PETERSON STRUCTURAL ENGINEERS

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Structural Design Calculations

OMIC Additive Manufacturing Center – Filter Platform
Scappoose, OR

Client Information

Al Peterson
AKAAN Architecture + Design LLC
101 St Helens St
St Helens, OR 97051

Project Site

OIT Manufacturing Innovation Center
33701 Charles T. Parker Way
Scappoose, OR 97056
45.7668, -122.8725

Prepared By

Peterson Structural Engineers
June 29, 2023
Project No. 1901-0313

Endorsement

Scope

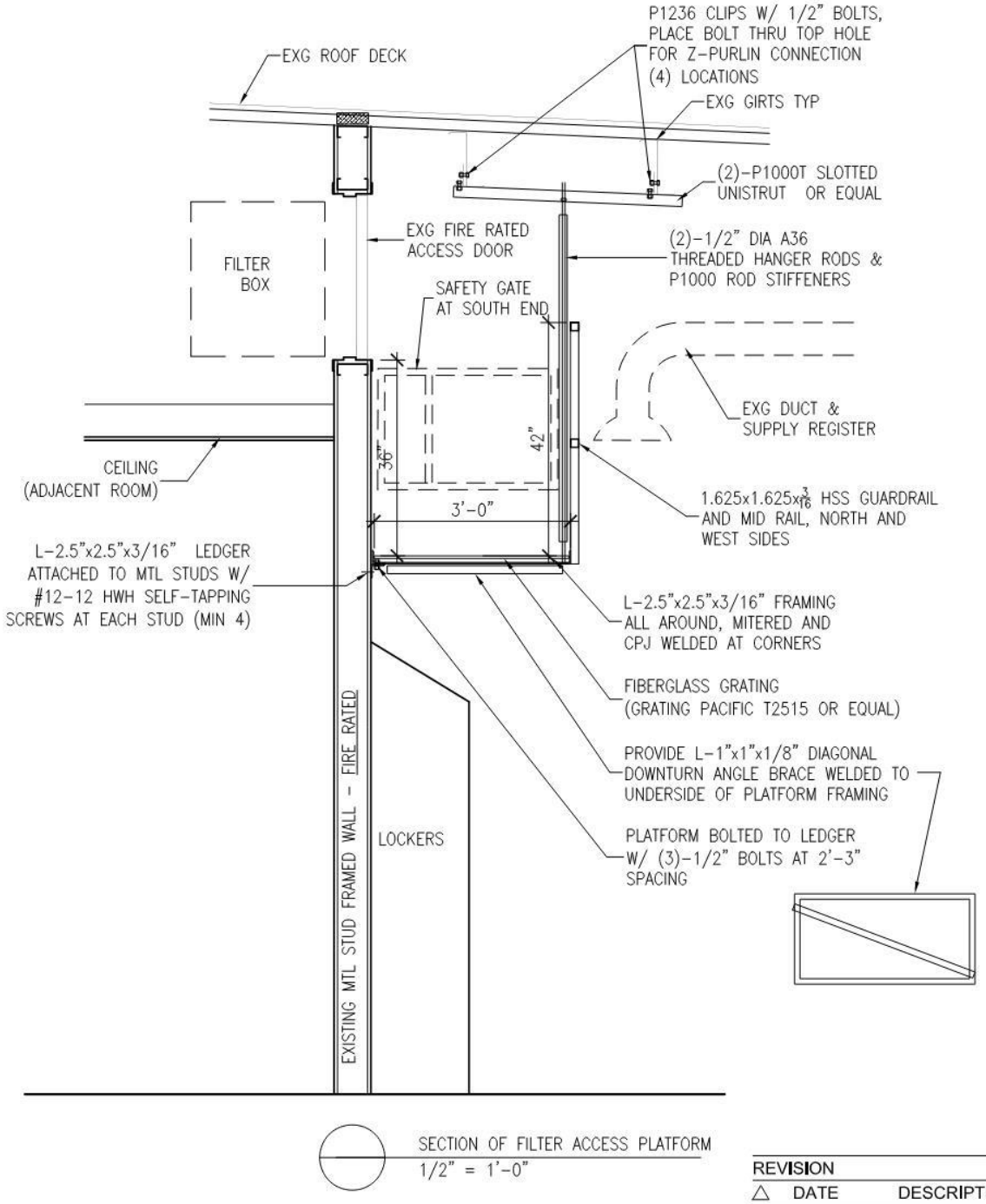
To provide structural calculations for design of the filter platform at the location given on the cover page. Elements under review include design of the catwalk, guardrail and attachments to the existing steel manufacturing framed building. Any other elements not specifically referenced in these calculations are outside the purview of these calculations and are designed by others.

