LETTER OF TRANSMITTAL

ROEBUCK CONSTRUCTION

1780 Oakdale Avenue San Francisco CA 94124 license #797773
phone (415) 255-1506 fax (415) 255-1508 www.roebucksf.com

Date 20-Sept-18	Job No. 515
Attention	Steve Ryder
Re:	
UC Hastings College of Law	
Infrastructure Improvements	
Submittal #009B - Window Washing Davit Arms	

TO MK Think Architects
1500 Sansome Street,
San Francisco, CA 94111

WE ARE SENDING YOU THE FOLLOWING: [X] Attached [ ] Email

[ ] Shop Drawings [ ] Prints [ ] Plans [ ] Specifications

[ ] Copy of Letter [ ] Change Order [X] Submittal

Copies	Date	No.	Description
1	20-Sept-18		Window Washing Davit Arms Submittal

[X] For approval [ ] Approved as submitted [ ] Resubmit _____ copies for approval

[ ] For your files [ ] Approved as noted [ ] For review and comments

[ ] As requested [ ] Returned for corrections [ ] FOR BIDS DUE _____

REMARKS:

Signed *Barry Doherty* Contracts Administrator

Copy To

Barry Doherty, PM

SKY CLIMBER®
ACCESS INNOVATIONS SINCE 1955

LETTER OF TRANSMITTAL

DATE: 9/19/2018

PROJECT: UC HASTINGS

ATTENTION TO:

BARRY DOHERTY
ROEBUCK CONSTRUCTION
415-255-1506

SUBMITTED BY:

MATT BEIER
PERMANENT INSTALLATIONS ENGINEER – SKY CLIMBER, I
1800 PITTSBURGH DRIVE
DELAWARE, OH 43015
740-203-3925

ARCH. LOG No. 17013 - SU 009B

RESUBMIT FOR REVIEW		THIS SUBMITTAL HAS BEEN CHECKED ONLY FOR CONFORMANCE WITH THE DESIGN CONCEPT OF THE PROJECT AND COMPLIANCE WITH THE INFORMATION GIVEN IN THE CONSTRUCTION DOCUMENTS. THE CHECKING OF THIS SUBMITTAL SHALL NOT RELIEVE THE CONTRACTOR FROM THE RESPONSIBILITY FOR DEVIATIONS FROM THE DRAWINGS OR SPECIFICATIONS UNLESS HE HAS IN WRITING CALLED THE ARCHITECTS ATTENTION TO SUCH DEVIATIONS AND SECURED HIS WRITTEN APPROVAL. NOR SHALL IT RELIEVE HIM FROM THE RESPONSIBILITY FOR ERRORS ON THIS SUBMITTAL.	REVIEW COMPLETED	
X	REVISE AND/OR CORRECT			NO CORRECTIONS NOTED
	REJECTED			MAKE CORRECTIONS NOTED
DATE 10/8/18		McGINNIS CHEN ASSOCIATES, INC. 1019 MISSION STREET SAN FRANCISCO, CA 94103 415-986-3873		BY WHOM ER
DATE				BY WHOM

ENCLOSED:

COPIES	DWG NO.	REV.	DESCRIPTION
1	SCL 1.0	C	ROOF EQUIPMENT LAYOUT
1	SCL 2.0	B	DAVIT DETAIL
1	SCL 2.1	A	DAVIT ASSEMBLY DETAILS
1	SCL 3.0	A	DAVIT BASE WELD CALCULATIONS
1	N/A	A	DAVIT MOBILE SOCKET CALCULATIONS
1	N/A	A	ROOF RIGGED DAVIT ARM CALCULATIONS

SUBMITTAL STATUS:

- ☒ FOR APPROVAL
- ☐ FOR RECORD ONLY

PLEASE PROVIDE A RESPONSE TO THIS SUBMITTAL ON OR BEFORE 9/25/2018.

Per MCA Stamp - Revise and Resubmit

REVIEWED			
NO CORRECTIONS NOTED		CORRECTIONS NOTED	X
REVISE AND RESUBMIT		REJECTED	
BY RJH		DATE 10/8/18	

THIS IS A GENERAL REVIEW ONLY, FOR COMPLIANCE WITH THE PLANS AND SPECIFICATIONS, AND DOES NOT CONSTITUTE A DETAILED CHECK OF DIMENSIONS, QUANTITIES, MATERIALS OR FABRICATION PROCESSES. THIS REVIEW SHALL NOT RELIEVE THE CONTRACTOR, SUB-CONTRACTOR OR VENDOR FROM CONFORMING WITH ALL ASPECTS OF THE PLANS AND SPECIFICATIONS, AND NEITHER THE ENGINEER NOR OWNER SHALL BE HELD RESPONSIBLE FOR ANY ERRORS OR OMISSIONS BY REASON OF THIS REVIEW

JYASF, INC.
STRUCTURAL ENGINEERS
1 KAISER PLAZA, SUITE 405, OAKLAND, CA

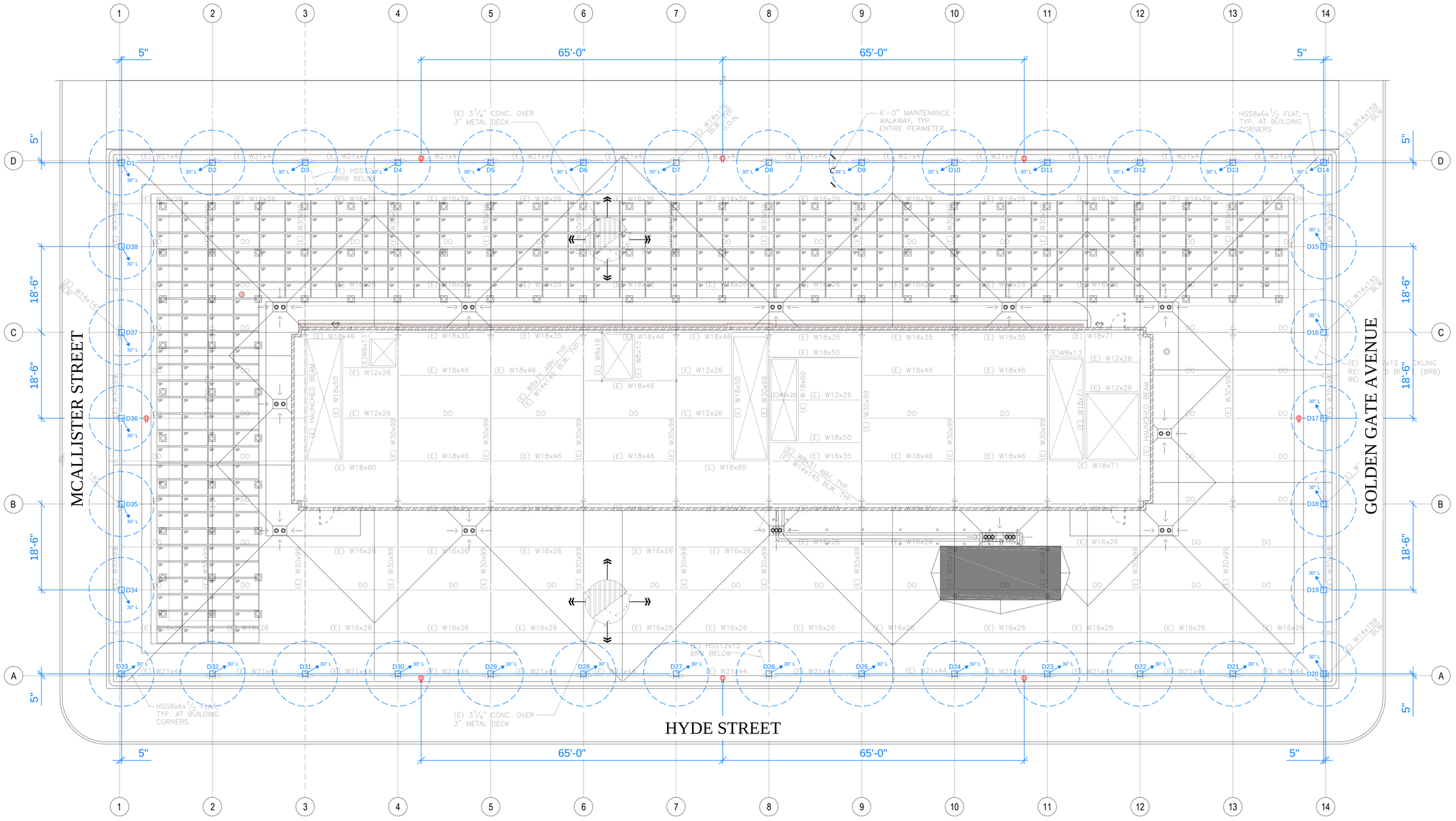
Per MCA Stamp - Revise and Resubmit

SRS Safety Services Inc.

