



ELVER PARK ART DISPLAY
Madison, WI

STRUCTURAL CALCULATIONS FOR FOUNDATION AND MOUNTING

Prepared for VEA EVENTS

Project No. 18073

Date 08/21/18

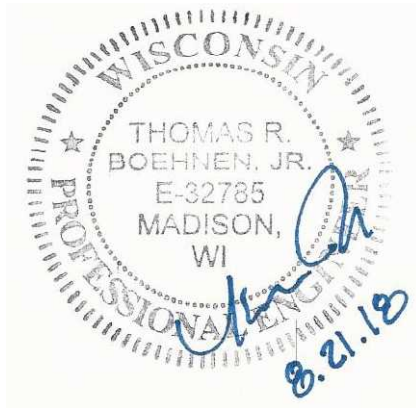
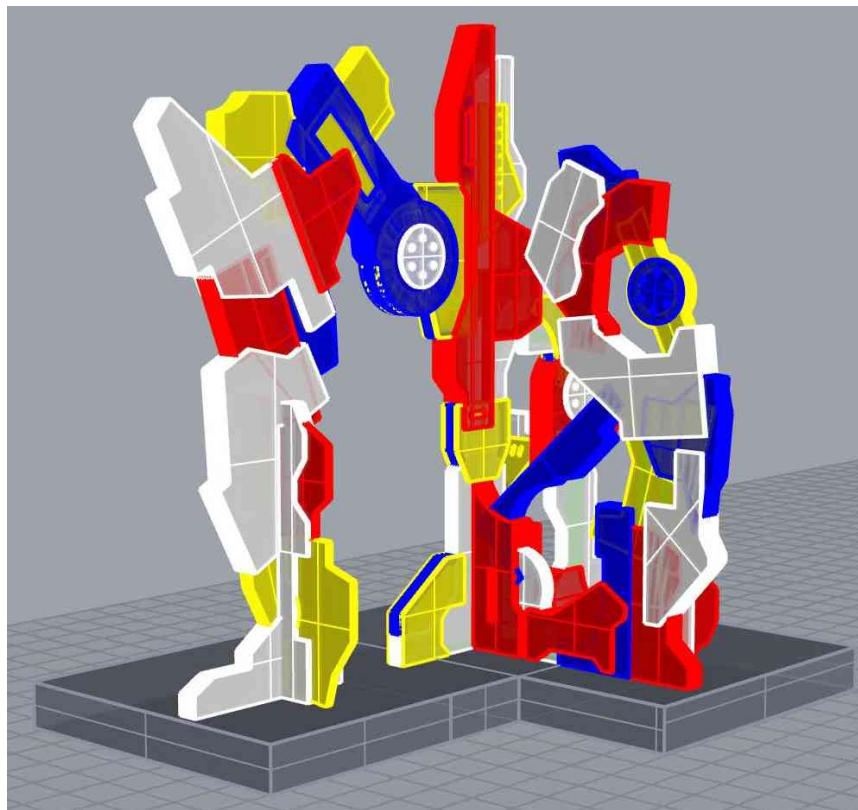


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Design Criteria.....DC
Framing.....FR



Wind Loads - Other Structures:

ASCE 7- 10

Ultimate Wind Pressures

Importance Factor = 1.00
Gust Effect Factor (G) = 0.85
Kzt = 1.00
Wind Speed = 115 mph
Exposure = C

A. Solid Freestanding Walls & Solid Signs (& open signs with less than 30% open)

Dist to sign top (h) = 8.0 ft
Height (s) = 8.0 ft
Width (B) = 8.0 ft
Wall Return (Lr) =
Directionality (Kd) = 0.85
Percent of open area to gross area = 0.0%

s/h = 1.00
B/s = 1.00
Lr/s = 0.00
Kz = 0.849
qz = 24.4 psf

ASCE7 Load Combinations Used

Open reduction factor = 1.00

Case A & B

Cf = 1.45
F = qz G Cf As = 30.1 As
As = 31.0 sf
F = 933 lbs

CaseC

Horiz dist from windward edge

| Horiz dist from windward edge | Cf | F=qzGCfAs (psf) |
|-------------------------------|------|-----------------|
| 0 to s | 1.80 | 37.4 As |
| s to 2s | 1.20 | 24.9 As |

Case C reduction factors

Factor if s/h>0.8 = 0.80
Wall return factor for Cf at 0 to s = 1.00

ASSUMED BEARING CAPACITY OF SOIL = 1500 PSF

F wind = 0.6(933) = 560 lbs

M = 560 (4') = 2240 ft-lbs

T/C anchor at narrow side = (2240/2) / (0.708x2) = 790 lbs

USE 3/8" DIAM STAINLESS STEEL EXP ANCHOR (4" EMBEDMENT) AT 18 LOCATIONS - SEE PLAN

t plate = [6*790*3"/(0.75*40000*5")]^{0.5} = .307" ---**Use 3/8"x5"x10 base plate** (SEE PLAN FOR LOCATIONS)

USE MIN FOOTING OF 12" THICK AND 4' WIDE WITH #5 BARS AT 12" O.C. EW BOTTOM OF FOOTING

General Footing

Lic. #: KW-06010406

Description: **MIN FOOTING FOR DISPLAY**

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Licensee: **Echelon Structures**

Code References

Calculations per ACI 318-11, IBC 2012, CBC 2013, ASCE 7-10
 Load Combinations Used : ASCE 7-05

General Information

Material Properties

| | | | |
|---|---|---------|-----|
| f _c : Concrete 28 day strength | = | 3.0 | ksi |
| f _y : Rebar Yield | = | 60.0 | ksi |
| E _c : Concrete Elastic Modulus | = | 3,122.0 | ksi |
| Concrete Density | = | 145.0 | pcf |
| φ Values Flexure | = | 0.90 | |
| Shear | = | 0.750 | |

Soil Design Values

| | | | |
|---------------------------------------|---|-------|-----|
| Allowable Soil Bearing | = | 1.50 | ksf |
| Increase Bearing By Footing Weight | = | No | |
| Soil Passive Resistance (for Sliding) | = | 150.0 | pcf |
| Soil/Concrete Friction Coeff. | = | 0.30 | |

Analysis Settings

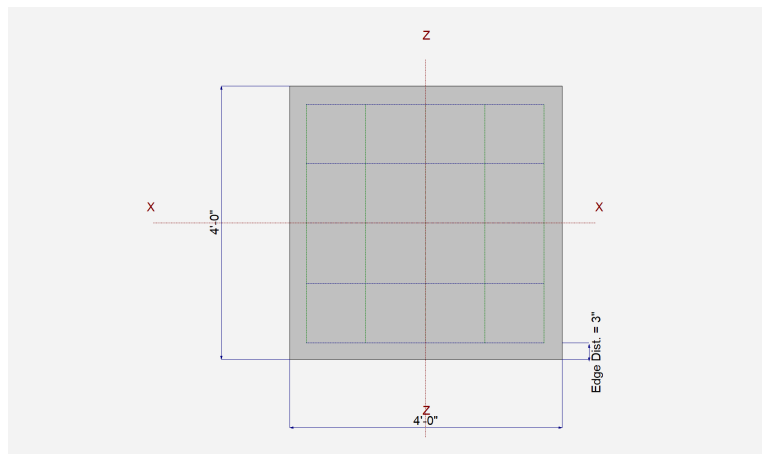
| | | | |
|--|---|---------|-----|
| Min Steel % Bending Reinf. | = | | |
| Min Allow % Temp Reinf. | = | 0.00180 | |
| Min. Overturning Safety Factor | = | 1.0 | : 1 |
| Min. Sliding Safety Factor | = | 1.0 | : 1 |
| Add Ftg Wt for Soil Pressure | : | Yes | |
| Use ftg wt for stability, moments & shears | : | Yes | |
| Add Pedestal Wt for Soil Pressure | : | No | |
| Use Pedestal wt for stability, mom & shear | : | No | |

| | | | |
|---|---|------|--------|
| Increases based on footing Depth | | | |
| Footing base depth below soil surface | = | 0.50 | ft |
| Allow press. increase per foot of depth when footing base is below | = | | ksf ft |
| Increases based on footing plan dimension | | | |
| Allowable pressure increase per foot of depth when max. length or width is greater than | = | | ksf ft |

Dimensions

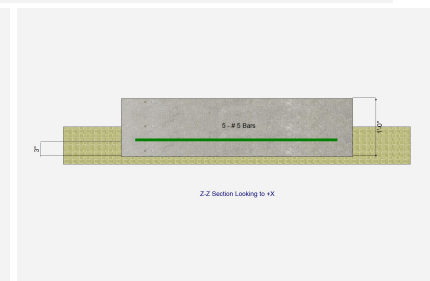
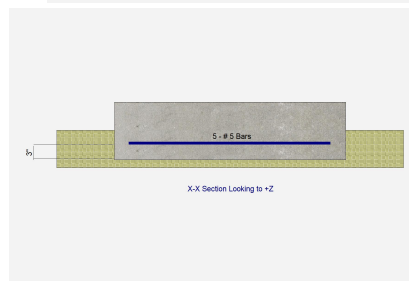
| | | | |
|-----------------------------|---|------|----|
| Width parallel to X-X Axis | = | 4.0 | ft |
| Length parallel to Z-Z Axis | = | 4.0 | ft |
| Footing Thickness | = | 12.0 | in |

| | | | |
|--|---|-----|----|
| Pedestal dimensions... | | | |
| px : parallel to X-X Axis | = | | in |
| pz : parallel to Z-Z Axis | = | | in |
| Height | = | | in |
| Rebar Centerline to Edge of Concrete... at Bottom of footing | = | 3.0 | in |



