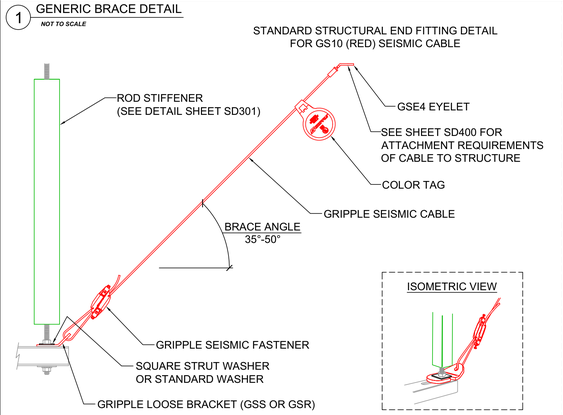
1 GENERIC BRACE DETAIL

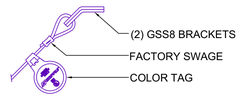
NOT TO SCALE



STANDARD STRUCTURAL END FITTING DETAIL FOR GS12 (GREEN) SEISMIC CABLE

STANDARD STRUCTURAL END FITTING DETAIL FOR GS19 (YELLOW) SEISMIC CABLE

STANDARD STRUCTURAL END FITTING DETAIL FOR GS25 (PURPLE) SEISMIC CABLE



NOTES:
1. ATTACHMENT OF GRIPPLE LOOSE BRACKET TO STRUT SHOWN FOR SCHEMATIC PURPOSES ONLY. ATTACH TO OTHER COMPONENTS (EQUIPMENT, TRAPEZE MEMBER, PIPE CLAMP, CLEVIS BOLT, ETC.) AS INDICATED IN ADDITIONAL DETAILS AND WITHIN MANUFACTURER'S INSTALLATION GUIDELINES. BRACKET TO BE SECURED TIGHT TO COMPONENT USING WASHER AND NUT AS SHOWN.
2. END FITTINGS SHOWN THIS DETAIL ARE STANDARD SELECTIONS; HOWEVER, DIFFERENT BRACKET(S) MAY BE REQUIRED BASED ON THE BOLT, ROD, OR ANCHOR THEY ARE ATTACHING TO. CONTRACTOR TO FIELD VERIFY SELECTIONS PRIOR TO INSTALLATION.
3. CABLE ORIENTATION FOR DETAILS SHOWN ABOVE REPRESENTS A LATERAL BRACE. ROTATE AND STACK CABLES AS REQUIRED FOR LONGITUDINAL AND FOUR WAY BRACES. SEE DETAIL THIS SHEET AND MANUFACTURER'S INSTALLATION GUIDELINES.

2 GRIPPLE GSR BRACKET INSTALLATION DETAILS

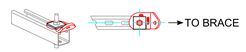
NOT TO SCALE

STEP 1
LOOSEN NUT AND WASHER

STEP 2
ATTACH RETROFIT BRACKET AND ALIGN IN DIRECTION OF CABLE BRACE

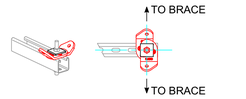
STEP 3
TIGHTEN DOWN NUT ON TOP OF SQUARE WASHER AND RETROFIT BRACKET

TYPICAL RETROFIT BRACKET INSTALLATION FOR LATERAL BRACES



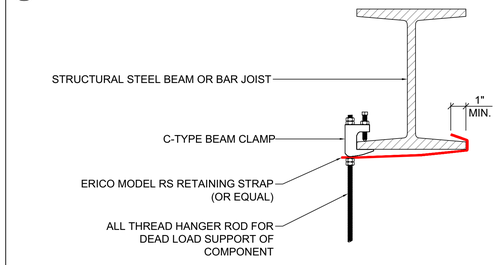
TYPICAL RETROFIT BRACKET INSTALLATION FOR FOUR-WAY BRACES

TYPICAL RETROFIT BRACKET INSTALLATION FOR LONGITUDINAL BRACES



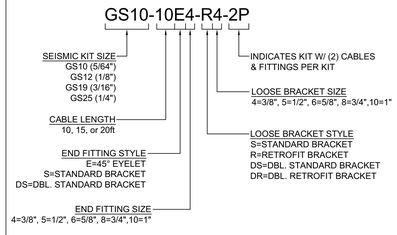
STRUT SHOWN FOR SCHEMATIC PURPOSES ONLY. SEE GENERAL BRACE THIS SHEET FOR ADDITIONAL COMMENTS. SQUARE WASHER SHOWN FOR SCHEMATIC PURPOSES. STANDARD ROUND WASHER ALSO ACCEPTABLE.

3 RETAINING STRAP DETAIL FOR C-TYPE BEAM CLAMPS



NOTES:
1. PER SECTION 13.4.6 OF ASCE 7, ADDITIONAL ATTENTION IS REQUIRED FOR COMPONENTS SUSPENDED FROM STRUCTURAL STEEL BEAMS OR BAR JOISTS USING C-TYPE BEAM CLAMPS. COMPONENTS SUSPENDED UTILIZING C-TYPE BEAM CLAMPS *THAT ARE NOT EXEMPT FROM SEISMIC RESTRAINT REQUIREMENTS* MUST BE EQUIPPED WITH RETAINING STRAPS FOLLOWING THE DETAIL SHOWN ABOVE. SEE "EXEMPTION NOTES" THIS SHEET FOR SPECIFIC REQUIREMENTS BASED ON COMPONENT TYPE/SIZE.
2. FOR DISTRIBUTION SYSTEMS THAT ARE NOT EXEMPT FROM SEISMIC RESTRAINT REQUIREMENTS, RETAINING STRAPS MUST BE INSTALLED AT EVERY HANGER LOCATION WHICH UTILIZES A C-TYPE BEAM CLAMP, NOT ONLY AT SEISMIC BRACE LOCATIONS.
3. RETAINING STRAPS ONLY APPLY TO C-TYPE BEAM CLAMPS USED FOR DEAD LOAD SUPPORT. STANDARD C-TYPE BEAM CLAMPS ARE NOT TO BE USED FOR ATTACHMENT OF SEISMIC BRACES. SEISMIC BRACES TO BE SECURED TO STRUCTURAL STEEL BEAMS AND BAR JOISTS FOLLOWING DETAILS PROVIDED ON ACCOMPANYING SHEET SD400. CLAMPS/ADAPTERS USED FOR SEISMIC BRACE ATTACHMENTS MUST BE SPECIFICALLY LISTED FOR SEISMIC APPLICATIONS.
4. C-TYPE BEAM CLAMPS TO BE EQUIPPED WITH LOCK NUTS TO PREVENT LOOSENING OF THREADED CONNECTIONS.

GRIPPLE PRODUCT CODE DESCRIPTION (SEISMIC KITS WITH RETROFIT BRACKETS INCLUDED)



END FITTING TO BE USED AT STRUCTURE.
LOOSE BRACKET TO BE USED AT COMPONENT.

SEISMIC RESTRAINT INSTALLATION NOTES

1. FOR CALCULATION PURPOSES, RESTRAINT ANGLE FROM HORIZONTAL (Θ) WITHIN THE SEISMIC CABLE CALCULATION DATA SHOWN ON ACCOMPANYING SHEETS WAS ASSUMED TO BE 50°. SEISMIC CABLE MAY BE INSTALLED WITHIN A BRACE ANGLE RANGE OF 35°- 50° AS MEASURED FROM THE HORIZONTAL AS SHOWN IN THE DETAILS. FOR THE BEST RESTRAINT SCENARIO, WE RECOMMEND MAINTAINING A 45° ANGLE WHERE POSSIBLE. IF THE BRACE ANGLE IS OUTSIDE OF THE 35°- 50° RANGE, THE DELEGATED SEISMIC ENGINEER MUST BE CONTACTED AND THE SEISMIC RESTRAINT LAYOUT MUST BE REEVALUATED.
2. SEISMIC CABLES TO BE INSTALLED FOLLOWING MANUFACTURER'S INSTRUCTIONS.
3. ROD STIFFENERS TO BE INSTALLED ON HANGER RODS NEAREST THE SEISMIC RESTRAINT CABLE WHEN INDICATED "REQUIRED" ON ACCOMPANYING SHEET SD301 FOR THE SPECIFIC SUSPENDED COMPONENT.
4. SEISMIC RESTRAINTS ARE ONLY REQUIRED AT THE LOCATIONS WHERE SEISMIC CABLES ARE SHOWN ON THE ACCOMPANYING SEISMIC CABLE LAYOUT SHEETS.
5. ALL COMPONENTS USED TO SUPPORT THE DEAD LOAD OF THE COMPONENT FROM THE STRUCTURE IS OUTSIDE OUR SCOPE OF WORK (DEAD LOAD SUPPORT DESIGN BY OTHERS). UNLESS SPECIFICALLY NOTED OTHERWISE, EVALUATION/DESIGN OF SYSTEMS FOR THERMAL EXPANSION TO BE PROVIDED BY OTHERS.
6. MINIMUM ROD DIAMETER FOR SINGLE RIGID ROD HANGERS TO BE DETERMINED FOLLOWING MSS SP-58 GUIDELINES.

DRAWING REFERENCES

SD10x - SEISMIC RESTRAINT LAYOUT(S)
SD210 - SEISMIC RESTRAINT DETAILS FOR SUSPENDED EQUIPMENT
SD300 - SEISMIC CABLE CALCULATION DATA
SD301 - ROD STIFFENER CALCULATIONS AND DETAILS
SD400 - STRUCTURAL ATTACHMENT DETAILS

21-011534-DFS-01-CO

ENGINEER'S REVIEW
DIBBLE ENGINEERS, INC.
__X__ No Exceptions Taken
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City Of Portland
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REV. #	DATE	DESCRIPTION

OREGON
RENEWAL 12/31/23
98513PE
10/25/22
SEPT. 8, 2020
CHRISTOPHER M SCOTT
EXPIRES: 6/30/24

ASC ENGINEERING
10801 JOHNSTON RD. STE. 105 • CHARLOTTE, NC 28226
AR 3313 MO 2017038603 MS 28689 TN 5345

SHAKE SHACK
(SHACK #1317)

1016 W BURNSIDE ST.
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CUSTOMER PROJECT #:	21-5033
PROJECT #:	2182111
DRAWN BY:	CMS
CHECKED BY:	CMS
DATE:	10.24.2022