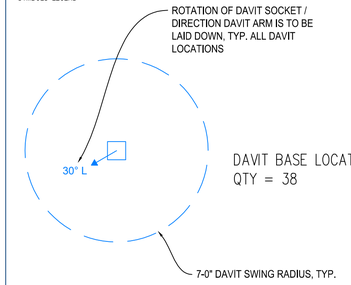
- ☐ REVIEWED
- ☑ REVIEWED AS NOTED
- ☐ REVISE AND RESUBMIT
- ☐ REJECTED
- ☐ FOR INFORMATION ONLY

This submittal has been reviewed for general conformance with the contract requirements only. The subcontractor is responsible for conforming to and correlating all quantities, dimensions, fabrication a, construction methods and coordination of this work with all other trades. This review does not relieve the subcontractor of their responsibilities to comply with the contract obligations and performance specifications.

BY RS DATE 09-28-2018



SYMBOLS LEGEND



DAVIT BASE LOCATION
QTY = 38

ELECTRICAL RECEPTACLE, L6-30 NEMA RATING 30A/250V, SINGLE PHASE TWISTLOCKS

SKY CLIMBER
ACCESS INNOVATIONS SINCE 1955

Sky Climber®, LLC
1800 Pittsburgh Drive, Delaware, OH 43015
Toll Free: 800.255.4629 Ph: 740.203.3900 Fax: 740.203.3901
E-mail: info@skyclimber.com Web: www.skyclimber.com

PROJECT

UC HASTINGS
SAN FRANCISCO, CA

SHEET TITLE

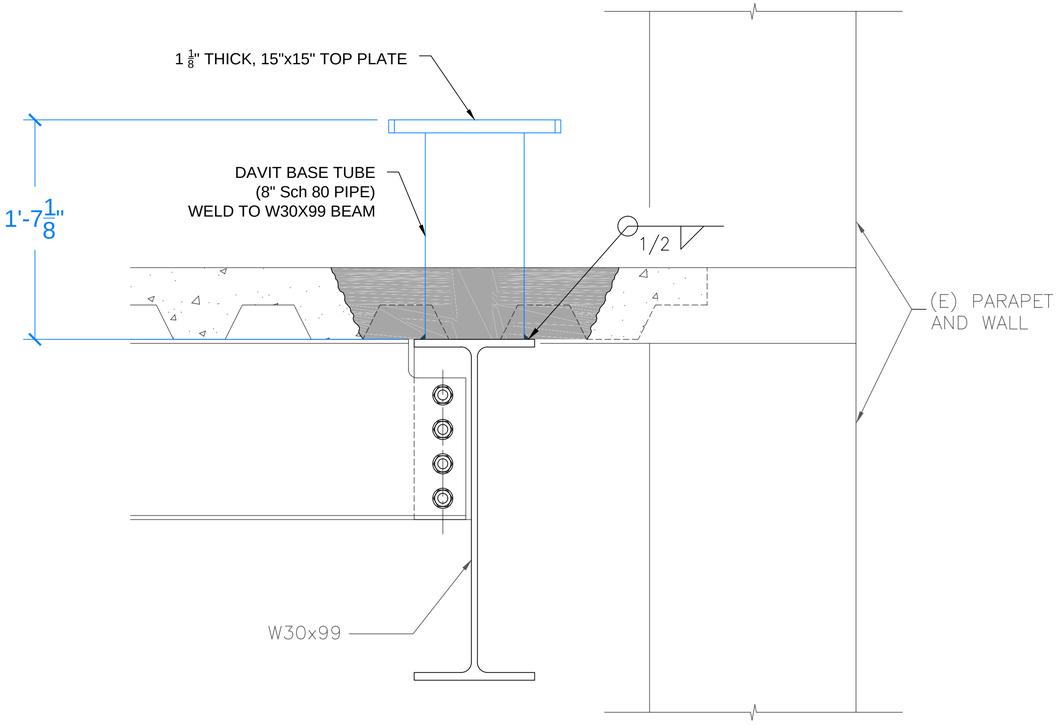
ROOF EQUIPMENT LAYOUT

REVISIONS

REV.	DESCRIPTION	DATE	REV. BY
A	INITIAL RELEASE	1-30-18	MB
B	UPDATED DAVIT ROTATIONS AND LOCATIONS	6-4-18	NK
C	ADDED ELECTRICAL RECEPTACLES.	9-20-18	MB

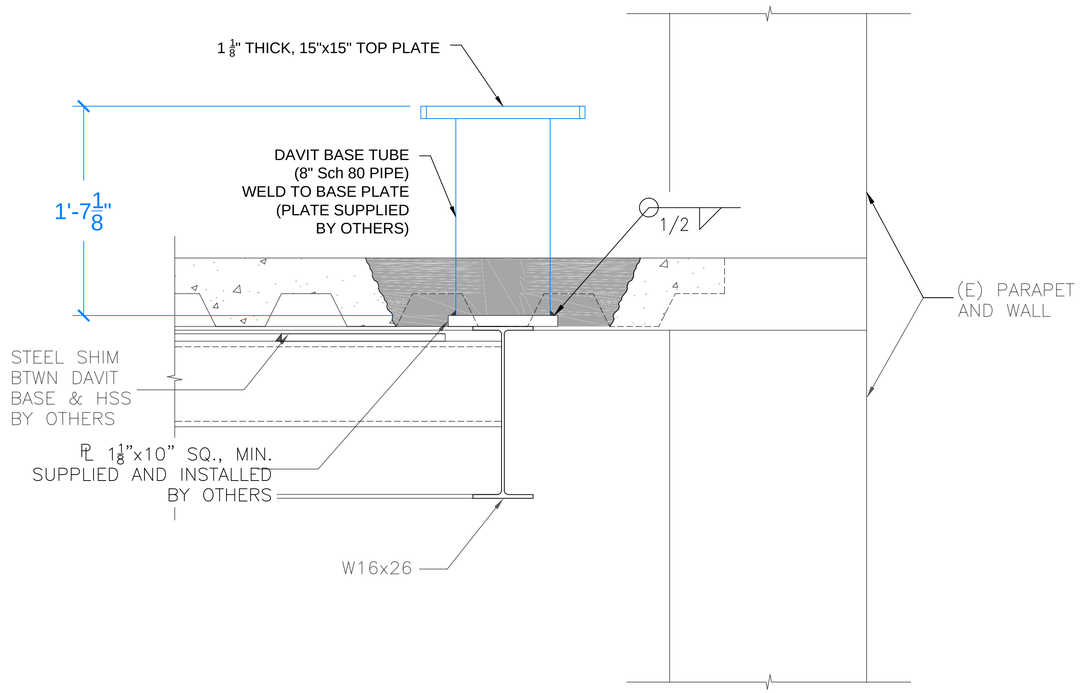
DATE: 6-4-18	DRAWN BY: NK
SCALE:	CHECKED BY:
PROJECT #:	
SHEET #: SCL 1.0	REVISION #: B

IMPOSED LOADS ON DAVIT BASE:
MAX MOMENT = 35,620 FT-LBS
MAX VERTICAL LOAD = 5,000 LBS



1 TYP. DAVIT DETAIL AT W30 BEAM

IMPOSED LOADS ON DAVIT BASE:
MAX MOMENT = 35,620 FT-LBS
MAX VERTICAL LOAD = 5,000 LBS



2 TYP. DAVIT DETAIL AT W16 BEAM

This sheet is outdated. A revised sheet dated 6-5-18 was provided as part of RFI #009. The revised sheet should be included rather than this outdated version.

