Development Services

From Concept to Construction

Phone: 503-823-7300 Email: bds@portlandoregon.gov 1900 SW 4th Ave, Portland, OR 97201
More Contact Info (http://www.portlandoregon.gov//bds/article/519984)

APPEAL SUMMARY

Status: Decision Rendered - Reconsideration of ID 14658

Appeal ID: 14748	**Project Address:** 1177 SE Stark St
Hearing Date: 3/8/17	**Appellant Name:** Bill Lanning
Case No.: B-006	**Appellant Phone:** 503-416-8014
Appeal Type: Building	**Plans Examiner/Inspector:** John Stelzenmueller, Peter Drake
Project Type: commercial	**Stories:** 4 **Occupancy:** R-2 **Construction Type:** V-A
Building/Business Name:	**Fire Sprinklers:** Yes - throughout
Appeal Involves: Erection of a new structure,Reconsideration of appeal	**LUR or Permit Application No.:** 15-243243-CO
Plan Submitted Option: pdf [File 1]	**Proposed use:** Multi-family residential

APPEAL INFORMATION SHEET

Appeal item 1

Code Section	OSSC 1009.16
Requires	In buildings four or more stories above grade plane, one stairway shall extend to the roof surface, unless the roof has a slope steeper than four units vertical in 12 units horizontal (33-percent slope). In buildings without an occupied roof, access to the roof from the top story shall be permitted to be by an alternating tread device or a ship stair or ladder that is constructed of steel, is a minimum 30 inches (762 mm) between handrails, has a rise and run of the stair or ladder of 12 inches (304.8) maximum and 4 inches (101.6 mm) minimum respectively and has handrails provided on both sides of the stair or ladder.
Proposed Design	This project provides ship ladders to the roof at each protected stair enclosure for a total of three locations. The 2014 OSSC does not stipulate the width of the treads for the application of a ships ladder under section 1009.16; Stairway to Roof. We are requesting confirmation that a tread width of 24” clear with a width of 30” clear between handrails is acceptable. The proposed design will meet the requirements of OSSC 1009.16, except the ship ladder will be constructed out of aluminum instead of steel.
Reason for alternative	St. Francis Park has three ship ladders provided for access to the unoccupied roof. OSSC 1009.16 requires the ship ladder to be 30 inches minimum between handrails. The design proposes to provide a ships ladder with 24 inch wide treads and 30 inches clear width to the roof. Handrails will be provided outside of the tread edge to allow 30 inches between the handrails from the floor up to the roof structure. Both handrails will be continued above the bottom of roof

structure for all three hatches. Firefighters will be able to maintain contact with two handrails to the roof hatch the entire time at 30 inches of width. A Bilco Ladder-up extension will be provided at each hatch. This facilitates the passage of fire apparatus between the rails where it is needed.

Appeal of Denial: The 2014 OSSC does not indicate a required width of tread for a ship ladder when used for roof access as allowed in 1009.16. The typical requirement for ship ladders is a 20" minimum. In reviewing the denial of the 24" wide treads with Fire Inspector Kari Schimel it is our understanding that the reason for the increase to a 30" width between the rails is to facilitate the transport of equipment carried on a fire fighters back and waist. It was discussed that a 24" wide tread would not impede this movement. Because of this we request that the appeal board reconsider the denial this item.

The ship ladders will be fabricated of NFPA 13 rated 6061 T6 Aluminum which is industrial grade, NFPA, ANSI and OSHA rated for loading. Our understanding of the requirement to use steel construction is due to the lower temperature that aluminum loses strength compared to steel. OSSC section 1009.16 does not indicate that ship ladder access to the roof be provided in a rated enclosure which could leave it exposed to fire depending upon where it is located. The ship ladders at St. Francis Park are all contained within two hour rated exit enclosures which are protected from the ground floor to the roof. The roof assembly at the stair enclosure is also two hour rated. In addition the stair assembly is protected with an NFPA 13 fire sprinkler system which activates at 155 degrees if heat build-up was to occur within the exit enclosure. Due to these reasons we believed that the ship ladders are better protected than required by code and the exposure of the aluminum construction to fire is greatly reduced, meeting the intent of the 2014 OSSC 1009.16 and request approval.

