

Calculations required to be provided by the Permittee on site for all Inspections



December 15, 2023

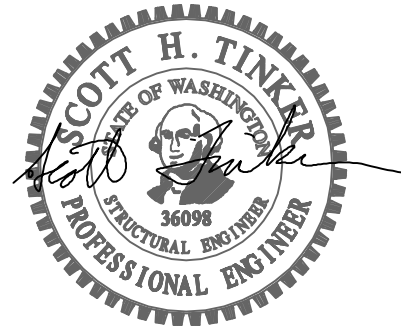
STRUCTURAL CALCULATIONS
(Permit Submittal)

**CENTERIS DATA CENTER VOLTAGE PARK
GENERATOR FOUNDATIONS**
1023 39th Avenue SE
Puyallup, WA 98374

Quantum Job Number: 23444.01

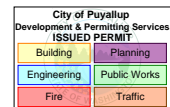
Prepared for:
CENTERIS DATA CENTERS
18300 Cascade Avenue S
Seattle, WA 981188

Prepared by:
QUANTUM CONSULTING ENGINEERS
1511 Third Avenue, Suite 323
Seattle, WA 98101
TEL 206.957.3900
FAX 206.957.3901



City of Puyallup
Building
REVIEWED
FOR
COMPLIANCE

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01/09/2024
12:56:14 PM



PRCTI20231761

8	7	6	5	4	3	2	1																														
<p>PROJECT NAME: CAT 3516C-HD 2,500KW W/ ALUMINUM UL2200 SOUND ATTENUATED ENCLOSURE</p>																																					
<p>GENERAL NOTES:</p>																																					
<p>1) DIMENSIONS AND WEIGHTS PROVIDED IN THESE DOCUMENTS ARE ESTIMATES BASED ON CALCULATION.</p>																																					
<p>PROJECT NOTES:</p>																																					
<p>1) GENSET: CATERPILLAR 3516C-HD, 2,500KW WEIGHT: 42,000 LBS. DIMENSIONS: 280.16"L X 90.12"W X 117.53"H ENGINE DWG # 593-3169</p> <p>2) ENCLOSURE WALLS: 0.08" ALUMINUM PANELS</p> <p>3) ENCLOSURE FRAME: 2"x2"x0.125" AL TUBING</p> <p>4) ENCLOSURE COLOR: TRAFFIC GREY.</p> <p>5) ESTIMATED TOTAL PACKAGE WEIGHT: 86,500 LBS DRY</p> <p>6) INTERIOR LINING: PERFORATED GALVANIZED STEEL</p> <p>7) SOUND ATTENUATION LEVEL: LEVEL 2, 85dBA AT 23FT (AVG FREE FIELD)</p> <p>8) SOUND ATTENUATION MATERIAL: 2" ROCKWOOL.</p> <p>9) SUBBASE FRAME SHALL BE PROVIDED W/ 8 LIFTING POINTS.</p> <p>10) ENCLOSURE UL 2200 LISTED, 130MPH WIND LOAD. DESIGN AIR FLOW: INTO ENCLOSURE: 102,586 CFM, 0.0710 LBS./FT3 OUT OF ENCLOSURE: 110,698 CFM, 0.06F1 LBS./FT3 MAX AMBIENT SPEC: 123°F@2460FT ASL.</p> <p>11) TANK INFORMATION: TANK UL 142 LISTED, NFPA-30 COMPLIANT. USABLE GALLONS: 8,400 NOMINAL GALLONS: 8,614 ESTIMATED TANK WEIGHT (DRY): 18,750 LBS</p>																																					
<p>DRAWING SET OUTLINE</p>																																					
<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td style="width:10%;">SHEET 1</td> <td>COVER SHEET</td> </tr> <tr> <td>SHEET 2</td> <td>BILL OF MATERIALS</td> </tr> <tr> <td>SHEET 3</td> <td>ELEVATION VIEWS</td> </tr> <tr> <td>SHEET 4</td> <td>ELEVATION VIEWS</td> </tr> <tr> <td>SHEET 5</td> <td>SECTION VIEWS</td> </tr> <tr> <td>SHEET 6</td> <td>ELECTRICAL DETAILS</td> </tr> <tr> <td>SHEET 7</td> <td>CONTROL AND WIRING DETAILS</td> </tr> <tr> <td>SHEET 8</td> <td>DIODE LAYOUT