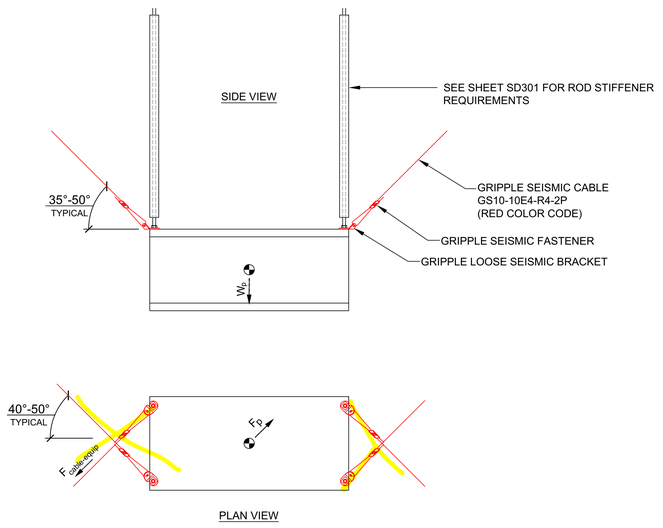
SHEET DESCRIPTION

SEISMIC RESTRAINT GENERAL NOTES & DETAILS

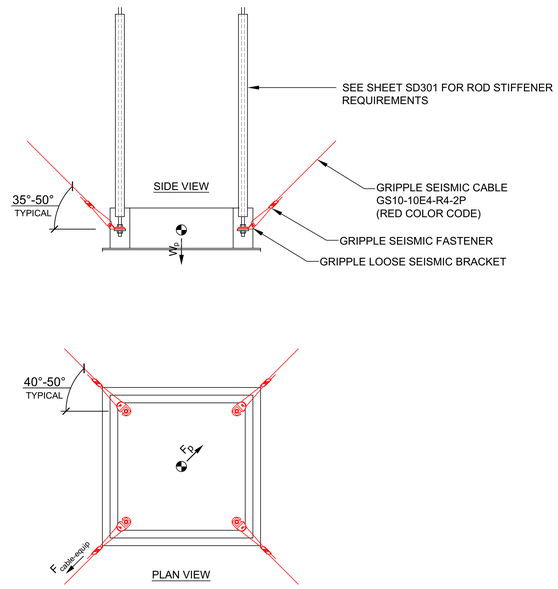
SHEET #

SD000

SEISMIC RESTRAINT REQUIREMENTS FOR: AC-1

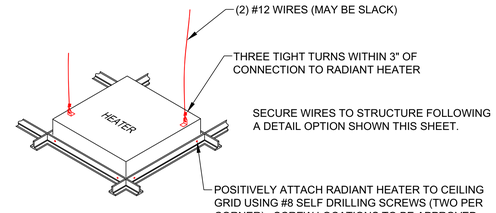


SEISMIC RESTRAINT REQUIREMENTS FOR: FCU-1

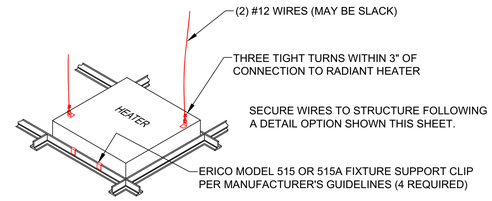


SEISMIC RESTRAINT REQUIREMENTS FOR: EUH-1

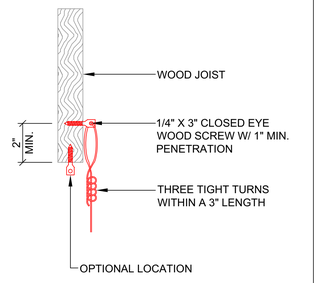
1 RADIANT HEATER RESTRAINT OPTION #1
DIRECT ATTACHMENT TO CEILING GRID



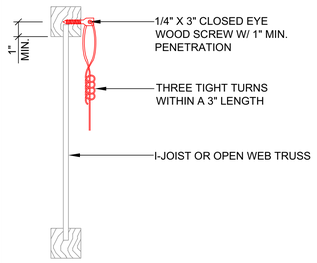
2 RADIANT HEATER RESTRAINT OPTION #2
ATTACHMENT TO CEILING GRID USING FIXTURE SUPPORT CLIPS



WIRE ATTACHMENT DETAIL TO WOOD JOIST



WIRE ATTACHMENT DETAIL TO I-JOIST OR OPEN WEB TRUSS



ASCE 7-10 SECTION 13.5.6 REFERENCES CISCA REQUIREMENTS FOR THE CONSTRUCTION OF SUSPENDED CEILINGS FOR SEISMIC APPLICATIONS. THE REFERENCED CISCA DOCUMENT ADDRESSES THE INTERFACE BETWEEN AIR TERMINALS & THE CEILING SYSTEM. THESE DETAILS ARE A REPRESENTATION OF THE CISCA REQUIREMENTS & ARE INTENDED FOR USE BY THE MECHANICAL CONTRACTOR TO ENSURE THIS INTERFACE HAS BEEN PROPERLY ADDRESSED BY THE CEILING INSTALLER. CEILING CLIP ASSEMBLY INSTALLATION PER MANUFACTURER'S SPECIFICATIONS. SEISMIC REQUIREMENTS FOR THE SUSPENDED CEILING SYSTEM BY OTHERS.

SEISMIC CALCULATION TABLE (SUSPENDED EQUIPMENT)

UNIT TAG	AC-1	FCU-1
W_p (lbs)	85	45.19
z/h	1	1
a_p	2.5	2.5
I_p	1	1
R_p	2.5	2.5
F_p(lbs)	72.2	38.4
F_{px}(lbs)	12.0	6.4
Θ	50	50
RESTRAINT PRODUCT CODE	GS10-10E4-R4-2P	GS10-10E4-R4-2P
$F_{cable-equip}$ = Fp/(cosΘ) (lbs)	112.3 < 400 OK	59.7 < 400 OK
SEISMIC KIT QUANTITY	2	2

DRAWING REFERENCES

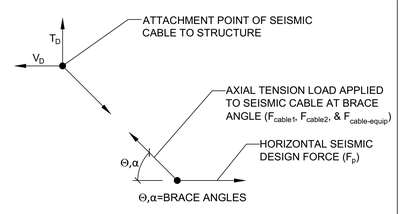
SEE THE FOLLOWING SHEETS FOR INSTALLATION DETAILS AND GENERAL NOTES REGARDING SEISMIC RESTRAINT COMPONENTS:

SD000 - GENERAL NOTES, SYMBOLS, AND DETAILS
SD301 - ROD STIFFENER CALCULATIONS & DETAILS
SD400 - STRUCTURAL ATTACHMENT DETAILS

ALL SEISMIC RESTRAINT COMPONENTS TO BE INSTALLED FOLLOWING MANUFACTURER'S INSTALLATION INSTRUCTIONS.

SEISMIC RESTRAINT DESIGN DATA

RESTRAINT DESIGNATION	RESTRAINT ASSEMBLY CAPACITY (F_{cable}) - LRFD
GS10 (RED)	400 lbs.[a]
GS12 (GREEN)	945 lbs.[a]
GS19[a] (YELLOW)	2265 lbs.[a]
GS25[a] (PURPLE)	3374 lbs.[b]



AS INDICATED IN ACCOMPANYING CALCULATION SHEETS AND DETAILS, THE FOLLOWING CALCULATED VALUES WERE UTILIZED WHEN SELECTING THE RESTRAINT ASSEMBLIES:

- FOR SUSPENDED EQUIPMENT: F_{cable} WAS COMPARED TO $F_{cable-equip}$

a. THE GOVERNING FAILURE MODE WAS DETERMINED TO BE THE SEISMIC RESTRAINT CABLE BASED ON INFORMATION PUBLISHED BY CABLE MANUFACTURER GRIPPLE. THIS FAILURE MODE PROVIDED A DEFORMABLE LINK IN THE LOAD PATH PRIOR TO BRITTLE FAILURE OF THE CONCRETE ATTACHMENT; THEREFORE, THE OVERSTRENGTH FACTOR (RECOGNIZED IN SECTION 13.3.1 OF ASCE 7) WAS NOT APPLIED TO THE CONCRETE ANCHORAGE CAPACITY.
b. THE GOVERNING FAILURE MODE WAS DETERMINED TO BE THE CAPACITY OF THE CAP SCREW AND CHANNEL NUT ATTACHMENT OF THE SEISMIC RESTRAINT CABLE TO THE B-LINE B22 CHANNEL. THIS FAILURE MODE PROVIDED A DEFORMABLE LINK IN THE LOAD PATH PRIOR TO BRITTLE FAILURE OF THE CONCRETE ATTACHMENT; THEREFORE, THE OVERSTRENGTH FACTOR (RECOGNIZED IN SECTION 13.3.1 OF ASCE 7) WAS NOT APPLIED TO THE CONCRETE ANCHORAGE CAPACITY.

City Of Portland
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By DEI/MKW Date 1/10/23
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REV. #	DATE	DESCRIPTION
2	12.6.2022	REVISED DETAIL FOR AC-1
1	10.25.2022	REVISED DETAIL FOR EUH

REGISTERED PROFESSIONAL ENGINEER
CHRISTOPHER M. SCOTT
9853PE
12/6/2022
OREGON
SEPT. 8, 2023
EXPIRES: 06-30-2024

ASC ENGINEERING
10801 JOHNSTON RD. STE. 105 ◆ CHARLOTTE, NC 28226
AR: 3313 MO: 2017038803 MS: 29888 TN: 5345

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1016 W BURNSIDE ST.
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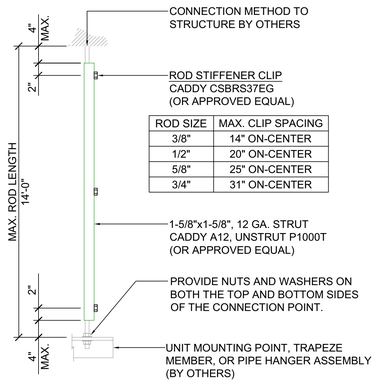
CUSTOMER PROJECT #:	21-5033
PROJECT #:	2182111
DRAWN BY:	CMS
CHECKED BY:	CMS
DATE:	10.24.2022

SHEET DESCRIPTION
SEISMIC RESTRAINT DETAILS FOR SUSPENDED EQUIPMENT

SHEET #
SD210

1 ROD STIFFENER DETAILS
NOT TO SCALE

ROD STIFFENERS ARE ONLY REQUIRED WHEN THE HANGER ROD EXPERIENCES UPLIFT. REFER TO TABLE(S) THIS SHEET TO DETERMINE ROD STIFFENER REQUIREMENTS FOR EACH SPECIFIC COMPONENT BASED ON ROD SIZE. IF ROD STIFFENERS ARE REQUIRED, INSTALLATION TO FOLLOW THE DETAILS SHOWN BELOW.



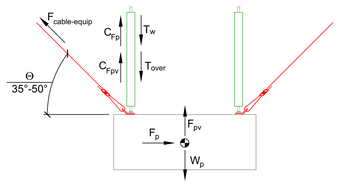
ROD SIZE	MAX. CLIP SPACING
3/8"	14" ON-CENTER
1/2"	20" ON-CENTER
5/8"	25" ON-CENTER
3/4"	31" ON-CENTER

GENERAL NOTES:
1. THE CALCULATIONS AND DETAILS SHOWN THIS SHEET ADDRESS ROD STIFFENER REQUIREMENTS AT SEISMIC BRACE LOCATIONS. THE CALCULATIONS DETERMINE IF A HANGER ROD IN THE ASSEMBLY EXPERIENCES A COMPRESSIVE LOAD DUE TO THE CALCULATED HORIZONTAL AND VERTICAL SEISMIC FORCES APPLIED TO THE SYSTEM (SEE ACCOMPANYING SHEETS FOR SEISMIC FORCE CALCULATIONS FOR EACH COMPONENT). MAXIMUM ROD LENGTHS WITHOUT A STIFFENER WERE DETERMINED USING A SLENDERNESS RATIO (KL/r) EQUAL TO 300. IF A HANGER ROD EXPERIENCES COMPRESSION, ROD STIFFENERS TO BE PROVIDED FOLLOWING THE DATA AND DETAILS SHOWN THIS SHEET. ROD STIFFENER REQUIREMENTS VARY BY COMPONENT TYPE/SIZE, ROD SIZE, AND ROD LENGTH.
2. SEE ACCOMPANYING SHEETS FOR SEISMIC FORCE AND RESTRAINT/BRACE CALCULATIONS.
3. HANGER RODS TO BE SELECTED FOLLOWING APPLICABLE CODES & STANDARDS (I.E. MSS SP-58) AND PROJECT SPECIFICATIONS/DRAWINGS BASED ON COMPONENT SIZE AND WEIGHT. DESIGN/SELECTION OF HANGER RODS AND ASSOCIATED SUPPORT COMPONENTS TO BE PROVED BY OTHERS.
4. ROD STIFFENER CALCULATIONS HAVE BEEN PROVIDED FOR 3/8", 1/2", 5/8", AND 3/4" RODS; HOWEVER, EACH ROD SIZE SHOWN IN THE TABLES MAY NOT BE APPLICABLE FOR SUPPORT OF A PARTICULAR COMPONENT.
5. IF ANY OF THE ASSUMPTIONS SHOWN IN THE TABLE ARE NOT CONSISTENT WITH FIELD CONDITIONS THE DELEGATED SEISMIC ENGINEER MUST BE CONTACTED AND THE ROD STIFFENER CALCULATIONS TO BE REEVALUATED.