Appeal of Denial: It was our initial understanding in discussing this requirement with Plans Examiner Peter Drake that the requirement for the use of steel was due to the higher melting point of the material as compared to aluminum. In reviewing the denial of the aluminum material with Fire Inspector Kari Schimel it is our understanding that the reason for this is due to concerns about strength of material for general loading and use. It was discussed that a structural analysis comparing the current aluminum design with a standard steel ship ladder would be a way to show strength comparability. A structural analysis was completed and indicates that there is less than a 3 percent difference in strength between the two systems.
The aluminum treads do have a greater deflection than the steel however based upon the current design that deflection is less than 1/32 of an inch. We believe that due to the location of the ship ladders in the 2 hour rated enclosure they are well protected against damage from heat and fire. We also believe that the structural property difference between the designed aluminum ship ladder and a typical steel ship ladder is equivalent based upon the intended use and requirements. Because of this we request that the appeal board reconsider the denial of this item.

APPEAL DECISION

Allowance of aluminum ship ladder to roof in lieu of steel: Granted as proposed.

The Administrative Appeal Board finds that the information submitted by the appellant demonstrates that the approved modifications or alternate methods are consistent with the intent of the code; do not lessen health, safety, accessibility, life, fire safety or structural requirements; and that special conditions unique to this project make strict application of those code sections impractical.

Pursuant to City Code Chapter 24.10, you may appeal this decision to the Building Code Board of Appeal within 180 calendar days of the date this decision is published. For information on the appeals process and costs, including forms, appeal fee, payment methods and fee waivers, go to www.portlandoregon.gov/bds/appealsinfo, call (503) 823-7300 or come in to the Development Services Center.

Project St. Francis — Ladders		Job No. 14114	ABHT STRUCTURAL ENGINEERS
Client	Location		
Designed by gle	Date Feb. 2017	Page	of
Sheet description			

Aluminum vs. Steel

Loading and aluminum checks from approved Deferred Submittal; 055000.B.7
Approved on 10/13/16

Stringer:

Aluminum = C8 x 0.250 x 2.290 6061-T6
Material Props: F_y = 35 ksi E = 10.1 msi
Steel = C8 x 11.5 A36 t = 0.22" b = 2.26"
Material props: F_y = 36 ksi E = 29.0 msi

Aluminum shape is slightly bigger:
t: 0.25" > 0.22" ✓OK (12% greater)
b: 2.29" > 2.26" ✓OK (1.31% greater)

Strength Design: (If shapes were equal)
Yield stress ratio: $\frac{35\,ksi}{36\,ksi} = 0.972$
⇒ Aluminum is max 2.78% weaker

Self weight:
Aluminum = 170 pcf (Lighter)
Steel = 490 pcf
Percent diff. in weight = 65.3%

Deflection: Aluminum will deflect more
Aluminum:
EI = 10.1 msi (25.988 in^4) = 262.5 m in^2
Steel:
EI = 29.0 msi (32.5 in^4) = 942.5 m in
Percent diff. = 72%
* However, design aluminum deflection (see next to last page)
⇒ 0.0301" < 1/32" ✓OK

Project St, Francis - Ladders		Job No. 14114
Client	Location	
Designed by gsc	Date Feb, 2017	Page of
Sheet description		

ABHT STRUCTURAL ENGINEERS

Aluminum VS. Steel

Check pipe handrail;

Aluminum = Pipe 1 1/4, Sched 40 6061-T6

Steel = Pipe 1 1/4, Sched 40 ASTM A53 GR.B

$\Rightarrow F_{y_{Al}} = F_{y_{steel}} = 35\ ksi$ ~ Same ✓OK

Same shape & yield stress

Strength checks OK by Inspection

Check Deflection: $I = 0.184\ in^4$

$h_{max} = 18''$

$\Delta_{max} = \frac{0.20 kip (18'')^3}{3(10.1 ksi)(0.184 in^4)} = 0.209''$

$\Rightarrow 0.209'' < 1/4''$ ✓OK

Check Treads: From prev. Submittal (See last page)

(Tread/grating capacity taken from catalog, not calculated)

DCR = Demand Capacity Ratio

Tread DCR = $250^{\#} / 987^{\#}$ = 0.253 ✓OK

Landing DCR = 100psf / 632psf = 0.158 ✓OK

Synopsis:

Strengthwise, aluminum is close to, or just as, the same as steel (max percent weaker = 2.78%). Due to the much lighter self-wt. and the slightly larger shape, we feel that aluminum is adequate

Deflections are greater w/ aluminum. However, due to the small overall deflections, we feel aluminum is acceptable