References

1. 2022 Oregon Structural Specialty Code (OSSC)
2. 2021 International Building Code (IBC)
3. ASCE/SEI 7-16, Minimum Design Loads for Buildings and Other Structures, American Society of Civil Engineers (ASCE)
4. 2017 Manual of Steel Construction, 15th Edition, American Institute of Steel Construction (AISC)
5. 2016 Seismic Design Manual, 3rd Edition and Seismic Provisions for Structural Steel Buildings, American Institute of Steel Construction (AISC 341)
6. Drawings provided by Akaan Architecture + Design, LLC, dated 06/15/2023 (Dwgs)

Table of Contents

Drawings



REVISION		
△	DATE	DESCRIPTION

AKAAN arch + design llc
101 St Helens St, St Helens, OR 97051
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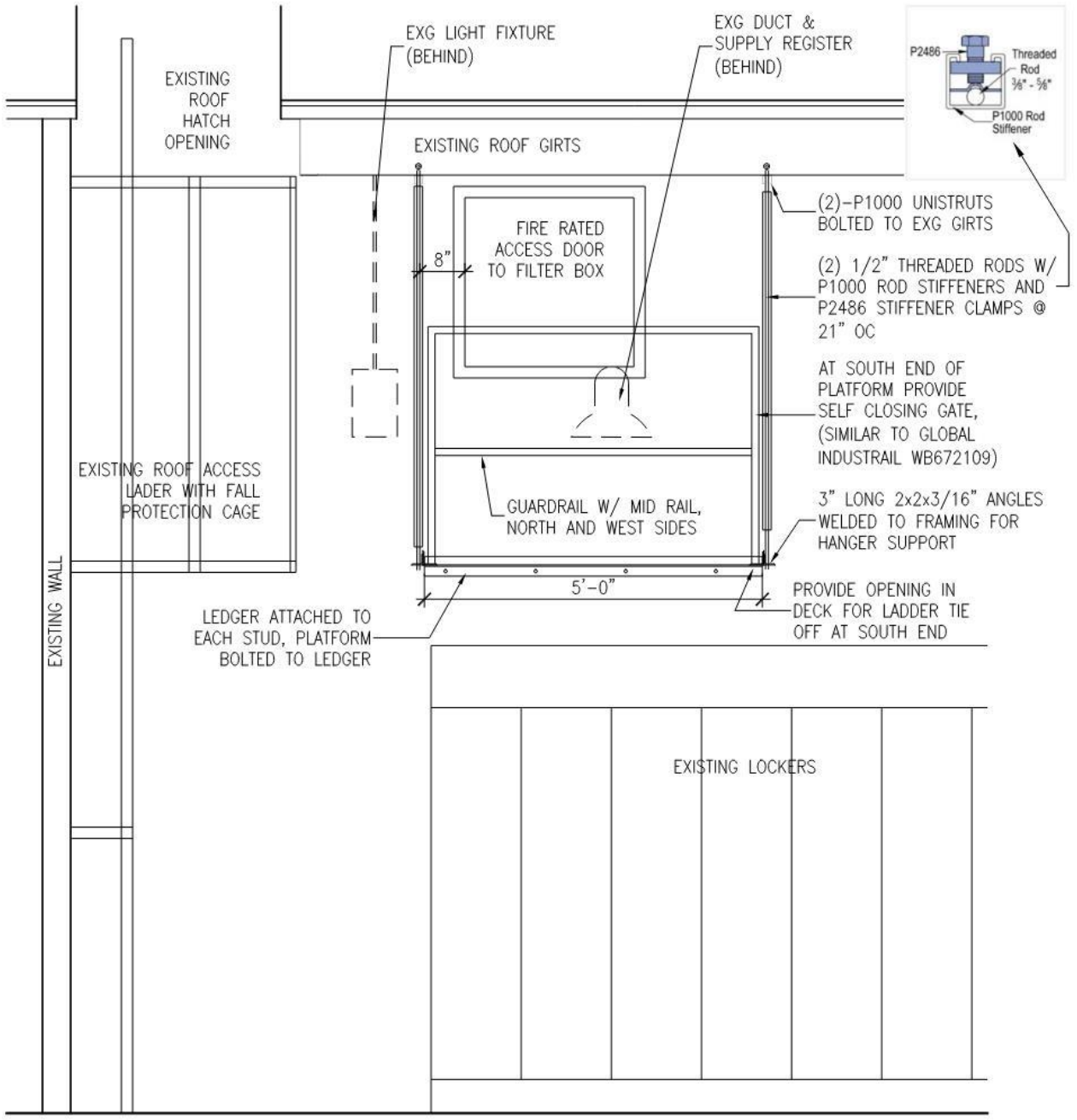
OMIC ADDITIVE INNOVATION CENTER
(Building 2)