ROD STIFFENER EVALUATION FOR SUSPENDED EQUIPMENT (LRFD)

UNIT TAG(S)	L (in)	W (in)	H (in)	L_{cg} (in)	W_{cg} (in)	H_{cg} (in)	N	T_w (lbs)	C_{over} (lbs)	T_{Fpv}/ C_{Fpv} (lbs)	C_{Fp} (lbs)	HANGER ROD CONDITION IF $(T_w+T_{over})>(C_p+C_{Fpv})$ → TENSION IF $(T_w+T_{over})>(C_p+C_{Fpv})$ → COMPRESSION	$C_{rod(max)}$ (lbs)	ARE ROD STIFFENERS REQUIRED? FOR 3/8" RODS	FOR 1/2" RODS	FOR 5/8" RODS	FOR 3/4" RODS
AC-1	36	10	15	23	3	8	4	17	52	3	86	COMPRESSION	20	ONLY FOR RODS > 36"	ONLY FOR RODS > 46"	ONLY FOR RODS > 56"	ONLY FOR RODS > 68"
FCU-1	21	21	10	14	7	5	4	9	9	1	46	COMPRESSION	29	ONLY FOR RODS > 36"	ONLY FOR RODS > 46"	ONLY FOR RODS > 56"	ONLY FOR RODS > 68"

HANGER ROD ANALYSIS FOR COMPRESSIVE LOADS DUE TO SEISMIC FORCES



L = LONGEST HORIZONTAL DISTANCE BETWEEN HANGERS
W = SHORTEST HORIZONTAL DISTANCE BETWEEN HANGERS
H = UNIT HEIGHT
L_{cg} = DISTANCE FROM HANGER TO UNIT C.G. ALONG LONG SIDE
W_{cg} = DISTANCE FROM HANGER TO UNIT C.G. ALONG SHORT SIDE
H_{cg} = VERTICAL DISTANCE FROM UNIT C.G. TO BRACE CONNECTION
N = NUMBER OF HANGERS
$T_w = 0.9W_p(L_{cg}/L)(W_{cg}/W)$
$T_{over} = [(F_pH_{cg})(2L_{cg}/L)(2W_{cg}/W)] / [(W/2)(N/2)]$
$C_{FPv} = F_{pv}(L_{cg}/L)(W_{cg}/W)$
$C_{Fp} = F_p(\tan\Theta)$

MAXIMUM COMPRESSION
$C_{rod1(max)} = (C_{Fp}+C_{Fpv})-(T_w+T_{over})$

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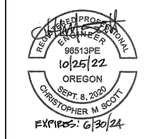

ASC ENGINEERING
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PROJECT #:	2182111
DRAWN BY:	CMS
CHECKED BY:	CMS
DATE:	10.24.2022

SHEET DESCRIPTION

ROD STIFFENER CALCULATIONS AND DETAILS

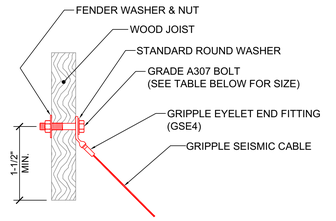
SHEET #

SD301

2 SEISMIC DETAIL - WOOD ATTACHMENTS - SEISMIC RESTRAINT CABLES

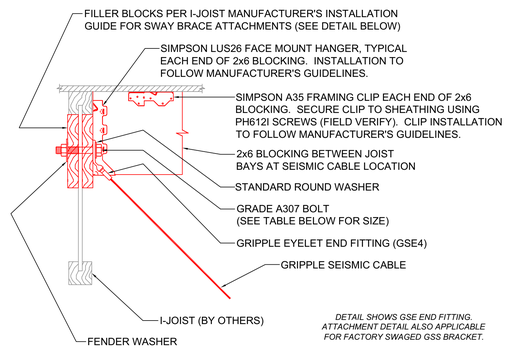
NOT TO SCALE

WOOD JOIST



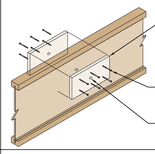
DETAIL SHOWS GSE END FITTING. ATTACHMENT DETAIL ALSO APPLICABLE FOR FACTORY SWAGED GSS BRACKET.

ENGINEERED WOOD I-JOISTS



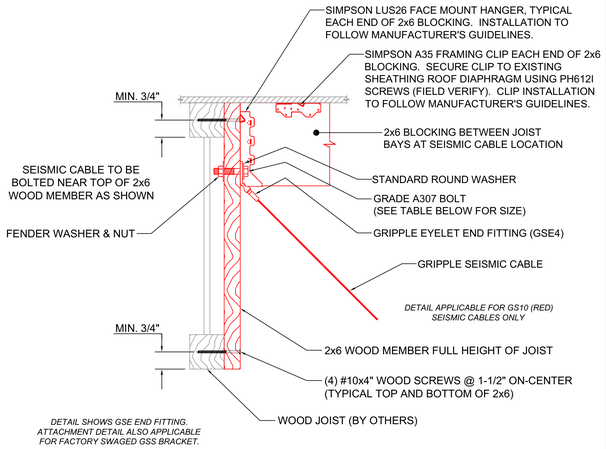
DETAIL SHOWS GSE END FITTING. ATTACHMENT DETAIL ALSO APPLICABLE FOR FACTORY SWAGED GSS BRACKET.

RED-I™ JOIST BLOCKING ATTACHMENT DETAIL



BLOCKING DETAIL TAKEN FROM REDBUILT SPRINKLER SYSTEM INSTALLATION GUIDE FOR SWAY BRACE ATTACHMENTS. DETAIL MAY NEED TO BE MODIFIED IF ANOTHER JOIST MANUFACTURER IS USED.

ENGINEERED WOOD OPEN WEB TRUSSES



DETAIL APPLICABLE FOR GS10 (RED) SEISMIC CABLES ONLY

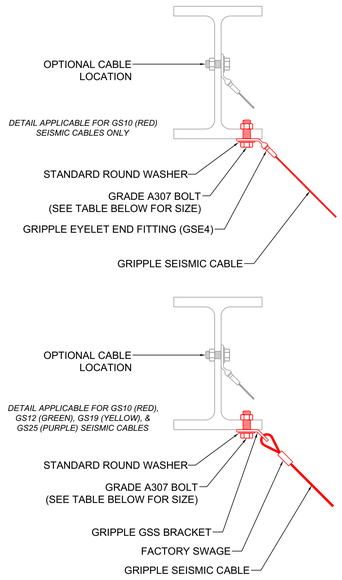
DETAIL SHOWS GSE END FITTING. ATTACHMENT DETAIL ALSO APPLICABLE FOR FACTORY SWAGED GSS BRACKET.

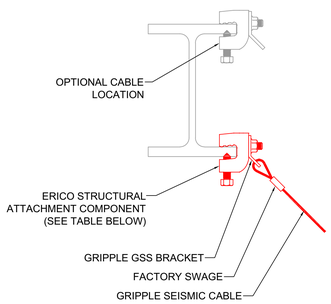
GRIPPLE SEISMIC KIT	SEISMIC BRACKET(S)	BOLT SIZE	BOLT SIZE	BOLT SIZE
GS10 (RED)	***GSE4, GSS4***	***3/8"***	***3/8"***	***3/8"***

2 SEISMIC DETAIL - STRUCTURAL ATTACHMENTS - SEISMIC RESTRAINT CABLES

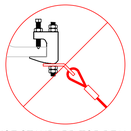
NOT TO SCALE

STRUCTURAL STEEL BEAM





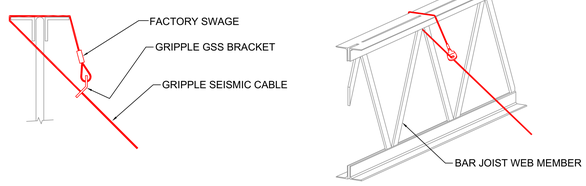
NOTE:
THE ERICO STRUCTURAL ATTACHMENT COMPONENT SHOWN THIS DETAIL IS SPECIFICALLY LISTED FOR SEISMIC (LATERAL) LOADS. STANDARD TOP BEAM CLAMPS USED FOR GRAVITY LOADS ARE NOT ACCEPTABLE FOR SEISMIC CABLE ATTACHMENT.



DO NOT USE STANDARD TOP BEAM CLAMPS FOR SEISMIC CABLE ATTACHMENT

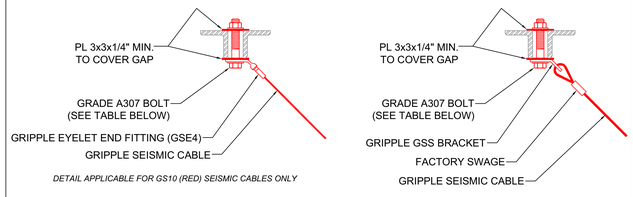
STEEL BAR JOIST

LOOP AROUND TOP CHORD OF JOIST



LOCATE LOOP AROUND TOP OF BAR JOIST, IN BETWEEN WEB MEMBERS, AND IN A MANNER THAT WILL NOT ALLOW THE CABLE TO SLIDE WHEN A TENSION LOAD IS APPLIED. INSTALLATION METHOD TO BE APPROVED BY STRUCTURAL ENGINEER OF RECORD PRIOR TO INSTALLATION.

BOLTED TO TOP CHORD OF JOIST



DETAIL APPLICABLE FOR GS10 (RED) SEISMIC CABLES ONLY

CONNECTION TO TOP OF JOIST ONLY. BOLT MUST BE WITHIN 6" OF PANEL POINT.

GRIPPLE SEISMIC KIT	SEISMIC BRACKET(S)	BOLT SIZE	PART NUMBER	BOLT SIZE
GS10 (RED)	GSE4, GSS4	3/8"	ERICO MODEL CSBS1 or CSBS2	3/8"

City Of Portland

REVIEWED FOR CODE COMPLIANCE

Date: 01/30/23

Project: 21-011534-DFS-01-CO

ENGINEER'S REVIEW
DIBBLE ENGINEERS, INC.
__X__ No Exceptions Taken
_____ Note Markings
_____ Revise & Resubmit
By DEI/MKW Date 1/10/23
ENGINEER'S REVIEW IS FOR GENERAL CONFORMANCE TO THE DESIGN CONCEPT AND CONTRACT DOCUMENTS. REVIEW OF THE SPECIALTY STRUCTURAL ENGINEERS (SSE) DESIGN IS FOR CONFORMANCE TO DESIGN CRITERIA AND COMPATIBILITY WITH THE DESIGN OF THE BUILDING AND DOES NOT RELIEVE THE SSE OF RESPONSIBILITY FOR DESIGN, MANUFACTURING. COMMENTS SHALL NOT BE CONSTRUED AS APPROVING THE CONTRACTOR FROM COMPLIANCE WITH THE PROJECT PLANS AND SPECIFICATIONS, NOT DEPARTURES THEREFROM. THE CONTRACTOR REMAINS RESPONSIBLE FOR DETAILS AND ACCURACY; FOR CONFIRMING AND CORRELATING ALL QUANTITIES AND DIMENSIONS; FOR SELECTION FABRICATION PROCESSES, FOR TECHNIQUES OF ASSEMBLY; AND FOR PERFORMING WORK IN A SAFE MANNER.

GENERAL NOTES:

1. STRUCTURAL ATTACHMENT DETAILS PROVIDED ON THIS SHEET ONLY ADDRESS THE SEISMIC ATTACHMENT COMPONENTS. THE ATTACHMENT POINT TO THE BUILDING STRUCTURE MUST BE CAPABLE OF WITHSTANDING THE CALCULATED POINT LOAD. THE STRUCTURAL ENGINEER OF RECORD MUST APPROVE THE ATTACHMENT METHOD PRIOR TO INSTALLATION.
2. ALL ANCHORS AND SEISMIC BRACING COMPONENTS TO BE INSTALLED FOLLOWING MANUFACTURER'S GUIDELINES.
3. THE DETAILS SHOWN ON THIS SHEET WERE INTENDED TO PROVIDE OPTIONS FOR ATTACHMENT OF THE SEISMIC RESTRAINT CABLE TO THE STRUCTURE. ALL OF THE ATTACHMENT DETAILS MAY OR MAY NOT BE APPLICABLE TO THIS PROJECT. USE ONLY THE ATTACHMENT METHODS THAT CORRESPOND TO THE CABLE DESIGNATION SPECIFIED ON THE ACCOMPANYING SEISMIC CALCULATIONS AND THE STRUCTURE TYPE DESCRIBED HEREIN. IF THE STRUCTURAL COMPONENT IS DIFFERENT THAN THE DETAILS SHOWN HEREIN, THE ENGINEER OF RECORD MUST BE CONTACTED FOR REVIEW.
4. CONCRETE ANCHORAGE CAPACITIES WERE BASED ON VERIFICATION CALCULATIONS USING HILTI PROFIS ANCHOR SOFTWARE AND TECHNICAL DATA PUBLISHED BY HILTI. THE SELECTED ANCHORS MEET THE DESIGN REQUIREMENTS SET FORTH BY ASCE 7 AND ACI 318.
5. PRYING EFFECTS WERE ACCOUNTED FOR IN CONCRETE ANCHORAGE CALCULATIONS PER SECTION 13.4.3 OF ASCE 7. LOCATE STEEL REINFORCING/REBAR WITHIN CONCRETE SLABS PRIOR TO DRILLING. MAINTAIN A MINIMUM EDGE DISTANCE OF 8" FOR ALL CONCRETE ANCHORS.
6. SEE SHEET SD401 FOR CONCRETE ANCHORAGE CALCULATION VERIFICATION DATA.

