REVIEW COMMENTS ON SHEETS 4, 5 AND 13
AND RESUBMIT THROUGH THE PERMIT
CENTER WITH REVISION APPLICATION
COMPLETED WITH REVISION FORM

Structural Calculations

PREPARED FOR:

Red Dot Corporation
Puyallup Corporate Center
East Main Avenue at Linden Lane

PROJECT:

Red Dot Corporation
Environmental Chamber Framing Re-Use
2220760.20

PREPARED BY:

Andrew McEachern, P.E., S.E.
Principal

DATE:

August 8, 2023

Structural Calculations

For

Red Dot Corporation

Environmental Chamber Framing Re-Use

Project # 2220760.20

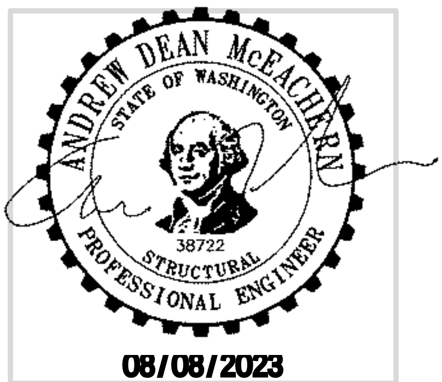
Project Principal Andrew D. McEachern, P.E., S.E.

Design Criteria

Design Codes and Standards

Codes and Standards: Structural design and construction shall be in accordance with the applicable sections of the following codes and standards as adopted and amended by the local building authority: International Building Code, 2018 Edition.

Structural Design Criteria:



Live Load Criteria:

Roof (Min Blanket Snow):	25 psf
Slab on Grade:	350 psf

Wind Load Criteria:

Basic Wind Speed:	97 mph
Risk Category:	II
Wind Exposure:	B
Topographic Factor:	1.0

Seismic Criteria:

Risk Category:	II
Seismic Importance Factor:	1.0
S_s = 1.258	S_1 = 0.433
S_{ds} = 1.006	S_{d1} = N/A
Site Class:	D
Seismic Design Category:	D

Soil Criteria:

Based on Geotechnical Engineering Report by: Terra Associates Inc, dated September 2019.

Soil Bearing Capacity: 2,500 psf when sitting on 2 feet of structural fill on the previously preloaded side. Allow 33% increase for loads from wind or seismic origin.

Project Description

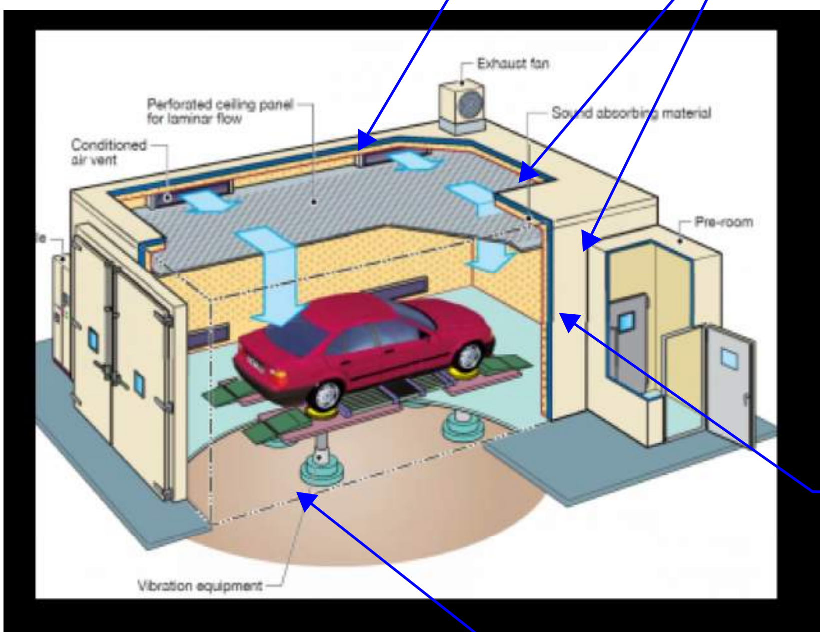
The scope of work for this project involves the structural evaluation of an existing Environmental Chamber to be relocated to a new facility. The Environmental Chamber is essentially a large walk-in cooler, which will be located within an existing building. This existing equipment was originally installed roughly 30 years ago.

The proposed Environmental Chamber is a relatively lightweight system of insulated wall and ceiling panels. The anticipated loads will fall within the minimum 350 psf uniform load specified for the original 7" thick concrete slab on grade. Equipment anchorage will be provided to meet the manufacturer's original recommendations. The Environmental Chamber is a self-supporting / freestanding element, which will be internally braced. Loads from the new Chamber will not be braced into the existing building structure. All Environmental Chamber loads will be delivered directly into the building slab on grade.

It is the intention of the structural design to satisfy the force levels of the IBC 2018.

Based upon our review of the design requirements for the Environmental Chamber, the anticipated vertical design loads and lateral design loads will be equivalent to the building code used for the original installation. The lid of the Environmental Chamber will be treated as a conventional accessible ceiling, which will be limited to a 200-pound live load. The lateral design of the Chamber will be governed by a minimum 5 psf wall load required by section IBC 1607.15.

Both the 200-pound live load and 5 psf wall load are requirements that were in place when the existing Environmental Chamber was originally designed and constructed. As the original design loads meet or exceed the current IBC design loads, it is structurally acceptable to reinstall the existing equipment in the new facility.



RELOCATED ENVIRO CHAMBER IS 18ft WIDE x 47ft LONG x 19'-2" TALL

ENVIRO CHAMBER WALL AND CEILING PANELS CONSIST OF 7" THICK INSULATED METAL PANELS

INSULATED PANELS ARE CONNECTED WITH CAM LOCKS AT EACH PANEL JOINT

PANEL BASES CONNECT TO CONCRETE SLAB ON GRADE WITH L 4x4 MEMBERS

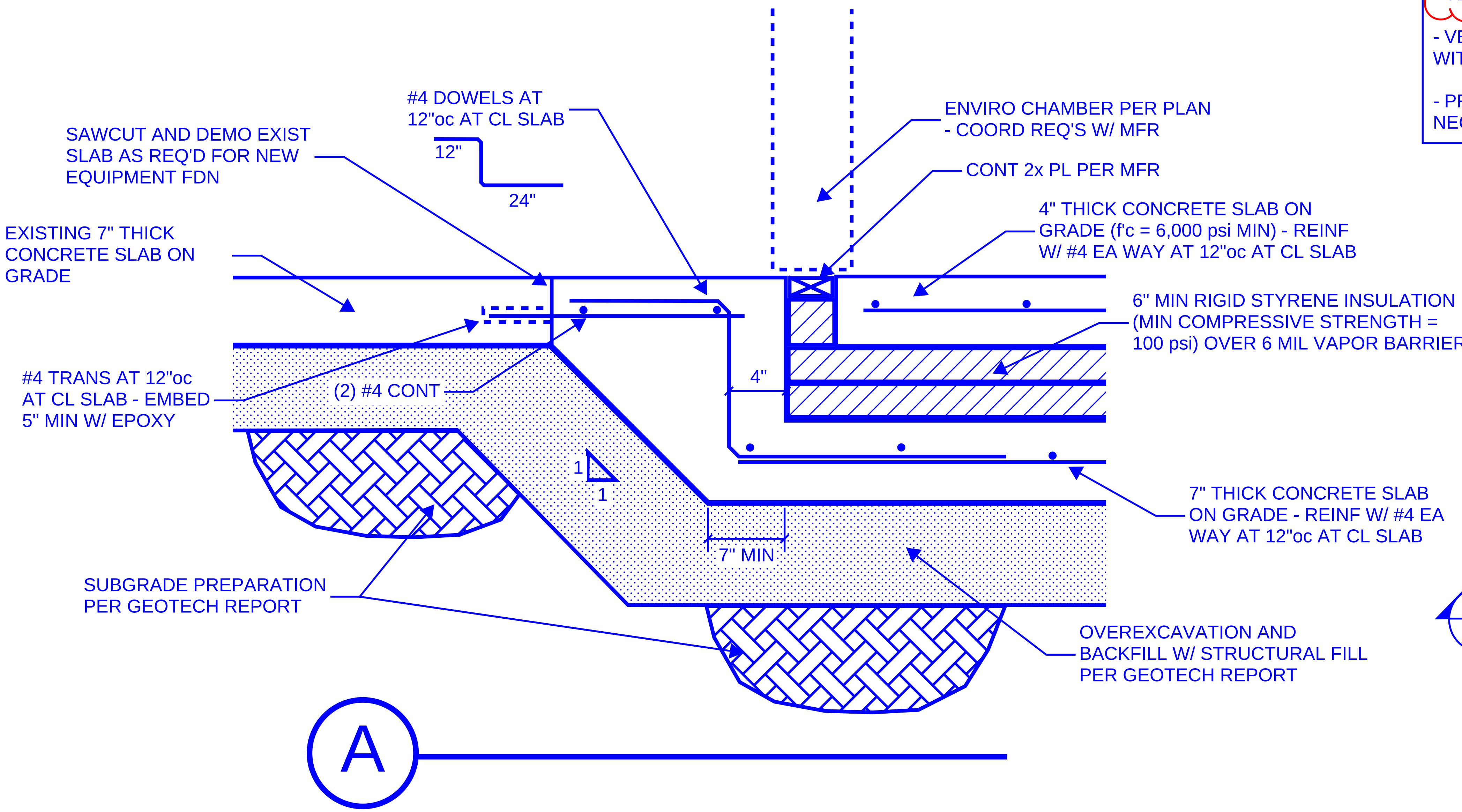
Provide complete detail how L 4 x 4 members will be used to connect panel bases to concrete. Provide location and number with type of brackets if utilized. Page 4 of 31

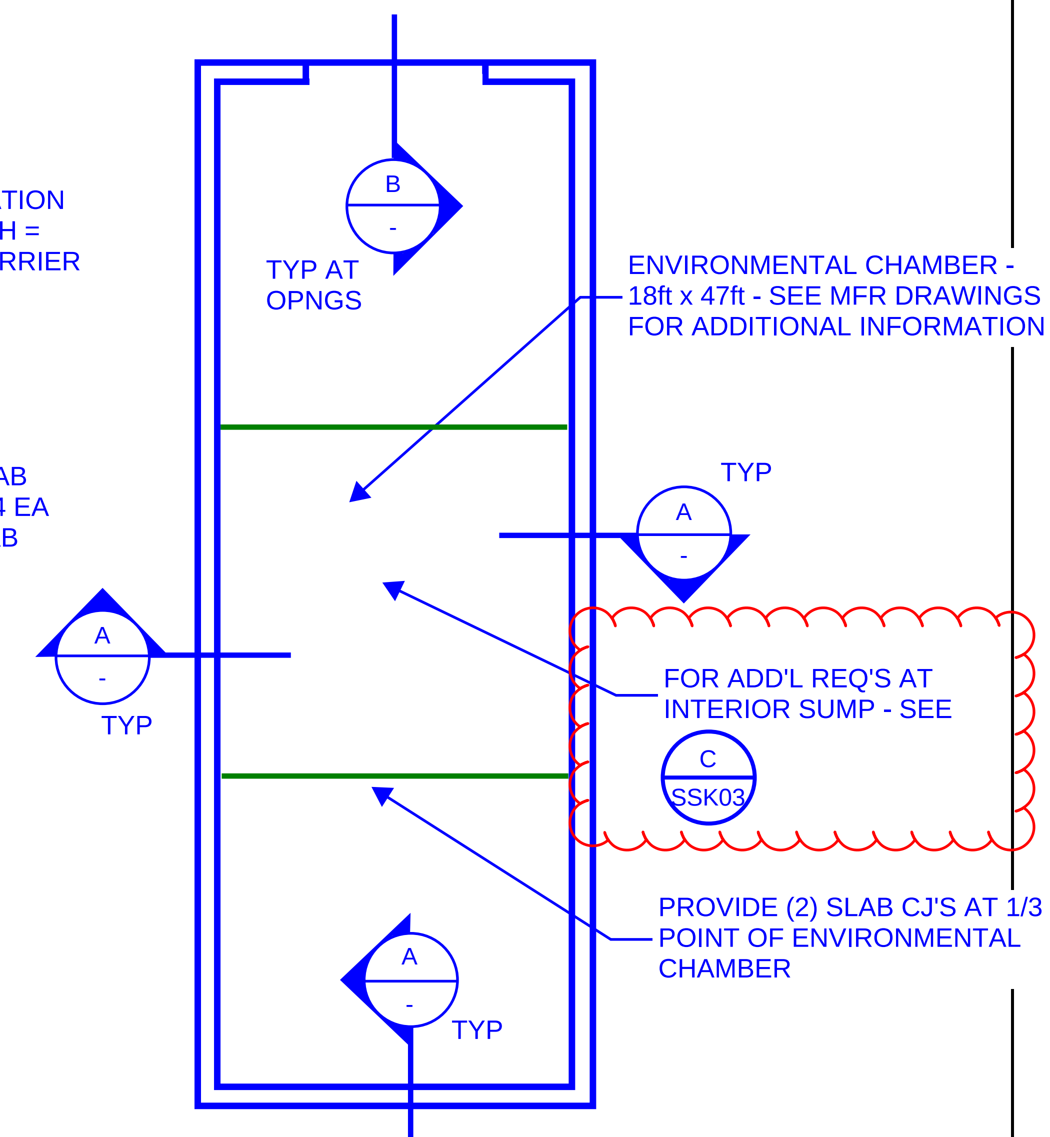
Provide detail how cam locks will be used at each panel joints include location and number to be installed. Page 4 of 31

Engineer report is for foundation only. Provide complete anchorage details for environmental chamber for installation and inspections of re-locating to new facility. (detail on page 4 of 31 does not provide complete design.)
General notes reference installation to manufactures specification for dimensions and other items. Provide manufactures specification or remove from all sheets as unavailable to reference. Page SSK-01

GENERAL NOTES:

- FIELD VERIFY ALL DIMENSIONS SHOWN W/ EQUIPMENT MFR
- MIN CONCRETE STRENGTH (f'c) 6,000 psi
- VERIFY ANCHORAGE REQUIREMENTS W/ EQUIPMENT MFR
- VERIFY SUBGRADE REQUIREMENTS AND SURFACE PREPARATION WITH GEOTECH AND EQUIPMENT MFR.
- PROVIDE GEOPIERS OR EQUIVALENT BELOW FDN PER GEOTECH IF NECESSARY TO MEET SLAB DEFLECTION REQUIREMENTS.





