIV/0!	Wood Grade: Choose
phi Mn: #N/A	phi Mn: #N/A	phi Mn: 0
Mn Interaction: #N/A	Mn Interaction: #N/A	Mn Interaction: #DIV/0!
Deflection (L/x): #N/A	Deflection (L/x): #DIV/0!	Deflection (L/x): #DIV/0!
Deflection: #N/A	Deflection: #DIV/0!	Deflection: #DIV/0!
SECTION : #N/A	SECTION: #N/A	SECTION: 0x0 - Choose



SIMPLE SPAN - 5% BEAM EVALUATION

Joist 1 (Supporting RTU 2)



ANALYSIS FROM ORIGINAL CONDITION (paste from original analysis)

REACTIONS	DL	LL	EQ/W	SERVICE	DESIGN
LEFT:	3600	3600	0	7,200	10,080
RIGHT:	3600	3600	0	7,200	10,080
FORCES	DL	LL	EQ/W	SERVICE	DESIGN
MAX SHEAR:	3600	3600	0	7,200	10,080
MAX MOMENT:	36000	36000	0	72,000	100,800
EQUIV (PLF)	DL	LL	EQ/W	SERVICE	DESIGN
SHEAR:	180	180	0	360	504
MOMENT:	180	180	0	360	504

Notes:

Original Deck Load with 30 psf Snow and 10 psf of ballast

ANALYSIS FROM MODIFIED CONDITION (from active analysis)

REACTIONS	DL	LL	EQ/W	SERVICE	DESIGN
LEFT:	3451	3000	0	6,451	8,941
RIGHT:	2554	3000	0	5,554	7,865
FORCES	DL	LL	EQ/W	SERVICE	DESIGN
MAX SHEAR:	3451	3000	0	6,451	8,941
MAX MOMENT:	27171	30000	0	57,115	80,517
EQUIV (PLF)	DL	LL	EQ/W	SERVICE	DESIGN
SHEAR:	173	150	0	323	447
MOMENT:	136	150	0	286	403

Notes:

Roof joist with worst case single joist loading. This is still conservative because about 5 psf in the dead load portion is actually allocated for Mechanical weights (meaning I could pull it out). Plus I am using 25 psf snow load, even though it could be reduced another 5 psf according to the building code. Even if I use a full 30 psf, it is still within tolerance.

5% COMPARISSON FROM ORIGINAL

REACTIONS	DL	LL	EQ/W	SERVICE	DESIGN
LEFT:	95.9%	83.3%	#DIV/0!	89.6%	88.7%
RIGHT:	70.9%	83.3%	#DIV/0!	77.1%	78.0%
FORCES	DL	LL	EQ/W	SERVICE	DESIGN
MAX SHEAR:	95.9%	83.3%	#DIV/0!	89.6%	88.7%
MAX MOMENT:	75.5%	83.3%	#DIV/0!	79.3%	79.9%
EQUIV (PLF)	DL	LL	EQ/W	SERVICE	DESIGN
SHEAR:	95.9%	83.3%	#DIV/0!	89.6%	88.7%
MOMENT:	75.5%	83.3%	#DIV/0!	79.3%	79.9%

JOIST SIZE:	24K10	ACTUAL	STATUS
LL Capacity:	206.00	150.00	OK
TL Capacity:	361.00	322.55	OK

SIMPLE SPAN - BEAM DESIGN

Girder 1 (Supporting RTU 2)