DESCRIPTION	DATE	REV. #

OREGON REGISTERED PROFESSIONAL ENGINEER
98513PE
10/25/22
OREGON
SEPT. 8, 2020
CHRISTOPHER M SCOTT
EXPIRES: 6/30/24

ASC ENGINEERING
10801 JOHNSTON RD. STE. 105 • CHARLOTTE, NC 28226
AR: 3313 MO: 2017036803 MS: 29888 TN: 5345

SHAKE SHACK
(SHACK #1317)

1016 W BURNSIDE ST.
PORTLAND, OR 97209

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CUSTOMER PROJECT #:	21-5033
PROJECT #:	2182111
DRAWN BY:	CMS
CHECKED BY:	CMS
DATE:	10.24.2022

SHEET DESCRIPTION

SEISMIC RESTRAINT STRUCTURAL ATTACHMENT DETAILS

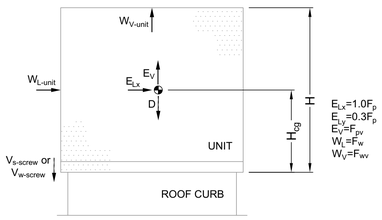
SHEET #

SD400

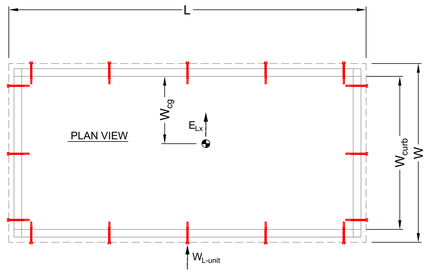
EQUIPMENT ON ROOF CURBS

APPLIED LOAD SCHEMATICS AND EQUATIONS - UNIT TO ROOF CURB

END VIEW



E_{Lx}=1.0F_p
E_{Ly}=0.3F_p
E_V=F_{pv}
W_L=F_w
W_V=F_{wv}



SCREW LAYOUT ABOVE SHOWN FOR SCHEMATIC PURPOSES ONLY.
SEE ACCOMPANYING SHEETS FOR UNIT SPECIFIC REQUIREMENTS.

ATTACHMENT CALCULATION FOR SEISMIC LOADS
GOVERNING LOAD COMBINATION = 0.9D+1.0E (LRFD)

$$V_{s\text{-}screw}=\frac{(1.0E_{Lx})H_{cg}+(1.0E_V)W_{cg}-(0.9D)W_{cg}}{W_{curb}(N_{screw\text{-}L})}$$

ATTACHMENT CALCULATION FOR WIND LOADS
GOVERNING LOAD COMBINATION = 0.9D+1.0W (LRFD)

$$V_{w\text{-}screw}=\frac{(1.0W_{L\text{-}unit})(0.5H)+(1.0W_{V\text{-}unit})(0.5W_{curb})-(0.9D)W_{cg}}{W_{curb}(N_{screw\text{-}L})}$$

$N_{screw\text{-}L}$ = SCREW QUANTITY ALONG LENGTH OF UNIT

CALCULATION PROCEDURE FOR UNIT TO ROOF CURB ATTACHMENT
SELF-DRILLING SCREW ATTACHMENTS EXPERIENCE SHEAR FORCES DUE TO OVERTURNING FROM THE SEISMIC/WIND LOADS. SELF-DRILLING SCREW SHEAR CAPACITIES (V_{cap}) WERE DETERMINED USING VALUES PUBLISHED IN THE PRODUCT ICC-ES EVALUATION REPORT. THE CALCULATED (REQUIRED) SHEAR LOADS ($V_{s\text{-}screw}$ & $V_{w\text{-}screw}$) WERE CHECKED AGAINST THE SHEAR CAPACITIES AS FOLLOWS:

SEISMIC LOAD SCENARIO: SHEAR CHECK: $V_{s\text{-}screw} < V_{cap\text{-}s}$

WIND LOAD SCENARIO: SHEAR CHECK: $V_{w\text{-}screw} < V_{cap\text{-}w}$

APPLIED LOAD SCHEMATICS AND EQUATIONS - ROOF CURB TO STRUCTURE

END VIEW

E_{Lx}=1.0F_p
E_{Ly}=0.3F_p
E_V=F_{pv}
W_L=F_w
W_V=F_{wv}

ANCHOR LAYOUT ABOVE SHOWN FOR SCHEMATIC PURPOSES ONLY.
SEE ACCOMPANYING SHEETS FOR UNIT SPECIFIC REQUIREMENTS.

ATTACHMENT CALCULATION FOR SEISMIC LOADS
GOVERNING LOAD COMBINATION = 0.9D+1.0E (LRFD)

$$T_{sx}=\frac{(1.0\Omega_0E_{Lx})(H_{cg}+H_{curb})+(1.0E_V)W_{cg}-(0.9D)W_{cg}}{W_{mnt}(N_{anchor\text{-}L})}$$

$$T_{sy}=\frac{(1.0\Omega_0E_{Ly})(H_{cg}+H_{curb})+(1.0E_V)L_{cg}-(0.9D)L_{cg}}{L_{mnt}(N_{anchor\text{-}L})}$$

$$T_s=T_{sx}+T_{sy}$$

$$V_{sx}=\frac{1.0\Omega_0E_{Lx}}{N_{anchor}}$$

$$V_{sy}=\frac{1.0\Omega_0E_{Ly}}{N_{anchor}}$$

$$V_s=\sqrt{V_{sx}^2+V_{sy}^2}$$

ATTACHMENT CALCULATION FOR WIND LOADS
GOVERNING LOAD COMBINATION = 0.9D+1.0W (LRFD)

$$T_w=\frac{(1.0W_{L\text{-}unit})(0.5H+H_{curb})+(1.0W_{L\text{-}curb})(0.5H_{curb})+(1.0W_{V\text{-}unit})(0.5W_{curb})-(0.9D)W_{cg}}{W_{mnt}(N_{anchor\text{-}L})}$$

$$V_w=\frac{1.0W_{L\text{-}unit}1.0W_{L\text{-}curb}}{N_{anchor}}$$

$N_{anchor\text{-}L}$ = ATTACHMENT QUANTITY ALONG LENGTH OF UNIT

N_{anchor} = TOTAL ANCHOR QUANTITY

T_{max} = GOVERNING TENSION LOAD ON ATTACHMENT
V_{max} = GOVERNING SHEAR LOAD ON ATTACHMENT

CALCULATION PROCEDURE FOR ATTACHMENT TO STRUCTURAL STEEL USING SCREWS
TENSION AND SHEAR STRENGTHS FOR SELF-DRILLING SCREWS WERE DETERMINED USING DATA PUBLISHED IN THE MANUFACTURER'S ICC-ES EVALUATION REPORT. THE CALCULATED (REQUIRED) TENSION AND SHEAR LOADS (T_{max} & V_{max}) WERE CHECKED AGAINST THE SCREW CAPACITIES (T_{cap} & V_{cap}) USING THE FOLLOWING INTERACTION EQUATION:

INTERACTION CHECK: $\frac{T_w}{T_{cap\text{-}w}}+\frac{V_w}{V_{cap\text{-}w}} \le 1.0$

CALCULATION PROCEDURE FOR ATTACHMENT TO WOOD USING LAG SCREWS
WITHDRAWAL AND LATERAL CAPACITIES (W' & Z') FOR LAG SCREWS WERE DETERMINED FOLLOWING THE PROCEDURES PROVIDED IN THE NATIONAL DESIGN SPECIFICATION FOR WOOD CONSTRUCTION. THE RESULTING CAPACITIES INCLUDED ALL APPLICABLE ADJUSTMENT FACTORS. FOR A COMBINED TENSION AND SHEAR LOADING SCENARIO, THE RESULTANT (REQUIRED) LOAD, P, WAS CHECKED AGAINST THE DESIGN VALUE, $P_{available}$, AS FOLLOWS:

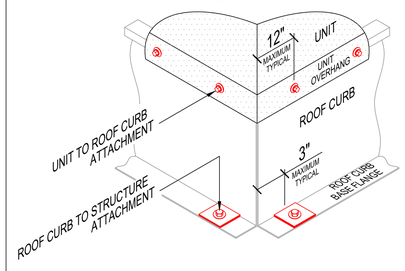
RESULTANT LOAD: $P=\sqrt{T_{max}^2+V_{max}^2}$ $\quad \alpha=\tan^{-1}\left(\frac{T_{max}}{V_{max}}\right)$

COMBINED TENSION & SHEAR CHECK: $P < P_{available}$

$$P_{available}=\frac{W'Z'}{W'\cos^2\alpha+Z'\sin^2\alpha}$$

ROOF CURB ATTACHMENT DETAIL @ CORNERS

NO SCALE



INTERMEDIATE ATTACHMENTS TO BE EQUALLY SPACED ALONG EACH CURB SIDE. SEE ACCOMPANYING SHEET(S) FOR SIZE, QUANTITY, & SPECIFICATIONS.

SEISMIC/WIND CALCULATION TABLE FOR UNITS ON ROOF CURBS

SEE SHEET SR201 FOR UNIT SPECIFIC ATTACHMENT DETAILS

	RTU-1,2	MAU-1
D (LBS)	2065	699
LENGTH (IN)	115.8	135.875
WIDTH (IN)	63.375	37.375
HEIGHT (IN)	57.375	60.75
Lcurb (IN)	109.25	79
Wcurb (IN)	54.0625	31
Hcurb (IN)	18	18
Lcg (IN)	43.7	31.6
Wcg (IN)	18.92	10.85
Hcg (IN)	29	30
Lmnt (IN)	101.3	71.0
Wmnt (IN)	57.1	34.0
Nscrew-L	11	8
Nscrew-W	5	3
Nanchor-L	8	8
Nanchor-W	0	2
Nanchor	16	20
ap	2.5	2.5
Ip	1.5	1.0
Rp	6.0	6.0
z/h	1	1
OMEGA	1.0	1.0
ELx (LBS)	1097	247
ELy (LBS)	329	74
EV (LBS)	292	99
Kz	0.7	0.7
V (MPH)	98	98
qz (LBS/SQFT)	14.6	14.6
(GCr)LATERAL	1.9	1.9
(GCr)VERTICAL	1.5	1.5
Af-unit (SQFT)	46.1	57.3
Ar-unit (SQFT)	51	35.3
WL-unit (LBS)	1279	1590
WV-unit (LBS)	1117	773
Af-curb (SQFT)	13.7	9.9
Ar-curb (SQFT)	41	17
WL-curb (LBS)	380	275
WV-curb (LBS)	898	372
BASIS	LRFD	LRFD
Vs-screw (LBS)	3	7
Vw-screw (LBS)	53	216
Tsx (LBS)	47	23
Tsy (LBS)	0	0
Ts (LBS)	47	23
Vsx (LBS)	69	12
Vsy (LBS)	21	4
Vs (LBS)	72	13
Tw (LBS)	127	311
Vw (LBS)	104	93
Tmax (LBS)	127	311
Vmax (LBS)	104	93
STRUCTURAL ATTACHMENT	LAG SCREW	SELF-DRILLING SCREW
CURB DESIGN	BY OTHERS	BY OTHERS

