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McNeil Engineering Structural L.C.

8610 South Sandy Parkway – Suite 200

Sandy, UT 84070

Ph: 801-255-7700 fax: 801-255-8071



IMPORTANT
the seal is not in red or green ink and the signature is not in red or blue ink, then this is an unauthorized copy and is to be rejected as unsanctioned and unusable.

Structural Calculations

For

KHR HOLDINGS, LLC

Attn: Chad Spencer

Ogden Warehouse Metal Building Foundation

Ogden, Utah

Prepared by: Matthew Roblez, S.E.

August 29, 2022

McNeil Engineering assumes responsibility only for the items addressed herein and does not assume responsibility for the remainder of the structure. No site observations are scheduled to verify the understanding of the contractor or the proper installation of the items addressed.

These calculations have been authorized for use at the property shown above. No provisions have been made for the re-use of these calculations on any other property.



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CIVIL, STRUCTURAL ENGINEERING & LAND SURVEYING
PAVEMENT & ROOF CONSULTING

PROJECT

**KHR HOLDINGS - WAREHOUSE METAL
BUILDING FOUNDATIONS**

DATE

8-23-22

SHEET

OF

DESIGNED BY

MR

PROJECT NO.

22403

BASIS OF DESIGN

THESE CALCULATIONS ARE FOR THE DESIGN OF THE FOUNDATION SYSTEM FOR A PRE-ENGINEERED METAL BUILDING. THE DESIGN OF THE FOUNDATION IS BASED ON REPORTED REACTIONS AND BASE PLATE SIZES FROM THE METAL BUILDING MANUFACTURER

METAL BUILDING MANUFACTURER: WESTERN STEEL BUILDINGS 300076-OGDEN WAREHOUSE

FROM GEOTECHNICAL REPORT

5.3 FOUNDATIONS

The foundations for the planned structures may consist of conventional continuous and/or spread footings. Due to the soft, compressible nature of the clay soils encountered at the site, we recommend that the spread footings be founded on rammed aggregate piers. The footings for the proposed structures should be a minimum of 20 inches and 30 inches wide for continuous and spot footings, respectively. The exterior footings should be established a minimum of 30 inches below the lowest adjacent grade to provide frost protection and confinement. Interior footings that are not subject to frost should be embedded a minimum of 18 inches for confinement.

EMAIL FROM RAMMED AGGREGATE PIER COMPANY

John,

For the bearing capacity of the site we are estimating 3000 psf for footings. And we would be adding cement to the aggregate piers due to the very soft clays. This can be an iterative process as once a foundation system is designed we can analyze the settlements we are anticipating.

**USE 3000 PSF BEARING CAPACITY WHEN DESIGNING
FOOTINGS**



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SPECIAL INSPECTIONS

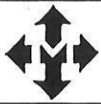
1705.3 Concrete construction.

Special inspections and tests of concrete construction shall be performed in accordance with this section and Table 1705.3.

Exception: *Special inspections* and tests shall not be required for:

1. Isolated spread concrete footings of buildings three stories or less above *grade plane* that are fully supported on earth or rock.
2. Continuous concrete footings supporting walls of buildings three stories or less above *grade plane* that are fully supported on earth or rock where:
 - 2.1. The footings support walls of light-frame construction.
 - 2.2. The footings are designed in accordance with Table 1809.7.
 - 2.3. The structural design of the footing is based on a specified compressive strength, f'_c , not more than 2,500 pounds per square inch (psi) (17.2 MPa), regardless of the compressive strength specified in the *approved construction documents* or used in the footing construction.