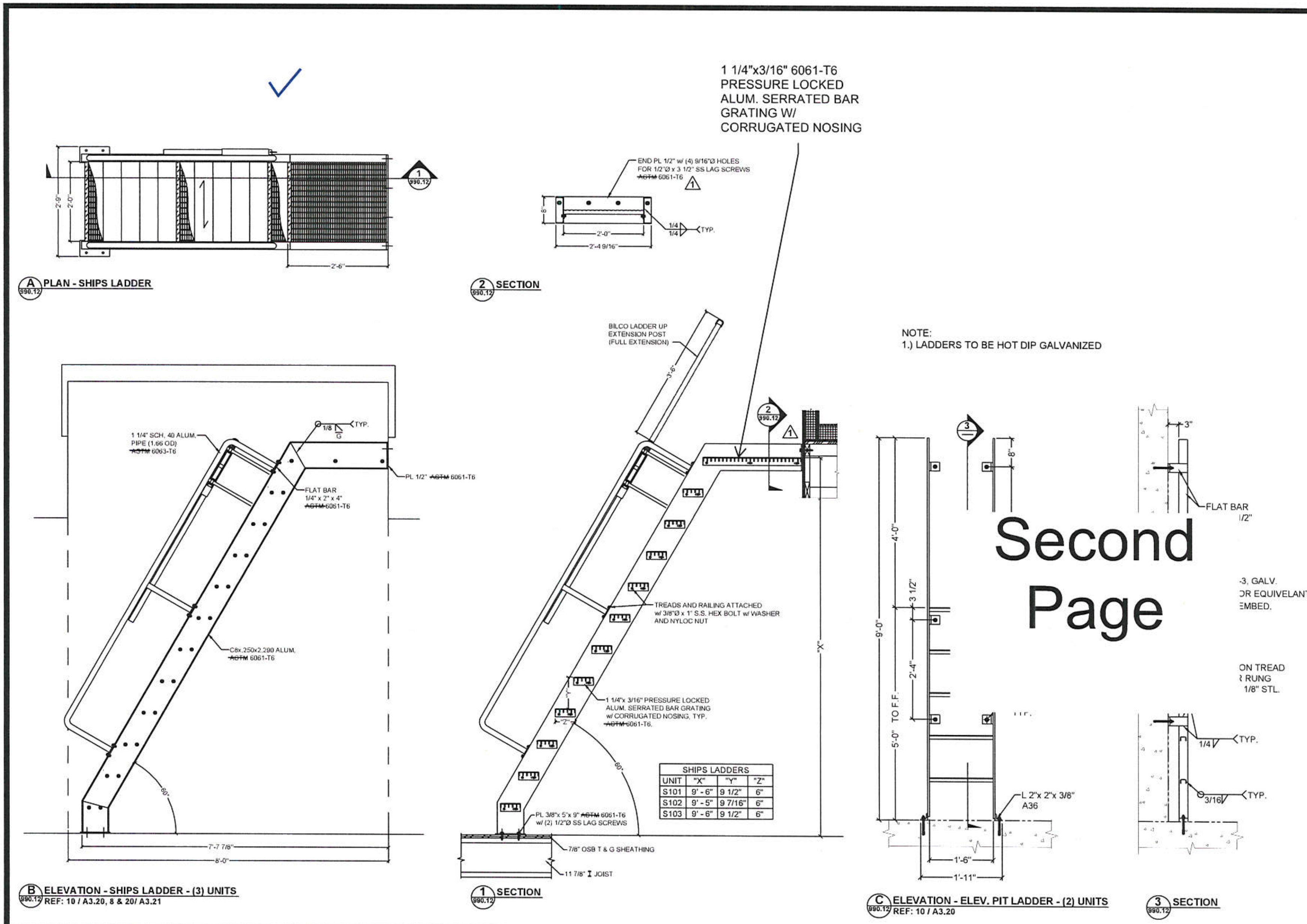
We did not perform any heat analysis/comparisons