GENERAL NOTES FOR ROOF CURB ATTACHMENTS:

1. THE SEISMIC AND WIND EQUATIONS AND SCHEMATICS SHOWN THIS SHEET WERE UTILIZED TO DETERMINE THE REACTIONS ON THE ATTACHMENTS FOR THE UNIT TO THE ROOF CURB AND THE ROOF CURB TO STRUCTURE. SEE ACCOMPANYING SHEETS FOR ATTACHMENT SPECIFICATIONS AND VERIFICATION FOR SIZE, QUANTITY, AND TYPE OF ATTACHMENTS REQUIRED.
2. CONSISTENT WITH THE REQUIREMENTS OF THE REFERENCED CODE AND STANDARD, THE PRIMARY HORIZONTAL SEISMIC FORCE (E_{Lx}) WAS APPLIED IN A DIRECTION THAT CREATED THE MOST DEMANDING REACTION AT THE ANCHORAGE LOCATIONS. A CONCURRENT HORIZONTAL SEISMIC FORCE (E_{Ly}) WAS APPLIED ORTHOGONAL TO E_{Lx} IN ADDITION TO A VERTICAL SEISMIC FORCE (E_V). ALL THREE FORCES WERE APPLIED THROUGH AN APPROXIMATED CENTER OF GRAVITY OF THE UNIT. HORIZONTAL AND VERTICAL WIND FORCES WERE APPLIED AT THE APPROXIMATE CENTER OF THE PROJECTED AREA NORMAL TO THE WIND DIRECTION. THE FORCES THAT CREATED THE MOST DEMANDING LOADS ON THE ANCHORAGE SYSTEM GOVERNED THE DESIGN.
3. THE BASE FLANGE OF THE ROOF CURB MUST BE CONTINUOUSLY SUPPORTED ALONG ALL FOUR SIDES. FOR ROOF CURBS SUPPORTED BY CONCRETE, THE ROOF CURB FLANGE MUST SIT ON A LEVEL CONCRETE SLAB (NO CROWNING ALLOWED). FOR ROOF CURBS SUPPORTED BY METAL DECKING, PROVIDE WOOD BLOCKING WITHIN THE LOWER FLUTES AS INDICATED IN ACCOMPANYING DETAILS. WHERE ROOF CURBS ARE SHOWN SUPPORTED BY METAL DECKING, THE STRUCTURAL ENGINEER OF RECORD TO APPROVE SUPPORT METHOD PRIOR TO INSTALLATION.
4. BUILDING STRUCTURE SUPPORT MEMBER SHOWN FOR SCHEMATIC PURPOSES ONLY. STRUCTURAL SUPPORT OF ROOF CURB BY OTHERS. OUR RESPONSIBILITY ENDS AT THE BOTTOM OF THE ROOF CURB.
5. IF AN INSTALLATION METHOD OR FIELD CONDITION VARIES FROM THE DETAILS SHOWN, THE SEISMIC/WIND DESIGN ENGINEER OF FOR THIS REPORT MUST BE CONTACTED.
6. THE ROOF CURB IS AN INTEGRAL COMPONENT IN ADEQUATELY TRANSFERRING THE SEISMIC AND/OR WIND LOADS FROM THE UNIT INTO THE BUILDING STRUCTURE. UNLESS SPECIFICALLY NOTED OTHERWISE, THE ABILITY OF THE ROOF CURB TO WITHSTAND THE IMPOSED LOADS TO BE EVALUATED AND CERTIFIED BY OTHERS. FOR INSTANCES WHERE WE HAVE EVALUATED THE STRENGTH OF THE ROOF CURB, IT WILL BE CLEARLY NOTED WITHIN THE NOTES AND CALCULATIONS HEREIN WITH CURB EVALUATION RESULTS INCLUDED WITHIN THE REPORT.
7. THE STRUCTURAL SUPPORT OF THE ROOF CURB MUST BE EVALUATED AND DESIGNED BY THE STRUCTURAL DESIGN PROFESSIONAL. THE ATTACHMENT METHOD OF THE ROOF CURB TO THE STRUCTURE SPECIFIED HEREIN MUST BE REVIEWED AND APPROVED BY THE STRUCTURAL DESIGN PROFESSIONAL.
8. ACCESSORY ATTACHMENTS (PIPE, CONDUIT, ETC.) TO THE UNIT SHOULD BE CONNECTED IN A MANNER THAT PREVENTS DIFFERENTIAL MOVEMENT BETWEEN THE TWO COMPONENTS OR THAT PROVIDES ADEQUATE FLEXIBILITY TO ACCOMMODATE DIFFERENTIAL MOVEMENT BETWEEN THE TWO COMPONENTS. UNIT ATTACHMENT DESIGN BY OTHERS.

ENGINEER'S REVIEW
DIBBLE ENGINEERS, INC.
__X__ No Exceptions Taken
_____ Note Markings
_____ Revise & Resubmit
By DEI/MKW Date 1/10/23
ENGINEER'S REVIEW IS FOR GENERAL CONFORMANCE TO THE DESIGN CONCEPT AND CONTRACT DOCUMENTS. REVIEW OF THE SPECIFIC STRUCTURAL ENGINEERING DESIGN CRITERIA AND COMPATIBILITY WITH THE DESIGN OF THE BUILDING AND DOES NOT RELIEVE THE SSE OF RESPONSIBILITY FOR THAT DESIGN. MARKINGS OR COMMENTS SHALL NOT BE CONSTRUED AS RELIEVING THE CONTRACTOR FROM COMPLIANCE WITH THE PROJECT PLANS AND SPECIFICATIONS, NOT FROM DEPARTURES THEREFROM. THE CONTRACTOR IS RESPONSIBLE FOR DETAILS AND ACCURACY, FOR CONFIRMING AND CORRELATING ALL QUANTITIES AND DIMENSIONS; FOR SELECTION FABRICATION PROCESSES AND TECHNIQUES; AND FOR PERFORMING WORK IN A SAFE MANNER.

City Of Portland
REVIEWED FOR CODE COMPLIANCE
Date: 01/30/23
Project: 21-011534-DFS-01-CO
Page 15 of 18

REV. #	DATE	DESCRIPTION
3	12.6.2022	REVISED CALCULATION DATA AND ATTACHMENT DETAILS
2	11.3.2022	REVISED CALCULATION DATA AND ATTACHMENT DETAILS
1	10.26.2022	REVISED CALCULATION DATA

PROFESSIONAL ENGINEER
CHRISTOPHER M. SCOTT
86513PE
12/2/2022
OREGON
SEPT. 8, 2020
EXPIRES: 06-30-2024

ASC ENGINEERING
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SHAKE SHACK
(SHACK #1317)

1016 W BURNSIDE ST.
PORTLAND, OR 97209

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CUSTOMER PROJECT #:	21-5033
PROJECT #:	2182111
DRAWN BY:	CMS
CHECKED BY:	CMS
DATE:	10.24.2022

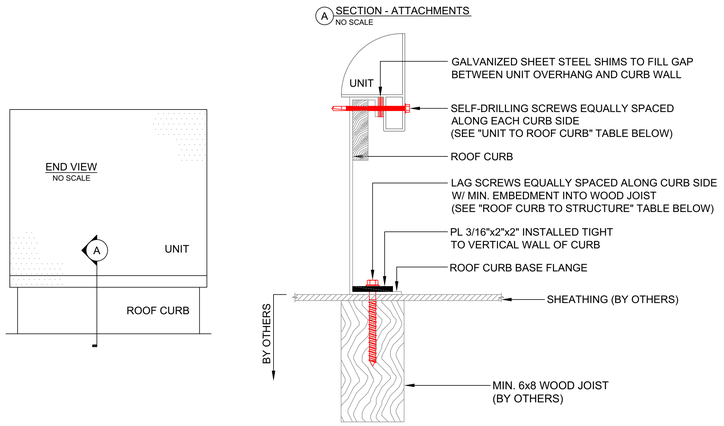
SHEET DESCRIPTION

GENERAL NOTES & DETAILS FOR SEISMIC/WIND ANCHORAGE CALCULATIONS FOR EQUIPMENT ON ROOF CURBS

SHEET #

SR200

SEISMIC/WIND ATTACHMENT REQUIREMENTS FOR:
RTU-1,2

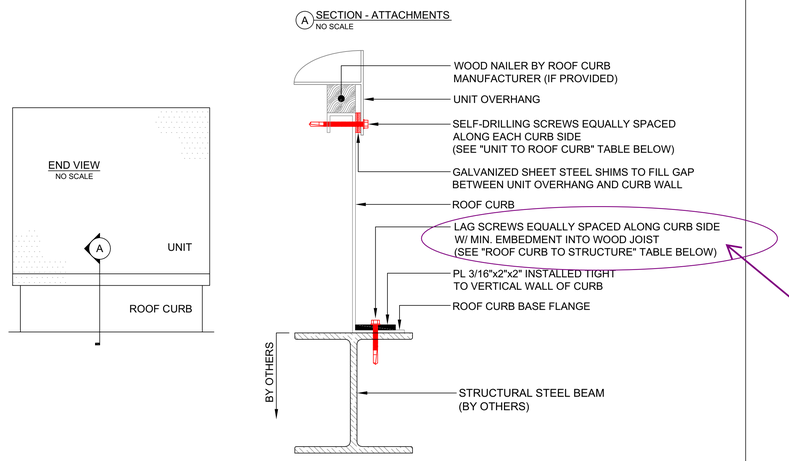


NOTES:
1. LAG SCREWS TO BE CENTERED IN WOOD JOISTS.
2. THE STRUCTURE'S ABILITY TO WITHSTAND THE IMPOSED LOADS TO BE VERIFIED BY OTHERS. STRUCTURAL ATTACHMENTS SHOWN ABOVE TO BE APPROVED BY THE STRUCTURAL ENGINEER OF RECORD PRIOR TO INSTALLATION.
3. SEE NOTES & DETAILS ON SHEET SR200 FOR ADDITIONAL COMMENTS AND ATTACHMENT INSTALLATION REQUIREMENTS.

UNIT TO ROOF CURB	
SCREW SIZE & MODEL	1/4" ITW BUILDEX TEKS
SCREW QTY. ALONG LENGTH	11
SCREW QTY. ALONG WIDTH	5
TOTAL SCREW QTY.	32
Vs-screw (LBS)	3
Vw-screw (LBS)	53
MIN. CURB THICKNESS	16 GA.
Vcap (lbs)	695
Vs-screw<Vcap (LBS)	3 < 695 OK
Vw-screw<Vcap-w (LBS)	53 < 695 OK

ROOF CURB TO STRUCTURE	
LAG SCREW SIZE	1/2"
LAG SCREW QTY. ALONG LENGTH	8
LAG SCREW QTY. ALONG WIDTH	0
TOTAL LAG SCREW QTY.	16
MIN. EMBEDMENT (IN)	4
P (LBS)	164
ALPHA	50.7
cos2(ALPHA)	0.40
sin2(ALPHA)	0.6
W '- AVAILABLE TENSION (LBS)	1918
Z ' - AVAILABLE SHEAR (LBS)	562
Pavailable (LBS)	976
COMBINED TENSION & SHEAR CHECK (LBS)	164 < 976 OK

SEISMIC/WIND ATTACHMENT REQUIREMENTS FOR:
MAU-1



NOTES:
1. SELF-DRILLING SCREWS TO BE INSTALLED FOLLOWING MANUFACTURER'S INSTALLATION GUIDELINES..
2. THE STRUCTURE'S ABILITY TO WITHSTAND THE IMPOSED LOADS TO BE VERIFIED BY OTHERS. STRUCTURAL ATTACHMENTS SHOWN ABOVE TO BE APPROVED BY THE STRUCTURAL ENGINEER OF RECORD PRIOR TO INSTALLATION.
3. SEE NOTES & DETAILS ON SHEET SR200 FOR ADDITIONAL COMMENTS AND ATTACHMENT INSTALLATION REQUIREMENTS.