THE FOUNDATION WALLS AND FOOTINGS ARE DESIGNED USING A 2500 PSI DESIGN STRENGTH



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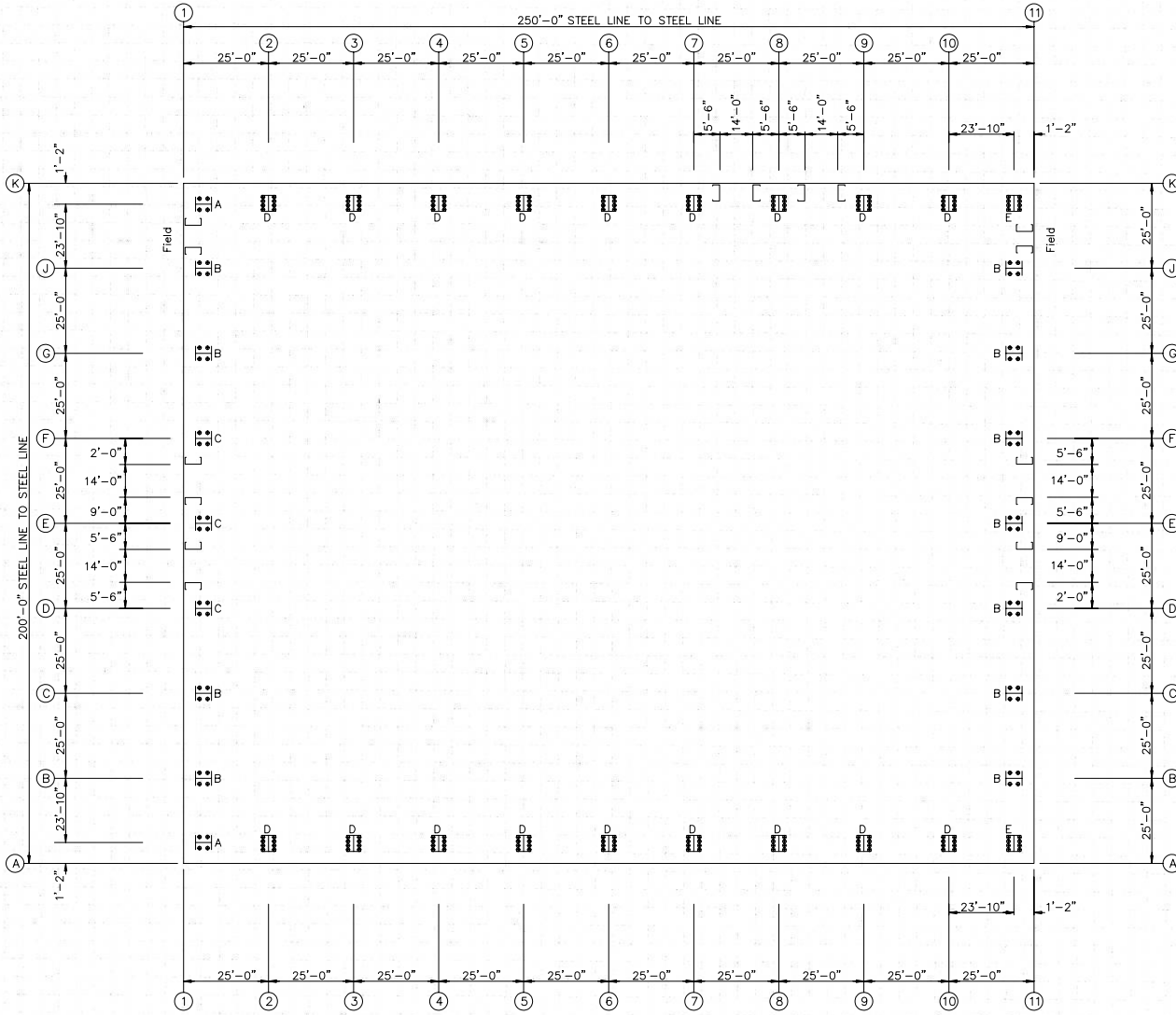
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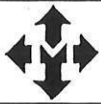
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ANCHOR BOLT PLAN
 NOTE: All Base Plates @ 100'-0" (U.N.)
 Finished Floor @ 100'-0"

DRAWING IS NOT TO SCALE



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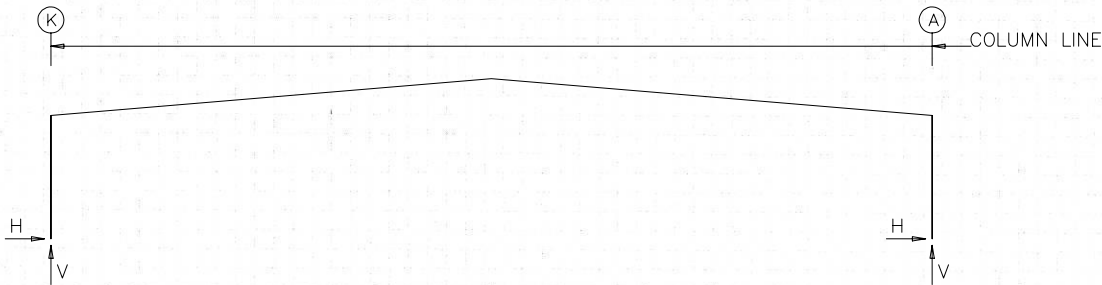
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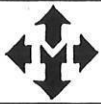
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FRAME LINES: 2 3 4 5 6 7 8 9 10