DETAILS</td> </tr> <tr> <td>SHEET 9</td> <td>TANK DETAILS</td> </tr> <tr> <td>SHEET 10</td> <td>NFPA 30 PANEL DETAILS</td> </tr> <tr> <td>SHEET 11</td> <td>CONCRETE PAD DETAILS</td> </tr> </table>								SHEET 1	COVER SHEET	SHEET 2	BILL OF MATERIALS	SHEET 3	ELEVATION VIEWS	SHEET 4	ELEVATION VIEWS	SHEET 5	SECTION VIEWS	SHEET 6	ELECTRICAL DETAILS	SHEET 7	CONTROL AND WIRING DETAILS	SHEET 8	DIODE LAYOUT DETAILS	SHEET 9	TANK DETAILS	SHEET 10	NFPA 30 PANEL DETAILS	SHEET 11	CONCRETE PAD DETAILS								
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ITEM	QTY.	DESCRIPTION	SHT #	SUPPLIER	MFG. DWG. #	REVISIONS	DATE	AP'D
1	1	CUSTOMER PROVIDED CATERPILLAR 3516C-HD (2.500AW) GENSET.	3.4.9	-	593-3169	ZONE LTR	DESCRIPTION	DWG
2	1	ENCLOSURE: 2"x2"x0.125" ALUM. TUBING COVERED IN 0.08" ALUMINUM PANELS. SLOPED ROOF. WIND RATING 130 MPH.	3.4			ALL A	ORIGINAL SUBMITTAL	5/19/2022
3	4	WALK-IN DESIGN: 2" ROCKWOOL LEVEL 2. 85CBA AT 2.3FT (AVG FREE FIELD).	3.4			ALL B	CUSTOMER COMMENTS	5/25/2022
4	1	40" SINGLE ACCESS MAINTENANCE DOORS FITTED WITH WATERIGHT RUBBER SEALS, DRIP LEDGES AND ALL FITTED WITH HEAVY DUTY REFRIGERATOR STYLE CHROME PLATED HANDLES, KEYS-A-LIKE & PAD LOCKABLE. HEAVY DUTY ALUMINUM PIANO HINGES FITTED WITH PANIC RELEASE, DOOR-HOLD-BACK LATCH AND BULB SEAL.	3.4			ALL C	480V PANEL BOARD	6/2/2022
5	1	24"x36" SINGLE ACCESS MAINTENANCE DOORS FITTED WITH WATERIGHT RUBBER SEALS, DRIP LEDGES AND ALL FITTED WITH HEAVY DUTY REFRIGERATOR STYLE CHROME PLATED HANDLES, KEYS-A-LIKE & PAD LOCKABLE. HEAVY DUTY ALUMINUM PIANO HINGES FITTED WITH PANIC RELEASE, DOOR-HOLD-BACK LATCH AND BULB SEAL.	3.4					
6	1	REAR PLENUM WITH BIRDSCREENING FOR VERTICAL AIR INTAKE. FITTED WITH MOTORIZED INTAKE LOUVERS (QTY 6).	3					
7	1	FRONT PLENUM WITH BIRDSCREENING FOR VERTICAL RADIATOR AIR DISCHARGE. FITTED W/ GRAVITY DISCHARGE LOUVERS (QTY 6).	3					
8	1	EXHAUST SILENCER: Ø80x27. CRITICAL GRADE, INTERNALLY INSULATED, DISC-TYPE.	3.4					
9	2	EXHAUST 90° ELBOW WITH WELDED RAINGUARD (SHIP LOOSE).	3.4					
10	2	FLEXIBLE CONNECTOR TO ENGINE.	3.4					
11	1	RAINCAP (SHIP LOOSE).	3.4					
12	1	8.400 GALLON SUBBASE TANK. NFPA-30 COMPLIANT.	3.4.8					
13	1	UL-142 LISTED STEEL DESIGN DIESEL FUEL TANK WITH HEAVY DUTY SIDE CHANNELS. PAINTED WITH TWO COATS OF BLACK FINISH. DOUBLE WALL W/ 10% RUPTURE BASIN FOR SECONDARY CONTAINMENT.						
14	1	VENT/FILL/ALARM PACKAGE INCLUDING: UL/NFPA SIZED EMERGENCY VENTS & 2" NORMAL VENT.						
15	1	MULTIPLE FUEL ALARM SWITCHES, MANUAL LOCKING FILL CAP, VISUAL FUEL LEVEL GAUGE AND LEAK DETECTION SWITCH. INSTALL AND WIRE FUEL TANK LEVEL SWITCHES; CRITICAL HIGH-LOW FUEL LEVEL ALARMS AND LEAK DETECTION ALARM TO ENGINE TERMINAL STRIP. YES TO PROVIDE AND INSTALL BRAIDED STAINLESS STEEL FUEL SUPPLY AND RETURN LINES TO AND FROM ENGINE. SITE PIPING BY OTHERS.						