Reinforcing

| | | | |
|---------------------------|---|-----|--|
| Bars parallel to X-X Axis | | | |
| Number of Bars | = | 5 | |
| Reinforcing Bar Size | = | # 5 | |
| Bars parallel to Z-Z Axis | | | |
| Number of Bars | = | 5 | |
| Reinforcing Bar Size | = | # 5 | |



| | | | |
|---|--|-----|--|
| Bandwidth Distribution Check (ACI 15.4.4.2) | | | |
| Direction Requiring Closer Separation | | n/a | |
| # Bars required within zone | | n/a | |
| # Bars required on each side of zone | | n/a | |

Applied Loads

| | D | Lr | L | S | W | E | H |
|-----------------|---|----|---|---|-------|---|------|
| P : Column Load | = | | | | | | k |
| OB : Overburden | = | | | | | | ksf |
| M-xx | = | | | | | | k-ft |
| M-zz | = | | | | 2.240 | | k-ft |
| V-x | = | | | | | | k |
| V-z | = | | | | | | k |

General Footing

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Lic. #: KW-06010406

Licensee: Echelon Structures

 Description: **MIN FOOTING FOR DISPLAY**
DESIGN SUMMARY
Design OK

| | Min. Ratio | Item | Applied | Capacity | Governing Load Combination |
|-------------|------------|-------------------|----------------|----------------|----------------------------|
| PASS | 0.3890 | Soil Bearing | 0.5835 ksf | 1.50 ksf | +0.60D+W+H about Z-Z axis |
| PASS | n/a | Overturning - X-X | 0.0 k-ft | 0.0 k-ft | No Overturning |
| PASS | 1.243 | Overturning - Z-Z | 2.240 k-ft | 2.784 k-ft | +0.60D+W+H |
| PASS | n/a | Sliding - X-X | 0.0 k | 0.0 k | No Sliding |
| PASS | n/a | Sliding - Z-Z | 0.0 k | 0.0 k | No Sliding |
| PASS | n/a | Uplift | 0.0 k | 0.0 k | No Uplift |
| PASS | 0.04223 | Z Flexure (+X) | 0.6347 k-ft/ft | 15.031 k-ft/ft | +0.90D+1.60W+1.60H |
| PASS | 0.02314 | Z Flexure (-X) | 0.3479 k-ft/ft | 15.031 k-ft/ft | +1.20D+0.50Lr+0.50L+1.60W |
| PASS | 0.0 | X Flexure (+Z) | 0.0 k-ft/ft | 15.031 k-ft/ft | +0.90D+1.60W+1.60H |
| PASS | 0.0 | X Flexure (-Z) | 0.0 k-ft/ft | 15.031 k-ft/ft | +0.90D+1.60W+1.60H |
| PASS | 0.04058 | 1-way Shear (+X) | 3.334 psi | 82.158 psi | +0.90D+1.60W+1.60H |
| PASS | 0.02432 | 1-way Shear (-X) | 1.998 psi | 82.158 psi | +1.20D+0.50Lr+0.50L+1.60W |
| PASS | 0.0 | 1-way Shear (+Z) | 0.0 psi | 82.158 psi | +0.90D+1.60W+1.60H |
| PASS | 0.0 | 1-way Shear (-Z) | 0.0 psi | 82.158 psi | +0.90D+1.60W+1.60H |
| PASS | 0.001265 | 2-way Punching | 0.2078 psi | 164.317 psi | +0.90D+1.60W+1.60H |

Detailed Results
Soil Bearing

| Rotation Axis & Load Combination... | Gross Allowable | Xecc | Zecc (in) | Actual Soil Bearing Stress @ Location | | Left, -X | Right, +X | Actual / Allow Ratio |
|-------------------------------------|-----------------|--------|-----------|---------------------------------------|---------|----------|-----------|----------------------|
| | | | | Bottom, -Z | Top, +Z | | | |
| X-X, D Only | 1.50 | n/a | 0.0 | 0.1450 | 0.1450 | n/a | n/a | 0.097 |
| X-X, +D+L+H | 1.50 | n/a | 0.0 | 0.1450 | 0.1450 | n/a | n/a | 0.097 |
| X-X, +D+Lr+H | 1.50 | n/a | 0.0 | 0.1450 | 0.1450 | n/a | n/a | 0.097 |
| X-X, +D+S+H | 1.50 | n/a | 0.0 | 0.1450 | 0.1450 | n/a | n/a | 0.097 |
| X-X, +D+0.750Lr+0.750L+H | 1.50 | n/a | 0.0 | 0.1450 | 0.1450 | n/a | n/a | 0.097 |
| X-X, +D+0.750L+0.750S+H | 1.50 | n/a | 0.0 | 0.1450 | 0.1450 | n/a | n/a | 0.097 |
| X-X, +D+W+H | 1.50 | n/a | 0.0 | 0.1450 | 0.1450 | n/a | n/a | 0.097 |
| X-X, +D+0.70E+H | 1.50 | n/a | 0.0 | 0.1450 | 0.1450 | n/a | n/a | 0.097 |
| X-X, +D+0.750Lr+0.750L+0.750W+H | 1.50 | n/a | 0.0 | 0.1450 | 0.1450 | n/a | n/a | 0.097 |
| X-X, +D+0.750L+0.750S+0.750W+H | 1.50 | n/a | 0.0 | 0.1450 | 0.1450 | n/a | n/a | 0.097 |
| X-X, +D+0.750Lr+0.750L+0.5250E+H | 1.50 | n/a | 0.0 | 0.1450 | 0.1450 | n/a | n/a | 0.097 |
| X-X, +D+0.750L+0.750S+0.5250E+H | 1.50 | n/a | 0.0 | 0.1450 | 0.1450 | n/a | n/a | 0.097 |
| X-X, +0.60D+W+H | 1.50 | n/a | 0.0 | 0.0870 | 0.0870 | n/a | n/a | 0.058 |
| X-X, +0.60D+0.70E+H | 1.50 | n/a | 0.0 | 0.0870 | 0.0870 | n/a | n/a | 0.058 |
| Z-Z, D Only | 1.50 | 0.0 | n/a | n/a | n/a | 0.1450 | 0.1450 | 0.097 |
| Z-Z, +D+L+H | 1.50 | 0.0 | n/a | n/a | n/a | 0.1450 | 0.1450 | 0.097 |
| Z-Z, +D+Lr+H | 1.50 | 0.0 | n/a | n/a | n/a | 0.1450 | 0.1450 | 0.097 |
| Z-Z, +D+S+H | 1.50 | 0.0 | n/a | n/a | n/a | 0.1450 | 0.1450 | 0.097 |
| Z-Z, +D+0.750Lr+0.750L+H | 1.50 | 0.0 | n/a | n/a | n/a | 0.1450 | 0.1450 | 0.097 |
| Z-Z, +D+0.750L+0.750S+H | 1.50 | 0.0 | n/a | n/a | n/a | 0.1450 | 0.1450 | 0.097 |
| Z-Z, +D+W+H | 1.50 | 11.586 | n/a | n/a | n/a | 0.0 | 0.3714 | 0.248 |
| Z-Z, +D+0.70E+H | 1.50 | 0.0 | n/a | n/a | n/a | 0.1450 | 0.1450 | 0.097 |
| Z-Z, +D+0.750Lr+0.750L+0.750W+H | 1.50 | 8.690 | n/a | n/a | n/a | 0.0 | 0.3015 | 0.201 |
| Z-Z, +D+0.750L+0.750S+0.750W+H | 1.50 | 8.690 | n/a | n/a | n/a | 0.0 | 0.3015 | 0.201 |
| Z-Z, +D+0.750Lr+0.750L+0.5250E+H | 1.50 | 0.0 | n/a | n/a | n/a | 0.1450 | 0.1450 | 0.097 |
| Z-Z, +D+0.750L+0.750S+0.5250E+H | 1.50 | 0.0 | n/a | n/a | n/a | 0.1450 | 0.1450 | 0.097 |
| Z-Z, +0.60D+W+H | 1.50 | 19.310 | n/a | n/a | n/a | 0.0 | 0.5835 | 0.389 |
| Z-Z, +0.60D+0.70E+H | 1.50 | 0.0 | n/a | n/a | n/a | 0.0870 | 0.0870 | 0.058 |

Overturning Stability

| Rotation Axis & Load Combination... | Overturning Moment | Resisting Moment | Stability Ratio | Status |
|-------------------------------------|--------------------|------------------|-----------------|--------|
| X-X, D Only | None | 0.0 k-ft | Infinity | OK |
| X-X, +D+L+H | None | 0.0 k-ft | Infinity | OK |
| X-X, +D+Lr+H | None | 0.0 k-ft | Infinity | OK |
| X-X, +D+S+H | None | 0.0 k-ft | Infinity | OK |
| X-X, +D+0.750Lr+0.750L+H | None | 0.0 k-ft | Infinity | OK |
| X-X, +D+0.750L+0.750S+H | None | 0.0 k-ft | Infinity | OK |
| X-X, +D+W+H | None | 0.0 k-ft | Infinity | OK |
| X-X, +D+0.70E+H | None | 0.0 k-ft | Infinity | OK |