SYMBOLS LEGEND

SKY CLIMBER
ACCESS INNOVATIONS SINCE 1955

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E-mail: info@skyclimber.com Web: www.skyclimber.com

PROJECT

UC HASTINGS
SAN FRANCISCO, CA

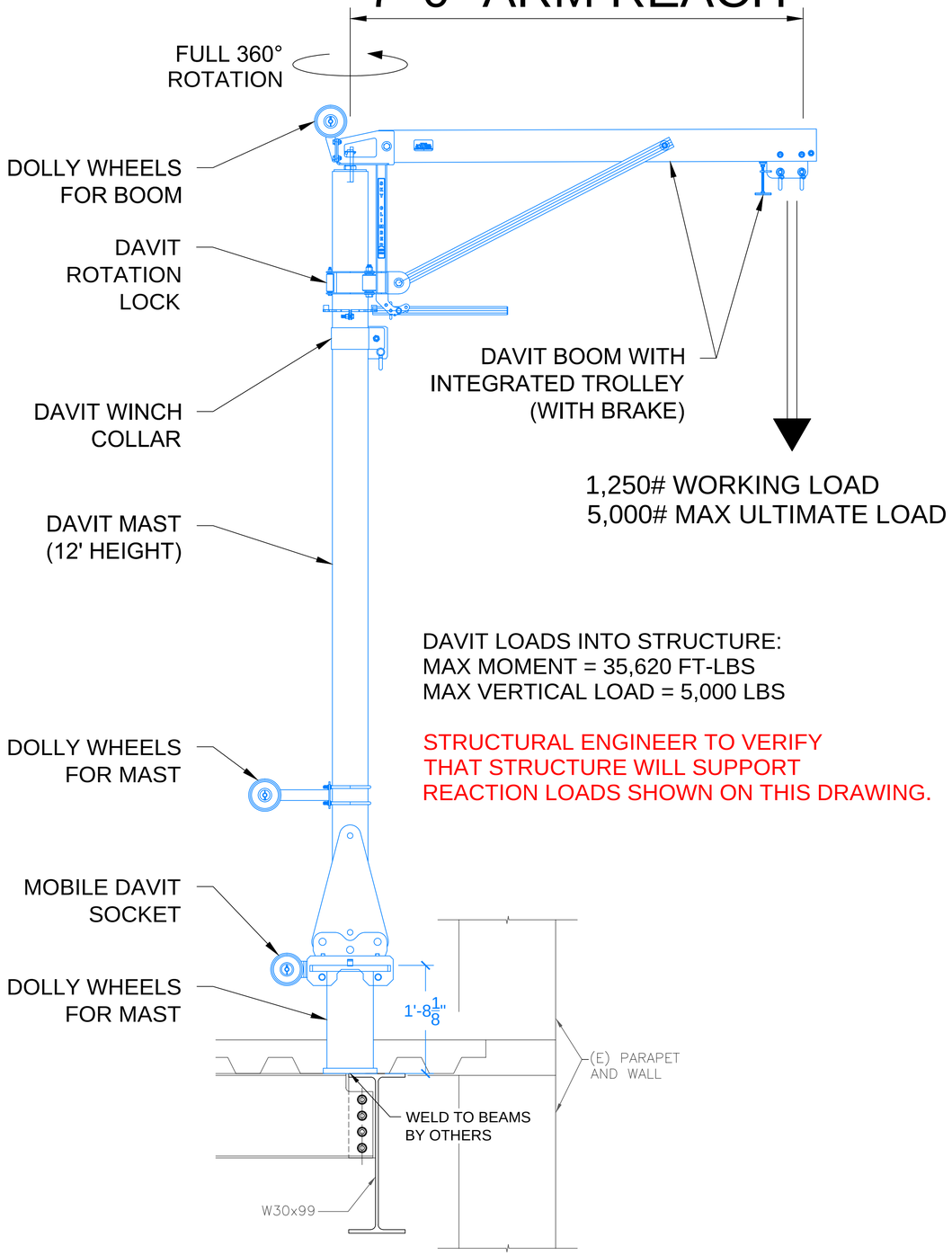
SHEET TITLE

DAVIT DETAIL

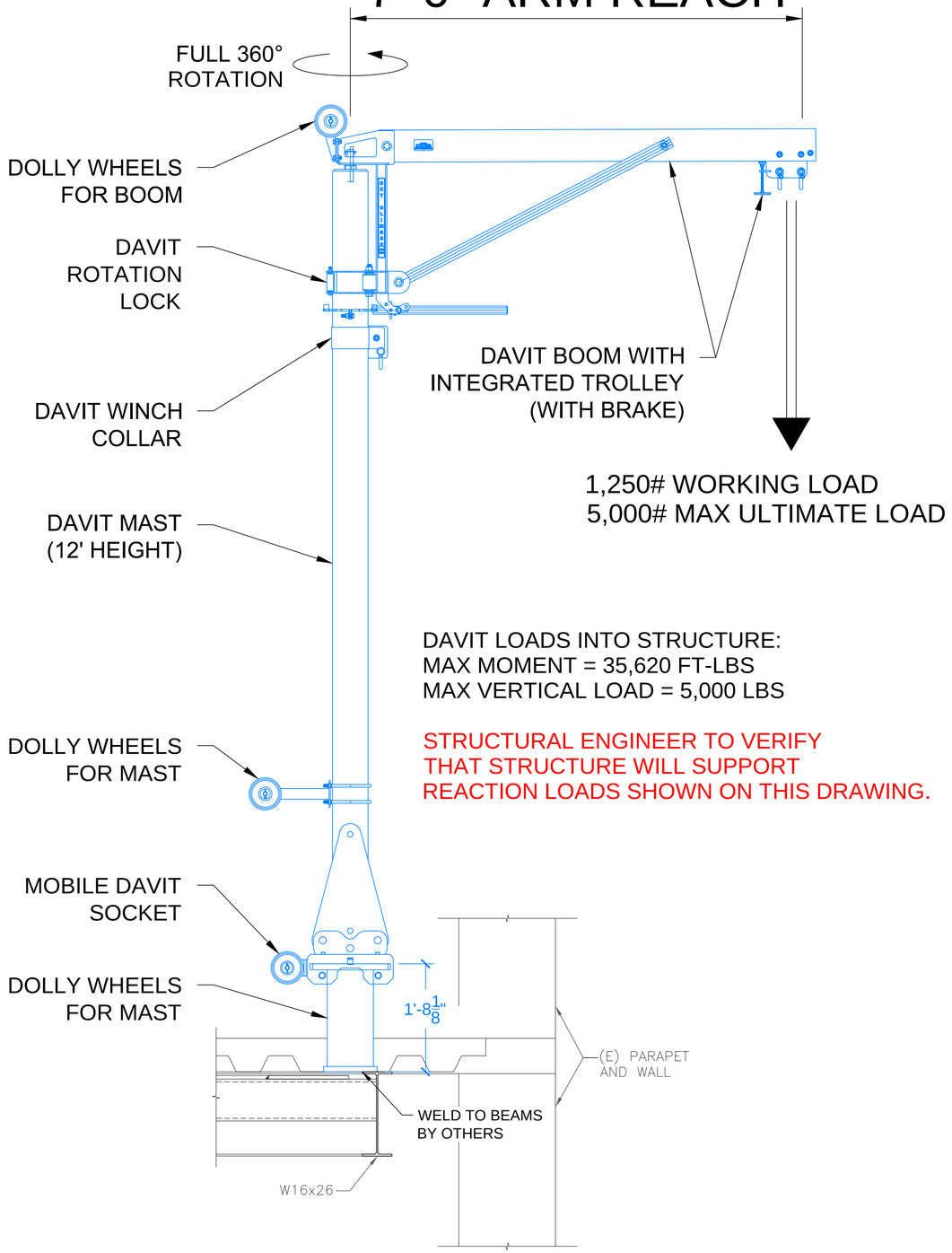
REVISIONS

REV.	DESCRIPTION	DATE	REV. BY
A	INITIAL RELEASE	1-30-18	MB
B	UPDATED BASE DETAILS, CALLED OUT BEAM SIZE.	2-13-18	MB

DATE: 1-30-18
DRAWN BY: MB
SCALE:
CHECKED BY:
PROJECT #:
SHEET #: SCL 2.0
REVISION #: B



1 TYP. DAVIT ASSEMBLY DETAIL AT W30 BEAM



2 TYP. DAVIT ASSEMBLY DETAIL AT W16 BEAM

SYMBOLS LEGEND

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PROJECT

UC HASTINGS
SAN FRANCISCO, CA

SHEET TITLE

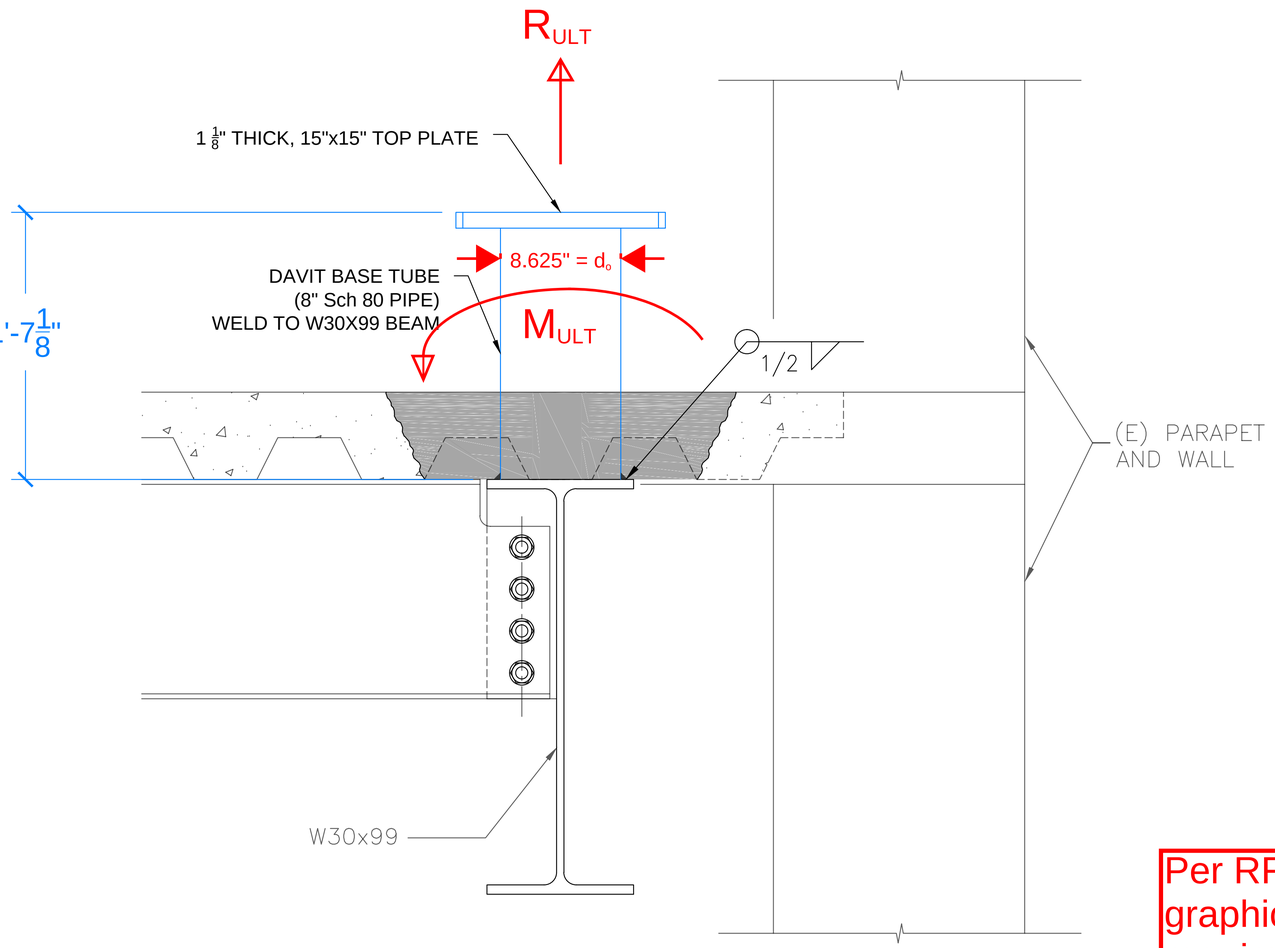
DAVIT ASSEMBLY DETAILS

REVISIONS

REV.	DESCRIPTION	DATE	REV. BY
A	INITIAL RELEASE	9-19-18	MB

DATE: 9-19-18
DRAWN BY: MB
SCALE:
CHECKED BY:
PROJECT #:
SHEET #: SCL 2.1