ENVIRONMENTAL CHAMBER PLAN

AHBL
2215 North 30th Street
Suite 300
Tacoma, WA 98403
253.383.2422 TEL
253.383.2572 FAX

RED DOT CORPORATION EQUIPMENT FOUNDATIONS

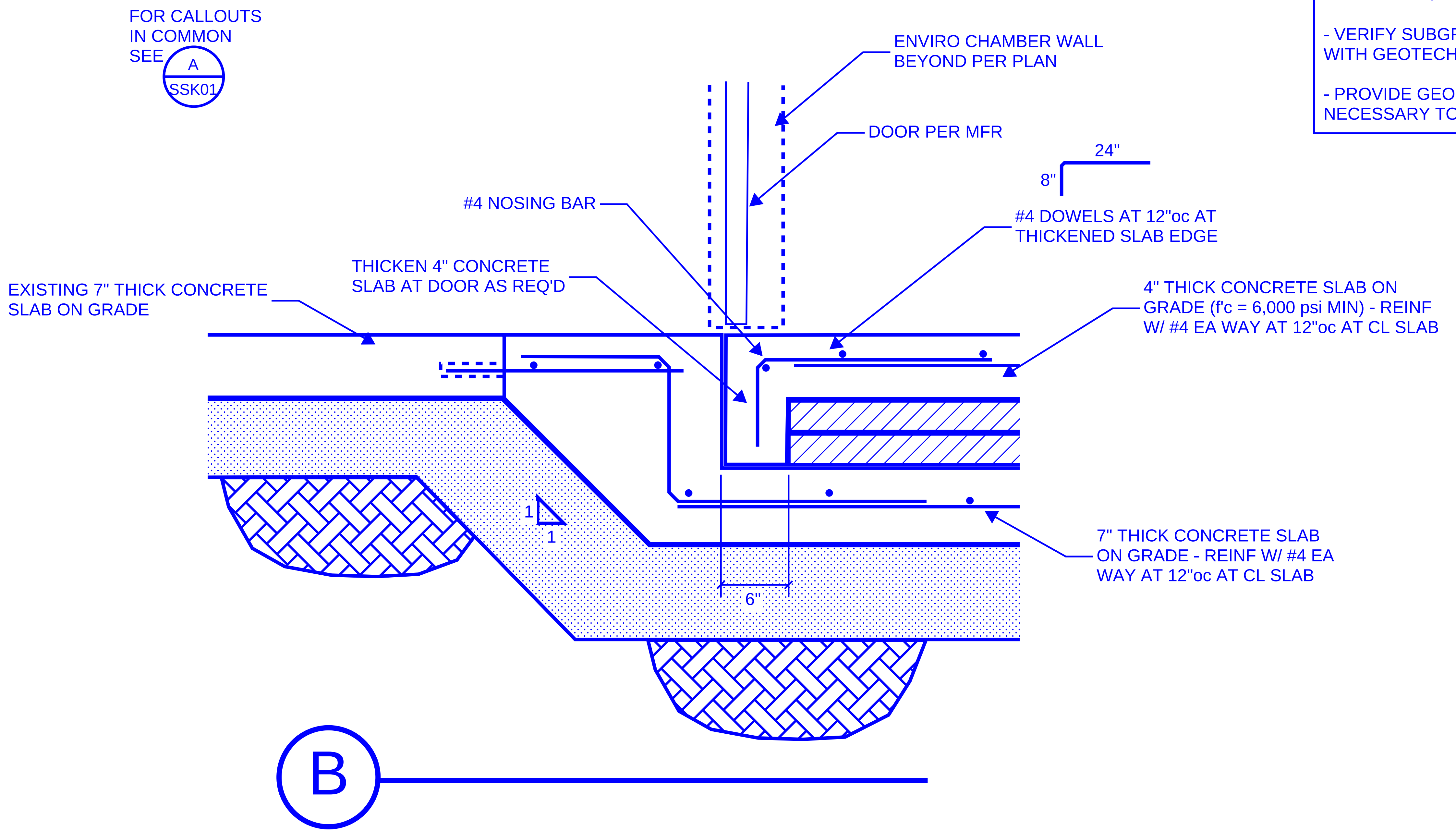
ENVIRONMENTAL CHAMBER FOUNDATION REQUIREMENTS

DRAWN BY: ADM | DATE: 12/28/2022 | JOB NO.: 2220760.20

SSK-01

GENERAL NOTES:

- FIELD VERIFY ALL DIMENSIONS SHOWN W/ EQUIPMENT MFR
- MIN CONCRETE STRENGTH (f'c) 6,000 psi
- VERIFY ANCHORAGE REQUIREMENTS W/ EQUIPMENT MFR
- VERIFY SUBGRADE REQUIREMENTS AND SURFACE PREPARATION WITH GEOTECH AND EQUIPMENT MFR.
- PROVIDE GEOPIERS OR EQUIVALENT BELOW FDN PER GEOTECH IF NECESSARY TO MEET SLAB DEFLECTION REQUIREMENTS.



AHBL
2215 North 30th Street
Suite 300
Tacoma, WA 98403
253.383.2422 TEL
253.383.2572 FAX

RED DOT CORPORATION EQUIPMENT FOUNDATIONS

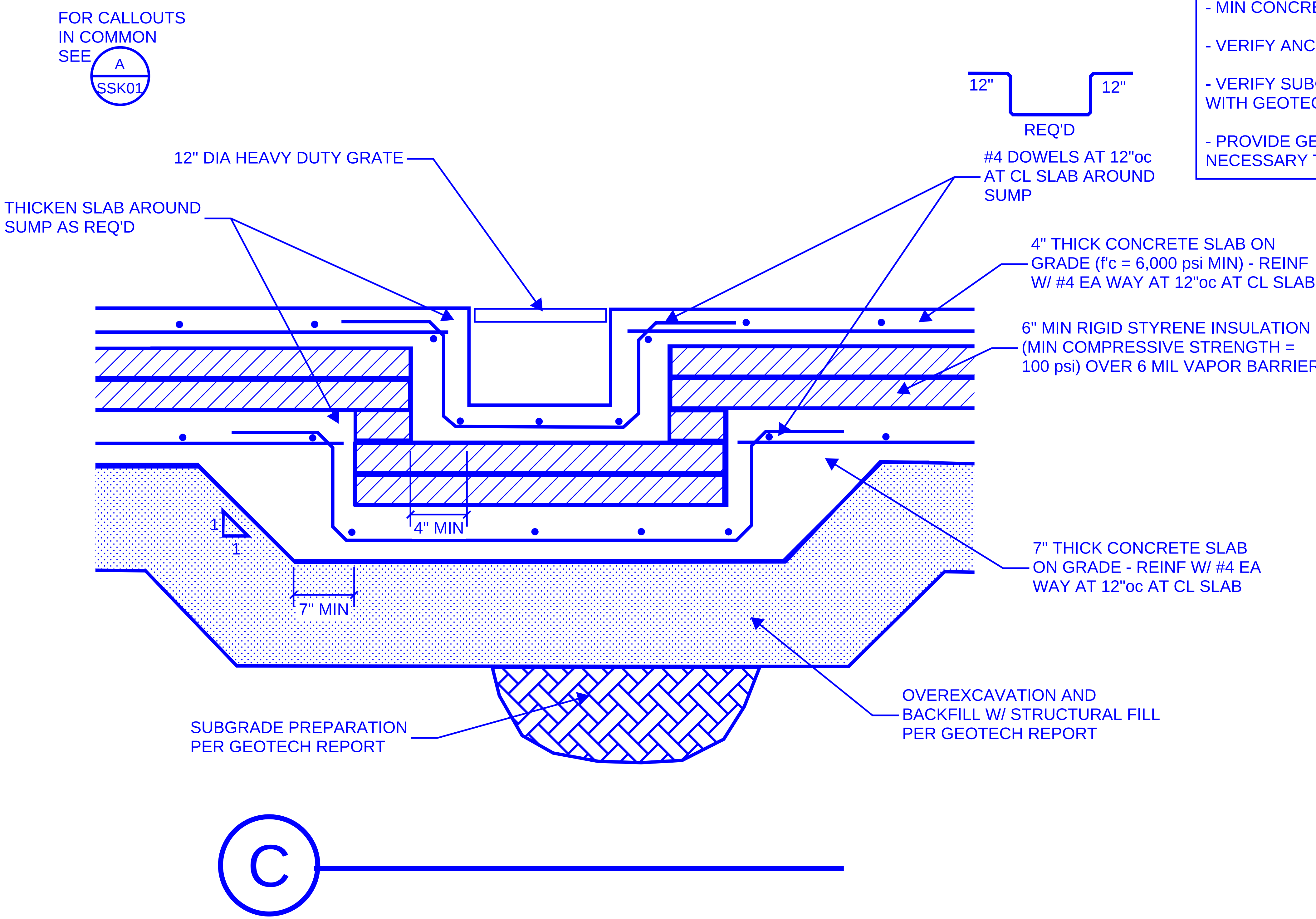
ENVIRONMENTAL CHAMBER FOUNDATION REQUIREMENTS

DRAWN BY: ADM | DATE: 12/28/2022 | JOB NO.: 2220760.20

SSK-02

GENERAL NOTES:

- FIELD VERIFY ALL DIMENSIONS SHOWN W/ EQUIPMENT MFR
- MIN CONCRETE STRENGTH (f'c) 6,000 psi
- VERIFY ANCHORAGE REQUIREMENTS W/ EQUIPMENT MFR
- VERIFY SUBGRADE REQUIREMENTS AND SURFACE PREPARATION WITH GEOTECH AND EQUIPMENT MFR.
- PROVIDE GEOPIERS OR EQUIVALENT BELOW FDN PER GEOTECH IF NECESSARY TO MEET SLAB DEFLECTION REQUIREMENTS.



AHBL
2215 North 30th Street
Suite 300
Tacoma, WA 98403
253.383.2422 TEL
253.383.2572 FAX

RED DOT CORPORATION EQUIPMENT FOUNDATIONS

ENVIRONMENTAL CHAMBER FOUNDATION REQUIREMENTS

DRAWN BY: ADM | DATE: 12/28/2022 | JOB NO.: 2220760.20

SSK-03

AHBL Engineers
2215 North 30th Street
Suite 300
Tacoma, WA 98403
253.383.2422

Project Title: Red Dot Corporation Equipment Foundation
Engineer: ADM
Project ID: 2220760.20
Project Descr: New Equipment Foundations

Point Load on Slab

Project File: 2220760.20.ec6

DESCRIPTION: Existing Slab Capacity - 10kip Point Load

7 INCH THICK CONCRETE SLAB ON GRADE

Code References

Calculations per IBC 2018, CBC 2019, ASCE 7-16
Load Combinations Used : IBC 2018

Analytical Values

d - Slab Thickness	7.0 in	Ks - Soil Modulus of Subgrade React	100.0 pci
FS - Req'd Factor of Safety	3.0 : 1	Ec - Concrete Elastic Modulus	3,605.0 ksi
		f'c - Concrete Compressive Strength	4.0 ksi
		μ - Poisson's Ratio	0.150
		Min. Adjacent Load Distance	48.064 in

Analysis Formulas

Pn = 1.72 [(Ks R1 / Ec) 10,000 + 3.6] Fr d'
Ks = Soil modulus of subgrade reaction
R1 = 50% plate average dimension = sqrt(PlWid * PlLer
Ec = Concrete elastic modulus
Fr - Concrete modulus of rupture = 7.5 * sqrt(f'c)
d - Slab Thickness

Min Adjacent Column Distance = 1.5 * ([Ec d^3 / (12 * (1- u^2) Ks] ^ 1
Ec = Concrete elastic modulus
d - Slab Thickness
u - Poisson's ratio
Ks = Soil modulus of subgrade reaction

Load & Capacity Table

Load ID	Plate (in) Wid	Len	R1 (in)	Applied Concentrated Load on Plate - (kip) D	Lr	L	S	W	E	Governing Ld Comb	Pu (kip)	Pn (kip)	Check
Point Loac	4.00	4.00	2.00	10.00						D Only	10.0	166.1	Pass, FS=16.61 >= 3

FACTOR OF SAFETY EXCEEDS 3:1 FOR POINT LOAD INDICATED

10 KIP POINT LOAD APPLIED OVER A 4" x 4" FOOTPRINT

AHBL Engineers
2215 North 30th Street
Suite 300
Tacoma, WA 98403
253.383.2422

Project Title: Red Dot Corporation Equipment Foundation
Engineer: ADM
Project ID: 2220760.20
Project Descr: New Equipment Foundations

Point Load on Slab

Project File: 2220760.20.ec6

LIC# : KW-06014847, Build:20.22.8.17 AHBL, INC

DESCRIPTION: Existing Slab Capacity - Typical Wall Load

7 INCH THICK CONCRETE SLAB ON GRADE

Code References

Calculations per IBC 2018, CBC 2019, ASCE 7-16
Load Combinations Used : IBC 2018

Analytical Values

d - Slab Thickness 7.0 in
FS - Req'd Factor of Safety 3.0 : 1

Ks - Soil Modulus of Subgrade React 100.0 pci
Ec - Concrete Elastic Modulus 3,605.0 ksi
f'c - Concrete Compressive Strength 4.0 ksi
μ - Poisson's Ratio 0.150

Min. Adjacent Load Distance 48.064 in

Analysis Formulas

Pn = 1.72 [(Ks R1 / Ec) 10,000 + 3.6] Fr d'
Ks = Soil modulus of subgrade reaction
R1 = 50% plate average dimension = sqrt(PlWid * PlLer
Ec = Concrete elastic modulus
Fr - Concrete modulus of rupture = 7.5 * sqrt(f'c)
d - Slab Thickness