drawing no: SK- A1
06/15/2023
project no: 1503



ELEVATION OF FILTER ACCESS PLATFORM
1/2" = 1'-0"

REVISION		
△	DATE	DESCRIPTION

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OMIC ADDITIVE INNOVATION CENTER
(Building 2)

drawing no: SK- A2
06/15/2023
project no: 1503

Design Criteria

Gravity Loading

Dead Load

Catwalk Dead Load; q_{DLf} = 10 psf;

Live Load

Catwalk Live Load; q_{LLf} = 40 psf; per OSSC Table 1607.1 A.1

Catwalk Live Load (point); P_{LL} = 300 lb; per OSSC Table 1607.1

Handrail Point Load; P_{LLh} = 200lbs; per OSSC Table 1607.1

Structural Calculations

Grating

Total Load; $q_{DLf} + q_{LLf}$ = 50 psf

1.5" thick Grainger Safe-T-Span (T2515) Grating Adequate by observation

Use Grainger SAFE-T-SPAN (T2515) (model #: 873200)

Catwalk Framing

Note: Catwalk framing is comprised of L2.5x2.5x3/16 angles all around. The longest angle away from the wall controls.

Total Dead Load; $P_{DL} = q_{DLf}*3ft*5ft$ = 150 lbs

Live Load; P_{LL} = 300 lbs

Span; 5 ft

See Appendix for Enercalc Output

Use L2.5x2.5x3/16

Platform to Ledger Connection

Assume Seismic Horizontal Force (F_{ph}) = 0.4

Total Seismic Force; $V = 0.4*P_{DL}$ = 60lbs

Shear per Bolt; V/3 = 20 lbs

Tension/Compression Couple; T = V*(3ft/2)/4ft = 22.5lbs

3/8" Diameter Bolts are adequate by observation

Ledger Connection to Studs

Total Shear; V = 60 lbs

Design for 300lb Shear Load

#12-14 HWH Shear Capacity; V_{allow} = 646 lbs > V, OK

Use (1) #12-14 HWH Screw at each Stud, (4) screws total

Hanging Rod

Total Dead Load; $P_{DL}/4 = 37.5$ lbs

Floor Live Load (point); $P_{LL} = 300$ lb;

Total Load; $P_{DL}/4 + P_{LL} = 337.5$ lbs

3/8" Diameter Rod Adequate by Observation

Strut between Roof Purlins

Total Load; $P_{DL}/4 + P_{LL} = 337.5$ lbs

Span; 3'

P1000T Channel Capacity; 1130 lbs

Deflection; 0.13 inches

Per manufacturer notes, multiply capacity by 85% for the T-series & 50% for concentrated midspan loads