16	1	MORRISON 918S PANEL.	3.5,9,10					
17	1	GAT BATTERY SET (8) AND CABLES. YES TO SUPPLY BATTERY RACK.	3					
18	1	PROVIDE AND INSTALL BATTERY HEATER PADS.	3.7					
19	2	20A BATTERY CHARGER	3					
20	1	WIRE AND INSTALL DIODE(S) FOR CUSTOMER PROVIDED BATTERY SELECTOR.	3.7					
21	1	150A, 120/208V, 3Ø, BASIC CIRCUIT BREAKER TYPE LOAD CENTER.	3.6					
22	1	CUSTOMER PROVIDED 4000A TRISTAR DOCKING STATION	3.6					
23	1	45KVA DRY TRANSFORMER, 480V PRIMARY, 120/208V SECONDARY, 3Ø. MOUNTED ON THE WALL.	3.6					
24	1	100AMP, 480V, 3Ø, BASIC CIRCUIT BREAKER TYPE POWER PANEL	3.6					
25	1	120VAC, 48" LED LIGHT FIXTURES.	3.7					
26	2	24VDC VAPOR PROOF LIGHT FIXTURES.	3.6					
27	1	60 MINUTE TIMER FOR DC LIGHTS.	3.6					
28	1	3-WAY SWITCHES, WALL MOUNTED, W/WEATHERPROOF COVER.	3.6					
29	1	DUPLEX GFCI RECEPTACLE.	3.6					
30	1	4.5KW SPACE HEATER, THERMOSTATICALLY CONTROLLED.	3.6					
31	2	DAYTON 484X38 EXHAUST FAN INSTALLED IN DISCHARGE WALL.	3.4,6					
32	1	THERMOSTAT FOR EXHAUST FAN.	3.6					
33	1	E-STOP, BREAK GLASS, NEMA-3R (SHIP LOOSE).	3.6					
34	1	ALL WIRING TO AND FROM ELECTRICAL ACCESSORIES IS TO BE INSTALLED IN ELECTRICAL METALLIC TUBING (EMT) AND LIQUID TIGHT FLEXIBLE CONDUIT. SHORE POWER TO BE PROVIDED BY CUSTOMER.	N/S					
35	1	7.5 GALLON SPILL BUCKET W/ 4" NPT FILL PORT.	3.9					
36	1	OVERFILL PREVENTION VALVE SET AT 95%, DROP TUBE TO BE 6" FROM BOTTOM OF TANK.	3.9					
37	1	CHECK VALVE ON FUEL SUPPLY.	3.9					
38	1	PROVIDE AND INSTALL TRIPLEX RACOR FILTER WITH SHUT OFF VALVES.	3.9					
39	1	INSTALL CUSTOMER PROVIDED FUEL POLISHING SYSTEM WIRED TO EMCP FOR STATUS.	3.6,9					
40	1	INSTALL CUSTOMER PROVIDED FUEL FLOW METER.	3.9					
41	1	INSTALL CUSTOMER PROVIDED STAINLESS STEEL FUEL LINES.	3					
42	1	PROVIDE AND INSTALL BRAIDED STAINLESS STEEL FUEL LINES.	3.9					
43	1	INSTALL CUSTOMER PROVIDED 5 GALLON KENCO OIL TANK.	3					
44	1	SUPPLY AND INSTALL CLOSED CRANKCASE VENTILATION CANISTER.	3.9					
45	1	WATER DRAIN BULKHEAD FITTINGS (3/4" MALE JIC).	3					
46	1	VIBRATION ISOLATORS.	3.4,9					
47	1	ALUMINUM PERSONAL TRAVEL RESTRAINT SYSTEM TIE-OFF.	3.4					
48	1	SMALL DOCUMENT HOLDER.	3					
49	1	INSTALL REMOVABLE ACCESS PANEL FOR DOCKING STATION ELECTRICAL ACCESS.	3					
50	1	PROVIDE RADIATOR COOLANT, AND FILL RADIATOR PRIOR TO SHIPPING.	N/S					
51	1	INSTALL CUSTOMER PROVIDED SURGE PROTECTOR.	3					
52	1	BREAK APART PACKAGE FOR SHIPPING (TANK ENCLOSURE & GENSET). DO NOT INSTALL AT&AC PIPE FOR SHIPPING.	N/S					
53	1	REMOVABLE COVER/TOP PLATE FOR STUB-UP AREA.						