Min Adjacent Column Distance = 1.5 * ([Ec d^3 / (12 * (1- u^2) Ks] ^ 1
Ec = Concrete elastic modulus
d - Slab Thickness
u - Poisson's ratio
Ks = Soil modulus of subgrade reaction

Load & Capacity Table

Load ID	Plate (in) Wid	Len	R1 (in)	Applied Concentrated Load on Plate - (kip) D	Lr	L	S	W	E	Governing Ld Comb	Pu (kip)	Pn (kip)	Check
Wall Load	4.00	12.00	3.46	25.00						D Only	25.0	182.3	Pass, FS= 7.29 >= 3

FACTOR OF SAFETY EXCEEDS 3:1 FOR POINT LOAD INDICATED

25 KIP POINT LOAD APPLIED OVER A 4" x 4" FOOTPRINT

AHBL Engineers
2215 North 30th Street
Suite 300
Tacoma, WA 98403
253.383.2422

Wall Footing

DESCRIPTION: Enviro Chamber Wall Load

Code References

Calculations per ACI 318-14, IBC 2018, CBC 2019, ASCE 7-16
Load Combinations Used : IBC 2018

General Information

Material Properties

f'c : Concrete 28 day strength	=	4.0 ksi
fy : Rebar Yield	=	60.0 ksi
Ec : Concrete Elastic Modulus	=	3,122.0 ksi
Concrete Density	=	145.0 pcf
φ Values Flexure	=	0.90
Shear	=	0.750

Analysis Settings

Min Steel % Bending Reinf.	=	
Min Allow % Temp Reinf.	=	0.0
Min. Overturning Safety Factor	=	1.0 : 1
Min. Sliding Safety Factor	=	1.0 : 1
AutoCalc Footing Weight as DL :		Yes

Soil Design Values

Allowable Soil Bearing	=	2.50 ksf
Increase Bearing By Footing Weight	=	No
Soil Passive Resistance (for Sliding)	=	250.0 pcf
Soil/Concrete Friction Coeff.	=	0.30

Increases based on footing Depth

Reference Depth below Surface	=	ft
Allow. Pressure Increase per foot of depth	=	ksf
when base footing is below	=	ft

Increases based on footing Width

Allow. Pressure Increase per foot of width	=	ksf
when footing is wider than	=	ft

Adjusted Allowable Bearing Pressure = 2.50 ksf

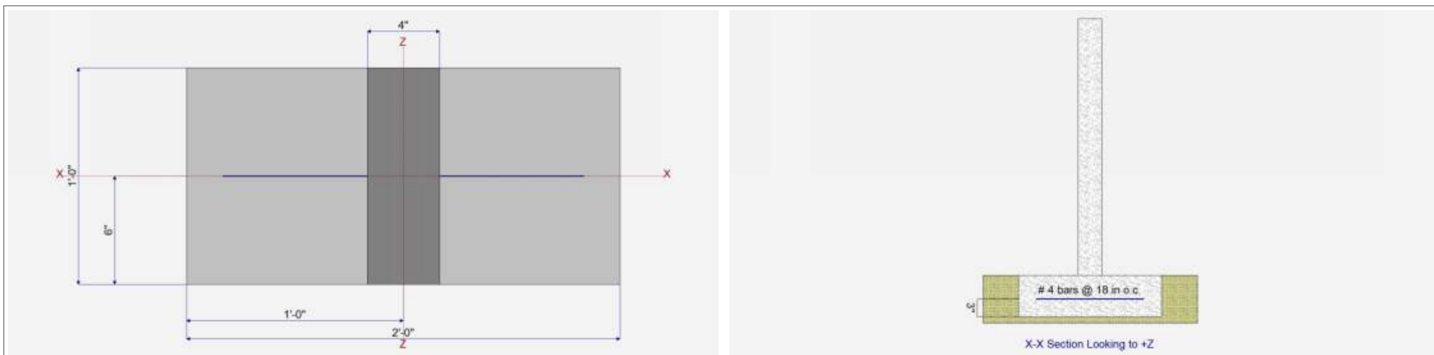
Dimensions

Footing Width	=	2.0 ft
Wall Thickness	=	4.0 in
Wall center offset from center of footing	=	0 in
Footing Thickness	=	7.0 in
Rebar Centerline to Edge of Concrete... at Bottom of footing	=	3.0 in

Reinforcing

Bars along X-X Axis

Bar spacing	=	18.00
Reinforcing Bar Size	=	# 4



Applied Loads

		D	Lr	L	S	W	E	H	
P : Column Load	=	2.0		1.0					k
OB : Overburden	=								ksf
V-x	=								k
M-zz	=								k-ft

Vx applied = in above top of footing

AHBL Engineers
2215 North 30th Street
Suite 300
Tacoma, WA 98403
253.383.2422

Project Title: Red Dot Corporation Equipment Foundation
Engineer: ADM
Project ID: 2220760.20
Project Descr: New Equipment Foundations

Wall Footing

Project File: 2220760.20.ec6

DESCRIPTION: Enviro Chamber Wall Load

DESIGN SUMMARY

Design OK

	Factor of Safety	Item	Applied	Capacity	Governing Load Combination
PASS	n/a	Overturning - Z-Z	0.0 k-ft	0.0 k-ft	No Overturning
PASS	n/a	Sliding - X-X	0.0 k	0.0 k	No Sliding
PASS	n/a	Uplift	0.0 k	0.0 k	No Uplift

	Utilization Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.6338	Soil Bearing	1.585 ksf	2.50 ksf	+D+L
PASS	0.3117	Z Flexure (+X)	0.7297 k-ft	2.341 k-ft	+1.20D+1.60L
PASS	0.1448	Z Flexure (-X)	0.3389 k-ft	2.341 k-ft	+0.90D
PASS	0.240	1-way Shear (+X)	22.766 psi	94.868 psi	+1.20D+1.60L
PASS	0.2215	1-way Shear (-X)	21.015 psi	94.868 psi	+1.20D+1.60L

Detailed Results

Soil Bearing

Rotation Axis & Load Combination...	Gross Allowable	Xecc	Actual Soil Bearing Stress -X	Actual Soil Bearing Stress +X	Actual / Allowable Ratio
, D Only	2.50 ksf	0.0 in	1.085 ksf	1.085 ksf	0.434
, +D+L	2.50 ksf	0.0 in	1.585 ksf	1.585 ksf	0.634
, +D+0.750L	2.50 ksf	0.0 in	1.460 ksf	1.460 ksf	0.584
, +0.60D	2.50 ksf	0.0 in	0.6508 ksf	0.6508 ksf	0.260

Overturning Stability

Units : k-ft

Rotation Axis & Load Combination...	Overturning Moment	Resisting Moment	Stability Ratio	Status
Footing Has NO Overturning				

Sliding Stability

Force Application Axis Load Combination...	Sliding Force	Resisting Force	Sliding SafetyRatio	Status
Footing Has NO Sliding				

Footing Flexure

Flexure Axis & Load Combination	Mu k-ft	Which Side ?	Tension @ Bot. or Top ?	As Req'd in^2	Gvrn. As in^2	Actual As in^2	Phi*Mn k-ft	Status
, +1.40D	0.5272	-X	Bottom	0.0294	Min for Bending	0.1333	2.341	OK
, +1.40D	0.5272	+X	Bottom	0.0294	Min for Bending	0.1333	2.341	OK
, +1.20D+1.60L	0.7297	-X	Bottom	0.0408	Min for Bending	0.1333	2.341	OK
, +1.20D+1.60L	0.7297	+X	Bottom	0.0408	Min for Bending	0.1333	2.341	OK
, +1.20D+0.50L	0.5387	-X	Bottom	0.0301	Min for Bending	0.1333	2.341	OK
, +1.20D+0.50L	0.5387	+X	Bottom	0.0301	Min for Bending	0.1333	2.341	OK
, +1.20D	0.4519	-X	Bottom	0.0252	Min for Bending	0.1333	2.341	OK
, +1.20D	0.4519	+X	Bottom	0.0252	Min for Bending	0.1333	2.341	OK
, +0.90D	0.3389	-X	Bottom	0.0189	Min for Bending	0.1333	2.341	OK
, +0.90D	0.3389	+X	Bottom	0.0189	Min for Bending	0.1333	2.341	OK

One Way Shear

Units : k

Load Combination...	Vu @ -X	Vu @ +X	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.40D	15.184 psi	16.45 psi	16.45 psi	94.868 psi	0.1734	OK
+1.20D+1.60L	21.015 psi	22.766 psi	22.766 psi	94.868 psi	0.24	OK
+1.20D+0.50L	15.515 psi	16.808 psi	16.808 psi	94.868 psi	0.1772	OK
+1.20D	13.015 psi	14.1 psi	14.1 psi	94.868 psi	0.1486	OK
+0.90D	9.761 psi	10.575 psi	10.575 psi	94.868 psi	0.1115	OK

1. STRUCTURAL NOTES

1.1. ANY DISCREPANCY FOUND AMONG THE DRAWINGS, SPECIFICATIONS, THESE NOTES, AND THE SITE CONDITIONS SHALL BE REPORTED TO THE ARCHITECT AND THE STRUCTURAL ENGINEER, WHO SHALL CORRECT SUCH DISCREPANCY IN WRITING. ANY WORK DONE BY THE CONTRACTOR AFTER DISCOVERY OF SUCH DISCREPANCY SHALL BE DONE AT THE CONTRACTOR'S RISK. THE CONTRACTOR SHALL VERIFY AND COORDINATE THE DIMENSIONS AMONG ALL DRAWINGS PRIOR TO PROCEEDING WITH ANY WORK OR FABRICATION. THE CONTRACTOR IS RESPONSIBLE FOR ALL ERECTION BRACING, FORMWORK AND TEMPORARY CONSTRUCTION SHORING.

1.1.1. THE CONTRACTOR SHALL NOT SCALE THE ARCHITECTURAL AND STRUCTURAL DRAWINGS FOR LOCATIONS OF ELEMENTS NOTED ABOVE.

1.1.2. ELECTRONIC COPIES OF THE STRUCTURAL DRAWINGS (PDF'S, CAD DRAWINGS OR BIM MODELS) MAY BE PROVIDED TO THE CONTRACTOR FOR THEIR USE. THESE FILES MAY BE PROVIDED AT THE REQUEST OF THE CONTRACTOR FOR THEIR CONVENIENCE ONLY. THE CONTRACTOR AGREES THAT THESE FILES SHALL NOT SUPERSEDE INFORMATION SHOWN ON THE ORIGINAL BID/ CONSTRUCTION DOCUMENTS. THE CONTRACTOR AGREES TO HOLD THE STRUCTURAL ENGINEER HARMLESS FOR ANY ERRORS OR DISCREPANCIES CONTAINED WITHIN THESE ELECTRONIC FILES.

1.2. CODES

1.2.1. ALL METHODS, MATERIALS AND WORKMANSHIP SHALL CONFORM TO THE 2015 INTERNATIONAL BUILDING CODE (IBC) AS AMENDED AND ADOPTED BY THE LOCAL BUILDING AUTHORITY.

1.2.2. ALL REFERENCES TO OTHER CODES, STANDARDS AND SPECIFICATIONS, (ACI, ASTM, ETC.), SHALL BE FOR THE EDITION CURRENTLY REFERENCED BY IBC AS AMENDED AND ADOPTED BY THE LOCAL BUILDING AUTHORITY.

1.3. DESIGN CRITERIA

1.3.1. UNIFORM LOADS:

LOCATION	LIVE LOAD	DEAD LOAD
ROOF	25 PSF (SNOW*)	ACTUAL
SLAB ON GRADE (STRUCTURAL)	7" SLAB = 350PSF	ACTUAL

* THIS IS NOT A GROUND SNOW LOAD

1.3.2. CONCENTRATED LOADS: ALL MANUFACTURERS OF PRE-ENGINEERED COMPONENTS OR SYSTEMS SHALL LOCATE, COORDINATE, VERIFY WEIGHTS, ETC., OF MECHANICAL UNITS OR OTHER CONCENTRATED LOADS AND DESIGN THEIR SYSTEM FOR THESE LOADS.

1.3.3. WIND LOADS (PER IBC SECTION 1609 AND ASCE 7 CHAPTERS 26 THRU 30):

ULTIMATE DESIGN WIND SPEED (V_{ult}):	110 MPH
RISK CATEGORY	II
WIND EXPOSURE:	B
APPLICABLE INTERNAL PRESSURE COEFFICIENT:	+/-0.18
TOPOGRAPHIC FACTOR (K_{zt})	1.0 (FLAT)

COMPONENTS AND CLADDING: ULTIMATE DESIGN WIND PRESSURES TO BE USED FOR THE DESIGN OF EXTERIOR COMPONENT AND CLADDING MATERIALS IS AS FOLLOWS:

ZONE:1	+/- 23 PSF (10 SQ FT)
ZONE:2	+/- 39 PSF (10 SQ FT)
ZONE:3	+/- 59 PSF (10 SQ FT)
ZONE:4	+/- 23 PSF (10 SQ FT)
ZONE:5	+/- 28 PSF (10 SQ FT)

1.3.4. SEISMIC LOADS (PER IBC SECTION 1613 AND ASCE 7 CHAPTERS 11 THRU 13):

RISK CATEGORY:	II
SEISMIC IMPORTANCE FACTOR (I_e):	1.0
S_s:	1.257
S_1:	0.433
SITE CLASS:	D
S_{DS}:	0.838
S_{D1}:	0.452
SEISMIC DESIGN CATEGORY:	D
SEISMIC RESPONSE COEFFICIENT (C_S):	0.168
ANALYSIS PROCEDURE USED:	EQUIVALENT LATERAL FORCE PROCEDURE

SEISMIC FORCE-RESISTING SYSTEM	RESPONSE MODIFICATION COEFFICIENT, R	OVERSTRENGTH FACTOR, Ω_0
1. SPECIAL REINFORCED CONCRETE SHEAR WALLS	5	2

NOTE: TABULATED OVERSTRENGTH FACTOR HAS BEEN REDUCED IN ACCORDANCE WITH ASCE 7 TABLE 12.2-1 FOOTNOTE G FOR STRUCTURES WITH FLEXIBLE DIAPHRAGMS.