Adjusted Capacity; 0.85*0.5*1130 lbs = 480 lbs > Total Load, OK

Use P1000T Channel

Channel to Girt Connection

Total Load; $P_{DL}/4 + P_{LL} = 337.5$ lbs

½" bolt w/ P1326 Clip Adequate by Observation

See Appendix B for connection to (E) Girts

Use P1326 Clip between P1000T Channel & Girt w/ ½" Bolts

Guardrail

Try HSS1.625"x1.625"x3/16" Framing

Handrail Point Load; $P_{LLh} = 200$lbs

Top Rail Length; 5'

Applied Moment; 1.6*200lbs*5ft/4 = 400lbs*ft = 4.8k*in

Moment Capacity; $0.9*50ksi*0.406in^3 = 18.27$ kip*in, OK

Use HSS1.625"x1.625"x3/16" Guardrail

Guardrail Post

Try HSS1.625”x1.625”x3/16” Framing

Handrail Point Load;	P_{LLh} = 200lbs
Guardrail Post Height;	42 in
Applied Moment;	1.6*200lbs*42in = 13.44k*in
Moment Capacity;	0.9*50ksi*0.406in^3 = 18.27 kip*in, OK

Use HSS1.625”x1.625”x3/16” Guardrail

Guardrail Connection to Framing

Assume guardrail posts are welded to the L2.5x2.5x3/16 framing

Moment;	M = 1.6*P_{LLh}*42in = 13400 lbs_in
Shear;	1.6*P_{LLh} = 320 lbs
Weld Size;	a = 0.125in
Length of Weld each side;	l_w = 2.5in
Weld Throat Size;	t_w = sqrt(2)/2*a = 0.088 in
Area of Weld;	A_w = l_w*t_w = 0.221 in^2
Total Area of Welds;	2*A_w = 0.442 in^2
Guardrail Post Width;	b_m = 1.625in
Width of Weld Group;	b_w = b_m + 2*t_w = 1.801 in

Section Modulus of Weld group; S_y = 1/3*b_w*l_w^2 = 3.752 in^3

Weld stress due to bending;	f_b = M/S_y = 3.572 ksi
Weld stress due to tension;	f_t = P_{LLh}/A_w = 1.448 ksi
Total Weld Stress;	f = (f_b^2 + f_t^2)$^{1/2}$ = 3.854 ksi
Allowable Weld Stress;	0.6*0.75*70ksi = 31.5 ksi, OK

Use min 1/8” Weld All-Around Guardrail Post to Framing

Appendix A

Project Title:
Engineer:
Project ID:
Project Descr:

Steel Beam

Project File: 2023_05_26 filter platform 1901-0313.ec6

LIC# : KW-06014167, Build:20.23.2.14 PETERSON STRUCTURAL ENGINEERS (c) ENERCALC INC 1983-2022

DESCRIPTION: platform angle

CODE REFERENCES

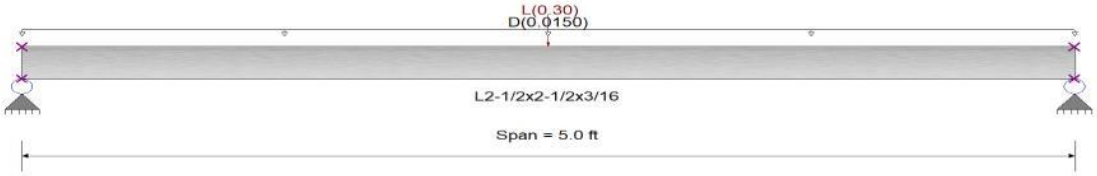
Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : IBC 2021

Material Properties

Analysis Method : Allowable Strength Design
Beam Bracing : Completely Unbraced
Bending Axis : Major Axis Bending

Fy : Steel Yield : 36.0 ksi
E: Modulus : 29,000.0 ksi

Vertical Leg Up



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight NOT internally calculated and added
Load(s) for Span Number 1
Point Load : L = 0.30 k @ 2.50 ft