REVISION #: A

IMPOSED LOADS ON DAVIT BASE:
MAX MOMENT = 35,620 FT-LBS = M_{ULT}
MAX VERTICAL LOAD = 5,000 LBS = R_{ULT}



M_{ULT} = 35,620 ft-lbs = 427,440 in-lbs
R_{ULT} = 5,000 lbs

t_w = fillet weld size = 0.5"

s_w = section modulus of weld / in
$s_w = \pi(d_o)^2 / 4 = \pi(8.625")^2 / 4 = 58.426\ in^2$

S_1 = stress on weld from moment
$S_1 = M_{ULT} / (s_w * t_w * 0.707) = 20{,}696$ psi

S_2 = stress on weld from vertical load
$S_2 = R_{ULT} / (\pi * d_o * 0.707 * t_w) = 522$ psi

$S_{MAX} = (S_1^2 + S_2^2)^{1/2} = 20{,}703$ psi

$F_{U,weld}$ = ultimate stress of weld
$F_{U,weld}$ = 70 ksi (E70xx electrode, min.)

$F_{A,weld}$ = allowable stress of weld
$F_{A,weld} = .6(F_{U,weld}) = 42$ ksi

$S_{MAX} < F_{A,weld}$ .... **OK**

Per RFI #009, this sheet shall be eliminated. The graphic is inconsistent with the structural details required.

SYMBOLS LEGEND

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ACCESS INNOVATIONS SINCE 1955