1.4. STATEMENT OF SPECIAL INSPECTIONS

SEE STATEMENT OF SPECIAL INSPECTION AND TESTING SHEET S0.2.

1.5. SHOP DRAWINGS

1.5.1. SUBMIT SHOP DRAWINGS TO THE ARCHITECT/ENGINEER FOR THE FOLLOWING:

A. CONCRETE MIX DESIGN SUBMITTALS

B. REINFORCING STEEL

C. STRUCTURAL AND MISCELLANEOUS STEEL INCLUDING WELD INSERTS AND ANCHORS

D. PRE-ENGINEERED STEEL JOISTS AND JOIST GIRDERS *

E. TILT UP WALLS

F. PRE-ENGINEERED STEEL STAIRS & CANOPIES *

* DEFERRED SUBMITTALS: PRE-ENGINEERED ITEMS SHALL BE SUBMITTED TO THE BUILDING OFFICIAL AFTER REVIEW BY THE ENGINEER OF RECORD AS A DEFERRED SUBMITTAL.

1.5.2. SHOP DRAWING REVIEW NOTES

A. ENGINEER OF RECORD SHALL REVIEW SHOP DRAWINGS FOR GENERAL CONFORMANCE WITH THE PROJECT CONSTRUCTION DOCUMENTS (PLANS AND SPECIFICATIONS).

B. ENGINEER OF RECORD REVIEW OF SHOP DRAWINGS SHALL NOT RELIEVE THE GENERAL CONTRACTOR OF THEIR RESPONSIBILITY FOR REVIEW OF THE SHOP DRAWINGS FOR COMPLIANCE WITH THE PROJECT REQUIREMENTS.

C. APPROVAL OF THE SHOP DRAWINGS BY THE ENGINEER OF RECORD SHALL NOT BE CONSIDERED AS A GUARANTEE BY THE ENGINEER THAT THE SHOP DRAWINGS COMPLY WITH ALL PROJECT REQUIREMENTS.

D. CONCURRENT SHOP DRAWING REVIEW SHALL ONLY BE PERMITTED IF APPROVED BY THE ARCHITECT/ENGINEER OF RECORD PRIOR TO THE START OF SHOP DRAWING REVIEW.

1.6. MISCELLANEOUS

1.6.1. VERIFY ALL DIMENSIONS AND CONDITIONS IN THE FIELD.

1.6.2. VERIFY SIZE AND LOCATION OF ALL OPENINGS IN THE FLOORS, ROOF AND WALLS WITH ARCHITECTURAL, MECHANICAL AND ELECTRICAL DRAWINGS.

1.6.3. CONSTRUCTION DETAILS NOT SPECIFICALLY SHOWN ON THE DRAWINGS SHALL FOLLOW SIMILAR DETAILS OF SECTIONS OF THIS PROJECT AS APPROVED BY THE ARCHITECT/ ENGINEER.

1.6.4. SEE ARCHITECTURAL, MECHANICAL AND ELECTRICAL DRAWINGS FOR DIMENSIONS AND LOCATIONS OF OPENINGS NOT DIMENSIONED OR SHOWN ON STRUCTURAL PLANS.

1.6.5. SEE ARCHITECTURAL, MECHANICAL AND ELECTRICAL DRAWINGS FOR LOCATIONS AND WEIGHTS OF ALL MECHANICAL AND ELECTRICAL EQUIPMENT INCLUDING HOUSEKEEPING PADS.

1.6.6. FOR PIPES, CONDUITS, DUCTS AND MECHANICAL EQUIPMENT SUPPORTED OR BRACED FROM STRUCTURE: CONFORM TO SHEET METAL AND AIR CONDITIONING CONTRACTORS NATIONAL ASSOCIATION, INC., PUBLICATION "APPENDIX E: SEISMIC RESTRAINT MANUAL GUIDELINES FOR MECHANICAL SYSTEMS." ALL BRACING AND SUPPORTS SHALL BE DESIGNED FOR SEISMIC HAZARD LEVEL (SHL) B. SPRINKLER LINE ATTACHMENTS SHALL CONFORM TO NFPA PAMPHLET 13.

1.6.7. THE STRUCTURE HAS BEEN DESIGNED TO RESIST CODE REQUIRED VERTICAL AND LATERAL FORCES AFTER THE CONSTRUCTION OF ALL STRUCTURAL ELEMENTS HAS BEEN COMPLETED. STABILITY OF THE STRUCTURE PRIOR TO COMPLETION IS THE SOLE RESPONSIBILITY OF THE GENERAL CONTRACTOR. THIS RESPONSIBILITY INCLUDES BUT IS NOT LIMITED TO JOB SITE SAFETY: ERECTION MEANS, METHODS, AND SEQUENCES; TEMPORARY SHORING, FORMWORK, AND BRACING; USE OF EQUIPMENT AND CONSTRUCTION PROCEDURES. WHERE SHORING IS REQUIRED, A SHORING PLAN, STAMPED BY A LICENSED PROFESSIONAL/STRUCTURAL ENGINEER SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL.

2. SITE PREPARATION/SOIL REMEDIATION

2.1. SOIL DATA

ALLOWABLE SOIL PRESSURE 2500 PSF WHEN SITTING ON 2' OF STRUCTURAL FILL AND PRELOADED SITE. ALLOW 33-1/3% INCREASE FOR LOADS FROM WIND OR SEISMIC ORIGIN. SEE GEOTECHNICAL ENGINEERING REPORT BY TERRA ASSOCIATES INC DATED SEPTEMBER 2019. SEE GEOTECH REPORT FOR ALL SUBGRADE PREPARATION REQUIREMENTS AS WELL AS CAPILLARY BREAK AND VAPOR BARRIER RECOMMENDATIONS.

2.2. EXCAVATION

EXCAVATE TO DEPTH SHOWN AND TO FIRM UNDISTURBED MATERIAL. OVER-EXCAVATIONS SHALL BE BACKFILLED WITH LEAN CONCRETE (f_c=500-1200 PSI) OR STRUCTURAL FILL AT THE CONTRACTOR'S EXPENSE. EXERCISE EXTREME CARE DURING EXCAVATION TO AVOID DAMAGE TO BURIED LINES, TANKS, AND OTHER CONCEALED ITEMS. UPON DISCOVERY, DO NOT PROCEED WITH WORK UNTIL RECEIVING WRITTEN INSTRUCTIONS FROM THE ARCHITECT. A COMPETENT REPRESENTATIVE OF THE OWNER SHALL INSPECT ALL FOOTING EXCAVATIONS FOR SUITABILITY OF BEARING SURFACES PRIOR TO PLACEMENT OF REINFORCING STEEL. PROVIDE DRAINAGE AS NECESSARY TO AVOID WATER-SOFTENED SUBGRADE.

2.3. FILL, BACKFILL AND COMPACTION

BACKFILL AGAINST WALLS SHALL NOT BE PLACED UNTIL AFTER THE REMOVAL OF ALL MATERIAL SUBJECT TO ROT OR CORROSION. ALL FILL PLACED AGAINST RETAINING WALLS OR BASEMENT WALLS SHALL BE FREE DRAINING GRANULAR MATERIAL. STRUCTURAL FILL OTHER THAN PEA GRAVEL SHALL BE GRANULAR PLACED IN 6-INCH LIFTS AND COMPACTED TO AT LEAST 95% OF ITS MAXIMUM DRY DENSITY AS DETERMINED BY ASTM D-1557 (MOD PROCTOR). PEA GRAVEL FILL SHALL HAVE A MAXIMUM PARTICLE SIZE OF 3/8" DIAMETER.

3. STRUCTURAL CONCRETE

3.1. GENERAL

ALL CONCRETE SHALL BE HARD ROCK CONCRETE MEETING THE REQUIREMENTS OF ACI-301, "SPECIFICATIONS FOR STRUCTURAL CONCRETE FOR BUILDINGS." PROPORTIONING OF INGREDIENTS FOR EACH CONCRETE MIX SHALL BE BY METHOD 2 OR THE ALTERNATE PROCEDURE GIVEN IN ACI-301. PLACE CONCRETE PER ACI-304 AND CONFORM TO ACI-604 (306) FOR WINTER CONCRETING AND ACI-605 (305) FOR HOT WEATHER CONCRETING. USE INTERIOR MECHANICAL VIBRATORS WITH 7,000 RPM MINIMUM FREQUENCY. DO NOT OVER-VIBRATE. CONCRETE SHALL BE PLACED MONOLITHICALLY BETWEEN CONSTRUCTION OR CONTROL JOINTS. PROTECT ALL CONCRETE FROM PREMATURE DRYING, EXCESSIVE HOT OR COLD TEMPERATURE FOR SEVEN DAYS AFTER PLACING.

3.2. STRENGTH

TWENTY-EIGHT DAY COMPRESSIVE STRENGTHS SHALL BE AS FOLLOWS:

SLABS ON GRADE	4000 PSI
FOOTINGS	3000 PSI
VERTICALLY FORMED WALLS	4000 PSI
TILT UP WALL PANELS	4000 PSI

CONCRETE SUPPLIER TO PROVIDE TEST RECORDS PER SECTION 26.4 OF ACI 318.

3.3. MATERIALS

3.3.1. CEMENT: ASTM C150, TYPE I OR TYPE II. ENGINEER'S APPROVAL IS NEEDED FOR USE OF TYPE III CEMENT.

3.3.2. COARSE AND FINE AGGREGATE: ASTM C33.

3.3.3. WATER SHALL BE CLEAN AND POTABLE.

3.3.4. FLYASH: ASTM C618 CLASS C OR CLASS F

3.3.5. GROUND GRANULATED BLAST FURNACE SLAG (GGBFS): SHALL NOT BE PERMITTED.

3.4. ADMIXTURES

3.4.1. WATER REDUCING ADMIXTURE: ASTM C494. ADMIXTURES SHALL BE USED IN EXACT ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.

3.4.2. WATER REDUCING ADMIXTURES SHALL BE USED AT ALL HEAVILY CONGESTED AREAS (I.E. CONCRETE WALLS WITH REINFORCING SPACING OF 4" OR LESS)

3.4.3. CONCRETE USING ADMIXTURES TO PRODUCE FLOWABLE CONCRETE MAY BE USED SUBJECT TO ENGINEER'S APPROVAL.

3.4.4. AIR ENTRAINMENT: ASTM C260 AND ASTM C494 ENTRAIN 5% PLUS/MINUS 1.5% BY VOLUME IN ALL CONCRETE EXPOSED TO WEATHER.

3.4.5. NO OTHER ADMIXTURES PERMITTED UNLESS APPROVED BY THE ENGINEER.

3.5. FORMWORK AND SHORING

3.5.1. FOLLOW RECOMMENDED PRACTICE FOR CONCRETE FORMWORK (ACI-347).

3.5.2. ALL SHORING SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR. FORMWORK SUPPORTS SHALL BE DESIGNED TO PROVIDE FINISHED CONCRETE SURFACES AT ALL FACES LEVEL, PLUMB AND TRUE TO THE DIMENSIONS AND ELEVATIONS SHOWN. TOLERANCES AND VARIATIONS SHALL BE AS SPECIFIED. A SHORING PLAN, STAMPED BY A LICENSED PROFESSIONAL ENGINEER SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL.

3.6. REINFORCING STEEL:

3.6.1. DETAIL, FABRICATE, AND PLACE PER ACI-315 AND ACI-318. SUPPORT REINFORCEMENT WITH APPROVED CHAIRS, SPACERS, OR TIES.

3.6.2. DEFORMED BAR REINFORCEMENT: ASTM A615 GR 60

3.6.3. WELDABLE DEFORMED BAR REINFORCEMENT: ASTM A706 GR 60 WHERE NOTED ON STRUCTURAL DRAWINGS

3.6.4. WELDED WIRE FABRIC: ASTM A-185 & ASTM A-82 Fy=65 KSI

3.6.5. DEFORMED BAR ANCHORS: ASTM A-496

3.6.6. EXCEPT AS NOTED SPECIFICALLY ON THE DRAWINGS, ALL CONCRETE REINFORCEMENT SHALL BE LAP-SPLICED AS FOLLOWS:

#6 AND SMALLER 48 X BAR DIAMETER
NO MORE THAN 50% HORIZONTAL OR VERTICAL BARS SHALL BE SPLICED AT ONE LOCATION

3.6.7. EXCEPT AS NOTED SPECIFICALLY ON THE DRAWINGS, PROVIDE CORNER BARS TO MATCH QUANTITY AND DIAMETER OF HORIZONTAL REINFORCEMENT AND LAP WITH HORIZONTAL REINFORCEMENT AS FOLLOWS:

#6 AND SMALLER 48 X BAR DIAMETER
THESE CORNER BARS SHALL BE PLACED AT ALL CORNERS AND INTERSECTIONS IN CONCRETE FOOTINGS AND WALLS.

3.6.8. LAP WELDED WIRE FABRIC 12" OR ONE SPACING PLUS 2", WHICHEVER IS MORE.

3.7. CONCRETE COVER ON REINFORCING SHALL BE AS FOLLOWS (UNLESS SHOWN OTHERWISE):

BOTTOM OF FOOTINGS	3"
FORMED EARTH FACE	2"
WALLS, WEATHER FACE	1-1/2"
WALLS, INSIDE FACE	1"

3.8. CONSTRUCTION AND CONTROL JOINTS

3.8.1. UNLESS NOTED OTHERWISE, LOCATION OF THE CONSTRUCTION OR CONTROL JOINTS IN SLAB ON GRADE SHALL NOT EXCEED THE DISTANCES NOTED BELOW. JOINTS SHALL BE LOCATED ON COLUMN GRIDS OR UNDER PERMANENT PARTITIONS TO THE GREATEST EXTENT POSSIBLE. ADDITIONAL JOINTS SHALL BE REQUIRED AT REENTRANT CORNERS AND CORNERS OF SLAB DEPRESSIONS OR PENETRATIONS. SEE ARCHITECTURAL DRAWINGS FOR JOINT LAYOUT AT EXPOSED CONCRETE CONDITIONS. PROVIDE JOINT SEALANT PER SPECIFICATIONS - INSTALL PER MANUFACTURER RECOMMENDATIONS.