DESIGN CRITERIA

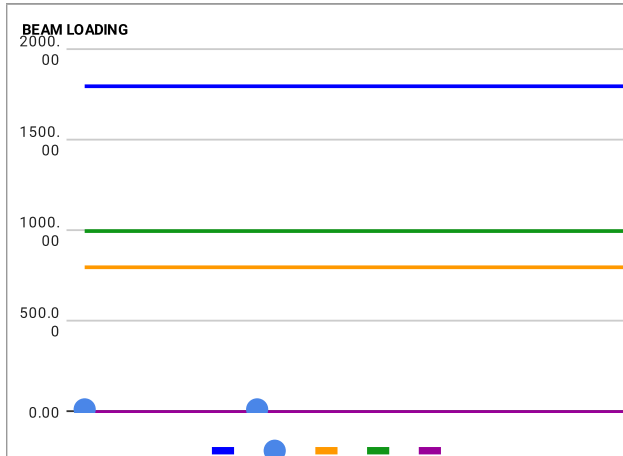
Length (ft): **30.00**

Deflect (L/x): **240**

SPACING: **40.00**

DL: **20.00**

LL: **25.00**

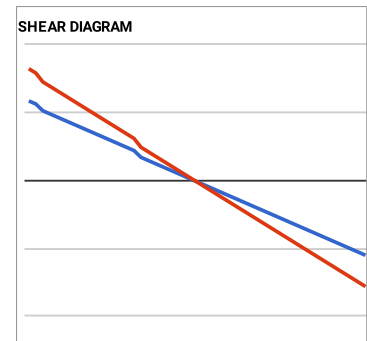


DISTRIBUTED	LOAD 1	LOAD 2	LOAD 3
Start Location	0.00		
End Location	30.00		
Dead Load Start	800		
Dead Load End	800		
Live/Snow Start	1000		
Live/Snow End	1000		
EQ/W Start			
EQ/W End			

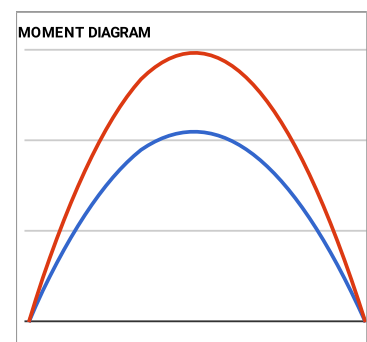
POINT LOADS	LOAD 1	LOAD 2	LOAD 3
Location	1.00	10.00	
Dead Load	1375	1375	
Live/Snow Load			
EQ/W Load			

Be sure to use the same units throughout, either plf and pounds or klf and kips. Never mix the two. For the Design Options to properly work, be sure to use PLF and POUNDS.

REACTIONS	DL	LL	EQ/W	SERVICE	DESIGN
LEFT:	14246	15000	0	29,246	41,095
RIGHT:	12504	15000	0	27,504	39,005
FORCES	DL	LL	EQ/W	SERVICE	DESIGN
MAX SHEAR:	14246	15000	0	29,246	41,095
MAX MOMENT:	97721	112500	0	210,063	297,075
EQUIV (PLF)	DL	LL	EQ/W	SERVICE	DESIGN
SHEAR:	950	1000	0	1,950	2,740
MOMENT:	869	1000	0	1,867	2,641



STEEL SECTION	CONCRETE SECTION	WOOD SECTION
Type: NO DESIGN	Width (in):	Width (in):
Trial Section:	Depth (in):	Depth (in):
Max Depth:	f'c (psi):	Member Type: Choose
FyZx min: 3961	Bar Size (#):	Wood Type: Choose
Ix min: 782	Min Depth: #DIV/0!	Wood Grade: Choose
phi Mn: #N/A	phi Mn: #N/A	phi Mn: 0
Mn Interaction: #N/A	Mn Interaction: #N/A	Mn Interaction: #DIV/0!
Deflection (L/x): #N/A	Deflection (L/x): #DIV/0!	Deflection (L/x): #DIV/0!
Deflection: #N/A	Deflection: #DIV/0!	Deflection: #DIV/0!
SECTION : #N/A	SECTION: #N/A	SECTION: 0x0 - Choose



SIMPLE SPAN - 5% BEAM EVALUATION

Girder 1 (Supporting RTU 2)



ANALYSIS FROM ORIGINAL CONDITION (paste from original analysis)

REACTIONS	DL	LL	EQ/W	SERVICE	DESIGN
LEFT:	18000	18000	0	36,000	50,400
RIGHT:	18000	18000	0	36,000	50,400
FORCES	DL	LL	EQ/W	SERVICE	DESIGN
MAX SHEAR:	18000	18000	0	36,000	50,400
MAX MOMENT:	135000	135000	0	270,000	378,000
EQUIV (PLF)	DL	LL	EQ/W	SERVICE	DESIGN
SHEAR:	1200	1200	0	2,400	3,360
MOMENT:	1200	1200	0	2,400	3,360

Notes:

Original Deck Load with 30 psf Snow and 10 psf of ballast

ANALYSIS FROM MODIFIED CONDITION (from active analysis)