RIGID FRAME: BASIC COLUMN REACTIONS (k)

Frame Line	Column Line	---Dead---		---Collateral---		---Live---		---Snow---		---Wind_Left1---		---Wind_Right1---	
		Horiz	Vert	Horiz	Vert	Horiz	Vert	Horiz	Vert	Horiz	Vert	Horiz	Vert
2*	K	17.7	18.5	14.5	12.5	57.9	50.0	75.0	64.8	-41.7	-37.3	-28.3	-28.2
2*	A	-17.7	18.5	-14.5	12.5	-57.9	50.0	-75.0	64.7	28.3	-28.2	41.7	-37.3
2*	K	---Wind_Left2---		---Wind_Right2---		---Wind_Long1---		---Wind_Long2---		---Seismic_Left---		Seismic_Right	
		Horiz	Vert	Horiz	Vert	Horiz	Vert	Horiz	Vert	Horiz	Vert	Horiz	Vert
2*	K	-25.0	-19.5	-11.8	-10.4	-35.3	-47.3	-36.6	-39.7	-11.9	-3.0	11.9	3.0
2*	A	11.8	-10.4	25.0	-19.5	36.6	-39.7	35.3	-47.3	-11.9	3.0	11.9	-3.0
2*	K	---Seismic_Long---		---MIN_SNOW---		F1UNB_SL_L---		F1UNB_SL_R---					
		Horiz	Vert	Horiz	Vert	Horiz	Vert	Horiz	Vert				
2*	K	0.0	-42.1	57.9	50.0	63.6	63.7	63.6	37.7				
2*	A	0.0	-42.1	-57.9	50.0	-63.6	37.7	-63.6	63.7				
11	K	---Dead---		---Collateral---		---Live---		---Snow---		---Wind_Left1---		---Wind_Right1---	
		Horiz	Vert	Horiz	Vert	Horiz	Vert	Horiz	Vert	Horiz	Vert	Horiz	Vert
11	K	17.7	18.5	14.5	12.5	57.8	50.0	74.8	64.7	-55.0	-51.5	-41.4	-37.5
11	A	-17.7	18.5	-14.5	12.5	-57.8	50.0	-74.8	64.7	41.4	-37.5	55.0	-51.5
11	K	---Wind_Left2---		---Wind_Right2---		---Wind_Long1---		---Wind_Long2---		---Seismic_Left---		Seismic_Right	
		Horiz	Vert	Horiz	Vert	Horiz	Vert	Horiz	Vert	Horiz	Vert	Horiz	Vert
11	K	-37.2	-33.7	-23.6	-19.6	-35.2	-39.0	-36.6	-31.3	-14.0	-3.5	14.0	3.5
11	A	23.6	-19.6	37.2	-33.7	36.6	-31.3	35.2	-39.0	-14.0	3.5	14.0	-3.5
11	K	---MIN_SNOW---		F2UNB_SL_L---		F2UNB_SL_R---							
		Horiz	Vert	Horiz	Vert	Horiz	Vert						
11	K	57.8	50.0	63.4	63.7	63.5	37.7						
11	A	-57.8	50.0	-63.5	37.7	-63.4	63.7						
2*	Frame lines:		2 3 4 5 6 7 8 9 10										



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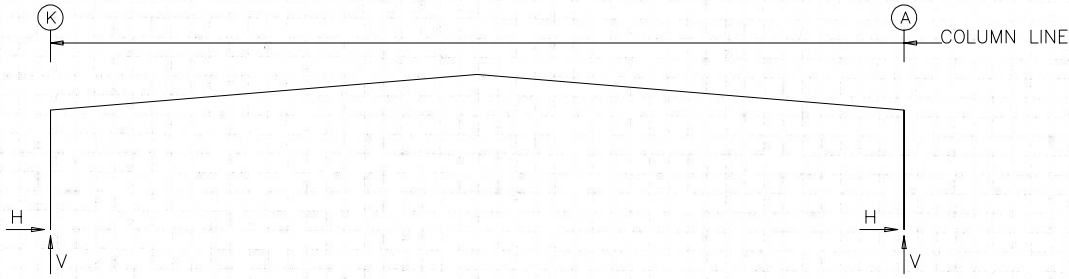
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FRAME LINES: 2 3 4 5 6 7 8 9 10