General Footing

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 Licensee : **Echelon Structures**

 Description : **MIN FOOTING FOR DISPLAY**
Overturning Stability

| Rotation Axis & Load Combination... | Overturning Moment | Resisting Moment | Stability Ratio | Status |
|-------------------------------------|--------------------|------------------|-----------------|--------|
| X-X, +D+0.750Lr+0.750L+0.750W+H | None | 0.0 k-ft | Infinity | OK |
| X-X, +D+0.750L+0.750S+0.750W+H | None | 0.0 k-ft | Infinity | OK |
| X-X, +D+0.750Lr+0.750L+0.5250E+H | None | 0.0 k-ft | Infinity | OK |
| X-X, +D+0.750L+0.750S+0.5250E+H | None | 0.0 k-ft | Infinity | OK |
| X-X, +0.60D+W+H | None | 0.0 k-ft | Infinity | OK |
| X-X, +0.60D+0.70E+H | None | 0.0 k-ft | Infinity | OK |
| Z-Z, D Only | None | 0.0 k-ft | Infinity | OK |
| Z-Z, +D+L+H | None | 0.0 k-ft | Infinity | OK |
| Z-Z, +D+Lr+H | None | 0.0 k-ft | Infinity | OK |
| Z-Z, +D+S+H | None | 0.0 k-ft | Infinity | OK |
| Z-Z, +D+0.750Lr+0.750L+H | None | 0.0 k-ft | Infinity | OK |
| Z-Z, +D+0.750L+0.750S+H | None | 0.0 k-ft | Infinity | OK |
| Z-Z, +D+W+H | 2.240 k-ft | 4.640 k-ft | 2.071 | OK |
| Z-Z, +D+0.70E+H | None | 0.0 k-ft | Infinity | OK |
| Z-Z, +D+0.750Lr+0.750L+0.750W+H | 1.680 k-ft | 4.640 k-ft | 2.762 | OK |
| Z-Z, +D+0.750L+0.750S+0.750W+H | 1.680 k-ft | 4.640 k-ft | 2.762 | OK |
| Z-Z, +D+0.750Lr+0.750L+0.5250E+H | None | 0.0 k-ft | Infinity | OK |
| Z-Z, +D+0.750L+0.750S+0.5250E+H | None | 0.0 k-ft | Infinity | OK |
| Z-Z, +0.60D+W+H | 2.240 k-ft | 2.784 k-ft | 1.243 | OK |
| Z-Z, +0.60D+0.70E+H | None | 0.0 k-ft | Infinity | OK |

All units k

Sliding Stability

| Force Application Axis Load Combination... | Sliding Force | Resisting Force | Stability Ratio | Status |
|--|---------------|-----------------|-----------------|--------|
|--|---------------|-----------------|-----------------|--------|

Footing Has NO Sliding

Footing Flexure

| Flexure Axis & Load Combination | Mu k-ft | Side | Tension Surface | As Req'd in^2 | Gvrn. As in^2 | Actual As in^2 | Phi*Mn k-ft | Status |
|---------------------------------|---------|------|-----------------|---------------|---------------|----------------|-------------|--------|
| X-X, +1.40D | 0.0 | +Z | Bottom | 0.2592 | Min Temp % | 0.3875 | 15.031 | OK |
| X-X, +1.40D | 0.0 | -Z | Bottom | 0.2592 | Min Temp % | 0.3875 | 15.031 | OK |
| X-X, +1.20D+0.50Lr+1.60L+1.60H | 0.0 | +Z | Bottom | 0.2592 | Min Temp % | 0.3875 | 15.031 | OK |
| X-X, +1.20D+0.50Lr+1.60L+1.60H | 0.0 | -Z | Bottom | 0.2592 | Min Temp % | 0.3875 | 15.031 | OK |
| X-X, +1.20D+1.60L+0.50S+1.60H | 0.0 | +Z | Bottom | 0.2592 | Min Temp % | 0.3875 | 15.031 | OK |
| X-X, +1.20D+1.60L+0.50S+1.60H | 0.0 | -Z | Bottom | 0.2592 | Min Temp % | 0.3875 | 15.031 | OK |
| X-X, +1.20D+1.60Lr+0.50L | 0.0 | +Z | Bottom | 0.2592 | Min Temp % | 0.3875 | 15.031 | OK |
| X-X, +1.20D+1.60Lr+0.50L | 0.0 | -Z | Bottom | 0.2592 | Min Temp % | 0.3875 | 15.031 | OK |
| X-X, +1.20D+1.60Lr+0.80W | 0.0 | +Z | Bottom | 0.2592 | Min Temp % | 0.3875 | 15.031 | OK |
| X-X, +1.20D+1.60Lr+0.80W | 0.0 | -Z | Bottom | 0.2592 | Min Temp % | 0.3875 | 15.031 | OK |
| X-X, +1.20D+0.50L+1.60S | 0.0 | +Z | Bottom | 0.2592 | Min Temp % | 0.3875 | 15.031 | OK |
| X-X, +1.20D+0.50L+1.60S | 0.0 | -Z | Bottom | 0.2592 | Min Temp % | 0.3875 | 15.031 | OK |
| X-X, +1.20D+1.60S+0.80W | 0.0 | +Z | Bottom | 0.2592 | Min Temp % | 0.3875 | 15.031 | OK |
| X-X, +1.20D+1.60S+0.80W | 0.0 | -Z | Bottom | 0.2592 | Min Temp % | 0.3875 | 15.031 | OK |
| X-X, +1.20D+0.50Lr+0.50L+1.60W | 0.0 | +Z | Bottom | 0.2592 | Min Temp % | 0.3875 | 15.031 | OK |
| X-X, +1.20D+0.50Lr+0.50L+1.60W | 0.0 | -Z | Bottom | 0.2592 | Min Temp % | 0.3875 | 15.031 | OK |
| X-X, +1.20D+0.50L+0.50S+1.60W | 0.0 | +Z | Bottom | 0.2592 | Min Temp % | 0.3875 | 15.031 | OK |
| X-X, +1.20D+0.50L+0.50S+1.60W | 0.0 | -Z | Bottom | 0.2592 | Min Temp % | 0.3875 | 15.031 | OK |
| X-X, +1.20D+0.50L+0.20S+E | 0.0 | +Z | Bottom | 0.2592 | Min Temp % | 0.3875 | 15.031 | OK |
| X-X, +1.20D+0.50L+0.20S+E | 0.0 | -Z | Bottom | 0.2592 | Min Temp % | 0.3875 | 15.031 | OK |
| X-X, +0.90D+1.60W+1.60H | 0.0 | +Z | Bottom | 0.2592 | Min Temp % | 0.3875 | 15.031 | OK |
| X-X, +0.90D+1.60W+1.60H | 0.0 | -Z | Bottom | 0.2592 | Min Temp % | 0.3875 | 15.031 | OK |
| X-X, +0.90D+E+1.60H | 0.0 | +Z | Bottom | 0.2592 | Min Temp % | 0.3875 | 15.031 | OK |
| X-X, +0.90D+E+1.60H | 0.0 | -Z | Bottom | 0.2592 | Min Temp % | 0.3875 | 15.031 | OK |
| Z-Z, +1.40D | 0.0 | -X | Bottom | 0.2592 | Min Temp % | 0.3875 | 15.031 | OK |
| Z-Z, +1.40D | 0.0 | +X | Bottom | 0.2592 | Min Temp % | 0.3875 | 15.031 | OK |
| Z-Z, +1.20D+0.50Lr+1.60L+1.60H | 0.0 | -X | Bottom | 0.2592 | Min Temp % | 0.3875 | 15.031 | OK |
| Z-Z, +1.20D+0.50Lr+1.60L+1.60H | 0.0 | +X | Bottom | 0.2592 | Min Temp % | 0.3875 | 15.031 | OK |
| Z-Z, +1.20D+1.60L+0.50S+1.60H | 0.0 | -X | Bottom | 0.2592 | Min Temp % | 0.3875 | 15.031 | OK |
| Z-Z, +1.20D+1.60L+0.50S+1.60H | 0.0 | +X | Bottom | 0.2592 | Min Temp % | 0.3875 | 15.031 | OK |
| Z-Z, +1.20D+1.60Lr+0.50L | 0.0 | -X | Bottom | 0.2592 | Min Temp % | 0.3875 | 15.031 | OK |
| Z-Z, +1.20D+1.60Lr+0.50L | 0.0 | +X | Bottom | 0.2592 | Min Temp % | 0.3875 | 15.031 | OK |
| Z-Z, +1.20D+1.60Lr+0.80W | 0.2240 | -X | Top | 0.2592 | Min Temp % | 0.3875 | 15.031 | OK |

General Footing

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 Licensee : **Echelon Structures**