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PROJECT

UC HASTINGS
SAN FRANCISCO, CA

SHEET TITLE

DAVIT BASE
WELD CALCULATIONS

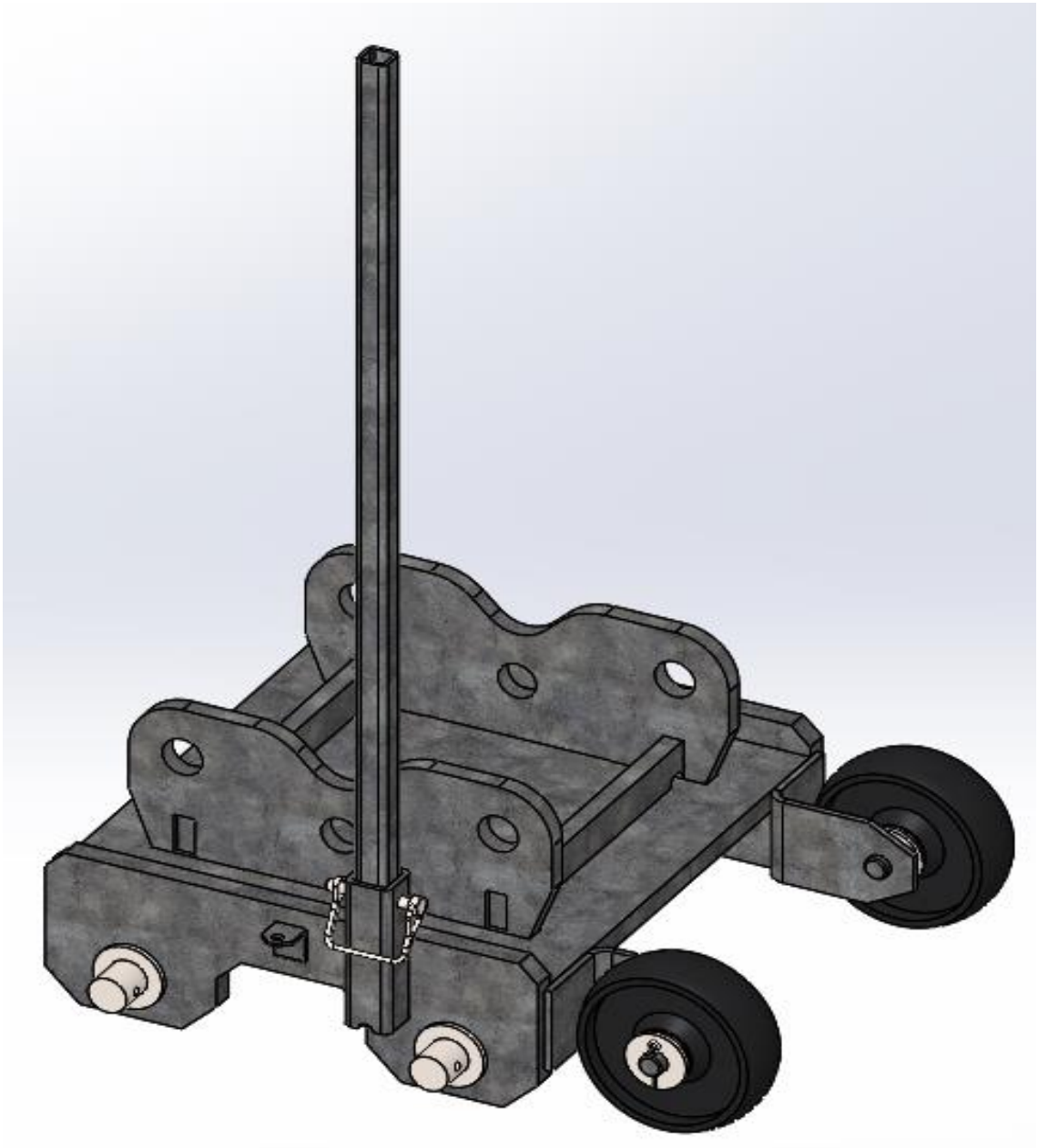
REVISIONS

REV.	DESCRIPTION	DATE	REV. BY
A	INITIAL RELEASE	3-6-18	NK

DATE: 3-6-18
DRAWN BY: NK
SCALE:
CHECKED BY:
PROJECT #:
SHEET #: SCL 3.0
REVISION #: A

SKY CLIMBER CALCULATION PACKAGE

PROJECT: PI Sockets
ENGINEER: Nick Slee
DATE: 8-Jun-18
DESCRIPTION: Davit Socket Base, Mobile, 1250# Capacity
DRAWING NO: DVT-SB-MOB
SPECS: 1250 lb. Capacity



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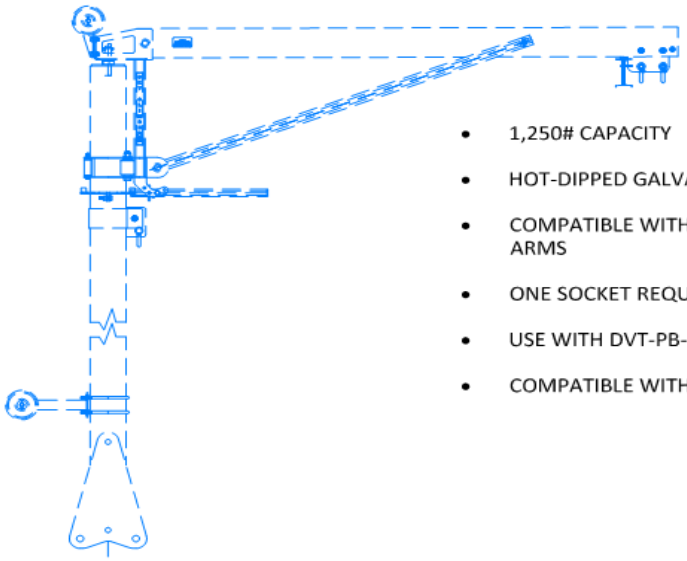
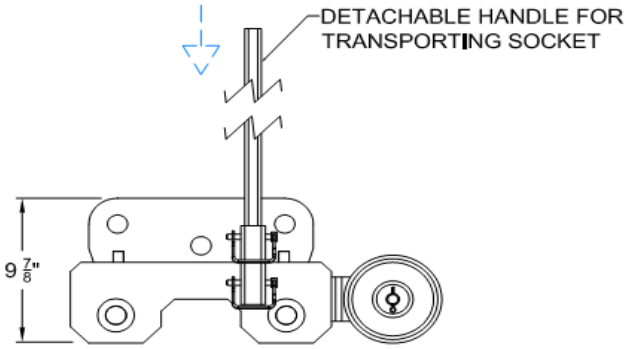
Web: www.skyclimber.com

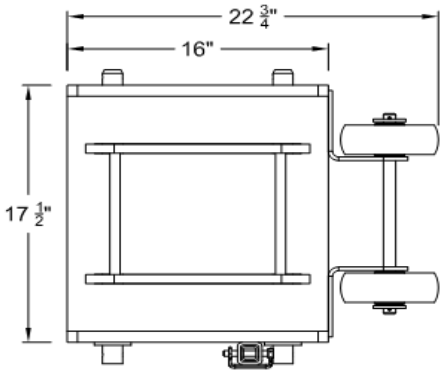
Sky Climber Model: DVT-SB-MOB

Application: Mobile Socket Base



- 1,250# CAPACITY
- HOT-DIPPED GALVANIZED FINISH
- COMPATIBLE WITH SKY CLIMBER 2.0 DAVIT ARMS
- ONE SOCKET REQUIRED FOR EACH DAVIT ARM
- USE WITH DVT-PB-MOB SERIES PEDESTAL BASES
- COMPATIBLE WITH DAVIT WINCH BRACKET





NOTE:
DAVIT IS CAPABLE OF SUPPORTING 5,000 LB. ULTIMATE LOAD AND 1,250 LB. ALLOWABLE LOAD. DAVIT MAY FAIL DUE TO IMPROPER INSTALLATION OR INADEQUATE SUPPORTING STRUCTURE. SERIOUS INJURY OR DEATH MAY RESULT FROM DAVIT FAILURE. INSTALLATION OF DAVIT MUST BE PERFORMED UNDER THE SUPERVISION OF A PROFESSIONAL ENGINEER WITH EXPERIENCE IN SUSPENDED ACCESS EQUIPMENT. ADDITIONALLY, DAVIT SHALL BE TESTED UNDER THE SUPERVISION OF A P.E. AND CERTIFIED BEFORE PLACING INTO SERVICE.

SPECIFIC CONSTRUCTION DETAILS AND APPLICATIONS VARY. THE STRUCTURE THE DAVIT BASE IS ATTACHED TO MUST BE ADEQUATE TO SUPPORT THE REQUIRED LOADING. THEREFORE, ALL INSTALLATION DETAILS MUST BE CONFIRMED BY THE BUILDING'S ENGINEER OF RECORD PRIOR TO THE INSTALLATION.

170526

Portable Socket

Loading Conditions

d	=	10.25	(in)	Davit pin spacing
M_{max}	=	520625	(in-lbs)	maximum moment from davit
T_{pin}	=	50793	(lbs)	Load on pin

ASTM A500 Grade B Steel

E	=	29000	(ksi)
F_{tu}	=	60	(ksi)
F_{ty}, F_{cy}	=	46	(ksi)
K	=	1	(-)

Calculations

AISC Table J3.4 — **Base/Socket Pin Hole Edge Distance**

d_{pin}	=	1.250	(in)	Diameter of pin
L_{edge}	=	1.63	(in)	Minimum Required Edge Distance
L_c	=	1.63	(in)	Actual Edge Distance

$L_c >= L_{edge}$ PASS

AISC Section J3.10 — **Base/Davit Pin Hole Bearing/Tearout Strength**

t	=	0.625	(in)	Plate Thickness
R_n	=	91406	(lbs)	Eqn. J3-6b
R_{max}	=	25396	(lbs)	[T_{pin}/2], Pin is in double shear

$R_{max} < R_n$ PASS

AISC Section J2 — **Weld Strength**

h	=	0.5	(in)
d	=	12	(in)
I	=	203.6	(in^3)
τ	=	15.3	(ksi)
τ_{allow}	=	34.6	(ksi)

$\tau < \tau_{allow}$ PASS

Socket Pin- 1.25" Round Bar

Section Properties

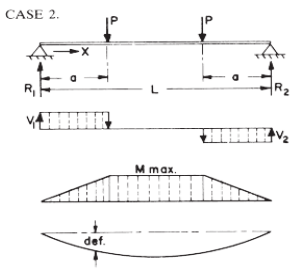
d_{pin}	=	1.25	(in)
A	=	1.227	(in^2)
I	=	0.120	(in^4)
S	=	0.192	(in^3)
Z	=	0.326	(in^3)

416 Stainless Steel Properties

F_{tu}	=	70	(ksi)	-
F_{ty}, F_{cy}	=	40	(ksi)	-
F_{sy}	=	24	(ksi)	-

Loading Conditions

a	=	0.250	(in)	Distance between support and load
d	=	10.25	(in)	pin spacing
M_{max}	=	520625	(in-lbs)	maximum moment from davit
T_{pin}	=	50793	(lbs)	Resolved moment on pin
M_{max}	=	6349	(in-lbs)	maximum bending moment on pin
$\sigma_{b,\,max}$	=	33.1	(ksi)	bending stress on pin