UNIT TO ROOF CURB	
SCREW SIZE & MODEL	1/4" ITW BUILDEX TEKS
SCREW QTY. ALONG LENGTH	8
SCREW QTY. ALONG WIDTH	3
TOTAL SCREW QTY.	22
Vs-screw (LBS)	7
Vw-screw (LBS)	216
MIN. CURB THICKNESS	16 GA.
Vcap (lbs)	695
Vs-screw<Vcap (LBS)	7 < 695 OK
Vw-screw<Vcap-w (LBS)	216 < 695 OK

ROOF CURB TO STRUCTURE	
SCREW SIZE & MODEL	1/4" ITW BUILDEX TEKS
SCREW QTY. ALONG LENGTH	8
SCREW QTY. ALONG WIDTH	2
TOTAL SCREW QTY.	20
Tmax (LBS)	311
Vmax (LBS)	93
MIN. BEAM FLANGE THICKNESS	3/16"
Tcap (lbs)	894
Vcap (lbs)	729
INTERACTION CHECK - WIND (LBS)	0.48 < 1.0 OK

Not wood. Use self-tapping screws for steel.

OK

ENGINEER'S REVIEW
DIBBLE ENGINEERS, INC.
__X__ No Exceptions Taken
_____ Note Markings
_____ Revise & Resubmit
By DEI/MKW Date 1/10/23
ENGINEER'S REVIEW IS FOR GENERAL CONFORMANCE TO THE DESIGN CONCEPT OF THE PROJECT AND GENERAL COMPLIANCE OF THE SPECIALTY STRUCTURAL ENGINEERS (SSE) DESIGN IS FOR CONFORMANCE TO DESIGN CRITERIA AND COMPATIBILITY WITH THE DESIGN OF THE BUILDING AND DOES NOT RELIEVE THE SSE OF RESPONSIBILITY FOR THAT DESIGN. MARKINGS OR COMMENTS SHALL NOT BE CONSTRUED AS RELIEVING THE CONTRACTOR FROM COMPLIANCE WITH THE PROJECT PLANS AND SPECIFICATIONS, NOT APPROVAL OF ANY ALTERATIONS. THE CONTRACTOR IS RESPONSIBLE FOR DETAILS AND ACCURACY, FOR CONFIRMING AND CORRELATING ALL QUANTITIES AND DIMENSIONS, FOR SELECTION, FABRICATION PROCESSES, FOR TECHNIQUES OF ASSEMBLY, AND FOR PERFORMING WORK IN A SAFE MANNER.

City Of Portland
REVIEWED FOR CODE COMPLIANCE
Date: 01/30/23
Project: 21-011534-DFS-01-CO

PREPARED BY ASC ENGINEERING

REV. #	DATE	DESCRIPTION
3	12.6.2022	REVISED ATTACHMENT DETAILS
2	11.3.2022	REVISED ATTACHMENT DETAILS
1	10.26.2022	REVISED ATTACHMENT DETAIL

REGISTERED PROFESSIONAL ENGINEER
CHRISTOPHER M. SCOTT
86513PE
12/6/2022
OREGON
SEPT. 8, 2015
CHRISTOPHER M SCOTT
EXPIRES: 06-30-2024

ASC ENGINEERING
10801 JOHNSTON RD. STE. 105 • CHARLOTTE, NC 28226
AR-3313 MO-2017036803 MS-29888 TN-5345

SHAKE SHACK
(SHACK #1317)

1016 W BURNSIDE ST.
PORTLAND, OR 97209

THIS SHEET IS PART OF AN OFFICIAL ENGINEERED REPORT BY ASC ENGINEERING AND SHALL NOT BE REMOVED, MODIFIED, REPRODUCED, OR OTHERWISE ALTERED. ANY APPLICATION OF THE DATA CONTAINED HEREIN TO OTHER PROJECTS OR OUPPOSES IS STRICTLY PROHIBITED.

CUSTOMER PROJECT #:	21-5033
PROJECT #:	2182111
DRAWN BY:	CMS
CHECKED BY:	CMS
DATE:	10.24.2022

SHEET DESCRIPTION

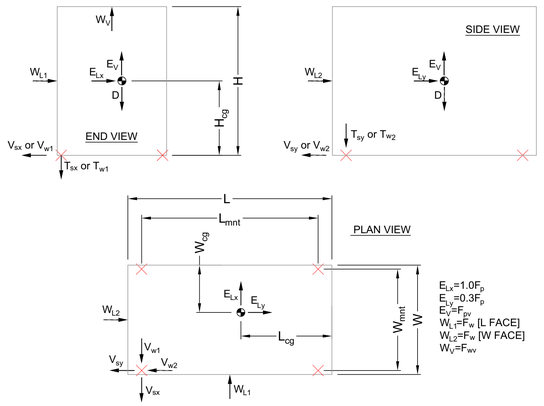
SEISMIC/WIND ANCHORAGE CALCULATIONS FOR EQUIPMENT ON ROOF CURBS

SHEET #

SR201

EQUIPMENT ON ROOF MOUNTING RAILS

APPLIED LOAD SCHEMATIC AND EQUATIONS FOR UNIT TO MOUNTING RAILS



CALCULATION NOTES:
1. FOUR ANCHORS SHOWN FOR SCHEMATIC PURPOSES ONLY.
2. W_{L1} & W_{L2} ARE NOT REQUIRED TO ACT SIMULTANEOUSLY.
3. WIND FORCE W_{L1} WAS DETERMINED USING THE PROJECTED AREA ALONG THE UNIT LENGTH (L). WIND FORCE W_{L2} WAS DETERMINED USING THE PROJECTED AREA ALONG THE UNIT WIDTH (W) . UNIT LENGTH > UNIT WIDTH; THEREFORE, W_{L1} PRODUCES THE LARGEST WIND LOAD.

ATTACHMENT CALCULATION FOR SEISMIC LOADS
GOVERNING LOAD COMBINATION = 0.9D+1.0E

$$T_{sx}=\frac{(1.0\Omega_0E_{Lx})H_{cg}+(1.0E_V)W_{cg}-(0.9D)W_{cg}}{W_{mnt}(0.5N)}$$

$$T_{sy}=\frac{(1.0\Omega_0E_{Ly})H_{cg}+(1.0E_V)L_{cg}-(0.9D)L_{cg}}{L_{mnt}(0.5N)}$$

$$T_s=T_{sx}+T_{sy}$$

$$V_{sx}=\frac{1.0\Omega_0E_{Lx}}{N}$$

$$V_{sy}=\frac{1.0\Omega_0E_{Ly}}{N}$$

$$V_s=\sqrt{V_{sx}^2+V_{sy}^2}$$

ATTACHMENT CALCULATION FOR WIND LOADS
GOVERNING LOAD COMBINATION = 0.9D+1.0W

$$T_{w1}=\frac{(1.0W_{L1})(0.5H)+(1.0W_V)(0.5W)-(0.9D)W_{cg}}{W_{mnt}(0.5N)}$$

$$V_{w1}=\frac{1.0W_{L1}}{N}$$

$$T_{w2}=\frac{(1.0W_{L2})(0.5H)+(1.0W_V)(0.5L)-(0.9D)L_{cg}}{L_{mnt}(0.5N)}$$

$$V_{w2}=\frac{1.0W_{L2}}{N}$$

T_{max} = GOVERNING TENSION LOAD ON ATTACHMENT
V_{max} = GOVERNING SHEAR LOAD ON ATTACHMENT
N = ATTACHMENT QUANTITY FOR UNIT TO MOUNTING RAILS

CALCULATION PROCEDURES & EQUATIONS

CALCULATION PROCEDURE FOR ATTACHMENT TO WOOD USING LAG SCREWS
WITHDRAWAL AND LATERAL CAPACITIES (W' & Z') FOR LAG SCREWS WERE DETERMINED FOLLOWING THE PROCEDURES PROVIDED IN THE NATIONAL DESIGN SPECIFICATION FOR WOOD CONSTRUCTION. THE RESULTING CAPACITIES INCLUDED ALL APPLICABLE ADJUSTMENT FACTORS. FOR A COMBINED TENSION AND SHEAR LOADING SCENARIO, THE RESULTANT (REQUIRED) LOAD, P, WAS CHECKED AGAINST THE DESIGN VALUE, $P_{available}$, AS FOLLOWS:

RESULTANT LOAD: $P=\sqrt{T_{max}^2+V_{max}^2}$ $\quad \alpha=\tan^{-1}\left(\frac{T_{max}}{V_{max}}\right)$

COMBINED TENSION & SHEAR CHECK: $P < P_{available}$

$$P_{available}=\frac{W'Z'}{W'\cos^2\alpha+Z'\sin^2\alpha}$$

ATTACHMENT TO CONCRETE (SEISMIC)
SEISMIC TENSION AND SHEAR CAPACITIES (T_{cap-s} & V_{cap-s}) WERE DETERMINED USING ANCHOR DESIGN SOFTWARE PROVIDED BY THE MANUFACTURER. CAPACITIES WERE DETERMINED FOLLOWING THE SEISMIC DESIGN PROVISIONS IN APPENDIX D OF ACI 318. AS INDICATED IN THE EQUATIONS AND CALCULATIONS HEREIN, EARTHQUAKE LOADS HAVE BEEN INCREASED BY OVERSTRENGTH FACTOR Ω_0. THE CALCULATED (REQUIRED) TENSION AND SHEAR LOADS (T_s & V_s) WERE CHECKED AGAINST THE SEISMIC TENSION AND SHEAR CAPACITIES (T_{cap-s} & V_{cap-s}) AS FOLLOWS:

TENSION CHECK: $T_s < T_{cap-s}$
SHEAR CHECK: $V_s < V_{cap-s}$

INTERACTION CHECK: $\frac{T_s}{T_{cap-s}}+\frac{V_s}{V_{cap-s}} \le 1.2$

CALCULATION PROCEDURE FOR ATTACHMENT TO CONCRETE (WIND)
WIND TENSION AND SHEAR CAPACITIES (T_{cap-w} & V_{cap-w}) WERE DETERMINED USING ANCHOR DESIGN SOFTWARE PROVIDED BY THE MANUFACTURER. THE CALCULATED (REQUIRED) TENSION AND SHEAR LOADS (T_w & V_w) WERE CHECKED AGAINST THE WIND ANCHOR CAPACITIES (T_{cap-w} & V_{cap-w}) AS FOLLOWS:

TENSION CHECK: $T_w < T_{cap-w}$
SHEAR CHECK: $V_w < V_{cap-w}$

INTERACTION CHECK: $\frac{T_w}{T_{cap-w}}+\frac{V_w}{V_{cap-w}} \le 1.2$

CALCULATION PROCEDURE FOR ATTACHMENT TO STRUCTURAL STEEL USING BOLTS
TENSION AND SHEAR STRENGTHS FOR BOLTED CONNECTIONS WERE DETERMINED FOLLOWING THE DESIGN PROVISIONS PROVIDED IN AISC's STEEL CONSTRUCTION MANUAL. THE GOVERNING TENSION AND SHEAR LOADS (T_{max} & V_{max}) WERE CHECKED AGAINST THE AVAILABLE TENSION AND SHEAR STRENGTHS AS FOLLOWS:

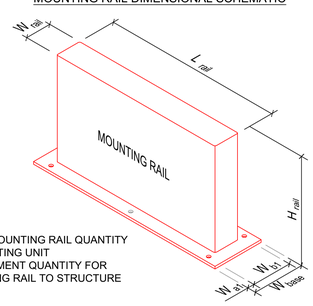
COMBINED TENSION & SHEAR CHECK: $T_{max} < \phi F'_{nt}A_b$

$$F'_{nt}=1.3F_{nt}-\frac{F_{nt}}{\phi F_{nv}}f_v \le F_{nt}$$

SHEAR CHECK: $V_{max} < \phi F_{nv}A_b$

ALL CALCULATIONS PERFORMED USING LRFD LOADS UNLESS NOTED OTHERWISE

MOUNTING RAIL DIMENSIONAL SCHEMATIC

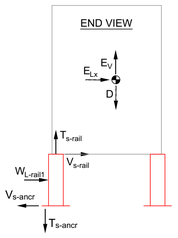


N_{rails} = TOTAL MOUNTING RAIL QUANTITY SUPPORTING UNIT
N_{base} = ATTACHMENT QUANTITY FOR MOUNTING RAIL TO STRUCTURE

APPLIED LOAD SCHEMATICS FOR MOUNTING RAIL TO STRUCTURE (SEISMIC)

THE CALCULATED SEISMIC LOADS ON THE UNIT CREATE THE LARGEST ATTACHMENT REACTIONS AT THE BASE OF THE MOUNTING RAIL WHEN E_{Lx} IS APPLIED PERPENDICULAR TO THE DIRECTION OF THE MOUNTING RAIL AS INDICATED BELOW IN THE SCHEMATIC.