 Description : **MIN FOOTING FOR DISPLAY**
Footing Flexure

| Flexure Axis & Load Combination | Mu k-ft | Side | Tension Surface | As Req'd in ² | Gvrn. As in ² | Actual As in ² | Phi*Mn k-ft | Status |
|---------------------------------|------------|------|--------------------|-----------------------------|-----------------------------|------------------------------|----------------|--------|
| Z-Z, +1.20D+1.60Lr+0.80W | 0.2240 | +X | Bottom | 0.2592 | Min Temp % | 0.3875 | 15.031 | OK |
| Z-Z, +1.20D+0.50L+1.60S | 0.0 | -X | Bottom | 0.2592 | Min Temp % | 0.3875 | 15.031 | OK |
| Z-Z, +1.20D+0.50L+1.60S | 0.0 | +X | Bottom | 0.2592 | Min Temp % | 0.3875 | 15.031 | OK |
| Z-Z, +1.20D+1.60S+0.80W | 0.2240 | -X | Top | 0.2592 | Min Temp % | 0.3875 | 15.031 | OK |
| Z-Z, +1.20D+1.60S+0.80W | 0.2240 | +X | Bottom | 0.2592 | Min Temp % | 0.3875 | 15.031 | OK |
| Z-Z, +1.20D+0.50Lr+0.50L+1.60W | 0.3479 | -X | Top | 0.2592 | Min Temp % | 0.3875 | 15.031 | OK |
| Z-Z, +1.20D+0.50Lr+0.50L+1.60W | 0.5481 | +X | Bottom | 0.2592 | Min Temp % | 0.3875 | 15.031 | OK |
| Z-Z, +1.20D+0.50L+0.50S+1.60W | 0.3479 | -X | Top | 0.2592 | Min Temp % | 0.3875 | 15.031 | OK |
| Z-Z, +1.20D+0.50L+0.50S+1.60W | 0.5481 | +X | Bottom | 0.2592 | Min Temp % | 0.3875 | 15.031 | OK |
| Z-Z, +1.20D+0.50L+0.20S+E | 0.0 | -X | Bottom | 0.2592 | Min Temp % | 0.3875 | 15.031 | OK |
| Z-Z, +1.20D+0.50L+0.20S+E | 0.0 | +X | Bottom | 0.2592 | Min Temp % | 0.3875 | 15.031 | OK |
| Z-Z, +0.90D+1.60W+1.60H | 0.2610 | -X | Top | 0.2592 | Min Temp % | 0.3875 | 15.031 | OK |
| Z-Z, +0.90D+1.60W+1.60H | 0.6347 | +X | Bottom | 0.2592 | Min Temp % | 0.3875 | 15.031 | OK |
| Z-Z, +0.90D+E+1.60H | 0.0 | -X | Bottom | 0.2592 | Min Temp % | 0.3875 | 15.031 | OK |
| Z-Z, +0.90D+E+1.60H | 0.0 | +X | Bottom | 0.2592 | Min Temp % | 0.3875 | 15.031 | OK |

One Way Shear

| Load Combination... | Vu @ -X | Vu @ +X | Vu @ -Z | Vu @ +Z | Vu:Max | Phi Vn | Vu / Phi*Vn | Status | |
|---------------------------|----------|----------|----------|----------|----------|-----------|-------------|--------|------|
| +1.40D | 0.00 psi | 0.00 psi | 0.00 psi | 0.00 psi | 0.00 psi | 0.00 psi | 82.16 psi | 0.00 | 0.00 |
| +1.20D+0.50Lr+1.60L+1.60H | 0.00 psi | 0.00 psi | 0.00 psi | 0.00 psi | 0.00 psi | 0.00 psi | 82.16 psi | 0.00 | 0.00 |
| +1.20D+1.60L+0.50S+1.60H | 0.00 psi | 0.00 psi | 0.00 psi | 0.00 psi | 0.00 psi | 0.00 psi | 82.16 psi | 0.00 | 0.00 |
| +1.20D+1.60Lr+0.50L | 0.00 psi | 0.00 psi | 0.00 psi | 0.00 psi | 0.00 psi | 0.00 psi | 82.16 psi | 0.00 | 0.00 |
| +1.20D+1.60Lr+0.80W | 1.33 psi | 1.33 psi | 0.00 psi | 0.00 psi | 1.33 psi | 82.16 psi | 0.02 | 0.00 | 0.00 |
| +1.20D+0.50L+1.60S | 0.00 psi | 0.00 psi | 0.00 psi | 0.00 psi | 0.00 psi | 82.16 psi | 0.00 | 0.00 | 0.00 |
| +1.20D+1.60S+0.80W | 1.33 psi | 1.33 psi | 0.00 psi | 0.00 psi | 1.33 psi | 82.16 psi | 0.02 | 0.00 | 0.00 |
| +1.20D+0.50Lr+0.50L+1.60W | 2.00 psi | 3.31 psi | 0.00 psi | 0.00 psi | 3.31 psi | 82.16 psi | 0.04 | 0.00 | 0.00 |
| +1.20D+0.50L+0.50S+1.60W | 2.00 psi | 3.31 psi | 0.00 psi | 0.00 psi | 3.31 psi | 82.16 psi | 0.04 | 0.00 | 0.00 |
| +1.20D+0.50L+0.20S+E | 0.00 psi | 0.00 psi | 0.00 psi | 0.00 psi | 0.00 psi | 82.16 psi | 0.00 | 0.00 | 0.00 |
| +0.90D+1.60W+1.60H | 1.50 psi | 3.33 psi | 0.00 psi | 0.00 psi | 3.33 psi | 82.16 psi | 0.04 | 0.00 | 0.00 |
| +0.90D+E+1.60H | 0.00 psi | 0.00 psi | 0.00 psi | 0.00 psi | 0.00 psi | 82.16 psi | 0.00 | 0.00 | 0.00 |

Two-Way "Punching" Shear

All units k

| Load Combination... | Vu | Phi*Vn | Vu / Phi*Vn | Status |
|---------------------------|----------|-----------|-------------|--------|
| +1.40D | 0.00 psi | 164.32psi | 0 | OK |
| +1.20D+0.50Lr+1.60L+1.60H | 0.00 psi | 164.32psi | 0 | OK |
| +1.20D+1.60L+0.50S+1.60H | 0.00 psi | 164.32psi | 0 | OK |
| +1.20D+1.60Lr+0.50L | 0.00 psi | 164.32psi | 0 | OK |
| +1.20D+1.60Lr+0.80W | 0.00 psi | 164.32psi | 0 | OK |
| +1.20D+0.50L+1.60S | 0.00 psi | 164.32psi | 0 | OK |
| +1.20D+1.60S+0.80W | 0.00 psi | 164.32psi | 0 | OK |
| +1.20D+0.50Lr+0.50L+1.60W | 0.19 psi | 164.32psi | 0.001181 | OK |
| +1.20D+0.50L+0.50S+1.60W | 0.19 psi | 164.32psi | 0.001181 | OK |
| +1.20D+0.50L+0.20S+E | 0.00 psi | 164.32psi | 0 | OK |
| +0.90D+1.60W+1.60H | 0.21 psi | 164.32psi | 0.001265 | OK |
| +0.90D+E+1.60H | 0.00 psi | 164.32psi | 0 | OK |

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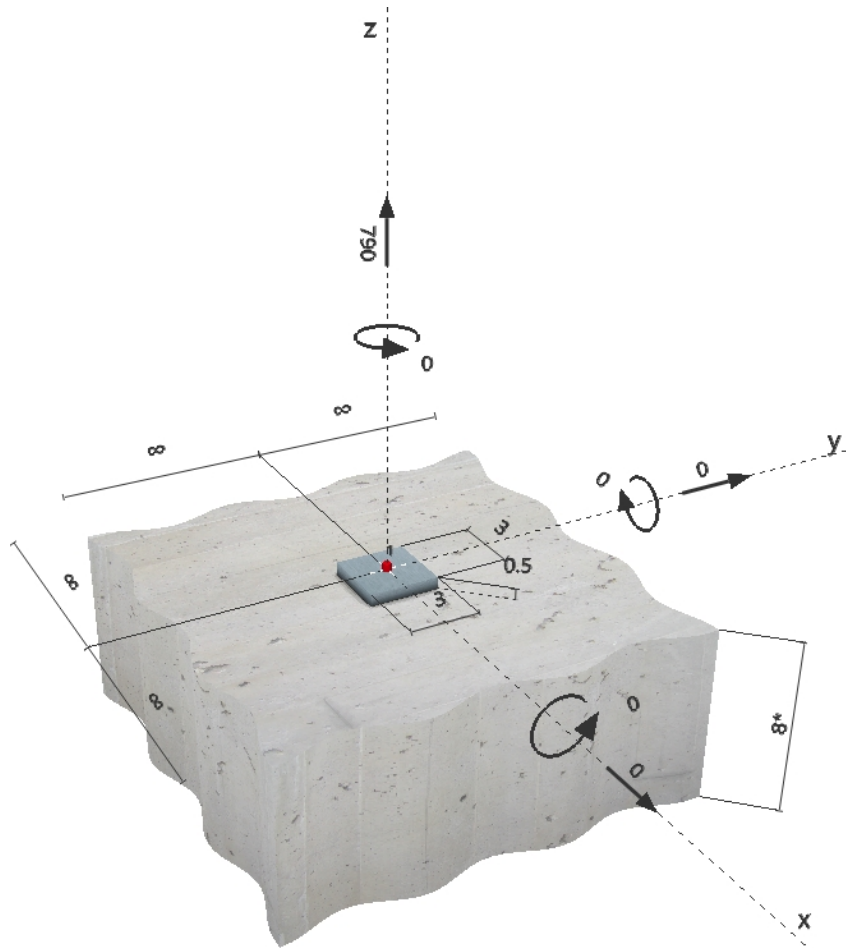
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Specifier's comments:

1 Input data

| | | |
|------------------------------------|--|--|
| Anchor type and diameter: | Kwik Bolt TZ - SS 304 3/8 (2) |   |
| Effective embedment depth: | $h_{ef} = 2.000$ in., $h_{nom} = 2.313$ in. | |
| Material: | AISI 304 | |
| Evaluation Service Report: | ESR-1917 | |
| Issued Valid: | 5/1/2017 5/1/2019 | |
| Proof: | Design method ACI 318 / AC193 | |
| Stand-off installation: | $e_b = 0.000$ in. (no stand-off); $t = 0.500$ in. | |
| Anchor plate: | $l_x \times l_y \times t = 3.000$ in. x 3.000 in. x 0.500 in.; (Recommended plate thickness: not calculated) | |
| Profile: | Round bars (AISC); $(L \times W \times T) = 0.063$ in. x 0.063 in. x 0.000 in. | |
| Base material: | cracked concrete, 3000, $f'_c = 3,000$ psi; $h = 8.000$ in. | |
| Reinforcement: | tension: condition B, shear: condition B; no supplemental splitting reinforcement present edge reinforcement: none or < No. 4 bar | |
| Seismic loads (cat. C, D, E, or F) | no | |

Geometry [in.] & Loading [lb, in.lb]



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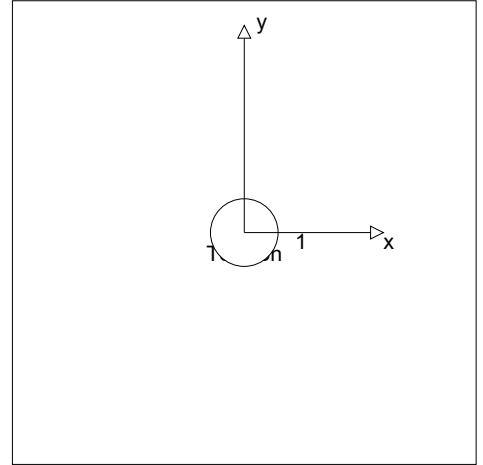
2 Load case/Resulting anchor forces

Load case: Design loads

Anchor reactions [lb]

Tension force: (+Tension, -Compression)

| Anchor | Tension force | Shear force | Shear force x | Shear force y |
|--------|---------------|-------------|---------------|---------------|
| 1 | 790 | 0 | 0 | 0 |

 max. concrete compressive strain: - [%]
 max. concrete compressive stress: - [psi]
 resulting tension force in (x/y)=(0.000/0.000): 790 [lb]
 resulting compression force in (x/y)=(0.000/0.000): 0 [lb]


3 Tension load

| | Load N_{ua} [lb] | Capacity ϕN_n [lb] | Utilization $\beta_N = N_{ua}/\phi N_n$ | Status |
|------------------------------|--------------------|--------------------------|---|--------|
| Steel Strength* | 790 | 4,476 | 18 | OK |
| Pullout Strength* | 790 | 1,666 | 48 | OK |
| Concrete Breakout Strength** | 790 | 1,712 | 47 | OK |

* anchor having the highest loading **anchor group (anchors in tension)

3.1 Steel Strength

 N_{sa} = ESR value refer to ICC-ES ESR-1917
 $\phi N_{sa} \geq N_{ua}$ ACI 318-08 Eq. (D-1)

Variables

| $A_{se,N}$ [in. ²] | f_{uta} [psi] |
|--------------------------------|-----------------|
| 0.05 | 115,000 |

Calculations

| N_{sa} [lb] |
|---------------|
| 5,968 |

Results

| N_{sa} [lb] | ϕ_{steel} | ϕN_{sa} [lb] | N_{ua} [lb] |
|---------------|----------------|--------------------|---------------|
| 5,968 | 0.750 | 4,476 | 790 |

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3.2 Pullout Strength

$$N_{pn,f_c} = N_{p,2500} \sqrt{\frac{f_c}{2500}} \quad \text{refer to ICC-ES ESR-1917}$$

$$\phi N_{pn,f_c} \geq N_{ua} \quad \text{ACI 318-08 Eq. (D-1)}$$

Variables

| f_c [psi] | $N_{p,2500}$ [lb] |
|-------------|-------------------|
| 3,000 | 2,340 |

Calculations

$$\frac{\sqrt{\frac{f_c}{2500}}}{1.095}$$

Results

| N_{pn,f_c} [lb] | $\phi_{concrete}$ | $\phi N_{pn,f_c}$ [lb] | N_{ua} [lb] |
|-------------------|-------------------|------------------------|---------------|
| 2,563 | 0.650 | 1,666 | 790 |

3.3 Concrete Breakout Strength

$$N_{cb} = \left(\frac{A_{Nc}}{A_{Nc0}} \right) \psi_{ed,N} \psi_{c,N} \psi_{cp,N} N_b \quad \text{ACI 318-08 Eq. (D-4)}$$

$$\phi N_{cb} \geq N_{ua} \quad \text{ACI 318-08 Eq. (D-1)}$$

 A_{Nc} see ACI 318-08, Part D.5.2.1, Fig. RD.5.2.1(b)

$$A_{Nc0} = 9 h_{ef}^2 \quad \text{ACI 318-08 Eq. (D-6)}$$

$$\psi_{ec,N} = \left(\frac{1}{1 + \frac{2 e_N}{3 h_{ef}}} \right) \leq 1.0 \quad \text{ACI 318-08 Eq. (D-9)}$$

$$\psi_{ed,N} = 0.7 + 0.3 \left(\frac{c_{a,min}}{1.5 h_{ef}} \right) \leq 1.0 \quad \text{ACI 318-08 Eq. (D-11)}$$

$$\psi_{cp,N} = \text{MAX} \left(\frac{c_{a,min}}{c_{ac}}, \frac{1.5 h_{ef}}{c_{ac}} \right) \leq 1.0 \quad \text{ACI 318-08 Eq. (D-13)}$$

$$N_b = k_c \lambda \sqrt{f_c} h_{ef}^{1.5} \quad \text{ACI 318-08 Eq. (D-7)}$$

Variables

| h_{ef} [in.] | $e_{c1,N}$ [in.] | $e_{c2,N}$ [in.] | $c_{a,min}$ [in.] | $\psi_{c,N}$ |
|----------------|------------------|------------------|-------------------|--------------|
| 2.000 | 0.000 | 0.000 | ∞ | 1.000 |

| c_{ac} [in.] | k_c | λ | f_c [psi] |
|----------------|-------|-----------|-------------|
| 3.875 | 17 | 1 | 3,000 |

Calculations

| A_{Nc} [in. ²] | A_{Nc0} [in. ²] | $\psi_{ec1,N}$ | $\psi_{ec2,N}$ | $\psi_{ed,N}$ | $\psi_{cp,N}$ | N_b [lb] |
|------------------------------|-------------------------------|----------------|----------------|---------------|---------------|------------|
| 36.00 | 36.00 | 1.000 | 1.000 | 1.000 | 1.000 | 2,634 |

Results

| N_{cb} [lb] | $\phi_{concrete}$ | ϕN_{cb} [lb] | N_{ua} [lb] |
|---------------|-------------------|--------------------|---------------|
| 2,634 | 0.650 | 1,712 | 790 |

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4 Shear load

| | Load V_{ua} [lb] | Capacity ϕV_n [lb] | Utilization $\beta_v = V_{ua}/\phi V_n$ | Status |
|---------------------------------------|--------------------|--------------------------|---|--------|
| Steel Strength* | N/A | N/A | N/A | N/A |
| Steel failure (with lever arm)* | N/A | N/A | N/A | N/A |
| Pryout Strength* | N/A | N/A | N/A | N/A |
| Concrete edge failure in direction ** | N/A | N/A | N/A | N/A |

* anchor having the highest loading **anchor group (relevant anchors)

5 Warnings

- The anchor design methods in PROFIS Anchor require rigid anchor plates per current regulations (ETAG 001/Annex C, EOTA TR029, etc.). This means load re-distribution on the anchors due to elastic deformations of the anchor plate are not considered - the anchor plate is assumed to be sufficiently stiff, in order not to be deformed when subjected to the design loading. PROFIS Anchor calculates the minimum required anchor plate thickness with FEM to limit the stress of the anchor plate based on the assumptions explained above. The proof if the rigid base plate assumption is valid is not carried out by PROFIS Anchor. Input data and results must be checked for agreement with the existing conditions and for plausibility!
- Condition A applies when supplementary reinforcement is used. The Φ factor is increased for non-steel Design Strengths except Pullout Strength and Pryout strength. Condition B applies when supplementary reinforcement is not used and for Pullout Strength and Pryout Strength. Refer to your local standard.
- Refer to the manufacturer's product literature for cleaning and installation instructions.
- Checking the transfer of loads into the base material and the shear resistance are required in accordance with ACI 318 or the relevant standard!