Two equal concentrated loads P equi-distant from the center

Reactions: $R_1 = R_2 = P$

Maximum shear forces: $V_1 = +P\,;\ V_2 = -P$

Maximum bending moment: $M_{max} = Pa$, between loads

Maximum deflection $= \frac{Pa}{24EI}(3L^2 - 4a^2)$

$\text{def.} = \frac{Px}{6EI}(3La - 3a^2 - x^2),\ \ o \le x \le a$

$= \frac{Pa}{6EI}(3Lx - 3x^2 - a^2),\ \ a \le x \le (L - a)$

Calculations

AISC Section F11.1 **Flexural Strength to Yield**

M_1	=	13021	(in-lbs)
M_2	=	11505	(in-lbs)
M_n	=	11505	(in-lbs)

$M_{max} < M_n$ PASS

AISC Section G.4 **Elements- Shear**

V	=	25396	(lbs)	pin in double shear
V_n	=	29452	(lbs)	Max allowable shear load

$V < V_n$ PASS

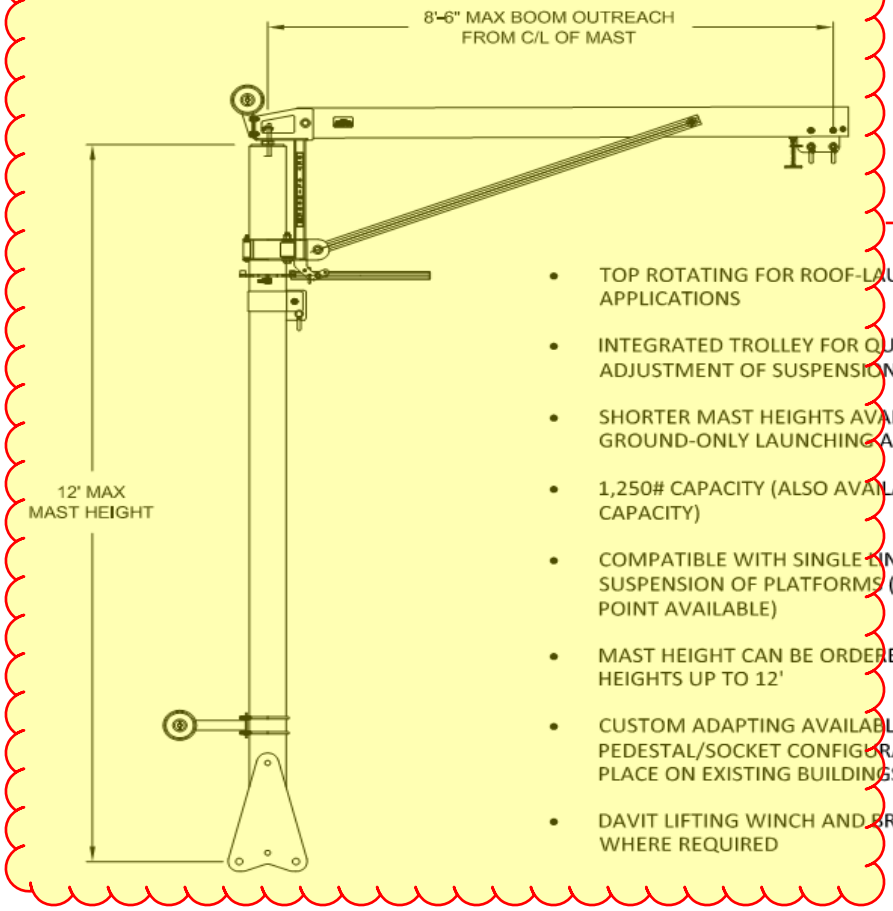
SKY CLIMBER CALCULATION PACKAGE

PROJECT: PI Davits
ENGINEER: Nick Slee
DATE: 21-Apr-17
DESCRIPTION: Davit 2.0, 12' Tall, 8.5' OR
DRAWING NO: DVT-RR-8-HD-2.0
SPECS: 1250# Capacity, 8.5' Outreach, 12' Tall

SKY CLIMBER®, LLC
1800 Pittsburgh Drive
Delaware, OH 43015 USA
Toll Free: 800.255.4629
Ph: 740.203.3900 Fax: 740.203.3901
E-mail: info@skyclimber.com
Web: www.skyclimber.com

Sky Climber Model: DVT-RR-8

Application: Roof Rigged, Top Rotating Davit Arm



RS/SRS: VERIFY FULLY ASSEMBLED PORTABLE DAVIT ARM IS LESS THAN 300 LBS.

- TOP ROTATING FOR ROOF-LAUNCHED APPLICATIONS
- INTEGRATED TROLLEY FOR QUICK AND EASY ADJUSTMENT OF SUSPENSION POINT / OUTREACH
- SHORTER MAST HEIGHTS AVAILABLE FOR GROUND-ONLY LAUNCHING APPLICATIONS
- 1,250# CAPACITY (ALSO AVAILABLE IN 1,000# CAPACITY)
- COMPATIBLE WITH SINGLE LINE AND TWO LINE SUSPENSION OF PLATFORMS (2ND SUSPENSION POINT AVAILABLE)
- MAST HEIGHT CAN BE ORDERED IN CUSTOM HEIGHTS UP TO 12'
- CUSTOM ADAPTING AVAILABLE FOR MANY PEDESTAL/SOCKET CONFIGURATIONS ALREADY IN PLACE ON EXISTING BUILDINGS
- DAVIT LIFTING WINCH AND BRACKET AVAILABLE WHERE REQUIRED

NOTE:
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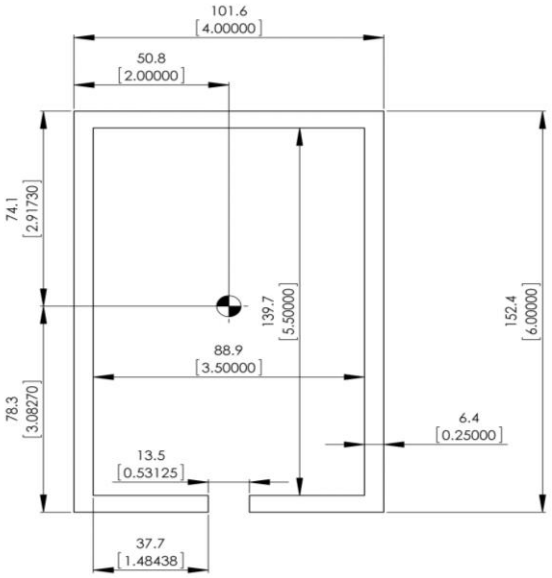
SPECIFIC CONSTRUCTION DETAILS AND APPLICATIONS VARY. THE STRUCTURE THE DAVIT BASE IS ATTACHED TO MUST BE ADEQUATE TO SUPPORT THE REQUIRED LOADING. THEREFORE, ALL INSTALLATION DETAILS MUST BE CONFIRMED BY THE BUILDING'S ENGINEER OF RECORD PRIOR TO THE INSTALLATION.