7" SLAB ON GRADE 20'-0" O.C. MAX

3.9. CONDUIT AND PIPING EMBEDDED IN CONCRETE

3.9.1. ELECTRICAL CONDUIT SHALL NOT BE PLACED WITHIN A SLAB ON GRADE, BUT PLACED BELOW THE SLAB IN THE SUB-BASE.

3.10. GROUT FOR BEARING PLATES

THE NON-SHRINK GROUT SHALL MEET ASTM C1107 GRADE B OR EQUIVALENT (MASTERFLOW 928 BY BASF OR APPROVED EQUIVALENT). GROUT SHALL BE A PRE-PACKAGED HYDRAULIC CEMENT BASED MINERAL AGGREGATE GROUT, MIXED, PLACED AND CURED AS RECOMMENDED BY THE MANUFACTURER. COMPRESSIVE STRENGTH SHALL EXCEED 6000 PSI AT 28 DAYS.

3.11. TILT-UP CONCRETE WALLS

3.11.1. TYPICAL AND SPECIAL REINFORCEMENT SHOWN ON PANEL ELEVATIONS IS DESIGNED FOR FORCES OCCURRING AFTER PANEL IS IN PLACE AND TIED TO ROOF AND FLOOR DIAPHRAGMS. USE STRONGBACKS AND EXTRA REINFORCEMENT AS REQUIRED AND DIRECTED BY PANEL LIFT INSERT MANUFACTURER/SUPPLIER FOR ERECTION PURPOSES. LIFT INSERT MANUFACTURER/SUPPLIER SHALL ANALYZE PANELS FOR ADEQUACY DURING COMPLETE LIFTING OPERATION FROM HORIZONTAL TO VERTICAL, INCLUDING LATERAL TRANSPORT (WALKING) OF PANELS.

3.11.2. ALL PANEL DIMENSIONS ON FOUNDATION PLANS ARE TO CENTER LINES OF CONNECTIONS UNLESS NOTED OTHERWISE. DO NOT SCALE PANEL ELEVATIONS.

3.11.3. DO NOT CUT OR DRILL PANELS WITHOUT APPROVAL OF ENGINEER UNLESS SHOWN OR INDICATED ON STRUCTURAL DRAWINGS.

3.11.4. SEE ARCH FOR FINISHES, CURING, ETC.

3.11.5. GROUT UNDER PANEL WITH A 9-SACK PEA GRAVEL CONCRETE GROUT MIX (f'c=5000 PSI AT 28 DAYS).

3.11.6. PANELS DRAWN SHOW TYPICAL LOCATIONS OF PANEL CONNECTIONS AND ADDITIONAL REINFORCING FOR MOST PANEL OPENINGS. NOT ALL EMBEDDED ITEMS AND MECHANICAL AND ELECTRICAL PENETRATIONS ARE SHOWN. CONTRACTOR SHALL COORDINATE PENETRATIONS WITH MECHANICAL AND ELECTRICAL AND REINFORCING PER PLANS.

3.11.7. GENERAL CONTRACTOR SHALL INCLUDE AN ALLOWANCE FOR STACKING OF PANELS OR RAT SLABS AS REQUIRED WHERE ADEQUATE CASTING AREA IS NOT AVAILABLE AT INTERIOR BUILDING SLAB ON GRADE AREAS.

5. METALS

5.1. STRUCTURAL STEEL GENERAL REQUIREMENTS

5.1.1. ALL DETAILING, FABRICATION, AND ERECTION SHALL CONFORM TO AISC 360-10 "SPECIFICATION FOR STRUCTURAL STEEL BUILDINGS", AISC 341-10 "SEISMIC PROVISIONS FOR STRUCTURAL STEEL BUILDINGS" AND AISC 303-10 "CODE OF STANDARD PRACTICE FOR STEEL BUILDINGS AND BRIDGES" EXCEPT AS AMENDED BY THESE STRUCTURAL NOTES.

5.2. STRUCTURAL STEEL

5.2.1. STEEL W SHAPES SHALL BE ASTM A992 F_y=50 KSI. OTHER SHAPES AND PLATES SHALL BE ASTM A36 F_y=36 KSI.

5.2.2. RECTANGULAR HOLLOW STEEL SECTIONS (HSS) OR TUBE STEEL SECTIONS (TS) SHALL BE ASTM A500, GRADE B, F_y=46 KSI (F_y=42 KSI FOR ROUND SECTIONS)

5.2.3. BOLTS

A. MACHINE BOLTS NOT SPECIFIED AS HIGH STRENGTH SHALL BE ASTM A-307 GRADE A.

B. HIGH STRENGTH BOLTS SHALL BE ASTM F3125 GRADE A325 OR GRADE A490 AS INDICATED ON STRUCTURAL DRAWINGS. ALL BOLTS SHALL BE CONSIDERED BEARING TYPE WITH THREADS INCLUDED IN SHEAR PLANE (CONNECTION TYPE N) UNLESS NOTED OTHERWISE. ALL HIGH STRENGTH BOLTED CONNECTIONS SHALL BE INSTALLED WITH NUTS CONFORMING TO ASTM A563 AND HARDENED WASHERS CONFORMING TO ASTM F436.

C. ALL HIGH STRENGTH BOLTS SHALL BE INSTALLED PER THE SPECIFICATION FOR STRUCTURAL JOINTS USING HIGH-STRENGTH BOLTS (LATEST EDITION) BY THE RESEARCH COUNCIL ON STRUCTURAL CONNECTIONS (WWW.BOLTCOUNCIL.ORG).

5.2.4. STEEL ANCHORAGE ELEMENTS:

A. THREADED RODS SHALL BE ALL-THREAD. (F_y=36 KSI) U.N.O.

B. WELDED HEADED STUDS: "NELSON STUDS" SHALL BE BY NELSON STUD WELDING, INC. OR APPROVED EQUIVALENT COMPLYING WITH ASTM A108. STUDS SHALL HAVE A MINIMUM F_u OF 65 KSI.

C. ANCHOR RODS: ANCHOR RODS SHALL BE ASTM F 1554, F_y=36 KSI.

D. EXPANSION ANCHORS SHALL BE CARBON STEEL AS NOTED IN THE FOLLOWING TABLE. ANCHORS IN CONCRETE SHALL HAVE BEEN TESTED IN ACCORDANCE WITH ACI 355.2 AND/OR ICC-ES AC193 FOR CRACKED CONCRETE AND SEISMIC APPLICATIONS. ANCHORS SHALL HAVE A CURRENT CODE REPORT THAT COMPLIES WITH THE CURRENT EDITION OF THE IBC AND SHALL BE RATED FOR USE IN THE SEISMIC DESIGN CATEGORY NOTED IN THE DESIGN CRITERIA SECTION OF THESE NOTES.

EXPANSION ANCHORS IN CONCRETE	CODE REPORT
HILTI KWIK BOLT TZ	ICC ESR-1917
SIMPSON STRONG-BOLT 2	ICC ESR-3037
DEWALT/POWERS POWER-STUD+ SD2	ICC ESR-2502

E. ADHESIVE ANCHORS SHALL BE THREADED ANCHOR RODS OR REBAR DOWELS USING AN INJECTABLE ADHESIVE AS NOTED IN THE FOLLOWING TABLE. ANCHORS IN CONCRETE SHALL HAVE BEEN TESTED IN ACCORDANCE WITH ACI 355.4 AND/OR ICC-ES AC-308 FOR CRACKED CONCRETE AND SEISMIC APPLICATIONS. ANCHORS SHALL HAVE A CURRENT CODE REPORT THAT COMPLIES WITH THE CURRENT EDITION OF THE IBC AND SHALL BE RATED FOR USE IN THE SEISMIC DESIGN CATEGORY NOTED IN THE DESIGN CRITERIA SECTION OF THESE NOTES.

ADHESIVE ANCHORS IN CONCRETE	CODE REPORT
HILTI HIT HY-200 SAFE SET	ICC ESR-3187
SIMPSON AT-XP *	IAPMO ER-263
DEWALT/POWERS PURE 110+	ICC ESR-3298

* SIMPSON SET-XP MAY BE USED WHERE BASE MATERIAL TEMPERATURE IS ABOVE 50 DEGREES FAHRENHEIT OR FOR EMBEDMENT GREATER THAN 12-INCHES FOR LONGER GEL TIME. SEE ICC ESR-2508 (CONC) AND IAPMO ER-265 (MASONRY).

F. POWDER ACTUATED FASTENERS: PDF'S OR PAF'S SHALL BE A MINIMUM 0.157" DIA KNURLED SHANK FASTENER AS NOTED IN THE FOLLOWING TABLE, UNLESS NOTED OTHERWISE. FASTENERS DRIVEN INTO STEEL SHALL BE DRIVEN SO THAT THE POINT OF THE FASTENER COMPLETELY PENETRATES THE STEEL BASE MATERIAL. AT TOPPING SLABS, PT SLABS OR SLABS WITH RADIANT HEAT TUBES EMBEDDED WITHIN THE SLAB, LIMIT THE PDF PENETRATION TO 3/4" MAXIMUM AND COORDINATE WITH TENDON/TUBE PLACEMENT AND COVER.

POWDER ACTUATED FASTENERS	CODE REPORT
HILTI X-U	ICC ESR-2269
SIMPSON PDPA	ICC ESR-2138
DEWALT/POWERS CSI PIN	ICC ESR-2024

5.2.5. METAL PROTECTION: ALL STEEL EXPOSED TO WEATHER, MOISTURE, SOIL, OR AS NOTED SHALL BE GALVANIZED PER ASTM A-123 OR A153 AS APPLICABLE. ALL OTHER STEEL SURFACES SHALL BE SHOP PRIMED AFTER FABRICATION.

REPAIR ALL DAMAGED AREAS OF GALVANIZED PARTS SUCH AS FIELD WELDS, ETC. APPLY REPAIR COATING THICKNESS GREATER THAN OR EQUAL TO ORIGINAL ZINC COATING THICKNESS.

5.2.6. STEEL COLUMNS: ALL VERTICAL LOAD CARRYING MEMBERS HAVE BEEN NOTED AS "COLUMNS" ON THE STRUCTURAL DRAWINGS. THIS NOTATION DOES NOT IDENTIFY THESE MEMBERS AS "POSTS" OR "COLUMNS" AS DEFINED BY THE LATEST OSHA RULES REGARDING COLUMN ANCHORAGE REQUIREMENTS (OSHA 29 CFR PARTS 1926.751 AND 1926.755). THE GENERAL CONTRACTOR, STEEL DETAILER, AND STEEL ERECTOR SHALL BE RESPONSIBLE TO DETERMINE THE CORRECT OSHA DESIGNATION OF EACH MEMBER REGARDLESS OF THE NOTATION SHOWN ON THE STRUCTURAL DRAWINGS.

5.2.7. PRE-ENGINEERED STEEL STAIRS AND CANOPIES: THE MANUFACTURER SHALL SUBMIT SHOP DRAWINGS AND CALCULATIONS SEALED BY A PROFESSIONAL ENGINEER LICENSED IN THE STATE OF THE PROJECT.

5.3. WELDING

5.3.1. ALL WELDING SHALL BE IN ACCORDANCE WITH THE "STRUCTURAL WELDING CODE," AWS D1.1, AWS D1.4 AND AWS D1.8 AS APPROPRIATE.

5.3.2. ALL WELDING SHALL BE BY CERTIFIED WELDERS; USE 70 KSI LOW HYDROGEN FILLER METAL, AND SHALL BE PROTECTED PER AWS D1.1 UNTIL USE. FOR ALL FULL PENETRATION WELDS, FILLER METAL SHALL BE NOTCH TOUGH TO MEET CHARPY V-NOTCH OF 20 FOOT-POUND AT -20°F.

5.3.3. NO WELDING OF REINFORCING STEEL SHALL BE ALLOWED EXCEPT WHERE SHOWN. ALL WELDING OF REINFORCEMENT SHALL BE PER ANSI/AWS D1.4. THE FOLLOWING FILLER METAL SHALL BE USED WHEN WELDING REINFORCEMENT:

A. FOR WELDING OF ASTM A706 GR 60 REBAR, 80 KSI FILLER METAL.

B. FOR WELDING OF ASTM A615 GR 60 REBAR, NOT PERMITTED.

C. FOR WELDING OF ASTM A615 GR 40 REBAR, NOT PERMITTED.

5.3.4. ALL FULL PENETRATION FIELD AND SHOP WELDS SHALL BE FULL TIME INSPECTED AND TESTED BY NON-DESTRUCTIVE PROCEDURES. RESULTS OF TESTS SHALL BE SUBMITTED FOR REVIEW BY THE STRUCTURAL ENGINEER.

5.4. WELDING PROCEDURE SPECIFICATION (WPS)

5.4.1. FOR ALL WELDING OF REINFORCING STEEL AND NON PREQUALIFIED WELDS CONTRACTOR SHALL SUBMIT A WELDING PROCEDURE SPECIFICATION (WPS) TO ENGINEER FOR APPROVAL. PRIOR TO WELDING, EACH WPS SHALL INCLUDE ALL NECESSARY INFORMATION REQUIRED BY AWS D1.1, AWS D1.4 AND AWS D1.8 AND AS FOLLOWS:

A. APPLICABLE BASE METAL TYPES AND THICKNESSES.

B. SKETCH OF JOINT INDICATING APPLICABLE DIMENSIONS. INDIVIDUAL PASSES SHALL BE IDENTIFIED AND NUMBERED TO IDENTIFY THE SEQUENCE. THE SKETCH SHALL IDENTIFY THE MAXIMUM THICKNESS AND BEAD WIDTH. IN NO CASE SHALL THE LAYER THICKNESS EXCEED 1/4" NOR THE BEAD WIDTH EXCEED 5/8."

C. PREHEAT REQUIREMENTS.

D. ELECTRICAL CHARACTERISTICS (I.E., CURRENT, VOLTAGE, TRAVEL SPEED, ETC.).

E. ELECTRODE REQUIREMENTS SHALL MEET THE REQUIREMENTS OF AWS A5.1, AWS A5.5, AWS A5.17, AWS A5.23, AWS A5.18, AWS A5.20, AWS A5.28, AND AWS A5.29, AS APPLICABLE FOR WELDING METHOD USED.