Fastening meets the design criteria!

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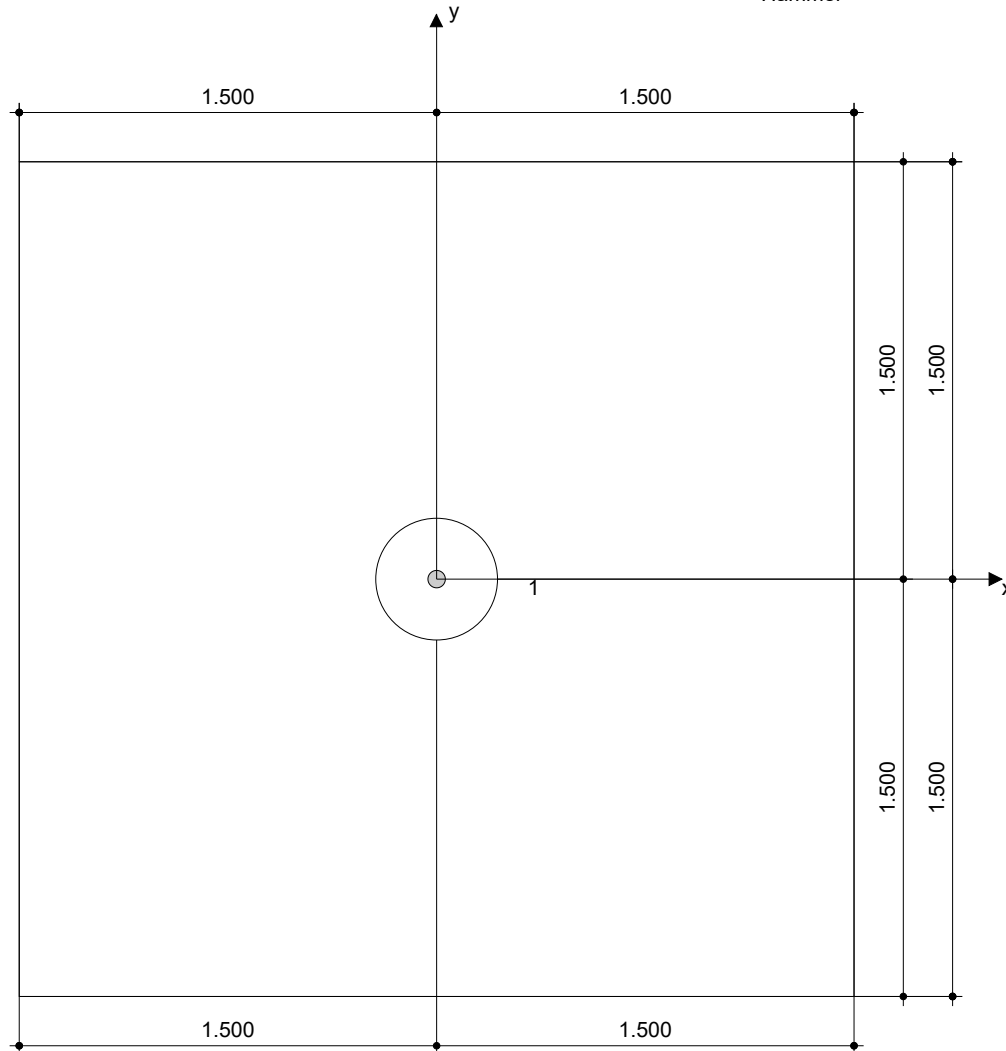
6 Installation data

Anchor plate, steel: -
 Profile: Round bars (AISC); 0.063 x 0.063 x 0.000 in.
 Hole diameter in the fixture: $d_f = 0.438$ in.
 Plate thickness (input): 0.500 in.
 Recommended plate thickness: not calculated
 Drilling method: Hammer drilled
 Cleaning: Manual cleaning of the drilled hole according to instructions for use is required.

Anchor type and diameter: Kwik Bolt TZ - SS 304 3/8 (2)
 Installation torque: 300.000 in.lb
 Hole diameter in the base material: 0.375 in.
 Hole depth in the base material: 2.625 in.
 Minimum thickness of the base material: 5.000 in.

6.1 Recommended accessories

| Drilling | Cleaning | Setting |
|--|--|--|
| <ul style="list-style-type: none"> Suitable Rotary Hammer Properly sized drill bit | <ul style="list-style-type: none"> Manual blow-out pump | <ul style="list-style-type: none"> Torque controlled cordless impact tool (Hilti Safeset System) Torque wrench Hammer |



Coordinates Anchor in.

| Anchor | x | y | C-x | C+y | C-y | C+xy |
|--------|-------|-------|-----|-----|-----|------|
| 1 | 0.000 | 0.000 | - | - | - | - |

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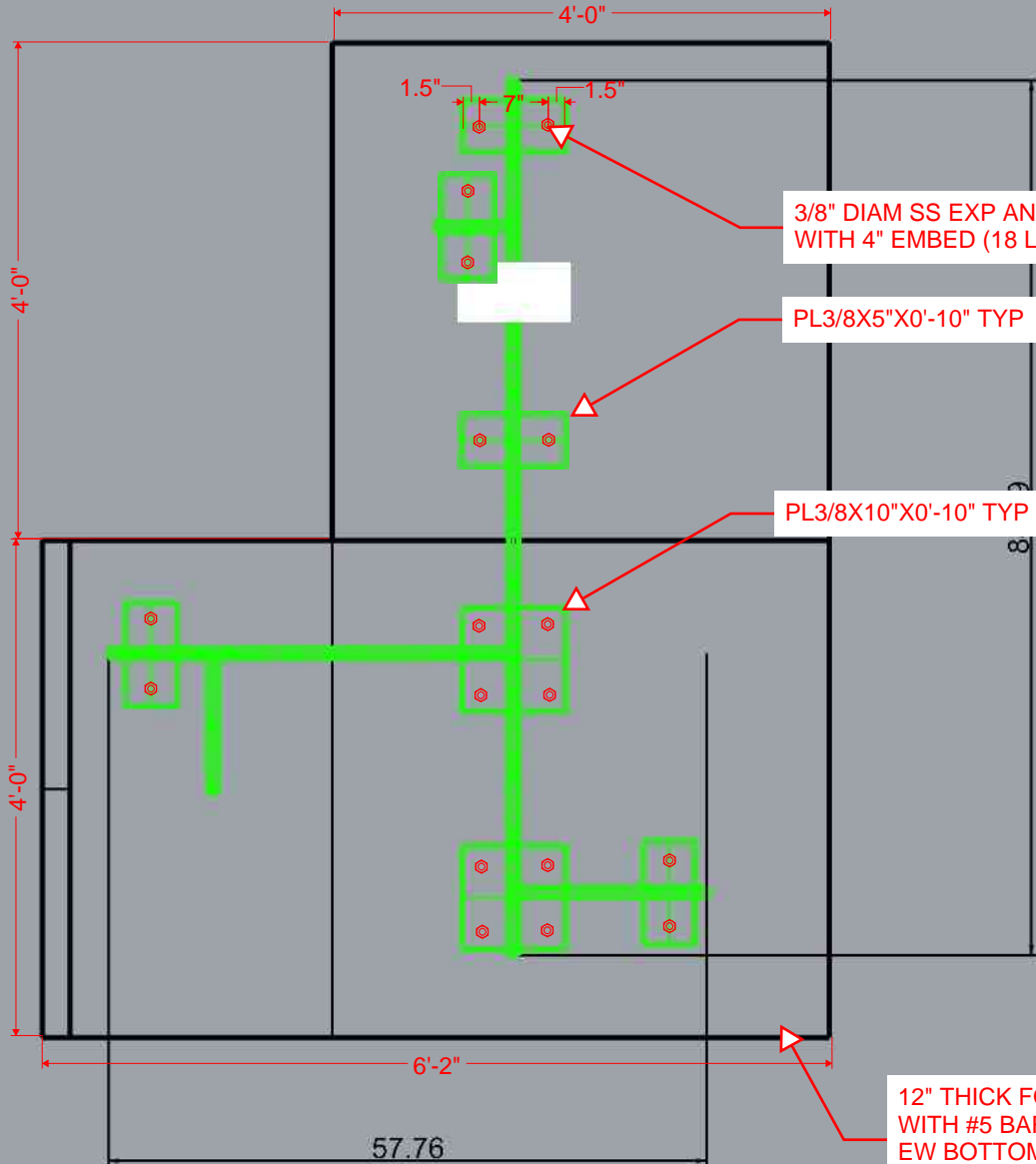
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7 Remarks; Your Cooperation Duties