170526

Beam: 6" X 4" X 0.25"

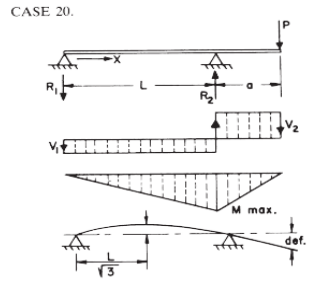
Section Properties

b	=	4	(in)
h	=	6	(in)
t	=	0.25	(in)
A	=	4.617	(in^2)
Ix	=	22.344	(in^4)
Iy	=	12.346	(in^4)
$S_{x,t}$	=	7.659	(in^3)
$S_{x,c}$	=	7.248	(in^3)
r_y	=	2.20	(in)
Z	=	9.142	(in^3)



Loading Conditions

a	=	26.625	(in)
L	=	77.5	(in)
P	=	1250	(lbs)
F.O.S.	=	4	(-)
M_{max}	=	133125	(in-lbs)
$\sigma_{b,\,max}$	=	17.381	(ksi)



Concentrated load, P, at end of overhang

Reactions: $R_1 = -\frac{Pa}{L}$

$R_2 = \frac{P}{L}(L + a)$

Shear forces: $V_1 = -\frac{Pa}{L}$

$V_2 = P$

Maximum bending moment:

$M_{max} = -Pa$, at right support

Deflections:

Maximum downward def. $= \frac{Pa^2}{3\,EI}(L + a)$, at load

Maximum upward deflection; at $x = \frac{L}{\sqrt{3}}$

$= \frac{PaL^2}{9\sqrt{3}\,EI} = 0.06415\,\frac{PaL^3}{EI}$

6061-T6 Aluminum Properties

E	=	10100 (ksi)	- Table A.3.4
F_{tu}	=	38 (ksi)	- Table A.3.4
F_{ty}, F_{cy}	=	35 (ksi)	- Table A.3.4
k_t	=	1 (-)	- Table A.3.3
F_{sy}	=	21 (ksi)	-

Calculations

ADM Section F.2 — Flexural Strength to Yield

M_1	=	319970	(in-lbs)
M_2	=	402105	(in-lbs)
M_3	=	380530	(in-lbs)
M_{np}	=	319970	(in-lbs)

$M_{max} < M_{np}$ PASS

ADM Section J.3.6 — Bearing Strength at Bolt

D	=	0.75	(in) Diameter of Bolt

t_w	=	0.250	(in)	Thickness of beam
d_e	=	3.000	(in)	bolt edge distance
R_n	=	28500	(lbs)	J.3-4 Equation- Bearing Strength
R_n	=	28500	(lbs)	J.3-4 Equation-Edge Distance
P_{pin}	=	6718	(lbs)	
		$P_{pin} < R_n$	**PASS**	

ADM Section G.2 **Elements- Shear**

B_s	=	27.2	(ksi)	Table 1-1
D_s	=	0.141	(ksi)	Table 1-1
λ_1	=	35		
b/t	=	22		
F_s	=	21	(ksi)	$b/t<\lambda_1$
F_{so}	=	1.46	(ksi)	$F_{so}=V_{max}/A=R_2/A$
		$F_{so} < F_s$	**PASS**	

ADM Section B.5.4.2 **Elements- Uniform Compression**

b/t	=	22	(-)	
B_p	=	45	(ksi)	Table 1-1
D_p	=	0.3	(ksi)	Table 1-1
λ_1	=	20.83	(-)	
λ_2	=	32.81	(-)	
k_1	=	0.35	(-)	Table B.4.3
F_c	=	34.44	(ksi)	$\lambda_1 < b/t < \lambda_2$
		$\sigma_{b,\,max} < F_c$	**PASS**	

ADM Section B.5.5.1 **Elements- Flexural Compression**

b/t	=	22	(-)	
B_{br}	=	66.8	(ksi)	Table 1-1
D_{br}	=	0.666	(ksi)	Table 1-1

c_o/c_c	=	-1	(-)	
m	=	0.65	(-)	$-c_o=c_c$
λ_1	=	33.03	(-)	
λ_2	=	54.01	(-)	
k_1	=	0.35	(-)	Table B.4.3
F_b	=	52.5	(ksi)	$b/t < \lambda_1$
		$\sigma_{b,\,max} < F_b$	**PASS**	

ADM Section F.4 **Lateral Torsional Buckling**

C_b	=	1.3	(-)	Section F.4.1
λ	=	8.8	(-)	Section F.4.2.3
C_c	=	66.0	(-)	Table 1-1
M_{nmb}	=	300577	(in-lbs)	$\lambda < C_c$
		$M_{max} < M_{nmb}$	**PASS**	

Mast: 8" SCH 40 Pipe

Section Properties

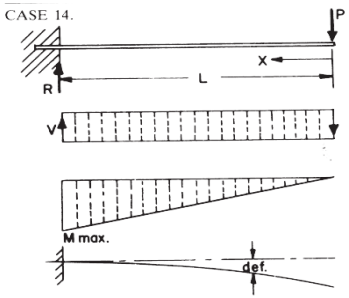
A	=	8.400 (in^2)	
$d_{y,bolt}$	=	18.000 (in)	mast bolt spacing
$d_{y,pin}$	=	10.250 (in)	mast pin spacing on adapter plate
OD	=	8.625 (in)	Pipe OD
L_{pipe}	=	66.000 (in)	
r	=	2.940 (in)	
Ix,Iy	=	72.500 (in^4)	
S	=	16.812 (in^3)	
Z	=	22.210 (in^3)	
t	=	0.322 (in)	
R_b/t	=	12.9 (in)	

6061-T6 Aluminum Properties

E	=	10100 (ksi)	- Table A.3.4
F_{tu}	=	38 (ksi)	- Table A.3.4
F_{ty}, F_{cy}	=	35 (ksi)	- Table A.3.4
k_t	=	1 (-)	- Table A.3.3

Loading Conditions

a	=	26.625 (in)	
L	=	77.5 (in)	
P	=	1250 (lbs)	
F.O.S.	=	4 (-)	4:1 Required F.O.S.
R	=	5000 (lbs)	
M_{max}	=	520625 (in-lbs)	
T_{bolt}	=	14516 (lbs)	Load on adapter plate bolts
T_{pin}	=	25427 (lbs)	Load on davit pins
$\sigma_{b,\,max}$	=	30.97 (ksi)	



Concentrated load, P, at free end of cantilever beam

Reaction: $R = P$, at fixed end

Shear force $V = -P,\ o \le x \le L$

Maximum bending moment $= -PL,\ x = L$

Bending moment: $M = -Px,\ o \le x \le L$

Maximum deflection $= \frac{PL^3}{3EI}$, at free end, $x = o$

$\text{def.} = \frac{P}{6EI}(2L^3 - 3L^2x + x^3),\ o \le x \le L$

Calculations

ADM Section F.2 — Flexural Strength to Yield

M_1	=	777341 (in-lbs)	
M_2	=	882609 (in-lbs)	
M_3	=	882609 (in-lbs)	
M_{np}	=	777341 (in-lbs)	

		$M_{max} < M_{np}$		**PASS**
	ADM Section B.5.4.5			**Elements- Uniform Compression**
R_b/t	=	12.9	(-)	
B_t	=	43.2	(ksi)	Table 1-1
C_t	=	141	(-)	Table 1-1
D_t	=	1.558	(ksi)	Table 1-1
λ_1	=	27.70	(-)	
F_c	=	35	(ksi)	$R_b/t < \lambda_1$
		$\sigma_{b,\,max} < F_c$		**PASS**
	ADM Section B.5.5.4			**Elements- Flexural Compression**
R_b/t	=	12.9	(-)	
B_{tb}	=	64.8	(ksi)	Table 1-1
C_{tb}	=	55.4	(-)	Table 1-1
D_{tb}	=	4.46	(ksi)	Table 1-1
λ_1	=	55.40	(-)	
F_b	=	48.79	(ksi)	$R_b/t < \lambda_1$
		$\sigma_{b,\,max} < F_b$		**PASS**
	ADM Section E.2			**Member Buckling**
λ	=	22.4	(-)	
B_c	=	39.4	(ksi)	Table 1-1
D_c	=	0.246	(ksi)	Table 1-1
λ_1	=	17.89	(-)	
λ_2	=	66.00	(-)	$\lambda_2=C_c$
F_c	=	33.40	(ksi)	$\lambda_1<\lambda<\lambda_2$
P_{nc}	=	280523	(lbs)	
		$R < P_{nc}$		**PASS**

ADM Section H.1				**Combined Flexure and Axial Forces**
P_R/P_C	=	0.018	(-)	
M_R/M_C	=	0.670	(-)	Table 1-1
$P_R/P_C + M_R/M_C$	=	0.688	(-)	Table 1-1
		$P_R/P_C + M_R/M_C<1.0$	**PASS**	
ADM Section J.3.6				**Bearing Strength at Mast Bolt**
D	=	1	(in)	Diameter of Bolt
t	=	0.322	(in)	Thickness of mast wall
d_e	=	2.125	(in)	bolt edge distance
R_n	=	24472	(lbs)	J.3-4 Equation- Bearing Strength
R_n	=	26002	(lbs)	J.3-4 Equation-Edge Distance
T_{bolt}	=	14516	(lbs)	
		$T_{bolt} < R_n$	**PASS**	
ADM Section J.3.6				**Bearing Strength at Davit Pin (Adapter Plate)**
D	=	1.25	(in)	Diameter of Pin
t	=	0.375	(in)	Thickness of adapter plate
d_e	=	1.875	(in)	Pin edge distance
R_n	=	35625	(lbs)	J.3-4 Equation- Bearing Strength
R_n	=	26719	(lbs)	J.3-4 Equation-Edge Distance
T_{pin}	=	25427	(lbs)	
		$T_{pin} < R_n$	**PASS**	
AISC Section J3.6				**Bolt Shear Strength**
tpi	=	8.00	(-)	threads per inch
A_b	=	0.61	(in^2)	nominal unthreaded body area of bolt
F_n	=	70	(ksi)	bolt tensile strength
F_{nv}	=	42	(ksi)	bolt shear strength (60% of bolt tensile strength)