SHIP LOOSE ITEMS TO BE
INSTALLED AT SITE BY OTHERS

DRAWING FOR APPROVAL
NOT FOR CONSTRUCTION PURPOSES

APPROVED AS DRAWN
APPROVED AS NOTED
REVISE AS NOTED, RESUBMIT

SIGNATURE _____ DATE _____
NAME (PLEASE PRINT) _____ TITLE _____

CUSTOMER:  _____

REFERENCE: ALUM. 0.080" SKIN ON ALUM. 26x60.125 TUBING
UNITED STATES: 16

DATE: 6/2/2022

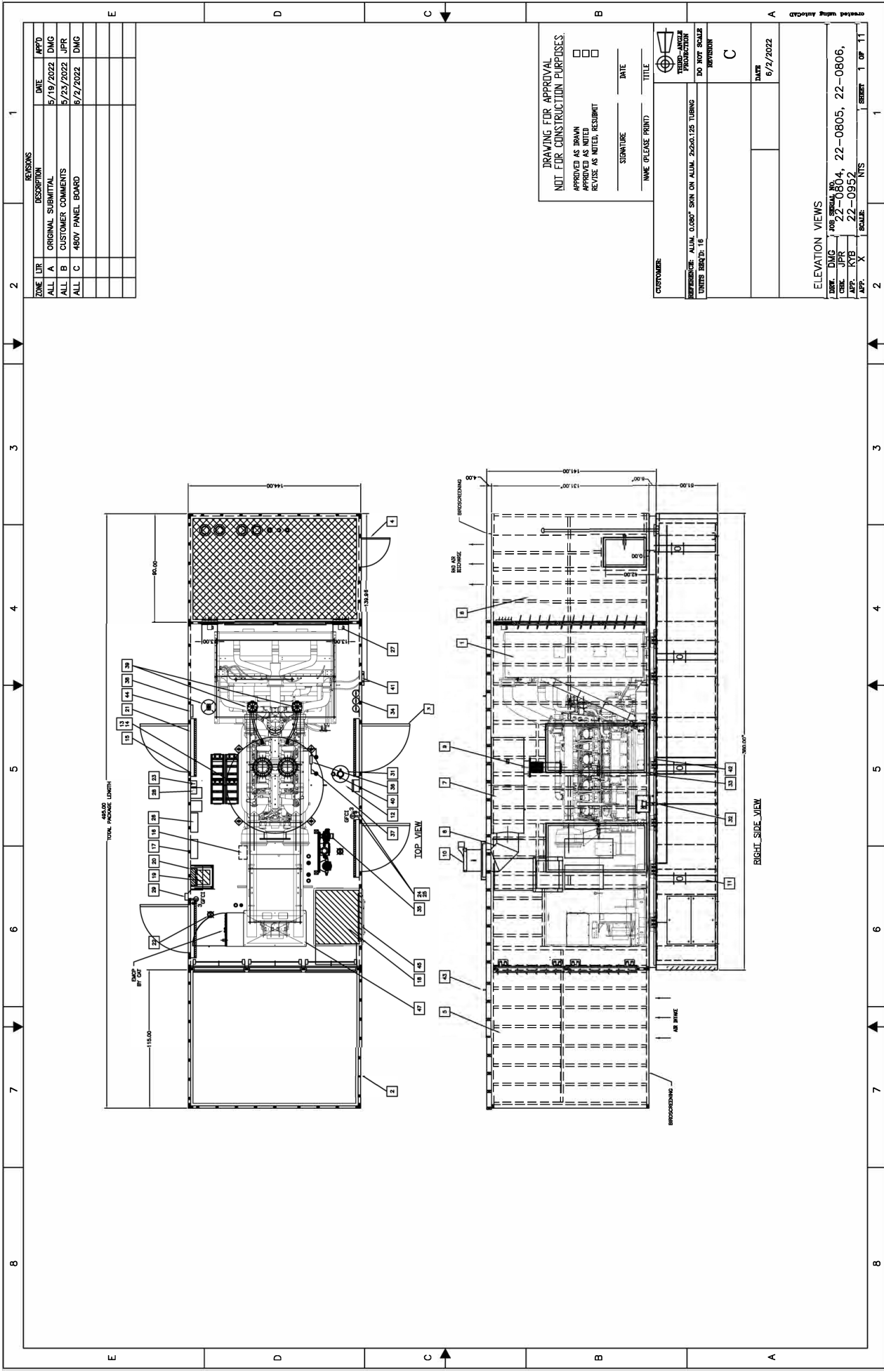
DO NOT SCALE
REVISION: C

GENERAL ARRANGEMENT SUBMITTAL
B.O.M.

DWG NO. 22-0804, 22-0805, 22-0806,
JOB SERIAL NO. 22-0804, 22-0805, 22-0806,
DATE: 22-0952

SCALE: _____ NTS _____

1 OF 11



ZONE	LR	REVISIONS	DATE	APP'D
ALL	A	ORIGINAL SUBMITTAL	5/19/2022	DMG
ALL	B	CUSTOMER COMMENTS	5/23/2022	JPR
ALL	C	480V PANEL BOARD	6/2/2022	DMG