Table 3.3-1
MINIMUM MECHANICAL PROPERTIES FOR ALUMINUM ALLOYS

ALLOY AND TEMPER	PRODUCT	THICKNESS RANGE in.	F_{tu} ksi	F_{ty} ksi	F_{cy} ksi	F_{su} ksi	COMPRESSIVE MODULUS OF ELASTICITY[2] E (ksi)
5052-O	Sheet & Plate	0.006 to 3.000	25	9.5	9.5	16	10,200
-H32	Sheet & Plate	All	31	23	21	19	10,200
-H34	Cold Fin. Rod & Bar	All	34	26	24	20	10,200
-H36	Drawn Tube						
	Sheet	0.006 to 0.162	37	29	26	22	10,200
5083-O	Extrusions	up thru 5.000	39	16	16	24	10,400
-H111	Extrusions	up thru 0.500	40	24	21	24	10,400
-H111	Extrusions	0.501 to 5.000	40	24	21	23	10,400
-O	Sheet & Plate	0.051 to 1.500	40	18	18	25	10,400
-H116	Sheet & Plate	0.188 to 1.500	44	31	26	26	10,400
-H32, H321	Sheet & Plate	0.188 to 1.500	44	31	26	26	10,400
-H116	Plate	1.501 to 3.000	41	29	24	24	10,400
-H32, H321	Plate	1.501 to 3.000	41	29	24	24	10,400
5086-O	Extrusions	up thru 5.000	35	14	14	21	10,400
-H111	Extrusions	up thru 0.500	36	21	18	21	10,400
-H111	Extrusions	0.501 to 5.000	36	21	18	21	10,400
-O	Sheet & Plate	0.020 to 2.000	35	14	14	21	10,400
-H112	Plate	0.025 to 0.499	36	18	17	22	10,400
-H112	Plate	0.500 to 1.000	35	16	16	21	10,400
-H112	Plate	1.001 to 2.000	35	14	15	21	10,400
-H112	Plate	2.001 to 3.000	34	14	15	21	10,400
-H116	Sheet & Plate	All	40	28	26	24	10,400
-H32	Sheet & Plate	All	40	28	26	24	10,400
	Drawn Tube						
-H34	Sheet & Plate	All	44	34	32	26	10,400
	Drawn Tube						
5154-H38	Sheet	0.006 to 0.128	45	35	33	24	10,300
5454-O	Extrusions	up thru 5.000	31	12	12	19	10,400
-H111	Extrusions	up thru 0.500	33	19	16	20	10,400
-H111	Extrusions	0.501 to 5.000	33	19	16	19	10,400
-H112	Extrusions	up thru 5.000	31	12	13	19	10,400
-O	Sheet & Plate	0.020 to 3.000	31	12	12	19	10,400
-H32	Sheet & Plate	0.020 to 2.000	36	26	24	21	10,400
-H34	Sheet & Plate	0.020 to 1.000	39	29	27	23	10,400
5456-O	Sheet & Plate	0.051 to 1.500	42	19	19	26	10,400
-H116	Sheet & Plate	0.188 to 1.250	46	33	27	27	10,400
-H32, H321	Sheet & Plate	0.188 to 1.250	46	33	27	27	10,400
-H116	Plate	1.251 to 1.500	44	31	25	25	10,400
-H32, H321	Plate	1.251 to 1.500	44	31	25	25	10,400
-H116	Plate	1.501 to 3.000	41	29	25	25	10,400
-H32, H321	Plate	1.501 to 3.000	41	29	25	25	10,400
~~6005-T5~~	Extrusions	up thru 1.000	38	35	35	24	10,100
6061-T6, T651	Sheet & Plate	0.010 to 4.000	42	35	35	27	10,100
-T6, T6510, T6511	Extrusions	All	38	35	35	24	10,100
-T6, T651	Cold Fin. Rod & Bar	up thru 8.000	42	35	35	25	10,100
-T6	Drawn Tube	0.025 to 0.500	42	35	35	27	10,100
-T6	Pipe	All	38	35	35	24	10,100
6063-T5,	Extrusions	up thru 0.500	22	16	16	13	10,100
-T52	Extrusions	up thru 1.000	22	16	16	13	10,100
-T5	Extrusions	0.500 to 1.000	21	15	15	12	10,100
-T6	Extrusions & Pipe	All	30	25	25	19	10,100
6066-T6, T6510, T6511	Extrusions	All	50	45	45	27	10,100
6070-T6, T62	Extrusions	up thru 2.999	48	45	45	29	10,100
6105-T5	Extrusions	up thru 0.500	38	35	35	24	10,100
6351-T5	Extrusions	up thru 1.000	38	35	35	24	10,100
6351-T6	Extrusions	up thru 0.750	42	37	37	27	10,100
6463-T6	Extrusions	up thru 0.500	30	25	25	19	10,100
7005-T53	Extrusions	up thru 0.750	50	44	43	28	10,500

1. F_{tu} and F_{ty} are minimum specified values (except F_{ty} for 1100-H12, H14 Cold Finished Rod and Bar and Drawn Tube, Alclad 3003-H18 Sheet and 5050-H32, H34 Cold Finished Rod and Bar which are minimum expected values); other strength properties are corresponding minimum expected values.

2. Typical values. For deflection calculations an average modulus of elasticity is used; this is 100 ksi lower than values in this column.