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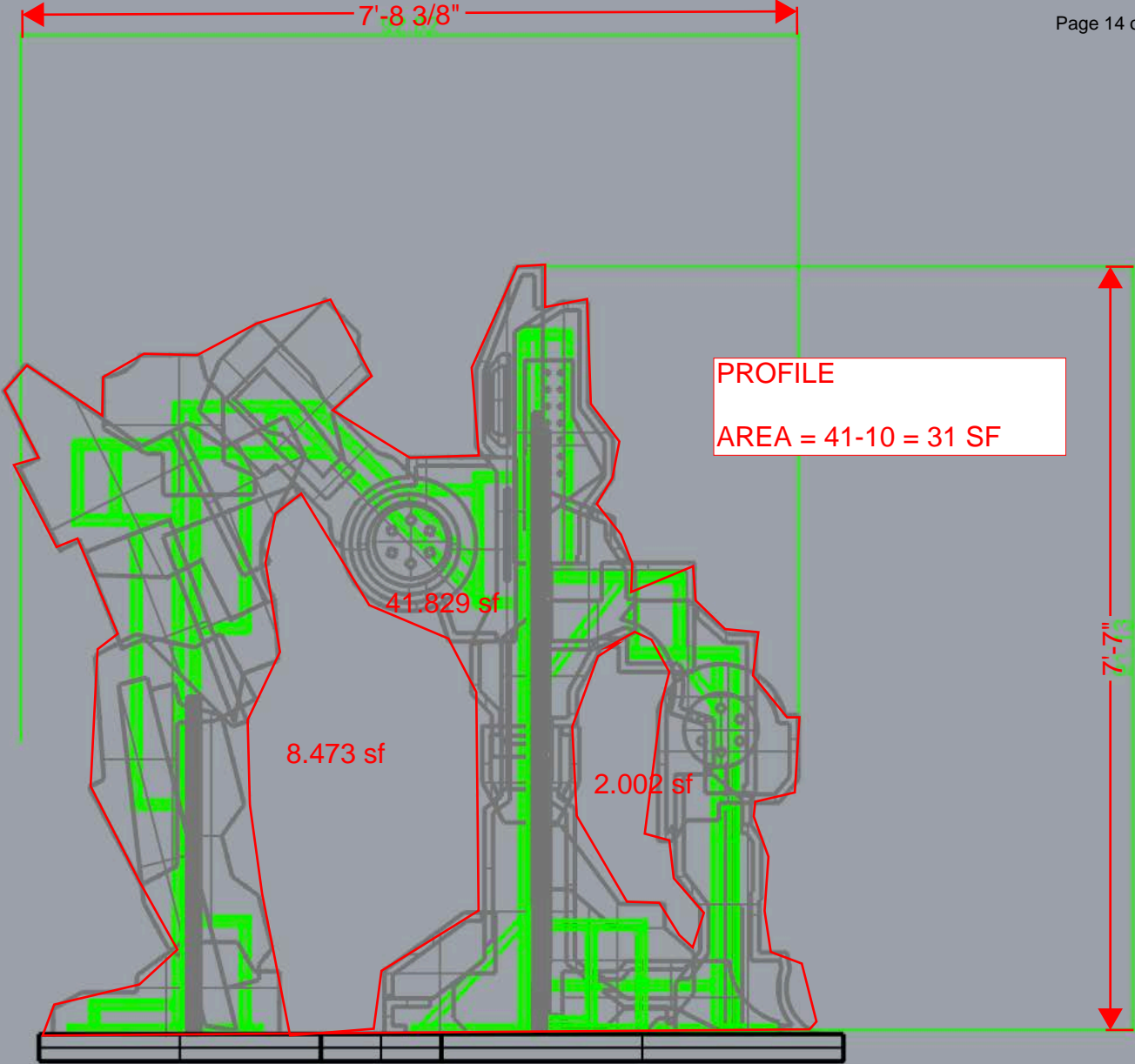


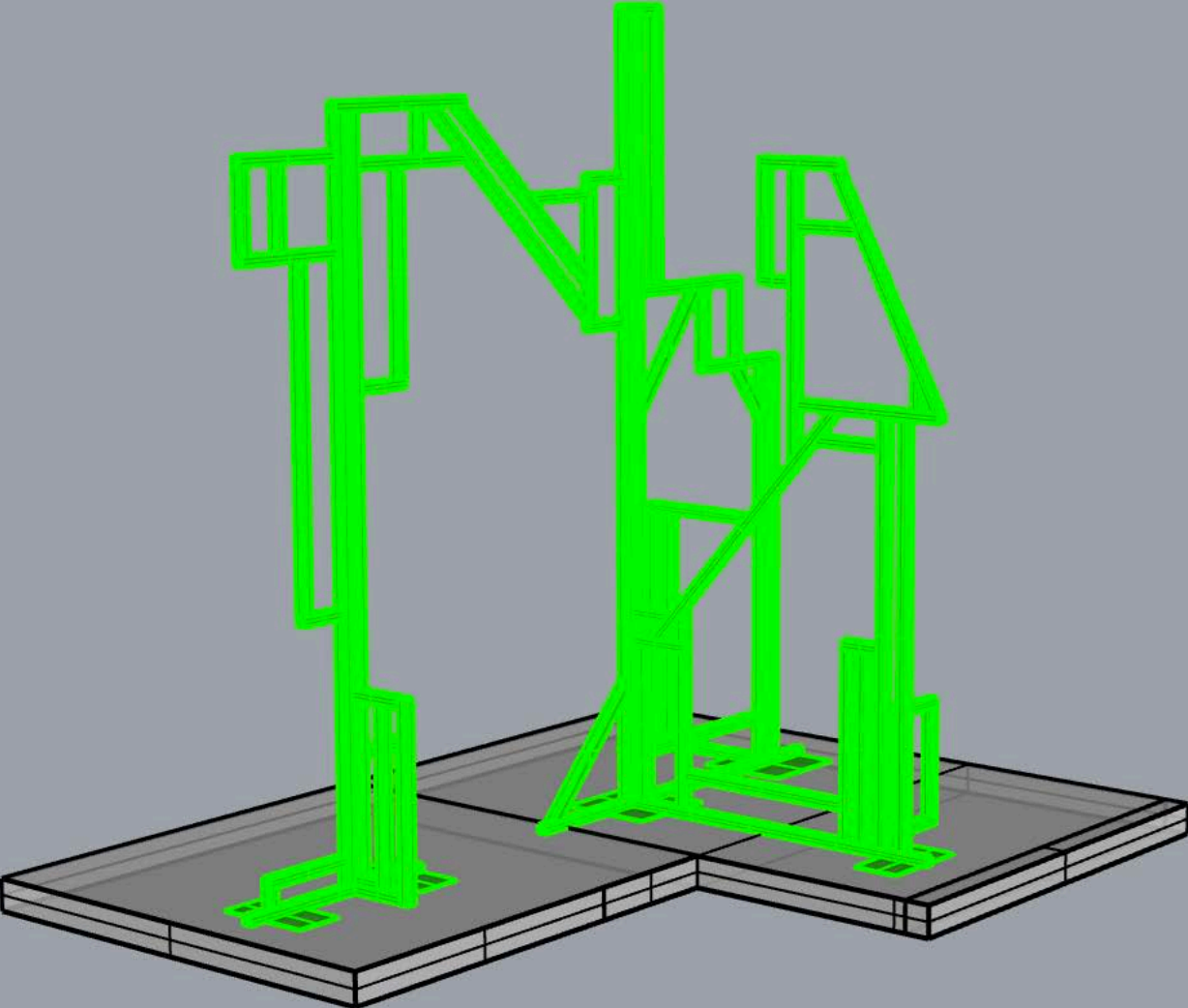
3/8" DIAM SS EXP ANCHOR WITH 4" EMBED (18 LOC)