DRAWING FOR APPROVAL
 NOT FOR CONSTRUCTION PURPOSES
 APPROVED AS SHOWN
 APPROVED AS NOTED
 REVISE AS NOTED, RESUBMIT

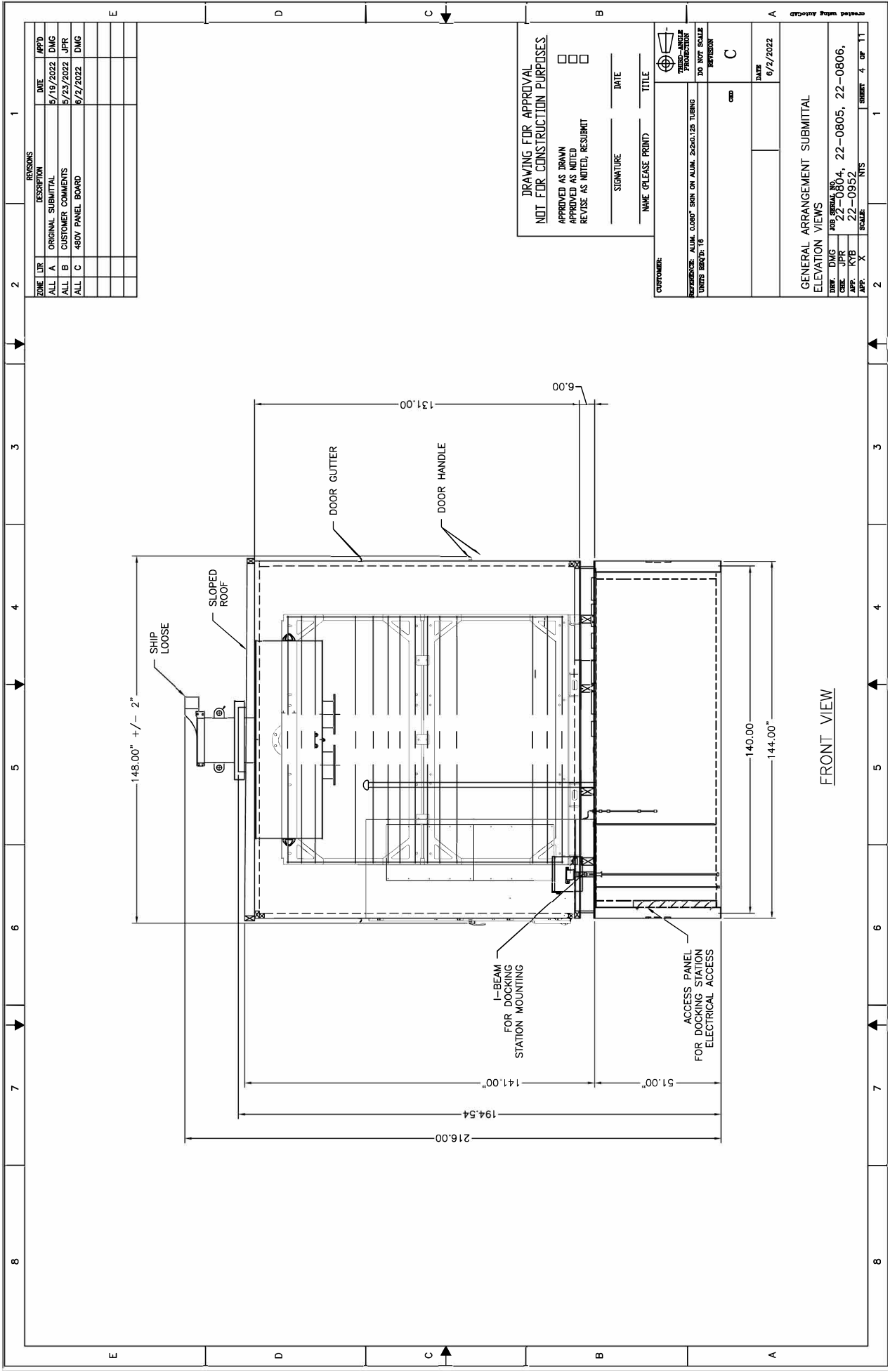
SIGNATURE _____ DATE _____
 TITLE _____

NAME (PLEASE PRINT) _____
 TITLE _____

CUSTOMER:	ALUM. 0.060" SKIN ON ALUM. 2500.125 TUBING
REFERENCE:	DO NOT SCALE
UNITED STATES:	REVISION
	C
DATE:	6/2/2022

ELEVATION VIEWS	
DRW.:	DMG
CHK.:	JPR
APP.:	X
DATE:	6/2/2022
PROJECT NO.:	22-0804, 22-0805, 22-0806,
REV.:	22-0952
SCALE:	NTS
SHEET:	1 OF 11

created using AutoCAD



ZONE	LR	DESCRIPTION	DATE	APP'D
ALL	A	ORIGINAL SUBMITTAL	5/19/2022	DMG
ALL	B	CUSTOMER COMMENTS	5/23/2022	JPR
ALL	C	480V PANEL BOARD	6/2/2022	DMG

**DRAWING FOR APPROVAL
NOT FOR CONSTRUCTION PURPOSES**

APPROVED AS DRAWN
 APPROVED AS NOTED
 REVISE AS NOTED, RESUBMIT

SIGNATURE _____ DATE _____
 TITLE _____

CUSTOMER:	
REFERENCE: ALUM. 0.060" SHIN ON ALUM. 2x2x0.125 TUBING	DO NOT SCALE
UNITS: IMPER: 16	SI: METRIC
DATE: 6/2/2022	SCALE: C

GENERAL ARRANGEMENT SUBMITTAL	
ELEVATION VIEWS	
DRW. NO. 22-0804	DATE 6/2/2022
CHK. JPR	SCALE C
APP. KYB	NO. 22-0805, 22-0806,
APP. X	22-0952
SCALE: X	REVISION: 4 OF 11

FRONT VIEW

⚠ This is a beta release of the new ATC Hazards by Location website. Please [contact us](#) with feedback.