R_n = 25441 (lbs) Eqn. J3-1

$T_{bolt} < R_n$ PASS

Brace: 2" X 2" X .125" Tube

Section Properties

b	=	2	(in)
t	=	0.125	(in)
A	=	0.840	(in^2)
I	=	0.486	(in^4)
S	=	0.486	(in^3)
r	=	0.761	(in)

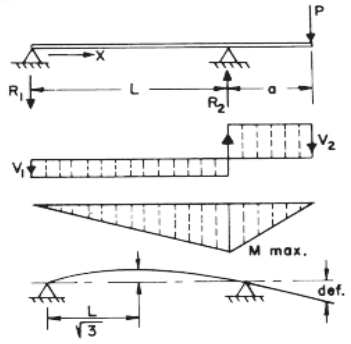
A500 Gr B Properties

E	=	29000	(ksi)
F_{tu}	=	58	(ksi)
F_{ty}, F_{cy}	=	45.7	(ksi)
k_t	=	1	(-)

Loading Conditions

a	=	26.625 (in)	
L	=	77.5 (in)	
L_c	=	72.125 (in)	Length of brace
P	=	1250 (lbs)	
F.O.S.	-	4 (-)	
R_2	=	6718 (lbs)	
Θ	=	21 (deg)	
P	=	18745 (lbs)	
$\sigma_{c,\,max}$	=	22.32 (ksi)	

CASE 20.



Concentrated load, P, at end of overhang

Reactions: $R_1 = -\frac{Pa}{L}$

$R_2 = \frac{P}{L}(L + a)$

Shear forces: $V_1 = -\frac{Pa}{L}$

$V_2 = P$

Maximum bending moment:

$M_{max} = -Pa$, at right support

Deflections:

Maximum downward def. $= \frac{Pa^2}{3\,EI}(L + a)$, at load

Maximum upward deflection; at $x = \frac{L}{\sqrt{3}}$

$= \frac{PaL^2}{9\sqrt{3}\,EI} = 0.06415\,\frac{PaL^2}{EI}$

Calculations

AISC Section J3.5 — Bolt Hole Edge Distance

d_{bolt}	=	0.75 (in)	Diameter of bolt
L_{edge}	=	1.00 (in)	Minimum Required Edge Distance
L_{act}	=	1.4375 (in)	Actual Edge Distance

$L_{edge} < L_{act}$ PASS

AISC Section J3.10 — Bolt Hole Bearing and Tearout Strength

l_c	=	1.0469 (in)	
t	=	0.125 (in)	Upper Plate Thickness
d_{bolt}	=	0.75 (in)	Diameter of bolt

R_n	=	11385	(lbs)	Eqn. J3-6b
R_{max}	=	9373	(lbs)	[P/2], Bolt is in double shear
		$R_{max} < R_n$	**PASS**	

	AISC Section J3.6			**Bolt Shear Strength**
tpi	=	10.00	(-)	threads per inch
A_b	=	0.33	(in^2)	nominal unthreaded body area of bolt
F_n	=	70	(ksi)	bolt tensile strength
F_{nv}	=	42	(ksi)	bolt shear strength (60% of bolt tensile strength)
R_n	=	14047	(lbs)	Eqn. J3-1
		$R_{max} < R_n$	**PASS**	Bolt in double shear

	AISC Section E3			**Member Buckling**
KL/r	=	94.8	(-)	
F_e	=	31.833	(ksi)	Table 1-1
F_y/F_e	=	1.4	(-)	Table 1-1
F_{cr}	=	27.92	(ksi)	$F_y/F_e<2.25$
P_n	=	33236	(lbs)	
		$R < P_n$	**PASS**	

	AISC Table B4.1a			**Width to Thickness Ratios**
b/t	=	16.0	(-)	
λ	=	35.27	(-)	
F_c	=	46	(ksi)	$b/t < \lambda_1$
		$\sigma_{c,\,max} < F_c$	**PASS**	

Shaft: 0.75" Round Bar

Section Properties

D	=	0.750	(in)
A	=	0.442	(in^2)
I	=	0.016	(in^4)
Loading C	=	0.041	(in^3)
L	=	0.636	(in)

Loading Conditions/Calcs

P	=	1250	(lbs)
FOS	=	4	(-)
M_{max}	=	2215	(in-lbs)
$\sigma_{c,\,max}$	=	53.5	(ksi)

$\sigma_{c,\,max} < F_{ty}$ PASS

Plate: 0.5" plate

Section Properties

t	=	0.5	(in)
d	=	0.75	(in)
I_c	=	0.742	(in)

Loading Conditions/Calcs

P	=	5000	(lbs)
R_n	=	46802	(lbs)

AISC Section J10

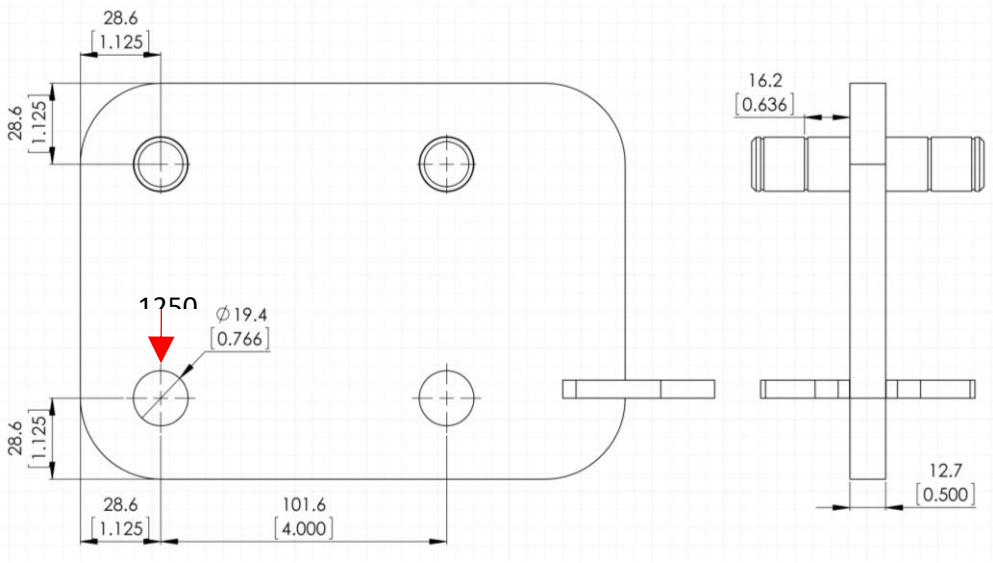
$P < R_n$ PASS

Bar: 316 SS (Annealed, cold drawn bar)

E	=	28000	(ksi)	
F_{tu}	=	89.9	(ksi)	-
F_{ty}, F_{cy}	=	60.2	(ksi)	-
				-

Plate: 316L SS (Annealed)

E	=	28000	(ksi)
F_{tu}	=	84.1	(ksi)
F_{ty}	=	42.1	(ksi)



Davit Pin: 1.25" Round Bar

Section Properties

D	=	1.250	(in)	
$d_{y,pin}$	=	10.250	(in)	mast pin spacing on adapter plate

Loading Conditions

a	=	26.625	(in)	
L	=	77.5	(in)	
P	=	1250	(lbs)	
F.O.S.	=	4	(-)	4:1 Required F.O.S.
M_{max}	=	520625	(in-lbs)	
T_{pin}	=	25427	(lbs)	Load on davit pins

Calculations

AISC Section J3.6 — **Pin Shear Strength**

A_b	=	1.23	(in^2)	Area of pin
R_n	=	29452	(lbs)	Eqn. J3-1

$T_{pin} < R_n$ PASS

416SS Properties

F_y	=	40	(ksi)	Yield Strength
F_s	=	24	(ksi)	Shear Strength