SHIPS LADDERS			
UNIT	"X"	"Y"	"Z"
S101	9' - 6"	9 1/2"	6"
S102	9' - 5"	9 7/16"	6"
S103	9' - 6"	9 1/2"	6"

A2 Fabrication, Inc.
9800 SE Mc BROD AVE #17
MILWAUKIE, OR. 97222
PH: (503) 771-2000
FX: (503) 496-1067

Project Information

ST. FRANCIS PARK APARTMENTS

General Notes

1. ALL INFORMATION TO BE VERIFIED BY CUSTOMER.
2. LOCAL CODES TO BE VERIFIED BY CONTRACTOR.
3. ALL SURFACES SHALL BE FREE OF SHARP EDGES WITH A UNIFORM RADIUS OF 1/8"
4. ALL WELDING PER AWS D1.1-06 OR D1.2-06

Drawing Notes

Date: 05/19/2016
Drawn By: SPC
Project Manager :-
Paper Size: 11 x 17

Revisions

1 07/15/2016

Elevator Pit & Ships Ladders

Page 13

990.12

FROM SUBMITTAL

FROM SUBMITTAL

CHECK C8 x 0.250 x 2.290 ALUMINUM CHANNEL

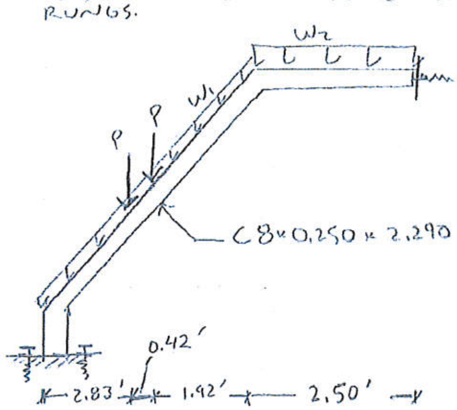
LOADING:

FIXED LADDER MUST SUPPORT MIN (2) 250 lb POINT LOADS [OREGON OSHA 1926.1053]

DL = 15 PSF

LANDING: LL = 100 PSF

LOAD CASE 1: (2) 250 lb PT LOADS AT CENTER OF LADDER ON CONSECUTIVE RUNGS.

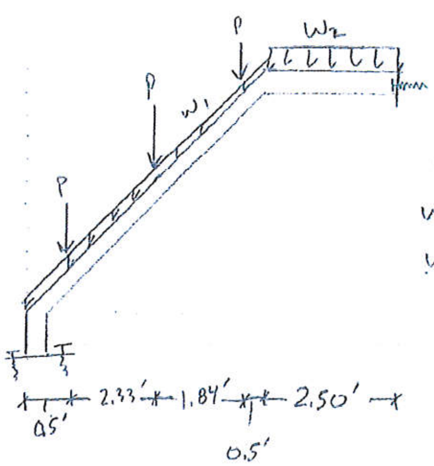


POINT LOAD: $\frac{250 \text{ lb}}{2} = 125$ lb

w_1 : DEAD LOAD : $w_1 = 15 \text{ PSF} (2\tfrac{1}{2}')/2 = 18.75$ plf

w_2 : DEAD LOAD + LIVE LOAD : $w_2 = (100 \text{ PSF} + 15 \text{ PSF})(2\tfrac{1}{2}')/2 = 144$ plf

LOAD CASE 2: (3) 250 lb PT LOADS SPACED ALONG LADDER



P = 125 lb

W1 = 18.75 plf ⇒ CONTROLS

W2 = 144 plf

MILLER CONSULTING ENGINEERS

9570 SW Barbur Blvd
Suite One Hundred
Portland, OR 97219

Phone 503.246.1250
Fax 503.246.1395
www.miller-se.com

Project Name St Francis Park Apartments Ships Ladder Design Project # 161411

Location 1136 SE Oak Street, Portland, Oregon

Client A 2 FABRICATIONS

By EWA Ck'd LPJ Date 11/3/16

FROM SUBMITTAL

Aluminum Channel Design: Channel that mounts treads

Section Properties:

b =	2.29	in	
d =	8	in	
t_{web} =	0.25	in	
$t_{flanges}$ =	0.25	in	
y bar =	4.00	in	
x bar =	0.51	in	
Scx =	6.497	in^3	
Sty =	6.497	in^3	
Scy =	0.703	in^3	
Sty =	2.443	in^3	
A =	3.02	in^2	
ae_y =	2	in	= 8*0.25
ae_x =	1.15	in	= 2.29*0.25*2
rx =	2.933	in^3	= SQRT(25.988/3.02)
ry =	0.643	in^3	= SQRT(1.25/3.02)
Ix =	25.988	in^4	
Iy =	1.250	in^4	

Material Properties:

Aluminum Grade: 6061-T6

Weld Filler Alloy: 4043

reaction does not occur within 1" from welded area

E =	10100	ksi
Fcy =	35	ksi
Fty =	35	ksi
Ftu =	38	ksi
Weld shear cap. =	5897	psi (based on weld alloy strength)

ny =	1.65
nu =	1.95
Cb =	1
k1 =	0.35
k2 =	2.27
kt =	1

Bbr =	66.76	ksi
Dbr =	0.66	
Cbr =	66.95	
Bs =	26.13	ksi
Ds =	0.13	
Cs =	80.61	
Bc =	39.37	ksi
Dc =	0.25	
Cc =	65.67	
Bp =	45.04	ksi
Dp =	0.30	
Cp =	61.39	

Bending:

Strong Axis:

M_x =	760	ft-lb (strong axis)
Lb_x =	14.00	in
Slenderness, S =	22	= 14/(0.643*SQRT(1))
leg length, b =	1.79	in
Slenderness, b/t =	7	
Fb_x =	21155	psi
fb_x =	1404	psi = 760*12/6.497
	6.64%	

Tension Element Check:

F =	27576	psi
f =	1404	psi
	5.09%	

Weak Axis:

Tip of channel leg in compression.

M_y =	0	ft-lb (weak axis)
co =	0.512	in
cc =	-1.778	in
co/cc =	-0.29	
m =	1.01	
Fb_y =	27576	psi
fb_y =	0	psi = 0*12/0.703
	0.00%	

Tension Element Check:

F =	19487	psi
f =	0	psi
	0.00%	

Compression in Beams, extreme fiber (3.4.11)

Slenderness Limitations:

	S1	S2
	21	79
Lb limit, (in) =	14	51

Stresses, psi:

S<S1	S1<S<S2	S2<S
N/A	21155	N/A

Compression in Beams Elements, (3.4.15)

Slenderness Limitations:

S1	S2
22	10

Stresses, psi:

b/t<S1	S1<b/t<S2	S2<b/t
21212	N/A	25412

Compression in Beams Elements: (3.4.17)

Tip of channel leg in compression.

Slenderness Limitations:

S1	S2
9	19

Stresses, psi:

b/t<S1	S1<b/t<S2	S2<b/t
27576	N/A	N/A

Compression in Beams Elements: (3.4.18)

Tip of channel leg in tension.

Slenderness Limitations:

S1	S2
32	35

Stresses, psi:

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Project Name St Francis Park Apartments Ships Ladder Design. Project # 161411

Location 1136 SE Oak Street, Portland, Oregon

Client A 2 FABRICATIONS

By EWA Ck'd LPS Date 11/3/16

FROM SUBMITTAL

b/t<S1	S1<b/t<S2	S2<b/t
27576	N/A	N/A

Tension: (3.4.4)

F = 27576 psi, stong axis
F = 19487 psi, weak axis

Compression:

P = 0 lb

Gross Area Check:

Lb =	12.00	in, strong axis bracing
k =	1	
Slenderness, kL/r =	19	
Fc =	17835	psi, from 3.4.7

Column Element Check:

b =	7.50	in
Slenderness, b/t =	30	
Fc =	5132	psi, from 3.4.8
Fc =	2184	psi, from 3.4.8.1
Fc =	15695	psi, from 3.4.9
Fc =	2184	psi, sect. 3.4.8.1 controls element check

4.7.4, effect of local buckling on column strength:

Fcr =	43265	psi = 3.14^2*10100/(1.6*30)^2*1000
Fcr/nu =	22187	psi > 2184, does not control
Frc =	41156	psi

Fc =	2184	psi, controlling capacity
fc =	0	psi = 0/3.02
	0.00%	

Compression in Columns: (3.4.7)

Slenderness Limitations: (kL/r)

S1	S2
0	66

Stresses, psi:

kL/r<S1	S1<kL/r<S2	S2<kL/r
N/A	17835	N/A

Compression in Column Elements: (3.4.8)

Slenderness Limitations: (b/t)

S1	S2
2	10

Stresses, psi:

b/t<S1	S1<b/t<S2	S2<b/t
N/A	N/A	5132

Compression in Column Elements: (3.4.8.1)

Slenderness Limitations: (b/t)

S1	S2
2	12

Stresses, psi:

b/t<S1	S1<b/t<S2	S2<b/t
N/A	N/A	2184

Compression in Column Elements: (3.4.9)

Slenderness Limitations: (b/t)

S1	S2
8	33

Stresses, psi:

b/t<S1	S1<b/t<S2	S2<b/t
N/A	15695	N/A

Shear:

Strong Axis:

V_y =	464	lb
h =	7.5	in = 8-2*0.25
Slenderness, h/t =	30	
Fv_y =	24268	psi
fv_y =	232	psi = 464/2
	0.96%	

Weak Axis:

V_x =	0	lb
h =	1.79	in = 2.29-2*0.25
Slenderness, h/t =	7.2	
Fv_x =	24268	psi
fv_x =	0	psi = 0/1.15
	0.00%	

Shear in Elements: (3.4.20)

Slenderness Limitations: (h/t)

S1	S2
36	64

Strong Axis:

Stresses, psi:

h/t<S1	S1<h/t<S2	S2<h/t
24268	N/A	N/A

Weak Axis:

Stresses, psi:

h/t<S1	S1<h/t<S2	S2<h/t
24268	N/A	N/A

Combined Forces:

0.07 < 1.00 OK

Use 6061-T6 2.29x8 aluminum channel

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Phone 503.246.1250
Fax 503.246.1395
www.miller-se.com

WinBeam

FROM SUBMITTAL

Project:				
By:	Date:	Checked:	Date:	Page:

Description:

Ship's Ladder channel
Load Case 2

Units: English

Properties - X = feet, E = ksi, I = in^4
X = 0; E = 10100; I = 25.988;

Moment Releases - X = feet

Supports - X = feet, Displacement = inches, Rotation = radians
X = 0; Disp = 0;
X = 7.67; Disp = 0;

Springs - X = feet, VSpring = kip/inch, RSpring = kip in/rad

Point Loads - X = feet, PLoad = kips, Moment = kip ft
X = .5; PLoad = -.125;
X = 2.8333; PLoad = -.125;
X = 4.67; PLoad = -.125;

Uniform Loads - XStart & XEnd = feet, UStart & UEnd = kip/ft
XStart = 0; XEnd = 5.17; UStart = -.01875; UEnd = -.01875;
XStart = 5.17; XEnd = 7.67; UStart = -.144; UEnd = -.144;

Analysis Data:

Beam Length = 7.67 feet
Number of Nodes = 201
Number of Elements = 200
Number of Degrees of Freedom = 402

Reactions:

X feet	Vert kips	Rot kip ft
0	0.367505	
7.670	0.464432	

Equilibrium:

	Force	Reaction	Diff
Vert	-0.831937	0.831938	0.000 kips
Rot	3.562	-3.562	-0.000 kip ft

Min & Max values:

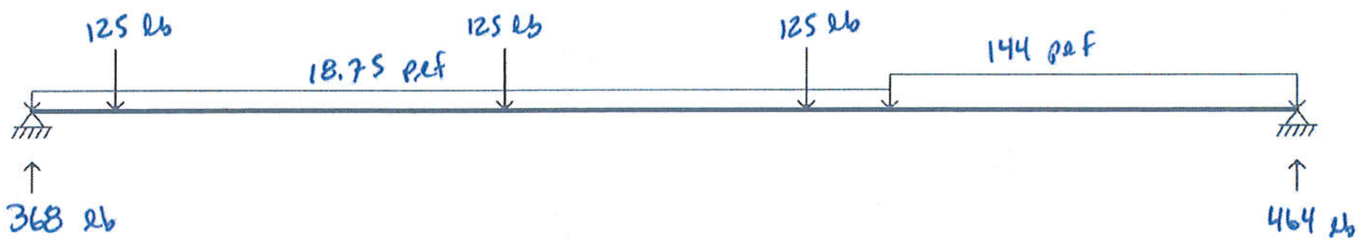
Min Shear	= -0.464432	kips	at	7.670 feet
Max Shear	= 0.367505	kips	at	0 feet
Min Moment	=-1.534e-014	kip ft	at	0 feet
Max Moment	= 0.760953	kip ft	at	4.670 feet
Min Rotation	= -0.001094	radians	at	7.670 feet
Max Rotation	= 0.001011	radians	at	0 feet
Min Deflection	= -0.030133	in	at	3.943 feet
Max Deflection	= 0	in	at	0 feet