ℹ The ATC Hazards by Location website will not be updated to support ASCE 7-22. [Find out why.](#)

ATC Hazards by Location

Search Information

Address: 1015 39th Ave SE Puyallup, WA 98374
Coordinates: 47.1590004, -122.2794422
Elevation: 489 ft
Timestamp: 2023-12-01T15:13:57.333Z
Hazard Type: Wind



ASCE 7-16

MRI 10-Year 67 mph
 MRI 25-Year 73 mph
 MRI 50-Year 78 mph
 MRI 100-Year 82 mph
 Risk Category I 92 mph
 Risk Category II 97 mph
 Risk Category III 104 mph
 Risk Category IV 108 mph

ASCE 7-10

MRI 10-Year 72 mph
 MRI 25-Year 79 mph
 MRI 50-Year 85 mph
 MRI 100-Year 91 mph
 Risk Category I 100 mph
 Risk Category II 110 mph
 Risk Category III-IV 115 mph

ASCE 7-05

ASCE 7-05 Wind Speed 85 mph

The results indicated here DO NOT reflect any state or local amendments to the values or any delineation lines made during the building code adoption process. Users should confirm any output obtained from this tool with the local Authority Having Jurisdiction before proceeding with design.

Please note that the ATC Hazards by Location website will not be updated to support ASCE 7-22. [Find out why.](#)

Disclaimer

Hazard loads are interpolated from data provided in ASCE 7 and rounded up to the nearest whole integer. Per ASCE 7, islands and coastal areas outside the last contour should use the last wind speed contour of the coastal area – in some cases, this website will extrapolate past the last wind speed contour and therefore, provide a wind speed that is slightly higher. NOTE: For queries near wind-borne debris region boundaries, the resulting determination is sensitive to rounding which may affect whether or not it is considered to be within a wind-borne debris region.

Mountainous terrain, gorges, ocean promontories, and special wind regions shall be examined for unusual wind conditions.

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ATC Hazards by Location

Search Information

Address: 1015 39th Ave SE Puyallup, WA 98374
Coordinates: 47.1590004, -122.2794422
Elevation: 489 ft
Timestamp: 2023-12-01T15:14:56.409Z
Hazard Type: Seismic
Reference Document: ASCE7-16
Risk Category: III
Site Class: D-default



Basic Parameters

Name	Value	Description
S _S	1.257	MCE _R ground motion (period=0.2s)
S ₁	0.433	MCE _R ground motion (period=1.0s)
S _{MS}	1.508	Site-modified spectral acceleration value
S _{M1}	* null	Site-modified spectral acceleration value
S _{DS}	1.005	Numeric seismic design value at 0.2s SA
S _{D1}	* null	Numeric seismic design value at 1.0s SA

* See Section 11.4.8

Additional Information

Name	Value	Description
SDC	* null	Seismic design category
F _a	1.2	Site amplification factor at 0.2s
F _v	* null	Site amplification factor at 1.0s
CR _S	0.914	Coefficient of risk (0.2s)
CR ₁	0.898	Coefficient of risk (1.0s)
PGA	0.5	MCE _G peak ground acceleration
F _{PGA}	1.2	Site amplification factor at PGA
PGA _M	0.6	Site modified peak ground acceleration
T _L	6	Long-period transition period (s)
SsRT	1.257	Probabilistic risk-targeted ground motion (0.2s)
SsUH	1.375	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
SsD	1.5	Factored deterministic acceleration value (0.2s)
S1RT	0.433	Probabilistic risk-targeted ground motion (1.0s)
S1UH	0.483	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
S1D	0.6	Factored deterministic acceleration value (1.0s)
PGA _d	0.5	Factored deterministic acceleration value (PGA)

* See Section 11.4.8

The results indicated here DO NOT reflect any state or local amendments to the values or any delineation lines made during the building code adoption process. Users should confirm any output obtained from this tool with the local Authority Having Jurisdiction before proceeding with design.

Ground Supported Tank For Liquids Seismic Design

IBC 2018, ASCE 7-16 Chapter 15

Seismic Criteria:

Site Class:	D	R:	3	ASCE Table 15.4-2 Flat Bottom Ground Supported Steel Tanks Mechanically Anchored
S_s :	1.26	L:	10	Tank Length
S_1 :	0.43	h:	3.145	Top of Liquid, ft
S_{D5} :	1.01	Tc:	2.0155	ASCE EQ 15.7-12
S_{D1} :	0.54	T_L :	6	ASCE Figure 22-14
I_E :	1.25			

$$T_s = S_{D1} / S_{D5} = 0.53$$

$$T_i < T_s \quad \text{Conservative}$$

$$\therefore S_{ai} = S_{ds} = 1.01 \quad \text{ASCE EQ 15.7-7}$$

$$T_c < T_L$$

$$\therefore S_{ac} = 1.5 S_{D1} / T_c = 0.402 \quad \text{ASCE EQ 15.7-10}$$

$$V_i = S_{ai} I_E / (R) = 0.42 W_i \quad \text{ASCE EQ 15.7-5}$$

$$V_c = S_{ac} I_E / (1.5) = 0.33 W_c \quad \text{ASCE EQ 15.7-6}$$



Quantum Consulting Engineers LLC

1511 Third Avenue, Suite 323

Seattle, WA 98101

Project: **Best Project**

Date: 12/15/23 Job No: **12345.01**

Designer: **ENGR** Sheet:

Client: **Great Client**

Checked:

2500 KW CAT Generator Foundation Design

IBC 2018, ASCE 7-16, ACI 318-14

1.) Generator

Enclosure Weight:	25.8 kips	Total Height H:	192 in
Generator Weight:	42 kips	Total Width B:	148 in
Tank Weight:	18.8 kips	Total Width L:	495 in
Tank Capacity:	8614 gal	Tank Int. Height H_T :	51 in
Liquid S.G.:	0.88	Tank Int. Width W_T :	140 in
Liquid Weight:	63.2 kips	Tank Int. Length L_T :	380 in
Snow Load:	25 psf		

2) Seismic Design per ASCE 7-16 Chapter 15 Non-Building Structure Procedure

Lateral System

Flat Bottom Ground Supported
Steel Tanks Mechanically Anchored

R:	3.0	ASCE Table 15.4-2
Ω_0 :	2.0	ASCE Table 15.4-2
C_d :	2.5	ASCE Table 15.4-2
I_E :	1.25	

Lateral Loads

Lateral resistance is provided by the steel tank anchored to the concrete slab.
See Ground Supported Tank For Liquids Seismic Design Spreadsheet

$V_i =$	0.42 W_i	ASCE EQ 15.7-5
$V_c =$	0.33 W_i	ASCE EQ 15.7-6

Enclosure EQ = $V_i * W_e =$	10.8 kips
Generator EQ = $V_i * W_g =$	17.7 kips
Tank EQ = $V_i * W_t =$	7.9 kips

Liquid $W_i =$	22.8 kips	ACI 350.3-06 EQ 9-15
Liquid $W_c =$	3.8 kips	ACI 350.3-06 EQ 9-16
Liquid EQ = $V_i * W_i + V_c * W_c =$	10.8 kips	



Quantum Consulting Engineers LLC
1511 Third Avenue, Suite 323
Seattle, WA 98101

Project: Centeris Data Centers

Date: 12/15/23 Job No: 23444.01

Designer: TVM Sheet: 1

Client: Benaroya

Checked:

2500 KW CAT Generator Foundation Design

IBC 2018, ASCE 7-16, ACI 318-14

2) Seismic Design per ASCE 7-16 Chapter 15 Non-Building Structure Procedure

Shear Connection

$V = \Sigma EQ =$ 47.2 kips Assume 3/4" Hilti KB3 SS
 Number of Anchors = 22.0 with 3 1/4" embed.
 Anchor Shear = $0.7 * V * \Omega / \# =$ 3.01 kips/anchor < ASD Capacity = 5.7 kips OK

Overturing Resistance About Width

	C.O.G.	EQ	OT Moment
Enclosure	121.5 in	10.8 kips	110 k-ft
Generator	88.8 in	17.7 kips	131 k-ft
Tank	25.5 in	7.9 kips	16.8 k-ft
Liquid	25.5 in	10.8 kips	23 k-ft
		$M_{OT} =$	280 k-ft
	Moment Arm	DL	Res. Moment
Resisting Dead Load	74 in	86.5 kips	533 k-ft
Resisting Liquid	74 in	63.2 kips	390 k-ft
		$M_R =$	923 k-ft
F.O.S. = $M_R / M_{OT} =$	3.3 OK Full Tank		
F.O.S. = $M_R / M_{OT} =$	2.1 OK Empty Tank		

3) Wind Design per ASCE 7-16 Chapter 29 Non-Building Structure Procedure

Wind Speed V: 104.0 mph ASCE 7-16 Risk Category III
 Exposure Cat. B
 Exposure Coe Kz: 0.62 Table 26.10-1 (H = 20')
 Direction Coe. Kd: 0.85 Table 26.6-1
 Topo Coe. Kzt: 1.00 Sec. 26.8

 V_Pressure qz = 14.6 psf EQ 26.10-1
 Gust Factor G: 0.85 Sec 26.11
 Af = 660 sqft
 h/d = 1.30
 Cf = 1.31 Figure 29.4-1
 F = 10.72 kips EQ 29.4-1

Shear Connection

WL < EQ Shear Connection OK By Inspection

Overturing Resistance About Width

$M_{OT} = F * H / 2$ 86 k-ft
 $M_R = DL * W / 2$ 533 k-ft (Exclude Liquid Weight)
 F.O.S. = $M_R / M_{OT} =$ 6.2 OK



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IBC 2018, ASCE 7-16, ACI 318-14

4) Foundation Design

Bearing Analysis

Allowable Bearing	2000 psf
Footing Width:	40 ft
Footing Length:	14 ft
Thickened Edge Width:	1 ft

Dead Load (Full):	150 kips
Snow Load:	12.7 kips
1.0DL+1.0SL Pressure:	1504 psf < 2000 psf OK