RIGID FRAME: BASIC COLUMN REACTIONS (k)

Frame Line	Column Line	---Dead---		---Collateral---		---Live---		---Snow---		---Wind_Left1---		---Wind_Right1---	
		Horiz	Vert	Horiz	Vert	Horiz	Vert	Horiz	Vert	Horiz	Vert	Horiz	Vert
2*	K	17.7	18.5	14.5	12.5	57.9	50.0	75.0	64.8	-41.7	-37.3	-28.3	-28.2
2*	A	-17.7	18.5	-14.5	12.5	-57.9	50.0	-75.0	64.7	28.3	-28.2	41.7	-37.3
Frame Line	Column Line	---Wind_Left2---		---Wind_Right2---		---Wind_Long1---		---Wind_Long2---		---Seismic_Left---		Seismic_Right	
		Horiz	Vert	Horiz	Vert	Horiz	Vert	Horiz	Vert	Horiz	Vert	Horiz	Vert
2*	K	-25.0	-19.5	-11.8	-10.4	-35.3	-47.3	-36.6	-39.7	-11.9	-3.0	11.9	3.0
2*	A	11.8	-10.4	25.0	-19.5	36.6	-39.7	35.3	-47.3	-11.9	3.0	11.9	-3.0
Frame Line	Column Line	---Seismic_Long---		---MIN_SNOW---		F1UNB_SL_L---		F1UNB_SL_R---					
		Horiz	Vert	Horiz	Vert	Horiz	Vert	Horiz	Vert				
2*	K	0.0	-42.1	57.9	50.0	63.6	63.7	63.6	37.7				
2*	A	0.0	-42.1	-57.9	50.0	-63.6	37.7	-63.6	63.7				
Frame Line	Column Line	---Dead---		---Collateral---		---Live---		---Snow---		---Wind_Left1---		---Wind_Right1---	
		Horiz	Vert	Horiz	Vert	Horiz	Vert	Horiz	Vert	Horiz	Vert	Horiz	Vert
11	K	17.7	18.5	14.5	12.5	57.8	50.0	74.8	64.7	-55.0	-51.5	-41.4	-37.5
11	A	-17.7	18.5	-14.5	12.5	-57.8	50.0	-74.8	64.7	41.4	-37.5	55.0	-51.5
Frame Line	Column Line	---Wind_Left2---		---Wind_Right2---		---Wind_Long1---		---Wind_Long2---		---Seismic_Left---		Seismic_Right	
		Horiz	Vert	Horiz	Vert	Horiz	Vert	Horiz	Vert	Horiz	Vert	Horiz	Vert
11	K	-37.2	-33.7	-23.6	-19.6	-35.2	-39.0	-36.6	-31.3	-14.0	-3.5	14.0	3.5
11	A	23.6	-19.6	37.2	-33.7	36.6	-31.3	35.2	-39.0	-14.0	3.5	14.0	-3.5
Frame Line	Column Line	---MIN_SNOW---		F2UNB_SL_L---		F2UNB_SL_R---							
		Horiz	Vert	Horiz	Vert	Horiz	Vert						
11	K	57.8	50.0	63.4	63.7	63.5	37.7						
11	A	-57.8	50.0	-63.5	37.7	-63.4	63.7						
2*	Frame lines:	2 3 4 5 6 7 8 9 10											



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IBC 2018 LOAD COMBINATIONS

$$D + F$$

(Equation 16-8)

$$D + H + F + L$$

(Equation 16-9)

$$D + H + F + (L_r \text{ or } S \text{ or } R)$$

(Equation 16-10)

$$D + H + F + 0.75(L) + 0.75(L_r \text{ or } S \text{ or } R)$$

(Equation 16-11)

$$D + H + F + (0.6W \text{ or } 0.7E)$$

(Equation 16-12)

$$D + H + F + 0.75(0.6W) + 0.75L + 0.75(L_r \text{ or } S \text{ or } R)$$

(Equation 16-13)

$$D + H + F + 0.75(0.7E) + 0.75L + 0.75S$$

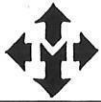
(Equation 16-14)

$$0.6D + 0.6W + H$$

(Equation 16-15)

$$0.6(D + F) + 0.7E + H$$

(Equation 16-16)