5.5. STEEL JOISTS AND JOIST GIRDERS

5.5.1. DESIGN LOADS SHALL BE AS STATED IN THE DESIGN CRITERIA SECTION OF THESE NOTES PLUS ANY SPECIAL LOADS INDICATED ON THE DRAWINGS. UNLESS OTHERWISE NOTED, MINIMUM DESIGN LOADS SHALL INCLUDE:

A. WHERE PRIMARY ROOF MEMBERS ARE EXPOSED TO A WORK FLOOR A SINGLE NON-CONCURRENT CONCENTRATED LIVE LOAD OF 2000 LBS SHALL BE LOCATED AT ANY PANEL POINT ALONG THE TRUSS BOTTOM CHORD.

B. AT ROOF JOISTS AND JOIST GIRDERS, A MINIMUM NET UPLIFT LOAD OF 10 PSF.

5.5.2. STEEL JOISTS AND JOIST GIRDERS SHALL BE MANUFACTURED PER THE LATEST EDITION OF THE STANDARD SPECIFICATIONS FOR STEEL JOISTS AND JOIST GIRDERS PUBLISHED BY THE STEEL JOIST INSTITUTE.

5.5.3. ALL STEEL JOISTS AND JOISTS GIRDERS SHALL BE MANUFACTURED BY A FABRICATOR CURRENTLY APPROVED BY ICC (INTERNATIONAL CODE COUNCIL). MANUFACTURER SHALL BE A MEMBER OF SJI, AND ALL STEEL JOISTS AND JOIST GIRDERS SHALL BE SJI APPROVED.

5.5.4. THE MANUFACTURER SHALL SUBMIT SHOP DRAWINGS AND CALCULATIONS SEALED BY A PROFESSIONAL ENGINEER LICENSED IN THE STATE OF THE PROJECT.

5.5.5. IT SHALL BE THE RESPONSIBILITY OF THE MANUFACTURER, THE GENERAL CONTRACTOR, AND THE ERECTOR TO MANUFACTURE AND INSTALL ALL STEEL JOISTS AND JOIST GIRDERS IN CONFORMANCE WITH THE MOST CURRENT OSHA RULES (OSHA 29 CFR PART 1926.757).

5.5.6. LIMIT LIVE LOAD AND/OR SNOW LOAD DEFLECTION TO L/240 FOR ROOF FRAMING MEMBERS.

5.5.7. THE JOIST MANUFACTURER SHALL DESIGN THE JOISTS FOR UNIFORM LOADS INDICATED ON THE STRUCTURAL DRAWINGS AS WELL AS ALL SPECIAL LOADS NOTED ON THE STRUCTURAL PLANS AND DETAILS. SPECIAL LOADS SHALL INCLUDE POINT LOADS FOR SUPPORT OF SECONDARY FRAMING, OVERFRAMING AND SUPPORTED EQUIPMENT (MECHANICAL UNITS, SUSPENDED EQUIPMENT, ETC.).

5.5.8. THE JOIST MANUFACTURER SHALL COORDINATE JOIST BRIDGING AT EXPOSED LOCATIONS FOR ARCHITECTURAL APPEARANCE. BRIDGING LOCATIONS SHALL ALSO BE COORDINATED TO AVOID CONFLICTS WITH MECHANICAL DUCTWORK, SKYLIGHTS AND OTHER BUILDING SYSTEMS.

6. CARPENTRY

DIMENSION LUMBER SHALL BE DF.#2 SAWN LUMBER BEAMS, HEADERS AND COLUMNS SHALL BE DF#2 OR AS SHOWN ON THE DRAWINGS. ALL 2" NOMINAL LUMBER SHALL BE KILN DRIED (KD). EACH PIECE OF LUMBER SHALL BEAR STAMP OF WEST COAST LUMBER INSPECTION BUREAU (WCLIB) AND/OR WESTERN WOOD PRODUCTS ASSOCIATION (WWPA) SHOWING GRADE MARK.

6.1. PRESSURE-PRESERVATIVE TREATMENT IN ACCORDANCE WITH AMERICAN WOOD PROTECTION ASSOCIATION (AWPA) STANDARD U1, LATEST EDITION TO THE USE CATEGORY AS FOLLOWS:

6.1.1. TREAT ALL WOOD IN CONTACT WITH CONCRETE, MORTAR, GROUT, MASONRY AND WITHIN 12" OF EARTH TO THE REQUIREMENTS OF USE CATEGORY UC2 (INTERIOR/DAMP).

6.2. CARPENTRY HARDWARE

6.2.1. MACHINE BOLTS SHALL BE ASTM A-307.

6.2.2. PROVIDE MALLEABLE IRON WASHERS (MIW) OR HEAVY PLATE CUT WASHERS WHERE BOLT HEADS, NUTS OR LAG SCREWS BEAR ON WOOD.

6.2.3. NAILS SHALL BE COMMON, AMERICAN OR CANADIAN MANUFACTURER ONLY WITH MIN. DIAMETERS AS FOLLOWS:

NAIL SIZE	MINIMUM NAIL SHANK DIAMETER	MINIMUM NAIL LENGTH
8d	0.131"	2 1/2"
10d	0.148"	3"
12d	0.148"	3 1/4"
16d SINKER	0.148"	3 1/4"
16d	0.162"	3 1/2"
20d	0.192"	4"

NELSON

Nelco Architecture, Inc.

1200 Fifth Ave.
Suite 1300
Seattle, WA 98101
Phone: (206) 408-8500
WWW.NELSONWORLDWIDE.COM

CLIENT:

PANATTONI®

PANATTONI DEVELOPMENT
1821 DOCK ST SUITE 100
TACOMA, WA 98402

PROJECT:

PUYALLUP CORPORATE CENTER

EAST MAIN AVENUE AT LINDEN LANE
PUYALLUP, WASHINGTON

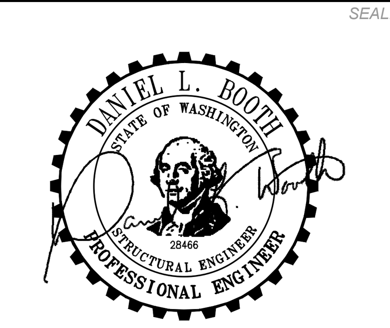
Description:	No:	Date:
PERMIT SUBMITTAL		04/03/2020
PRICING SET	△	07/21/2020
PERMIT RESUBMITTAL		08/24/2020

AHBL

TACOMA · SEATTLE · SPOKANE · TRI-CITIES

2215 North 30th Street, Suite 300 Tacoma, WA 98403
253.383.2422 TEL 253.383.2572 FAX www.ahbl.com WEB

SEAL:



CITY STAMP:

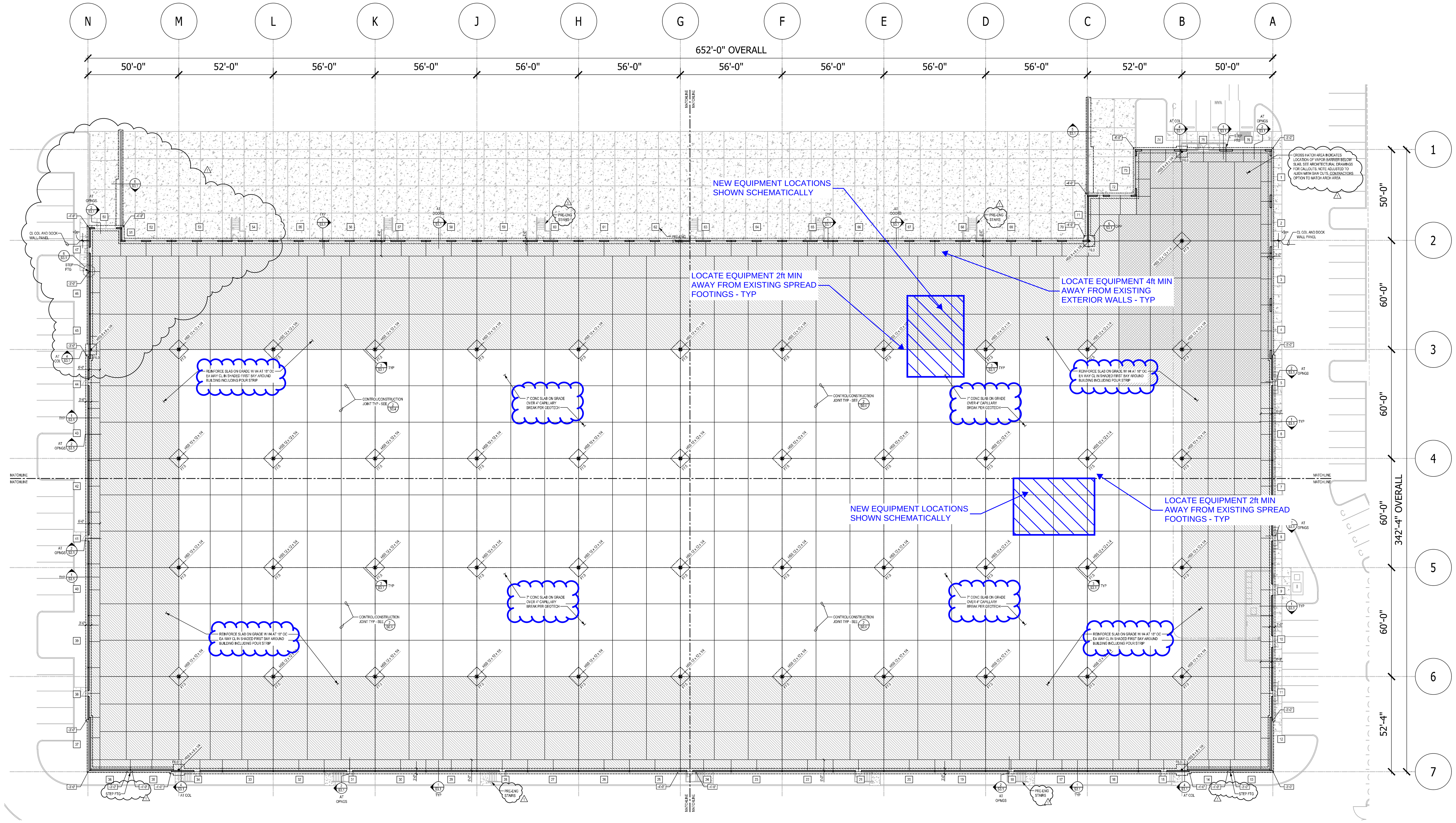
NOTICE:

STRUCTURAL NOTES

Proj. No: 2190390.20

Reviewed By: LAH/CLR

S0.1



OVERALL FOUNDATION PLAN

NTS

1

SCALE IN FEET (0, 32, 64)

Provide location of placement of the Environmental Chamber on foundation plan to indicate where it will be installed.
Page S1.0

FOOTING SCHEDULE

MARK	SIZE	REINFORCING	REMARKS
F6.0	6'-0" x 6'-0" x 1'-2"	(7) #5 EACH WAY AT BOTTOM OF FOOTING	
F7.5	7'-6" x 7'-6" x 1'-4"	(7) #6 EACH WAY AT BOTTOM OF FOOTING	

FOOTINGS SCHEDULE NOTES:

1. TOP OF FOOTING ELEVATION = -1'-0" UNLESS NOTED OTHERWISE ON PLAN.
2. FOOTING DESIGN BASED ON 2500 PSF ALLOWABLE SOIL BEARING PRESSURE.
3. EQUALLY SPACE REINFORCING IN EACH DIRECTION.
4. PROVIDE 3" CLEAR TO REINFORCING AT BOTTOM OF FOOTING.

FOUNDATION NOTES:

1. SEE SHEET S0.1 AND S0.2 FOR GENERAL NOTES. SEE SHEET S0.4 FOR TYPICAL DETAILS. SEE SHEET S0.3 FOR TESTING AND INSPECTION NOTES.
2. SEE GEOTECHNICAL ENGINEERING REPORT FOR ALL FOUNDATION AND SLAB SUPPORT REQUIREMENTS. THIS INCLUDES ALL EXCAVATION, FILL AND FILL PLACEMENT REQUIREMENTS.
3. SEE ARCHITECTURAL/MECHANICAL DRAWINGS FOR DRAINS, SLOPES, AND OTHER FLOOR DEPRESSIONS NOT SHOWN.
4. SEE ARCHITECTURAL DRAWINGS FOR DIMENSIONS, ELEVATIONS, AND WALLS NOT SHOWN.
5. VERIFY ALL WINDOW AND DOOR WIDTH AND HEIGHTS WITH ARCHITECTURAL DRAWINGS.
6. SEE ARCHITECTURAL DRAWINGS FOR STUD SIZE, SPACING, AND CALLOUTS AT NON-STRUCTURAL WALLS.
7. FOR TYPICAL CONNECTION OF NON-LOAD BEARING WALLS TO SLAB, USE POWER ACTUATED FASTENERS AT 16" O.C.
8. PANEL DIMENSIONS SHOWN ARE TO CENTERLINE OF PANEL JOINT. SEE ARCHITECTURAL DRAWINGS FOR ADDITIONAL PANEL DIMENSIONS.
9. ELEVATIONS OF PANELS ARE SHOWN STARTING ON SHEET S5.1 THROUGH S5.6.
10. UNLESS NOTED OTHERWISE, TILT-UP PANEL ELEVATIONS SHOW PANELS VIEWED FROM INSIDE OF BUILDING LOOKING TOWARDS BUILDING EXTERIOR.
11. POUR STRIP CONTROL JOINTS, LOCATE AT PANEL JOINTS AND MIDWAY BETWEEN. AT TURNS IN POUR STRIP ADD JOINTS FROM MAIN SLAB TO OUTSIDE WALL.
12. SEE 1/S3.2 FOR TRASH ENCLOSURE. SEE ARCHITECTURAL SITE PLAN FOR LOCATION.