Earthquake OT (Full)	280 k-ft
Applied Pressure:	500 psf
1.15DL+0.7EQ Pressure:	1945 psf < 2000 psf * (4/3) OK

Sliding Analysis

Slab-on-Grade Thickness	8 in
-------------------------	------

Allow. Coefficient of Friction:	0.3	
(0.7) Earthquake (Full):	33.1 kips	
Dead Load (Full):	206 kips	Includes Slab-on-Grade Weight
Sliding Resistance:	61.7 kips	
Unity Check $U_c =$	1.87 > 1.0 OK	

(0.7) Earthquake (Empty)	25.5 kips	
Dead Load (Empty):	143 kips	Includes Slab-on-Grade Weight
Sliding Resistance:	42.8 kips	
Unity Check $U_c =$	1.68 > 1.0 OK	



Quantum Consulting Engineers LLC
1511 Third Avenue, Suite 323
Seattle, WA 98101

Project: **Centeris Data Centers**

Date: **12/15/23** Job No: **23444.01**

Designer: **TVM** Sheet: **3**

Client: **Benaroya**

Checked:

KWIK Bolt 3 Expansion Anchor 3.3.6**Table 8 - Stainless Steel KWIK Bolt 3 Allowable Loads in Normal-Weight Concrete¹**

Anchor Diameter in. (mm)	Embedment Depth in. (mm)	$f'_c = 2000$ psi (13.8 MPa)		$f'_c = 3000$ psi (20.7 MPa)		$f'_c = 4000$ psi (27.6 MPa)		$f'_c = 6000$ psi (41.4 MPa)	
		Tension lb (kN)	Shear lb (kN)	Tension lb (kN)	Shear lb (kN)	Tension lb (kN)	Shear lb (kN)	Tension lb (kN)	Shear lb (kN)
1/4 (6.4)	1-1/8 (29)	260 (1.2)	595 (2.6)	320 (1.4)	675 (3.0)	380 (1.7)	725 (3.2)	470 (2.1)	805 (3.6)
	2 (51)	540 (2.4)	675 (3.0)	625 (2.8)		705 (3.1)	805 (3.6)	910 (4.0)	
	3 (76)	685 (3)		750 (3.3)		810 (3.6)			
3/8 (9.5)	1-5/8 (41)	605 (2.7)	880 (3.9)	670 (3.0)	1110 (4.9)	730 (3.2)	1345 (6.0)	950 (4.2)	1690 (7.5)
	2-1/2 (64)	1285 (5.7)	1570 (7.0)	1430 (6.4)	1570 (7.0)	1575 (7.0)	1590 (7.1)	1940 (8.6)	1590 (7.1)
	3-1/2 (89)	1620 (7.2)		1755 (7.8)		1885 (8.4)		2035 (9.1)	
1/2 (12.7)	2-1/4 (57)	1015 (4.5)	1875 (8.3)	1230 (5.5)	2130 (9.5)	1450 (6.4)	2380 (10.6)	1620 (7.2)	2740 (12.2)
	3-1/2 (89)	1445 (6.4)	3010 (13.4)	1975 (8.8)	3010 (13.4)	2510 (11.2)	3045 (13.5)	2655 (11.8)	3045 (13.5)
	4-3/4 (121)	1990 (8.9)		2250 (10.0)		2985 (13.3)			
5/8 (15.9)	2-3/4 (70)	1650 (7.3)	2875 (12.8)	1755 (7.8)	3485 (15.5)	1860 (8.3)	4095 (18.2)	2335 (10.4)	4625 (20.6)
	4 (102)	2455 (10.9)	4625 (20.6)	2900 (12.9)	4625 (20.6)	3340 (14.9)	4625 (20.6)	4395 (19.5)	
	5-1/2 (140)	3480 (15.5)		3885 (17.3)		4290 (19.1)		6260 (27.8)	
3/4 (19.1)	3-1/4 (83)	1550 (6.9)	3945 (17.5)	1950 (8.7)	4260 (18.9)	2350 (10.5)	5645 (25.1)	2610 (11.6)	5645 (25.1)
	4-3/4 (121)	2510 (11.2)	5535 (24.6)	3250 (14.5)	5535 (24.6)	3870 (17.2)		4670 (20.8)	
	8 (203)	2930 (13.0)		3735 (16.6)		4530 (20.2)		5120 (22.9)	
1 (25.4)	4-1/2 (114)	3120 (13.9)	6080 (27.0)	3870 (17.2)	6770 (30.1)	4610 (20.5)	7470 (33.2)	4800 (21.4)	7470 (33.2)
	6 (152)	4400 (19.6)	7470 (33.2)	6400 (28.5)	7470 (33.2)	7200 (32.0)		7330 (32.6)	
	9 (229)	5600 (24.9)		8000 (35.6)		9390 (41.8)		9390 (41.8)	

¹ Intermediate load values for other concrete strengths and embedments can be calculated by linear interpolation.