SEISMIC SCENARIO
MOUNTING RAILS ARE ALONG THE LONG SIDE (LENGTH) OF THE UNIT



$$T_{sx\text{-}rail}=\frac{(1.0\Omega_0E_{Lx})H_{cg}+(1.0E_V)W_{cg}-(0.9D)W_{cg}}{W_{mnt}}$$

$$T_{sy\text{-}rail}=\frac{(1.0\Omega_0E_{Ly})H_{cg}+(1.0E_V)L_{cg}-(0.9D)L_{cg}}{L_{mnt}}$$

$$T_{s\text{-}rail}=T_{sx}+T_{sy}$$

$$V_{sx\text{-}rail}=\frac{1.0\Omega_0E_{Lx}}{N_{rails}} \qquad V_{s\text{-}rail}=\sqrt{V_{sx}^2+V_{sy}^2}$$

$$V_{sy\text{-}rail}=\frac{1.0\Omega_0E_{Ly}}{N_{rails}}$$

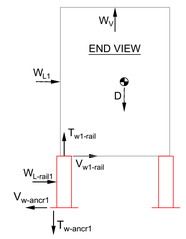
$$T_{s\text{-}ancr}=\frac{V_{s\text{-}rail}H_{rail}}{\left(\frac{W_{a1}^2}{W_{b1}+W_{a1}}+W_{b1}+W_{a1}\right)0.5N_{base}}+\frac{T_{s\text{-}rail}}{N_{base}}$$

$$V_{s\text{-}ancr}=\frac{V_{s\text{-}rail}}{N_{base}}$$

APPLIED LOAD SCHEMATICS FOR MOUNTING RAIL TO STRUCTURE (WIND)

WHERE APPLICABLE, THE FOLLOWING WIND LOAD SCENARIOS WERE CONSIDERED TO DETERMINING THE LARGEST ATTACHMENT REACTIONS AT THE BASE OF THE MOUNTING RAIL. THE SCENARIO CREATING THE LARGEST ATTACHMENT LOADS GOVERNED THE ATTACHMENT DESIGN.

WIND SCENARIO 1
MOUNTING RAIL ORIENTATION ALONG UNIT LENGTH
WIND LOAD, W_{L1}, PERPENDICULAR TO MOUNTING RAILS



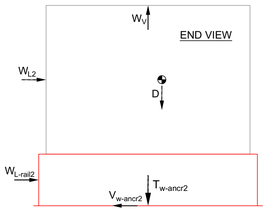
$$T_{w1\text{-}rail}=\frac{(1.0W_{L1})(0.5H)+(1.0W_V)(0.5W)-(0.9D)W_{cg}}{W_{mnt}}$$

$$V_{w1\text{-}rail}=\frac{1.0W_{L1}}{N_{rails}}$$

$$T_{w\text{-}ancr1}=\frac{V_{w1\text{-}rail}H_{rail}+W_{L\text{-}rail1}(0.5H_{rail})}{\left(\frac{W_{a1}^2}{W_{b1}+W_{a1}}+W_{b1}+W_{a1}\right)0.5N_{base}}+\frac{T_{w1\text{-}rail}}{N_{base}}$$

$$V_{w\text{-}ancr1}=\frac{V_{w1\text{-}rail}+W_{L\text{-}rail1}}{N_{base}}$$

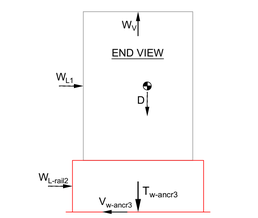
WIND SCENARIO 2
MOUNTING RAIL ORIENTATION ALONG UNIT LENGTH
WIND LOAD, W_{L2}, PARALLEL TO MOUNTING RAILS



$$T_{w\text{-}ancr2}=\frac{(1.0W_{L2})(0.5H+H_{rail})+(1.0W_{L\text{-}rail2})(0.5H_{rail})N_{rails}+(1.0W_V)(0.5L_{rail})-(0.9D)L_{cg}}{0.5L_{rail}N_{rails}(N_{base}\text{-}2)}$$

$$V_{w\text{-}ancr2}=\frac{1.0W_{L2}+1.0W_{L\text{-}rail2}N_{rails}}{N_{rails}N_{base}}$$

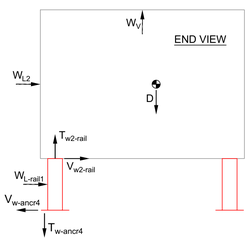
WIND SCENARIO 3
MOUNTING RAIL ORIENTATION ALONG UNIT WIDTH
WIND LOAD, W_{L1}, PARALLEL TO MOUNTING RAILS



$$T_{w\text{-}ancr3}=\frac{(1.0W_{L1})(0.5H+H_{rail})+(1.0W_{L\text{-}rail2})(0.5H_{rail})N_{rails}+(1.0W_V)(0.5L_{rail})-(0.9D)W_{cg}}{0.5L_{rail}N_{rails}(N_{base}\text{-}2)}$$

$$V_{w\text{-}ancr3}=\frac{1.0W_{L1}+1.0W_{L\text{-}rail2}N_{rails}}{N_{rails}N_{base}}$$

WIND SCENARIO 4
MOUNTING RAIL ORIENTATION ALONG UNIT WIDTH
WIND LOAD, W_{L2}, PERPENDICULAR TO MOUNTING RAILS



$$T_{w2\text{-}rail}=\frac{(1.0W_{L2})(0.5H)+(1.0W_V)(0.5L)-(0.9D)L_{cg}}{L_{mnt}}$$

$$V_{w2\text{-}rail}=\frac{1.0W_{L2}}{N_{rails}}$$

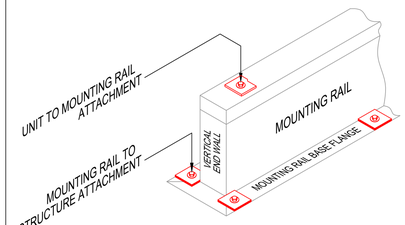
$$T_{w\text{-}ancr4}=\frac{V_{w2\text{-}rail}H_{rail}+W_{L\text{-}rail1}(0.5H_{rail})}{\left(\frac{W_{a1}^2}{W_{b1}+W_{a1}}+W_{b1}+W_{a1}\right)0.5N_{base}}+\frac{T_{w2\text{-}rail}}{N_{base}}$$

$$V_{w\text{-}ancr4}=\frac{V_{w2\text{-}rail}+W_{L\text{-}rail1}}{N_{base}}$$

$T_{w\text{-}ancr\text{-}max}$ = MAXIMUM TENSION LOAD ON ATTACHMENT FROM $T_{w\text{-}ancr\#}$ CALCS ABOVE
$V_{w\text{-}ancr\text{-}max}$ = MAXIMUM SHEAR LOAD ON ATTACHMENT FROM $T_{w\text{-}ancr\#}$ CALCS ABOVE

MOUNTING RAIL ATTACHMENT DETAIL @ RAIL ENDS

NO SCALE



LOCATE STRUCTURAL ATTACHMENTS NEAR EACH END OF MOUNTING RAIL THROUGH BOTH MOUNTING RAIL BASE FLANGES AS SHOWN. INTERMEDIATE ATTACHMENTS TO BE EQUALLY SPACED ALONG EACH SIDE OF MOUNTING RAIL.

SEISMIC/WIND CALCULATION TABLE FOR UNITS ON MOUNTING RAILS

SEE SHEET SR301 FOR UNIT SPECIFIC ATTACHMENT DETAILS

	ESP-1
D (LBS)	2300
LENGTH (IN)	178.5
WIDTH (IN)	67.43
HEIGHT (IN)	36
Lrail (IN)	72
Wrail (IN)	4
Hrail (IN)	18
Lcg (IN)	71.4
Wcg (IN)	23.6
Hcg (IN)	18
Lmnt (IN)	130.5
Wmnt (IN)	59
N	8
Nrails	4
Nbase	4
Wbase (IN)	8
Wa1 (IN)	1
Wb1 (IN)	6
ap	2.5
Ip	1.0
Rp	6.0
z/h	1
OMEGA	1.0
ELx (LBS)	814
ELy (LBS)	244
EV (LBS)	326
Kz	0.7
V (MPH)	98
qz (LBS/SQFT)	14.6
(GCr)LATERAL	1.9
(GCr)VERTICAL	1.5
Af (SQFT)	44.6
Af2 (SQFT)	16.9
Ar (SQFT)	83.6
WL1 (LBS)	1237
WL2 (LBS)	469
WV (LBS)	1831
Af-rail1 (SQFT)	9
Ar-rail2 (SQFT)	0.5
WL-rail1 (LBS)	250
WL-rail2 (LBS)	14
BASIS	LRFD
ISOLATOR	n/a
Lbaseplate (IN)	n/a
La (IN)	n/a
Lb (IN)	n/a
Wbaseplate (IN)	n/a
Wa (IN)	n/a
Wb (IN)	n/a
Hiso (IN)	0
Nbaseplate	n/a
Tsx (LBS)	0
Tsy (LBS)	0
Ts (LBS)	0
Vsx (LBS)	102
Vsy (LBS)	31
Vs (LBS)	107
Tw1 (LBS)	149
Vw1 (LBS)	155
Tw2 (LBS)	46
Vw2 (LBS)	59
Tmax (LBS)	149
Vmax (LBS)	155
SEISMIC	APPLICABLE
Tsx-rail (LBS)	0
Tsy-rail (LBS)	0
Ts-rail (LBS)	0
Vsx-rail (LBS)	204
Vsy-rail (LBS)	61
Vs-rail (LBS)	213
Ts-ancr (LBS)	268
Vs-ancr (LBS)	53
WIND 1 (WL1 ⊥ TO RAIL)	NOT USED
Tw1-rail (LBS)	n/a
Vw1-rail (LBS)	n/a
Tw-ancr1 (LBS)	n/a
Vw-ancr1 (LBS)	n/a
WIND 2 (WL2 || TO RAIL)	NOT USED
Tw-ancr2 (LBS)	n/a
Vw-ancr2 (LBS)	n/a
WIND 3 (WL1 || TO RAIL)	APPLICABLE
Tw-ancr3 (LBS)	216
Vw-ancr3 (LBS)	81
WIND 4 (WL2 ⊥ TO RAIL)	APPLICABLE
Tw2-rail (LBS)	184
Vw2-rail (LBS)	117
Tw-ancr4 (LBS)	351
Vw-ancr4 (LBS)	92
Tw-ancr-max (LBS)	351
Vw-ancr-max (LBS)	92
STRUCTURAL ATTACHMENT	LAG SCREW
RAIL DESIGN	BY OTHERS
PAD ISOLATOR	n/a