LEGEND:

- ## — TILT-UP CONCRETE WALL. FOR REINFORCING REQUIREMENTS AND JOINT LOCATIONS, SEE TILT-UP CONCRETE PANEL ELEVATIONS ON SHEETS S5.1 THRU S5.6.
- PANEL JOINT BETWEEN TILT-UP CONCRETE WALL PANELS.

NELSON
Nelco Architecture, Inc.
1200 Fifth Ave.
Suite 1300
Seattle, WA 98101
Phone: (206) 408-8500
WWW.NELSONWORLDWIDE.COM

CLIENT:

PANATTONI®

PANATTONI DEVELOPMENT
1821 DOCK ST SUITE 100
TACOMA, WA 98402

PROJECT:

PUYALLUP CORPORATE CENTER

EAST MAIN AVENUE AT LINDEN LANE
PUYALLUP, WASHINGTON

Description:	No:	Date:
PERMIT SUBMITTAL		04/03/2020
PRICING SET	△	07/21/2020
PERMIT RESUBMITTAL		08/24/2020

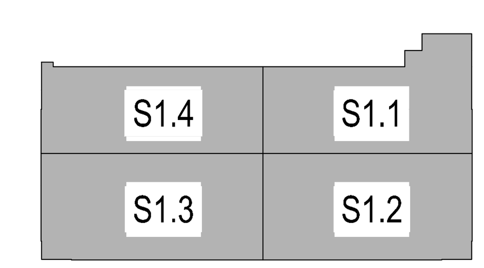
AHBL
TACOMA · SEATTLE · SPOKANE · TRI-CITIES
2215 North 30th Street, Suite 300 Tacoma, WA 98403
253.383.2422 TEL 253.383.2572 FAX www.ahbl.com WEB

SEAL:

DANIEL L. BOOTH
STATE OF WASHINGTON
STRUCTURAL ENGINEER
PROFESSIONAL ENGINEER

CITY STAMP:

NOTICE:



KEY PLAN

OVERALL FOUNDATION PLAN

Proj. No: 2190390.20

Reviewed By: LAH/CLR

S1.0

TABLE 1607.1
MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS, L_o, AND MINIMUM CONCENTRATED LIVE LOADS[g]

OCCUPANCY OR USE	UNIFORM (psf)	CONCENTRATED (pounds)
1. Apartments (see residential)	—	—
2. Access floor systems Office use Computer use	 50 100	 2,000 2,000
3. Armories and drill rooms	150^{n}	—
4. Assembly areas Fixed seats (fastened to floor) Follow spot, projections and control rooms Lobbies Movable seats Stage floors Platforms (assembly) Other assembly areas	 60^{m} 50 100^{m} 100^{m} 150^{n} 100^{m} 100^{m}	—
5. Balconies and decks[h]	1.5 times the live load for the area served, not required to exceed 100	—
6. Catwalks	40	300
7. Cornices	60	—
8. Corridors First floor Other floors	 100 Same as occupancy served except as indicated	—
9. Dining rooms and restaurants	100^{m}	—
10. Dwellings (see residential)	—	—
11. Elevator machine room and controlroom grating (on area of 2 inches by 2 inches)	—	300
12. Finish light floor plate construction (on area of 1 inch by 1 inch)	—	200
13. Fire escapes On single-family dwellings only	100 40	—
14. Garages (passenger vehicles only) Trucks and buses	40^{o} See Section 1607.7	Note a
15. Handrails, guards and grab bars	See Section 1607.8	
16. Helipads	See Section 1607.6	
17. Hospitals Corridors above first floor Operating rooms, laboratories Patient rooms	 80 60 40	 1,000 1,000 1,000
18. Hotels (see residential)	—	—
19. Libraries Corridors above first floor Reading rooms Stack rooms	 80 60 150$^{b, n}$	 1,000 1,000 1,000
20. Manufacturing Heavy Light	 250^{n} 125^{n}	 3,000 2,000
21. Marquees, except one- and two-family dwellings	75	—
22. Office buildings Corridors above first floor File and computer rooms shall be designed for heavier loads based on anticipated occupancy Lobbies and first-floor corridors Offices	 80 — 100 50	 2,000 — 2,000 2,000

(continued)

TABLE 1607.1—continued
MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS, L_o, AND MINIMUM CONCENTRATED LIVE LOADS[g]

OCCUPANCY OR USE	UNIFORM (psf)	CONCENTRATED (pounds)
23. Penal institutions Cell blocks Corridors	 40 100	—
24. Recreational uses: Bowling alleys, poolrooms and similar uses Dance halls and ballrooms Gymnasiums Ice skating rink Reviewing stands, grandstands and bleachers Roller skating rink Stadiums and arenas with fixed seats (fastened to floor)	 75^{m} 100^{m} 100^{m} 250^{n} 100$^{c, m}$ 100^{m} 60$^{c, m}$	—
25. Residential One- and two-family dwellings Uninhabitable attics without storagei Uninhabitable attics with storage[i, j, k] Habitable attics and sleeping areas[k] Canopies, including marquees All other areas Hotels and multifamily dwellings Private rooms and corridors serving them Public roomsm and corridors serving them	 10 20 30 20 40 40 100	—
26. Roofs All roof surfaces subject to maintenance workers Awnings and canopies: Fabric construction supported by a skeleton structure All other construction, except one- and two-family dwellings Ordinary flat, pitched, and curved roofs (that are not occupiable) Primary roof members exposed to a work floor Single panel point of lower chord of roof trusses or any point along primary structural members supporting roofs over manufacturing, storage warehouses, and repair garages All other primary roof members Occupiable roofs: Roof gardens Assembly areas All other similar areas	 5^{m} 20 20 100 100^{m} Note 1	 300 2,000 300 Note 1
27. Schools Classrooms Corridors above first floor First-floor corridors	 40 80 100	 1,000 1,000 1,000
28. Scuttles, skylight ribs and accessible ceilings	—	200
29. Sidewalks, vehicular driveways and yards, subject to trucking	250$^{d, m}$	8,000
30. Stairs and exits One- and two-family dwellings All other	 40 100	 300^{f} 300^{f}

(continued)

This is a beta release of the new ATC Hazards by Location website. Please contact us with feedback.

The ATC Hazards by Location website will not be updated to support ASCE 7-22. Find out why.

ATC Hazards by Location

Search Information

Coordinates: 47.19119836700967, -122.2611706795929

Elevation: 55 ft

Timestamp: 2022-10-05T02:44:43.491Z

Hazard Type: Wind

Map data ©2022 Imagery ©2022 , Maxar Technologies, U.S. Geological Survey, USDA/FPAC/GEO

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.

While the information presented on this website is believed to be correct, ATC and its sponsors and contributors assume no responsibility or liability for its accuracy. The material presented in the report should not be used or relied upon for any specific application without competent examination and verification of its accuracy, suitability and applicability by engineers or other licensed professionals. ATC does not intend that the use of this information replace the sound judgment of such competent professionals, having experience and knowledge in the field of practice, nor to substitute for the standard of care required of such professionals in interpreting and applying the results of the report provided by this website. Users of the information from this website assume all liability arising from such use. Use of the output of this website does not imply approval by the governing building code bodies responsible for building code approval and interpretation for the building site described by latitude/longitude location in the report.

1607.13.5.1 Roof live load. Roof structures that support photovoltaic panel systems shall be designed to resist each of the following conditions:

1. Applicable uniform and concentrated roof loads with the photovoltaic panel system dead loads.

   Exception: Roof live loads need not be applied to the area covered by photovoltaic panels where the clear space between the panels and the roof surface is 24 inches (610 mm) or less.

2. Applicable uniform and concentrated roof loads without the photovoltaic panel system present.

1607.13.5.2 Photovoltaic panels or modules. The structure of a roof that supports solar photovoltaic panels or modules shall be designed to accommodate the full solar photovoltaic panels or modules and ballast dead load, including concentrated loads from support frames in combination with the loads from Section 1607.13.5.1 and other applicable loads. Where applicable, snow drift loads created by the photovoltaic panels or modules shall be included.

1607.13.5.2.1 Photovoltaic panels installed on open grid roof structures. Structures with open grid framing and without a roof deck or sheathing supporting photovoltaic panel systems shall be designed to support the uniform and concentrated roof live loads specified in Section 1607.13.5.1, except that the uniform roof live load shall be permitted to be reduced to 12 psf (0.57 kN/m^2).

1607.13.5.3 Photovoltaic panels or modules installed as an independent structure. Solar photovoltaic panels or modules that are independent structures and do not have accessible/occupied space underneath are not required to accommodate a roof photovoltaic live load, provided that the area under the structure is restricted to keep the public away. Other loads and combinations in accordance with Section 1605 shall be accommodated.

Solar photovoltaic panels or modules that are designed to be the roof, span to structural supports and have accessible/occupied space underneath shall have the panels or modules and all supporting structures designed to support a roof photovoltaic live load, as defined in Section 1607.13.5.1 in combination with other applicable loads. Solar photovoltaic panels or modules in this application are not permitted to be classified as "not accessible" in accordance with Section 1607.13.5.1.

1607.13.5.4 Ballasted photovoltaic panel systems. Roof structures that provide support for ballasted *photovoltaic panel systems* shall be designed, or analyzed, in accordance with Section 1604.4; checked in accordance with Section 1604.3.6 for deflections; and checked in accordance with Section 1611 for ponding.

1607.14 Crane loads. The crane live load shall be the rated capacity of the crane. Design loads for the runway beams, including connections and support brackets, of moving bridge cranes and monorail cranes shall include the maximum wheel loads of the crane and the vertical impact, lateral and longitudinal forces induced by the moving crane.

1607.14.1 Maximum wheel load. The maximum wheel loads shall be the wheel loads produced by the weight of the bridge, as applicable, plus the sum of the rated capacity and the weight of the trolley with the trolley positioned on its runway at the location where the resulting load effect is maximum.

1607.14.2 Vertical impact force. The maximum wheel loads of the crane shall be increased by the following percentages to determine the induced vertical impact or vibration force:

Monorail cranes (powered) . . . . 25 percent

Cab-operated or remotely operated bridge cranes (powered). . . . . 25 percent

Pendant-operated bridge cranes (powered) . . . . 10 percent

Bridge cranes or monorail cranes with hand-geared bridge, trolley and hoist . . . . 0 percent

1607.14.3 Lateral force. The lateral force on crane runway beams with electrically powered trolleys shall be calculated as 20 percent of the sum of the rated capacity of the crane and the weight of the hoist and trolley. The lateral force shall be assumed to act horizontally at the traction surface of a runway beam, in either direction perpendicular to the beam, and shall be distributed with due regard to the lateral stiffness of the runway beam and supporting structure.

1607.14.4 Longitudinal force. The longitudinal force on crane runway beams, except for bridge cranes with hand-geared bridges, shall be calculated as 10 percent of the maximum wheel loads of the crane. The longitudinal force shall be assumed to act horizontally at the traction surface of a runway beam, in either direction parallel to the beam.

1607.15 Interior walls and partitions. Interior walls and partitions that exceed 6 feet (1829 mm) in height, including their finish materials, shall have adequate strength and stiffness to resist the loads to which they are subjected but not less than a horizontal load of 5 psf (0.240 kN/m^2).

1607.15.1 Fabric partitions. Fabric partitions that exceed 6 feet (1829 mm) in height, including their finish materials, shall have adequate strength and stiffness to resist the following load conditions:

1. The horizontal distributed load need only be applied to the partition framing. The total area used to determine the distributed load shall be the area of the fabric face between the framing members to which the fabric is attached. The total distributed load shall be uniformly applied to such framing members in proportion to the length of each member.

2. A concentrated load of 40 pounds (0.176 kN) applied to an 8-inch-diameter (203 mm) area [50.3 square inches (32 452 mm^2)] of the fabric face at a height of 54 inches (1372 mm) above the floor.

1607.15.2 Fire walls. In order to meet the structural stability requirements of Section 706.2 where the structure on either side of the wall has collapsed, fire walls and their supports shall be designed to withstand a minimum horizontal allowable stress load of 5 psf (0.240 kN/m^2).

This is a beta release of the new ATC Hazards by Location website. Please contact us with feedback.

The ATC Hazards by Location website will not be updated to support ASCE 7-22. Find out why.

ATC Hazards by Location

Search Information

Coordinates: 47.19119836700967, -122.2611706795929

Elevation: 55 ft

Timestamp: 2022-10-05T02:47:09.267Z

Hazard Type: Seismic

Reference Document: ASCE7-16

Risk Category: II

Site Class: D-default

Map data ©2022 Imagery ©2022 , Maxar Technologies, U.S. Geological Survey, USDA/FPAC/GEO

Basic Parameters

Name	Value	Description
S_S	1.258	MCE_R ground motion (period=0.2s)
S_1	0.433	MCE_R ground motion (period=1.0s)
S_{MS}	1.509	Site-modified spectral acceleration value
S_{M1}	* null	Site-modified spectral acceleration value
S_{DS}	1.006	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	1.258	Probabilistic risk-targeted ground motion (0.2s)
SsUH	1.376	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	0.482	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
S1D	0.6	Factored deterministic acceleration value (1.0s)
PGAd	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.

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 provided by the U.S. Geological Survey Seismic Design Web Services.

While the information presented on this website is believed to be correct, ATC and its sponsors and contributors assume no responsibility or liability for its accuracy. The material presented in the report should not be used or relied upon for any specific application without competent examination and verification of its accuracy, suitability and applicability by engineers or other licensed professionals. ATC does not intend that the use of this information replace the sound judgment of such competent professionals, having experience and knowledge in the field of practice, nor to substitute for the standard of care required of such professionals in interpreting and applying the results of the report provided by this website. Users of the information from this website assume all liability arising from such use. Use of the output of this website does not imply approval by the governing building code bodies responsible for building code approval and interpretation for the building site described by latitude/longitude location in the report.