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FRAMES 2-10

LOAD COMBINATIONS

MARK	DEAD		COLLATERAL		LIVE		SNOW		WIND LEFT 1		WIND RIGHT 1		WIND LEFT 2		WIND RIGHT 2	
	HORIZ	VERT	HORIZ	VERT	HORIZ	VERT	HORIZ	VERT	HORIZ	VERT	HORIZ	VERT	HORIZ	VERT	HORIZ	VERT
2-10 K	17.7	18.5	14.5	14.5	12.5	57.9	50	75	64.8	-41.7	-37.3	-28.3	-28.2	-25	-19.5	-10.4
2-10 A	-17.7	18.5	-14.5	-14.5	12.5	-57.9	50	-75	64.8	28.3	-28.2	41.7	-37.3	11.8	-10.4	-19.5

D + (Lr OR s) EQ 16-10

	HORIZ	VERT
2-10 K	107.2	95.8
2-10 A	-90.1	95.8

D + WIND LEFT 1 EQ 16-12

	HORIZ	VERT
2-10 K	-9.5	-6.3
2-10 A	-3.9	2.8

D + WIND LEFT 2 EQ 16-12

	HORIZ	VERT
2-10 K	7.2	11.5
2-10 A	-20.4	20.6

D + WIND RIGHT 1 EQ 16-12

	HORIZ	VERT
2-10 K	3.9	2.8
2-10 A	9.5	-6.3

D + WIND RIGHT 2 EQ 16-12

	HORIZ	VERT
2-10 K	20.4	20.6
2-10 A	-7.2	11.5

D + 0.75*WIND LEFT 1 + 0.75* SNOW EQ 16-13

	HORIZ	VERT
2-10 K	57.175	51.625
2-10 A	-67.225	58.45

D + 0.75*WIND LEFT 2 + 0.75* SNOW EQ 16-13

	HORIZ	VERT
2-10 K	69.7	64.975
2-10 A	-79.6	71.8

D + 0.75*WIND RIGHT 1 + 0.75* SNOW EQ 16-13

	HORIZ	VERT
2-10 K	67.225	58.45
2-10 A	-57.175	51.625

D + 0.75*WIND RIGHT 2 + 0.75* SNOW EQ 16-13

	HORIZ	VERT
2-10 K	79.6	71.8
2-10 A	-69.7	64.975

0.6*D + WIND LEFT 1 EQ 16-15

	HORIZ	VERT
2-10 K	-22.38	-18.7
2-10 A	8.98	-9.6

0.6*D + WIND LEFT 2 EQ 16-15

	HORIZ	VERT
2-10 K	-5.68	-0.9
2-10 A	-7.52	8.2

0.6*D + WIND RIGHT 1 EQ 16-15

	HORIZ	VERT
2-10 K	-8.98	-9.6
2-10 A	22.38	-18.7

0.6*D + WIND RIGHT 2 EQ 16-15

	HORIZ	VERT
2-10 K	7.52	8.2
2-10 A	5.68	-0.9

SUMMARY:

VERTICAL

MAX UPLIFT =	-18.7 KIP
MAX DOWN =	95.8 KIP

HORIZONTAL

MAX HORIZ	
MAX LEFT =	-90.1 KIP
MAX RIGHT =	107.2 KIP



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FRAMES 2-10

SUMMARY:

VERTICAL

MAX UPLIFT = **-18.7** KIP

MAX DOWN = **95.8** KIP

HORIZONTAL

MAX HORIZ

MAX LEFT = **-90.1** KIP

MAX RIGHT = **107.2** KIP

MIN FOOTING SIZE FOR VERTICAL DOWNWARD LOAD

$$B \text{ MIN} = \sqrt{96/3} = 5.65 - \text{FT MIN}$$

CONCENTRICALLY LOADED SQUARE SPREAD FOOTINGS							
$f'_c = 3,000 \text{ psi}$				$f_y = 60,000 \text{ psi}$			
FACTORED SOIL BEARING CAPACITY 4,200 psf (SAFE BEARING CAPACITY 3,000 psf)							
Size B	Thick-ness (in.)	Min. Col. Size (in.)	Bars Each Way (No.-Size)	Required Steel Area (sq.-in.)	Weight of Bars (pounds)	Volume of Concrete (cu. yd.)	Factored Column Capacity (kips)
4'-0"	12	10	4-#4*	0.73	19	0.6	64
4'-6"	12	10	5-#4	0.83	27	0.8	81
5'-0"	13	10	4-#5	1.05	38	1.0	100
5'-6"	14	10	5-#5	1.31	52	1.3	121
6'-0"	15	10	6-#5	1.59	69	1.7	143
6'-6"	16	10	7-#5	1.90	88	2.1	167
7'-0"	17	10	8-#5	2.23	108	2.6	193
7'-6"	18	10	6-#6	2.62	126	3.1	221
8'-0"	19	10	7-#6	3.00	158	3.8	251
8'-6"	21	10	8-#6	3.19	192	4.7	281
9'-0"	22	10	9-#6	3.61	230	5.5	313
9'-6"	23	10	10-#6	4.06	270	6.4	348
10'-0"	24	10	8-#7	4.55	311	7.4	384
10'-6"	25	10	9-#7	5.05	368	8.5	422
11'-0"	26	11	10-#7	5.47	429	9.7	461
11'-6"	27	11	11-#7	6.00	495	11.0	502
12'-0"	28	11	11-#7	6.56	517	12.4	544
12'-6"	29	12	12-#7	7.04	589	14.0	588
13'-0"	30	12	13-#7	7.63	664	15.6	634
13'-6"	30	13	11-#8	8.54	764	16.9	683
14'-0"	31	13	12-#8	9.19	865	18.8	732
14'-6"	32	14	13-#8	9.74	972	20.8	782
15'-0"	33	14	11-#9	10.48	1085	22.9	834
15'-6"	34	14	12-#9	11.19	1224	25.2	887
16'-0"	35	15	12-#9	11.79	1285	27.7	941
16'-6"	36	15	13-#9	12.53	1414	30.3	996
17'-0"	37	16	14-#9	13.16	1571	33.0	1053
17'-6"	38	16	14-#9	13.94	1618	35.9	1112
18'-0"	38	17	16-#9	15.10	1904	38.0	1176
18'-6"	39	17	16-#9	15.93	1958	41.2	1237
19'-0"	41	17	17-#9	16.23	2139	45.7	1294
19'-6"	41	18	14-#10	17.55	2289	48.1	1363
20'-0"	42	18	15-#10	18.43	2517	51.9	1428

Notes: 1. Epoxy-coated bars of the same size and number may be used except where an "*" is printed. In which case, use: smaller bars (with increased number of bars); hooked or headed bars; increased f'_c , or larger footing.
 2. Reinforcing steel quantities do not include footing dowels.



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FRAMES 2-10

**MIN FOOTING SIZE FOR VERTICAL DOWNWARD LOAD BASED ON 16" THICK
FOOTING**

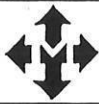
$$B \text{ MIN} = \sqrt{19 / (0.15 \times 1.25)} = 10\text{-FT}$$

TRY 2-FT THICK

$$B \text{ MIN} = 7.95\text{-FT}$$

FOR FRAMES 2-10 USE:

8'-0" X 8'-0" X 24" WITH #5 @ 12" O.C. EACH WAY TOP AND BOTTOM



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FRAME 11

LOAD COMBINATIONS

MARK	DEAD		COLLATERAL		LIVE		SNOW		WIND LEFT 1		WIND RIGHT 1		WIND LEFT 2		WIND RIGHT 2	
	HORIZ	VERT	HORIZ	VERT	HORIZ	VERT	HORIZ	VERT	HORIZ	VERT	HORIZ	VERT	HORIZ	VERT	HORIZ	VERT
2-10 K	17.7	18.5	14.5	14.5	12.5	57.9	50	75	64.8	-55	-51.5	-55	-51.5	-37.2	-33.7	-19.6
2-10 A	-17.7	18.5	-14.5	-14.5	12.5	-57.9	50	-75	64.8	41.4	-37.5	41.4	-37.5	23.6	-19.6	-33.7