FROM SUBMITTAL

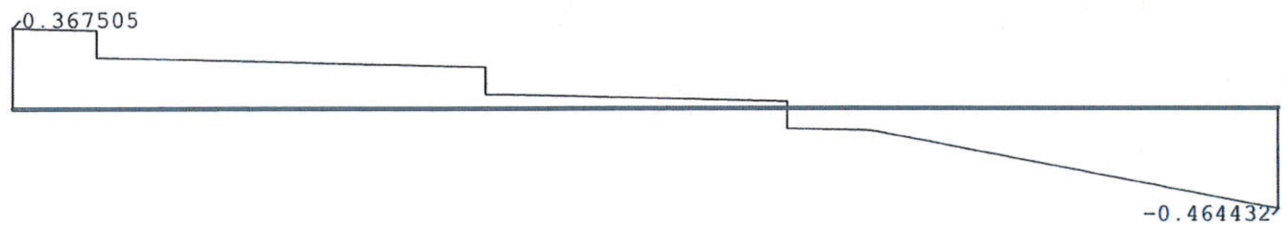
WinBeam

Project:				
By:	**Date:**	**Checked:**	**Date:**	**Page:**

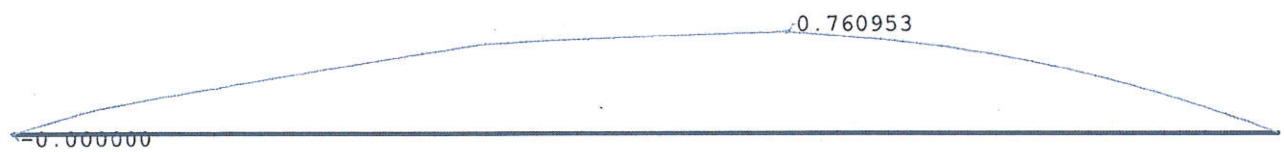
Reactions - kips, kip ft



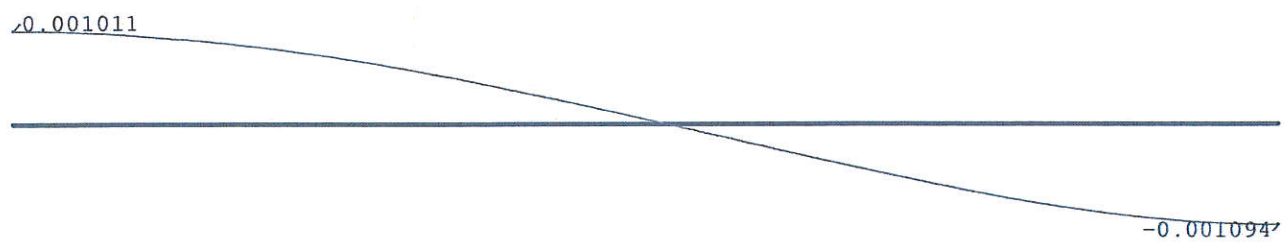
Shear - kips



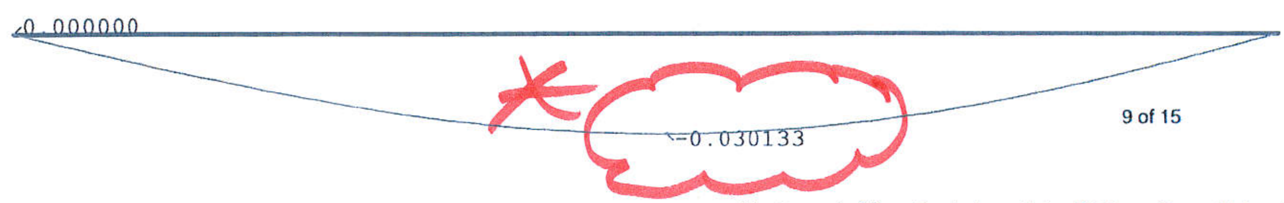
Moment - kip ft



Rotation - radians



Deflection - inches



FROM SUBMITTAL

CHECK LADDER TREADS

APPLIED LOAD: 250 lb PT. LOAD (OSHA 1926.1053)

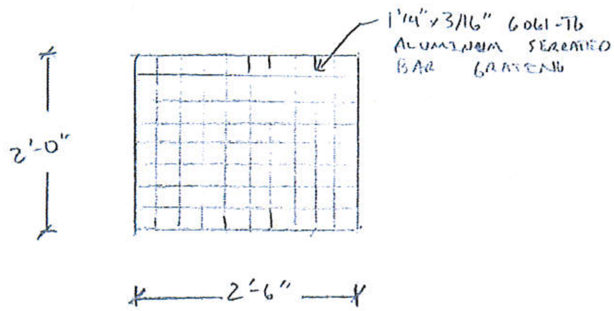
1 1/4" x 3/16" ALUMINUM SERRATED BAR GRATING:

SPAN: 2'-0"

ALLOWABLE = 987 lb > 250 lb OK - SEE REF 1 FOR ALLOWABLE

$\therefore$ USE 1 1/4" x 3/16" SERRATED BAR ALUMINUM GRATING FOR TREADS

CHECK LANDING AT TOP OF LADDER



APPLIED LOAD = 100 PSF

ALLOWABLE:

MAX SPAN: 2'-6"

ALLOW = 632 PSF > 100 PSF

$\therefore$ USE 1 1/4" x 3/16" SERRATED BAR 6061-T6 ALUMINUM GRATING FOR LANDING