AHBL Inc.
2215 N. 30th St.
Tacoma, WA 98403
253-383-2422

JOB TITLE	Red Dot - Equipment		
JOB NO.	2220760.20	SHEET NO.	
CALCULATED BY		DATE	
CHECKED BY	ADM	DATE	8/8/23

Seismic Loads: IBC 2018 — Strength Level Forces

Risk Category : II
Importance Factor (I) : 1.00
Site Class : D - code default

Ss (0.2 sec) = 125.80 %g
S1 (1.0 sec) = 43.30 %g
A site specific ground motion analysis is required for seismically isolated structures or with damping systems, see ASCE7 11.4.8

Fa =	1.200	Sms =	1.510	S_{DS} =	1.006	Design Category =	D
Fv =	1.867	Sm1 =	0.808	S_{D1} =	0.539	Design Category =	D

Seismic Design Category = **D**

Redundancy Coefficient ρ = 1.00 Code exception must be met for p to equal 1.0
Number of Stories: 1
Structure Type: All other building system:
Horizontal Struct Irregularities: No plan Irregularity
Vertical Structural Irregularities: No vertical Irregularity
Flexible Diaphragms: No
Building System: **Bearing Wall Systems**
Seismic resisting system: **Light frame walls with shear panels - all other materials**
System Structural Height Limit: **35 ft**
Actual Structural Height (hn) = 16.9 ft
See ASCE7 Section 12.2.5 for exceptions and other system limitations

DESIGN COEFFICIENTS AND FACTORS

Response Modification Coefficient (R) = 2
Over-Strength Factor (Ωo) = 2.5
Deflection Amplification Factor (Cd) = 2
S_{DS} = 1.000 (Sds modified for Cs & Ev calculation since
S_{D1} = 0.539 meets ASCE 7 section 12.8.1.3

Seismic Load Effect (E) = Eh +/-Ev = ρ Q_E +/- $0.2S_{DS}$ D = Qe +/- 0.200D Q_E = horizontal seismic force
Special Seismic Load Effect (Em) = Emh +/- Ev = Ωo Q_E +/- $0.2S_{DS}$ D = 2.5Qe +/- 0.201D D = dead load

PERMITTED ANALYTICAL PROCEDURES

Simplified Analysis - Use Equivalent Lateral Force Analysis

Equivalent Lateral-Force Analysis - Permitted
Building period coef. (C_T) = 0.020 Cu = 1.40
Approx fundamental period (Ta) = $C_T h_n^x$ = 0.167 sec x= 0.75 Tmax = CuTa = 0.233
User calculated fundamental period (T) = sec Use T = 0.167
Long Period Transition Period (TL) = ASCE7 map = 6

Seismic response coef. (Cs) = SdsI/R = 0.500 ASCE7 11.4.8 exception 2 equations used
but not less than Cs = 0.044SdsI = 0.044
USE Cs = 0.500
Design Base Shear V = 0.500W

Model & Seismic Response Analysis - Permitted (see code for procedure)

ALLOWABLE STORY DRIFT

Structure Type: All other structures
Allowable story drift Δa = 0.020hsx where hsx is the story height below level x

3.3 Groundwater

We observed light to moderate groundwater seepage in 6 of the 14 test pits at depths ranging from 7.5 to 10 feet below existing site grades. Additionally, we observed wet soil from 7.5 to 10 feet in 8 of the test pits. We performed two pore water dissipation tests. One at CPT-1 and one at CPT-5. Based on the test results, the static groundwater level was indicated to be at a depth of four to seven feet below current site grades. Fluctuations in the static groundwater level will occur seasonally. Based on the time of year of our testing, we expect the groundwater levels indicated to be near their seasonal lows. Typically, groundwater will reach maximum levels during the wet winter months.

3.4 Seismic

Liquefaction is a phenomenon where there is a reduction or complete loss of soil strength due to an increase in water pressure induced by vibrations. Liquefaction mainly affects geologically recent deposits of fine-grained sands underlying the groundwater table. Soils of this nature derive their strength from intergranular friction. The generated water pressure or pore pressure essentially separates the soil grains and eliminates this intergranular friction; thus, eliminating the soil's strength.

We completed a liquefaction analysis using the computer program LiquefyPro published by CivilTech Corporation. The analysis was completed using a ground acceleration value of 0.55g, which is the ASCE 7-16 site-modified peak ground acceleration value (PGA_M) determined using the map-based online ground motion parameter calculator at https://seismicmaps.org/ for Latitude 47.191033°N and Longitude 122.261465°W. The results of the liquefaction analysis are attached in Appendix B.

The results of our analysis indicate soil liquefaction could occur during the design earthquake event. Analysis indicates that liquefaction of the alluvial soil layers could result in total settlements between three and three and one half inches, half of which could be differential. If unmitigated, these settlements would result in some cracking of building walls and floor slabs, as well as distortion of doors and windows, but would not structurally impair the building's use, in our opinion. If the Owner is not willing to accept the risk associated with the potential settlements due to liquefaction of the site soils, the building should be supported on densified aggregate piers.

Based on the soil conditions encountered and the local geology, the 2018 International Building Code (IBC) indicates that site class "D" should be used in structural design.

4.0 DISCUSSION AND RECOMMENDATIONS

4.1 General

Based on our study, in our opinion, development of the site as proposed is feasible from a geotechnical engineering standpoint. The primary geotechnical concern at the site is the presence of compressible soil strata susceptible to consolidation under the planned fill placement and building loads. If unmitigated, compression of these soft soils under project loads would result in unacceptable levels of differential settlement.

4.4 Foundations

Spread Footings

The industrial building may be supported on conventional spread footing foundations bearing on foundation subgrade prepared as recommended in Section 4.2 of this report. Perimeter foundations exposed to the weather should bear at a minimum depth of 1.5 feet below final exterior grades for frost protection. Interior foundations can be constructed at any convenient depth below the floor slab.

Following the completion of a successful surcharge program, we recommend designing foundations for a net allowable bearing capacity of 2,500 pounds per square foot (psf). For short-term loads, such as wind and seismic, a one-third increase in this allowable capacity can be used in design. Following successful completion of the surcharge program, with structural loading as anticipated and this bearing stress applied, estimated immediate foundation settlements of about 1-inch and differential settlement of ½-inch should be expected.

For designing foundations to resist lateral loads, a base friction coefficient of 0.35 can be used. Passive earth pressures acting on the sides of the footings can also be considered. We recommend calculating this lateral resistance using an equivalent fluid weight of 300 pounds per cubic foot (pcf). We recommend not including the upper 12 inches of soil in this computation because it can be affected by weather or disturbed by future grading activity. This value assumes the foundations will be backfilled with structural fill, as described in Section 4.2 of this report. The values recommended include a safety factor of 1.5.

Ground Improvement

As discussed above, as a foundation support alternative in lieu of implementing a surcharge fill program, we recommend using ground improvement techniques to establish support for conventional spread footing designs. Methods that could be considered include vibrated stone columns or aggregate rammed piers. Both of these methods create highly densified columns of graded aggregate that would extend through the upper softer soils into the underlying medium dense soils.

Because of the methods used to construct the columns, some improvement of the adjacent soils is also realized. Moreover, these methods can provide liquefaction mitigation by providing drainage paths and reduced pore pressures during ground shaking, and by constructing relatively high strength, non-liquefiable inclusions in the soils. Once constructed, conventional spread footing foundations can be designed to bear immediately above the stone column/aggregate pier locations.

These ground improvement techniques are typically completed on a design/build approach with both design and construction completed by a specialty contractor. We can assist in selecting the specialty contractor, if desired.

4.5 Slab-on-Grade Floors

Slab-on-grade floors may be supported on a subgrade as recommended in Section 4.2. Immediately below the floor slab, we recommend placing a four-inch thick capillary break layer composed of clean, coarse sand or fine gravel that has less than three percent passing the No. 200 sieve. This material will reduce the potential for upward capillary movement of water through the underlying soil and subsequent wetting of the floor slab.

The capillary break layer will not prevent moisture intrusion through the slab caused by water vapor transmission. Where moisture by vapor transmission is undesirable, such as covered floor areas, a common practice is to place a durable plastic membrane on the capillary break layer and then cover the membrane with a layer of clean sand or fine gravel to protect it from damage during construction, and to aid in uniform curing of the concrete slab. It should be noted that if the sand or gravel layer overlying the membrane is saturated prior to pouring the slab, it will not be effective in assisting uniform curing of the slab and can actually serve as a water supply for moisture bleeding through the slab, potentially affecting floor coverings. Therefore, in our opinion, covering the membrane with a layer of sand or gravel should be avoided if floor slab construction occurs during the wet winter months and the layer cannot be effectively drained. We recommend floor designers and contractors refer to the current American Concrete Institute (ACI) Manual of Concrete Practice for further information regarding vapor barrier installation below slab-on-grade floors.

4.6 Infiltration Feasibility

Based on our study, it is our opinion that subsurface conditions are generally not favorable for infiltration of site stormwater. The native soils observed at the site contain a high percentage of soil fines that would impede any downward migration of site stormwater. Additionally, mottling was observed that indicates a shallow groundwater table develops at the site that would further impede any stormwater migration. Even low impact development (LID) techniques would likely fill up and overtop during rain events and cause minor local flooding. The USDA Natural Resources Conservation Service (NRSC) categorizes the soils at the lower southern portion of the site as Briscot loam. These soils fall into Hydrologic Group C as outlined in Table B.5 in Appendix III-B of the *2015 Pierce County Stormwater and Site Development Manual (PCSSDM)* and are classified as having low infiltration rates when wetted. Based on these soil conditions, it is our opinion that the stormwater should be managed using a conventional system.

4.7 Lateral Earth Pressures

The magnitude of earth pressure development on retaining walls will partly depend on the quality of wall backfill. Where fill is placed behind retaining walls, we recommend placing and compacting it as structural fill as described in Section 4.2. To guard against the build-up of hydrostatic pressure, wall drainage must also be installed. We recommend that wall drainage consist of a minimum 12-inch thick layer of washed gravel placed adjacent to the wall. Alternatively, a composite drainage panel such as Mirafi G100N or equal can be used. A four-inch diameter perforated pipe should be placed on a bed of gravel along the base of the wall footing and directed to a suitable outlet. A typical wall drainage detail is attached as Figure 4.

With granular backfill placed and compacted as recommended and drainage properly installed, we recommend designing restrained (not free to deflect) retaining walls for an at-rest earth pressure equivalent to a fluid weighing 50 pcf. A value of 35 pcf may be used for the case where the wall is unrestrained. These values do not include other surcharge loading such as from fill backslopes or adjacent footings that may act on the wall. If such conditions will exist, then the imposed loading must be included in wall design. Values of friction at the base of wall foundations and passive earth pressure that are used in design to resist lateral loads are provided in Section 5.4 of this report.

30 ft
STANLEY
P.R. APP'D
NO. 339 TC


STANLEY


9
8
7
6
5
4
3
2
STANLEY

Project RSD DOT
Subject
With/To
Address
Date 8/8/23

Project No. 2220760.20
Phone
Fax #
Faxed Pages
By AA

☐ Page ___ of ___
☒ Calculations
☐ Fax
☐ Memorandum
☐ Meeting Minutes
☐ Telephone Memo

AHBL

Civil Engineers

Structural Engineers

Landscape Architects

Community Planners

Land Surveyors

ENVIRO CHAMBER LATERAL ANALYSIS

MINIMUM OUT-OF-PLANE LOAD

5 PSF FOR INTERIOR PARTITIONS

SEISMIC ANALYSIS

7" FOAM SANDWICH PANELS

$w = 4$ PSF (APPROX)

SEISMIC LOAD - WALL DESIGN FORCES

$F_p = 0.4 (S_{DS})(I_e) w_p$

$= 0.4 (1.006)(1.0)(4 \text{ psf})$

$= 1.61$ PSF (ULT)

∴ 5 PSF GOVERNS BY INSPECTION

If this does not meet with your understanding, please contact us in writing within seven days. THANK YOU.

Project RED DOT

Subject

With/To

Address

Date 8/8/20

Project No. 2220760.20

Phone

Fax #

Faxed Pages

By ADM

☐ Page _____ of _____
☒ Calculations
☐ Fax
☐ Memorandum
☐ Meeting Minutes
☐ Telephone Memo

AHBL

Civil Engineers

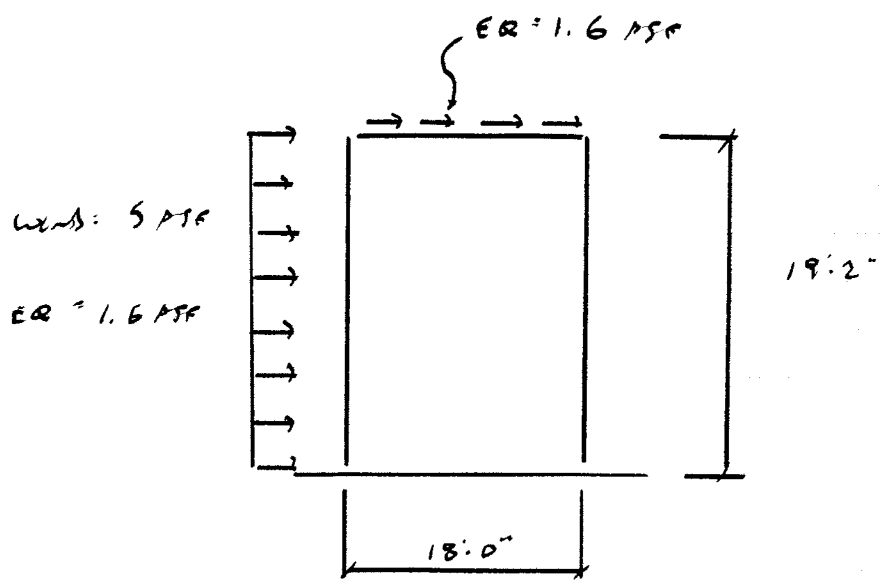
Structural Engineers

Landscape Architects

Community Planners

Land Surveyors

ENVIRO CHAMBER LATERAL ANALYSIS



LOAD TO ROOF LEVEL

WIND = 5 PSF (1/2) (19'-2") (2 WALLS)

= 96 PLF ASD

SEISMIC = 1.6 PSF (1/2) (19'-2") (2 WALLS) +
1.6 PSF (18')

= 59.5 PLF (ULT)
= 42 PLF (ASD) ∴ 5 PSF LOAD GOVERNS