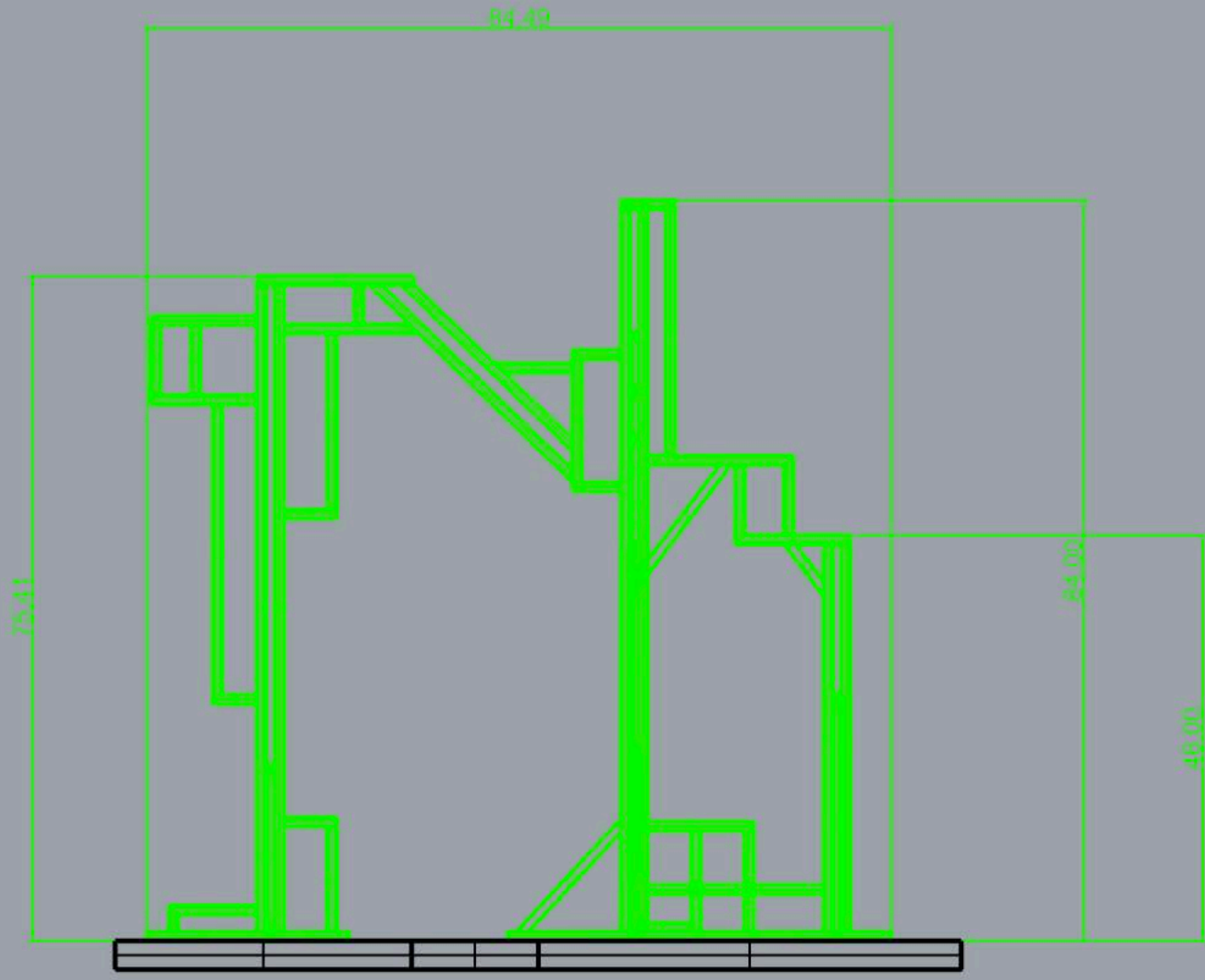
PL3/8X5"X0'-10" TYP

PL3/8X10"X0'-10" TYP

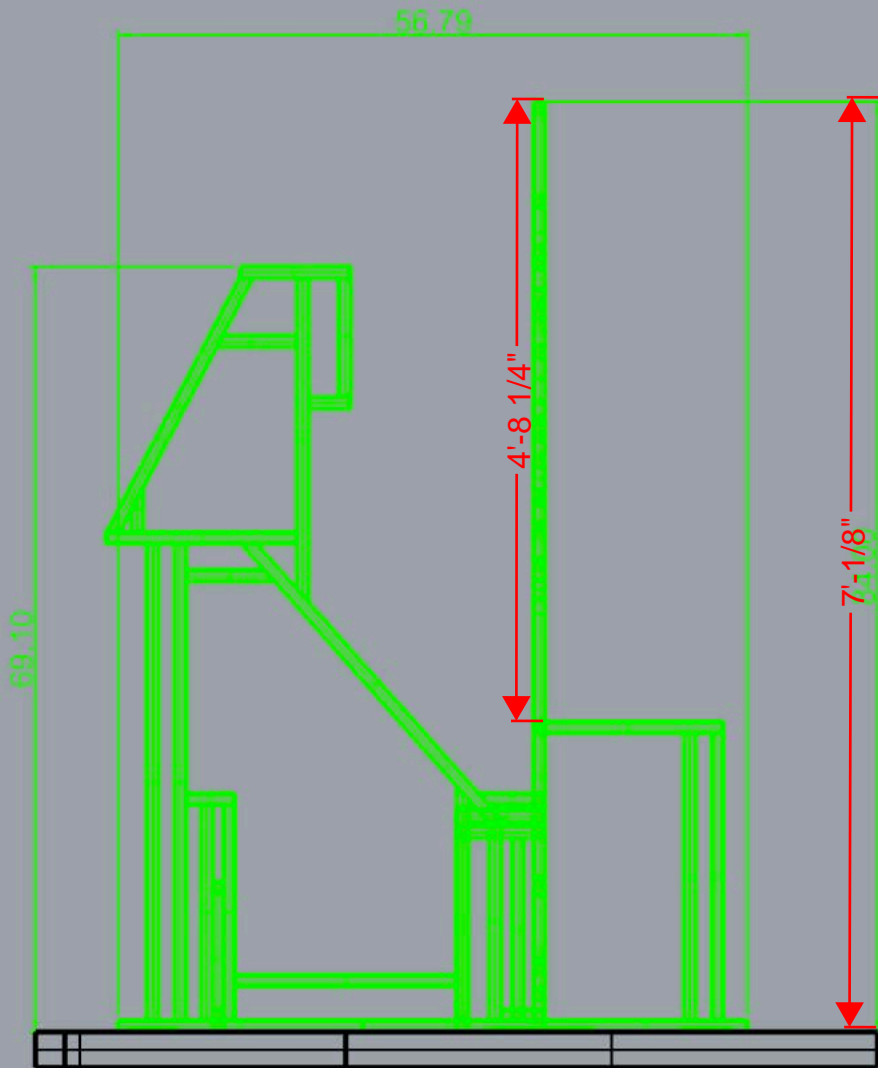
12" THICK FOOTING REINF WITH #5 BARS AT 12" O.C. EW BOTTOM (3" CLR FROM BOTT AND SIDES)

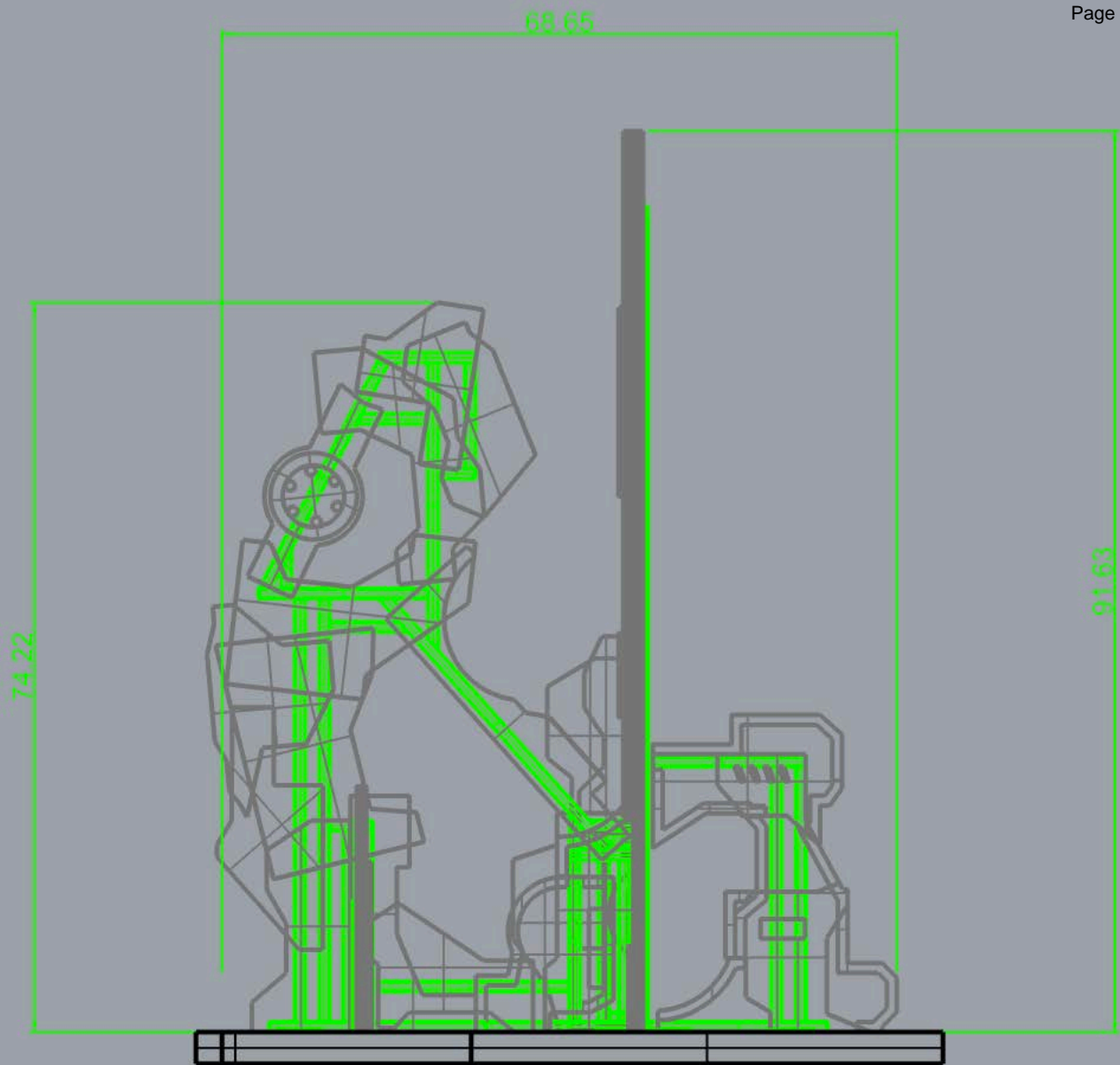






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