GENERAL NOTES FOR MOUNTING RAIL ATTACHMENTS:
1. THE SEISMIC AND WIND EQUATIONS AND SCHEMATICS SHOWN THIS SHEET WERE UTILIZED TO DETERMINE THE REACTIONS ON THE ATTACHMENTS FOR THE UNIT TO THE MOUNTING RAIL AND THE MOUNTING RAIL TO STRUCTURE. SEE ACCOMPANYING SHEETS FOR ATTACHMENT SPECIFICATIONS AND VERIFICATION FOR SIZE, QUANTITY, AND TYPE OF ATTACHMENTS REQUIRED.
2. CONSISTENT WITH THE REQUIREMENTS OF THE REFERENCED CODE AND STANDARD, THE PRIMARY HORIZONTAL SEISMIC FORCE (E_{Lx}) WAS APPLIED IN A DIRECTION THAT CREATED THE MOST DEMANDING REACTION AT THE ANCHORAGE LOCATIONS. A CONCURRENT HORIZONTAL SEISMIC FORCE (E_{Ly}) ACTED ORTHOGONAL TO E_{Lx} IN ADDITION TO A VERTICAL SEISMIC FORCE (E_V). ALL THREE FORCES WERE APPLIED THROUGH AN APPROXIMATED CENTER OF GRAVITY OF THE UNIT. HORIZONTAL AND VERTICAL WIND FORCES WERE APPLIED AT THE APPROXIMATE CENTER OF THE PROJECTED AREA NORMAL TO THE WIND DIRECTION. THE FORCES THAT CREATED THE MOST DEMANDING LOADS ON THE ANCHORAGE SYSTEM GOVERNED THE DESIGN.
3. THE BASE OF THE MOUNTING RAIL MUST BE CONTINUOUSLY. FOR MOUNTING RAILS SUPPORTED BY CONCRETE, THE MOUNTING RAIL BASE FLANGE MUST SIT ON A LEVEL CONCRETE SLAB (NO CROWNING ALLOWED). FOR MOUNTING RAILS SUPPORTED BY METAL DECKING, PROVIDE WOOD BLOCKING WITHIN THE LOWER FLUTES AS INDICATED IN ACCOMPANYING DETAILS. WHERE MOUNTING RAILS ARE SHOWN SUPPORTED BY METAL DECKING, THE STRUCTURAL ENGINEER OF RECORD TO APPROVE SUPPORT METHOD PRIOR TO INSTALLATION.
4. BUILDING STRUCTURE SUPPORT MEMBER SHOWN FOR SCHEMATIC PURPOSES ONLY. STRUCTURAL SUPPORT OF MOUNTING RAILS BY OTHERS. OUR RESPONSIBILITY ENDS AT THE BOTTOM OF THE MOUNTING RAIL.
5. IF AN INSTALLATION METHOD OR FIELD CONDITION VARIES FROM THE DETAILS SHOWN, THE DESIGN ENGINEER FOR THIS REPORT MUST BE CONTACTED.
6. MOUNTING RAILS ARE AN INTEGRAL COMPONENT IN ADEQUATELY TRANSFERRING THE SEISMIC AND/OR WIND LOADS FROM THE UNIT INTO THE BUILDING STRUCTURE. ATTACHMENT EVALUATIONS WERE BASED ON INDUSTRY STANDARD TYPE MOUNTING RAILS WITH A WOOD NAILER ON TOP OF A SHEET METAL SECTION AS INDICATED IN THE DETAILS.
7. THE MINIMUM EMBEDMENT DEPTH OF LAG SCREWS SHOWN HEREIN CONNECTING THE UNIT (OR VIBRATION ISOLATORS) TO THE MOUNTING RAIL IS DRIVEN BY THE THICKNESS OF THE WOOD NAILER. IF THE WOOD NAILER THICKNESS IS LESS THAN THE MINIMUM LAG SCREW EMBEDMENT DEPTH SPECIFIED HEREIN, THE DESIGN ENGINEER FOR THIS REPORT TO BE CONTACTED. THE WOOD NAILER MUST BE SECURED TO THE SHEET METAL PORTION OF THE MOUNTING RAIL IN A MANNER TO ADEQUATELY TRANSFER THE UNIT LOADS. LAG SCREWS TO BE CENTERED ALONG WIDTH OF WOOD NAILER AND LOCATED MINIMUM 4" FROM WOOD NAILER ENDS.
8. UNLESS SPECIFICALLY NOTED OTHERWISE, THE ABILITY OF THE MOUNTING RAILS TO WITHSTAND THE IMPOSED LOADS TO BE EVALUATED AND CERTIFIED BY OTHERS. THIS INCLUDES THE ATTACHMENT METHOD OF THE WOOD NAILER TO THE SHEET METAL SECTION. FOR INSTANCES WHERE WE HAVE EVALUATED THE STRENGTH OF THE MOUNTING RAILS, IT WILL BE CLEARLY NOTED WITHIN THE NOTES AND CALCULATIONS HEREIN WITH MOUNTING RAIL EVALUATION RESULTS INCLUDED WITHIN THE REPORT.
9. STRUCTURAL SUPPORT OF MOUNTING RAILS MUST BE EVALUATED AND DESIGNED BY THE STRUCTURAL DESIGN PROFESSIONAL. THE ATTACHMENT METHOD OF THE MOUNTING RAIL TO THE STRUCTURE SPECIFIED HEREIN MUST BE REVIEWED AND APPROVED BY THE STRUCTURAL DESIGN PROFESSIONAL.
10. ACCESSORY ATTACHMENTS (PIPE, CONDUIT, ETC.) TO THE UNIT SHOULD BE CONNECTED IN A MANNER THAT PREVENTS DIFFERENTIAL MOVEMENT BETWEEN THE TWO COMPONENTS OR THAT PROVIDES ADEQUATE FLEXIBILITY TO ACCOMMODATE DIFFERENTIAL MOVEMENT BETWEEN THE TWO COMPONENTS. UNIT ATTACHMENT DESIGN BY OTHERS.

ENGINEER'S REVIEW
DIBBLE ENGINEERS, INC.
X No Exceptions Taken
_____ Note Markings
_____ Revise & Resubmit
By DEI/MKW Date 1/10/23
ENGINEER'S REVIEW IS FOR GENERAL CONFORMANCE TO THE DESIGN CONCEPT AND GENERAL COMPLIANCE WITH APPLICABLE CONSTRUCTION DOCUMENTS. CONTRACTOR IS RESPONSIBLE FOR CONFIRMING AND CORRELATING ALL QUANTITIES AND DIMENSIONS, SELECTING FABRICATION PROCESSES AND TECHNIQUES OF CONSTRUCTION, COORDINATING THE WORK WITH THAT OF ALL TRADES, AND PERFORMING WORK IN A SAFE MANNER.

City Of Portland
REVIEWED FOR CODE COMPLIANCE
Date: 01/30/23
Project: 21-011534-DFS-01-CO
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REV. #	DATE	DESCRIPTION

REGISTERED PROFESSIONAL ENGINEER
96573PE
10/20/22
OREGON
SEPT. 8, 2020
CHRISTOPHER M SCOTT
EXPIRES: 06-30-2024

ASC ENGINEERING
10801 JOHNSTON RD. STE. 105 ◆ CHARLOTTE, NC 28226
AR: 3313 MO: 2017038803 MS: 29888 TN: 5345

SHAKE SHACK
(SHACK #1317)
1016 W BURNSIDE ST.
PORTLAND, OR 97209

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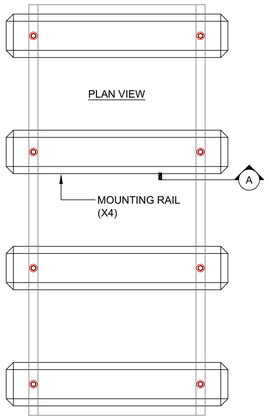
CUSTOMER PROJECT #:	21-5033
PROJECT #:	2182111
DRAWN BY:	CMS
CHECKED BY:	CMS
DATE:	10.24.2022

SHEET DESCRIPTION
GENERAL NOTES & DETAILS FOR SEISMIC/WIND ANCHORAGE CALCULATIONS FOR EQUIPMENT ON MOUNTING RAILS

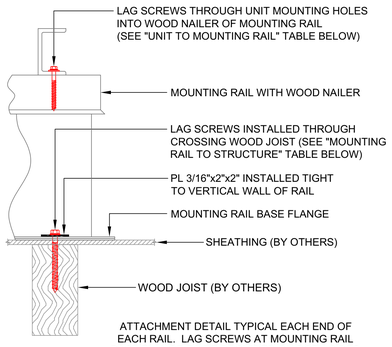
SHEET #
SR300

SEISMIC/WIND ATTACHMENT REQUIREMENTS FOR:

ESP-1



A SECTION - ATTACHMENTS
NO SCALE



ATTACHMENT DETAIL TYPICAL EACH END OF EACH RAIL. LAG SCREWS AT MOUNTING RAIL BASE FLANGE TO BE PROVIDED ON BOTH SIDES OF RAIL AS SHOWN IN DETAIL ON SHEET SR300.

NOTES:
1. LAG SCREWS TO BE CENTERED IN WOOD JOISTS.
2. THE STRUCTURE'S ABILITY TO WITHSTAND THE IMPOSED LOADS TO BE VERIFIED BY OTHERS. STRUCTURAL ENGINEER OF RECORD TO APPROVE ATTACHMENT METHOD SHOWN ABOVE PRIOR TO INSTALLATION.
3. SUPPORT METHOD SHOWN ABOVE TO BE APPROVED BY UNIT MANUFACTURER PRIOR TO INSTALLATION. PROVIDE ADDITIONAL SUPPORT UNDER THE MOUNTING RAILS, BETWEEN THE WOOD JOISTS IF REQUIRED BY STRUCTURAL ENGINEER OF RECORD. ADDITIONAL SUPPORT DESIGN BY OTHERS.
4. SEE NOTES & DETAILS ON SHEET SR300 FOR ADDITIONAL COMMENTS AND ATTACHMENT INSTALLATION REQUIREMENTS.

UNIT TO MOUNTING RAIL	
LAG SCREW SIZE	3/8"
LAG SCREW QTY. PER UNIT	8
MIN. EMBEDMENT (IN)	1.5
P (LBS)	215
ALPHA	43.9
cos2(ALPHA)	0.52
sin2(ALPHA)	0.48
W '- AVAILABLE TENSION (LBS)	580
Z ' - AVAILABLE SHEAR (LBS)	151
Pavailable (LBS)	234
COMBINED TENSION & SHEAR CHECK (LBS)	215 < 234 OK

MOUNTING RAIL TO STRUCTURE (TYPICAL EACH RAIL)	
LAG SCREW SIZE	3/8"
LAG SCREW QUANTITY	4
MIN. EMBEDMENT (IN)	3
T1 (LBS)	351
V1 (LBS)	92
P (LBS)	363
ALPHA	75.3
cos2(ALPHA)	0.06
sin2(ALPHA)	0.94
W '- AVAILABLE TENSION (LBS)	1414.8
Z ' - AVAILABLE SHEAR (LBS)	378
Pavailable (LBS)	1215
COMBINED TENSION & SHEAR CHECK (LBS)	363 < 1215 OK

ENGINEER'S REVIEW
DIBBLE ENGINEERS, INC.
__X__ No Exceptions Taken
_____ Note Markings
_____ Revise & Resubmit
By DEI/MKW Date 1/10/23
ENGINEER'S REVIEW IS FOR GENERAL CONFORMANCE TO THE DESIGN CONCEPT AND CONTRACT DOCUMENTS. REVIEW OF THE SPECIALTY STRUCTURAL ENGINEERS (SSE) DESIGN IS FOR CONFORMANCE TO DESIGN CRITERIA AND COMPATIBILITY WITH THE DESIGN OF THE BUILDING AND DOES NOT RELIEVE THE SSE OF RESPONSIBILITY FOR THAT DESIGN. MARKINGS OR COMMENTS SHALL NOT BE CONSTRUED AS RELIEVING THE CONTRACTOR FROM COMPLIANCE WITH THE PROJECT PLANS AND SPECIFICATIONS, NOT DEPARTURES THEREFROM. THE CONTRACTOR REMAINS RESPONSIBLE FOR DETAILS AND ACCURACY, FOR CONFIRMING AND CORRELATING ALL QUANTITIES AND DIMENSIONS, FOR SELECTION FABRICATION PROCESSES, FOR TECHNIQUES OF ASSEMBLY, AND FOR PERFORMING WORK IN A SAFE MANNER.

City Of Portland
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REV. #	DATE	DESCRIPTION
1	10.26.2022	REVISED ATTACHMENT DETAIL

REGISTERED PROFESSIONAL ENGINEER
96573PE
10/20/22
OREGON
SEPT. 8, 2020
CHRISTOPHER M SCOTT
EXPIRES: 06-30-2024

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CUSTOMER PROJECT #:	21-5033
PROJECT #:	2182111
DRAWN BY:	CMS
CHECKED BY:	CMS
DATE:	10.24.2022

SHEET DESCRIPTION

SEISMIC/WIND ANCHORAGE CALCULATIONS FOR EQUIPMENT ON MOUNTING RAILS

SHEET #

SR301