REACTIONS	DL	LL	EQ/W	SERVICE	DESIGN
LEFT:	14246	15000	0	29,246	41,095
RIGHT:	12504	15000	0	27,504	39,005
FORCES	DL	LL	EQ/W	SERVICE	DESIGN
MAX SHEAR:	14246	15000	0	29,246	41,095
MAX MOMENT:	97721	112500	0	210,063	297,075
EQUIV (PLF)	DL	LL	EQ/W	SERVICE	DESIGN
SHEAR:	950	1000	0	1,950	2,740
MOMENT:	869	1000	0	1,867	2,641

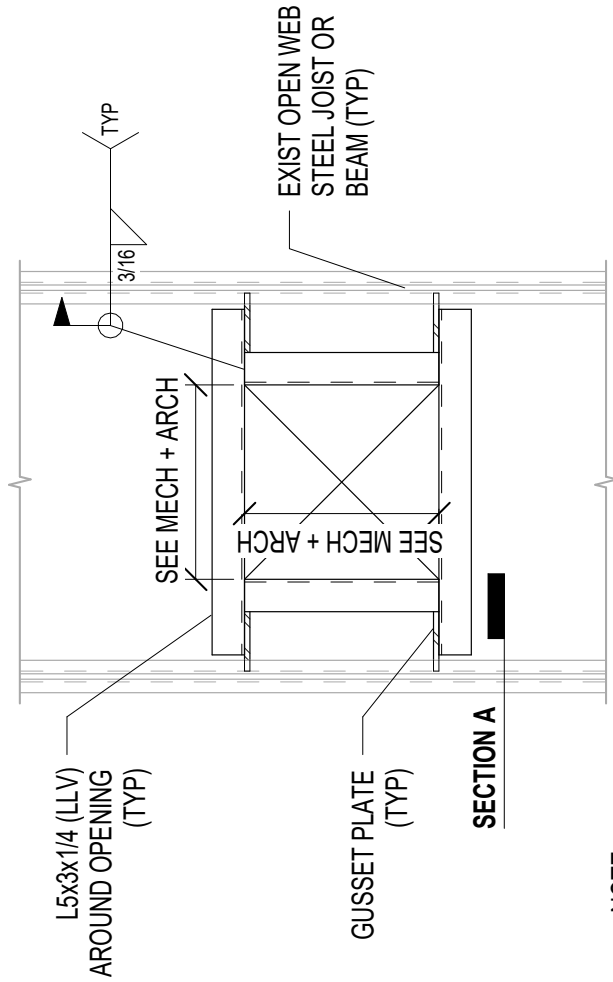
Notes:

Roof girder with worst case loading as it is carrying the full unit. This is still conservative because about 5 psf in the dead load portion is actually allocated for Mechanical weights (meaning I could pull it out). Plus I am using 25 psf snow load, even though it could be reduced another 5 psf according to the building code. Even if I use a full 30 psf, it is still within tolerance.

5% COMPARISSON FROM ORIGINAL

REACTIONS	DL	LL	EQ/W	SERVICE	DESIGN
LEFT:	79.1%	83.3%	#DIV/0!	81.2%	81.5%
RIGHT:	69.5%	83.3%	#DIV/0!	76.4%	77.4%
FORCES	DL	LL	EQ/W	SERVICE	DESIGN
MAX SHEAR:	79.1%	83.3%	#DIV/0!	81.2%	81.5%
MAX MOMENT:	72.4%	83.3%	#DIV/0!	77.8%	78.6%
EQUIV (PLF)	DL	LL	EQ/W	SERVICE	DESIGN
SHEAR:	79.1%	83.3%	#DIV/0!	81.2%	81.5%
MOMENT:	72.4%	83.3%	#DIV/0!	77.8%	78.6%

JOIST SIZE:		ACTUAL	STATUS
LL Capacity:	2,100.00	1,000.00	OK
TL Capacity:	2,100.00	1,949.72	OK



NOTE:

1. WELD THE EXISTING STEEL ROOF DECK TO THE ANGLE FRAME.
2. REFER TO TYPICAL ROOF TOP MECHANICAL UNIT SUPPORT FRAME DETAIL FOR FRAMES BENEATH MECHANICAL UNITS.

SECTION A

TYPICAL ROOF OPENING SUPPORT IN EXISTING ROOF

D5
S001

Scale: NTS