Uniform Load : D = 0.010 ksf, Tributary Width = 1.50 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.711 : 1	Maximum Shear Stress Ratio =	0.031 : 1
Section used for this span	L2-1/2x2-1/2x3/16	Section used for this span	L2-1/2x2-1/2x3/16
Ma : Applied	0.422 k-ft	Va : Applied	0.1875 k
Mn / Omega : Allowable	0.593 k-ft	Vn/Omega : Allowable	6.079 k
Load Combination	+D+L	Load Combination	+D+L
		Location of maximum on span	0.000 ft
Span # where maximum occurs	Span # 1	Span # where maximum occurs	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.087 in	Ratio =	686	>=360
Max Upward Transient Deflection	0.000 in	Ratio =	0	<360 Span: 1 : L Only
Max Downward Total Deflection	0.101 in	Ratio =	594	>=180 Span: 1 : +D+L
Max Upward Total Deflection	0.000 in	Ratio =	0	<180

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+L	1	0.1010	2.514		0.0000	0.000

Vertical Reactions

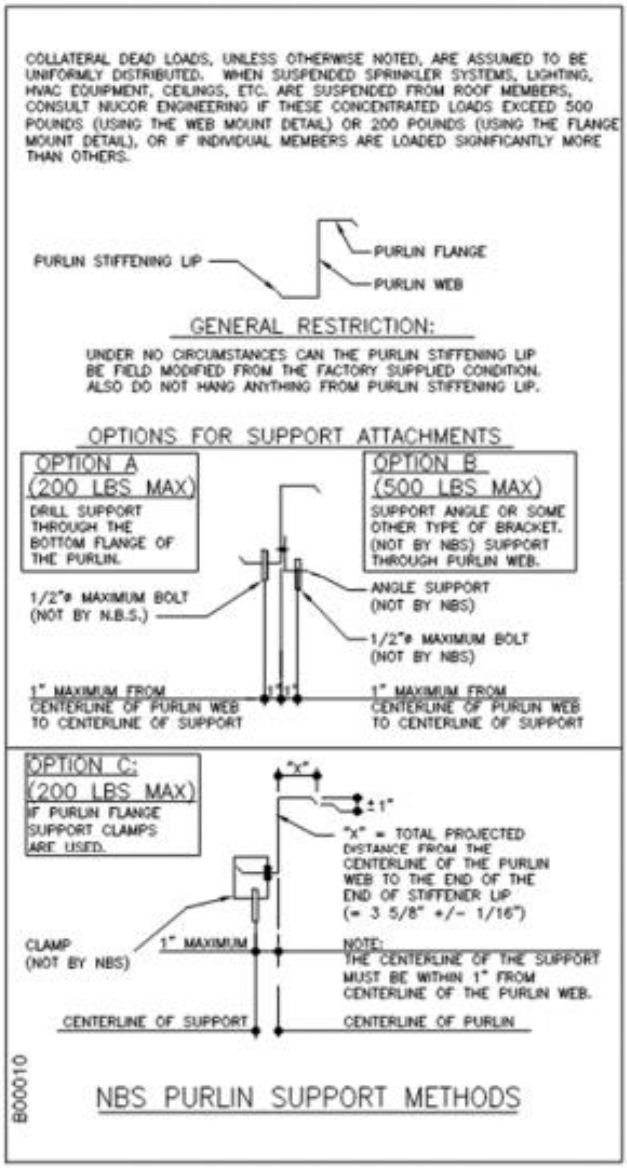
Support notation : Far left is #' Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	0.188	0.188
Max Upward from Load Combinations	0.188	0.188
Max Upward from Load Cases	0.150	0.150
D Only	0.038	0.038
+D+L	0.188	0.188
+D+0.750L	0.150	0.150
+0.60D	0.023	0.023
L Only	0.150	0.150

Appendix B

NUCOR BUILDING SYSTEMS | SECTION B0 | CAD DETAILS MANUAL | ROOF SECONDARY FRAMING

NBS PURLIN SUPPORT METHODS



DTLR NOTES:
1) THIS DETAIL SHOULD NOT BE USED WHEN THE COLLATERAL LOAD IS "0".

LAST REVISION	DETAIL NAME IF APPLICABLE	DETAIL BOX SIZE
DATE: 4-13-15 BY: AES CHK: EGB	B00010.DWG	2