D + (Lr OR s) EQ 16-10

	HORIZ	VERT
2-10 K	107.2	95.8
2-10 A	-90.1	95.8

D + WIND LEFT 1 EQ 16-12

	HORIZ	VERT
2-10 K	-22.8	-20.5
2-10 A	9.2	-6.5

D + WIND LEFT 2 EQ 16-12

	HORIZ	VERT
2-10 K	-5	-2.7
2-10 A	-8.6	11.4

D + WIND RIGHT 1 EQ 16-12

	HORIZ	VERT
2-10 K	-22.8	-20.5
2-10 A	9.2	-6.5

D + WIND RIGHT 2 EQ 16-12

	HORIZ	VERT
2-10 K	8.6	11.4
2-10 A	-69.4	-2.7

D + 0.75*WIND LEFT 1 + 0.75* SNOW EQ 16-13

	HORIZ	VERT
2-10 K	47.2	40.975
2-10 A	-57.4	51.475

D + 0.75*WIND LEFT 2 + 0.75* SNOW EQ 16-13

	HORIZ	VERT
2-10 K	60.55	54.325
2-10 A	-70.75	64.9

D + 0.75*WIND RIGHT 1 + 0.75* SNOW EQ 16-13

	HORIZ	VERT
2-10 K	47.2	40.975
2-10 A	-57.4	51.475

D + 0.75*WIND RIGHT 2 + 0.75* SNOW EQ 16-13

	HORIZ	VERT
2-10 K	70.75	64.9
2-10 A	-116.35	54.325

0.6*D + WIND LEFT 1 EQ 16-15

	HORIZ	VERT
2-10 K	-35.68	-32.9
2-10 A	22.08	-18.9

0.6*D + WIND LEFT 2 EQ 16-15

	HORIZ	VERT
2-10 K	-17.88	-15.1
2-10 A	4.28	-1

0.6*D + WIND RIGHT 1 EQ 16-15

	HORIZ	VERT
2-10 K	-35.68	-32.9
2-10 A	22.08	-18.9

0.6*D + WIND RIGHT 2 EQ 16-15

	HORIZ	VERT
2-10 K	-4.28	-1
2-10 A	-56.52	-15.1

SUMMARY:

VERTICAL
 MAX UPLIFT = **-32.9** KIP
 MAX DOWN = **95.8** KIP

HORIZONTAL

MAX HORIZ
 MAX LEFT = **-116.35** KIP
 MAX RIGHT = **107.2** KIP



PROJECT
**KHR HOLDINGS - WAREHOUSE METAL
 BUILDING FOUNDATIONS**

DATE
8-24-22

SHEET OF

DESIGNED BY
MR

PROJECT NO.
22403

FRAME 11

SUMMARY:

VERTICAL
 MAX UPLIFT = **-32.9** KIP
 MAX DOWN = **95.8** KIP

HORIZONTAL

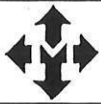
MAX HORIZ
 MAX LEFT = **-116.35** KIP
 MAX RIGHT = **107.2** KIP

MIN FOOTING SIZE FOR VERTICAL DOWNWARD LOAD

$B \text{ MIN} = \sqrt{96/3} = 5.65 - \text{FT MIN}$

CONCENTRICALLY LOADED SQUARE SPREAD FOOTINGS							
$f'_c = 3,000 \text{ psi}$				$f_y = 60,000 \text{ psi}$			
FACTORED SOIL BEARING CAPACITY 4,200 psf (SAFE BEARING CAPACITY 3,000 psf)							
Size B	Thick-ness (in.)	Min. Col. Size (in.)	Bars Each Way (No.-Size)	Required Steel Area (sq.-in.)	Weight of Bars (pounds)	Volume of Concrete (cu. yd.)	Factored Column Capacity (kips)
4'-0"	12	10	4-#4*	0.73	19	0.6	64
4'-6"	12	10	5-#4	0.83	27	0.8	81
5'-0"	13	10	4-#5	1.05	38	1.0	100
5'-6"	14	10	5-#5	1.31	52	1.3	121
6'-0"	15	10	6-#5	1.59	69	1.7	143
6'-6"	16	10	7-#5	1.90	88	2.1	167
7'-0"	17	10	8-#5	2.23	108	2.6	193
7'-6"	18	10	6-#6	2.62	126	3.1	221
8'-0"	19	10	7-#6	3.00	158	3.8	251
8'-6"	21	10	8-#6	3.19	192	4.7	281
9'-0"	22	10	9-#6	3.61	230	5.5	313
9'-6"	23	10	10-#6	4.06	270	6.4	348
10'-0"	24	10	8-#7	4.55	311	7.4	384
10'-6"	25	10	9-#7	5.05	368	8.5	422
11'-0"	26	11	10-#7	5.47	429	9.7	461
11'-6"	27	11	11-#7	6.00	495	11.0	502
12'-0"	28	11	11-#7	6.56	517	12.4	544
12'-6"	29	12	12-#7	7.04	589	14.0	588
13'-0"	30	12	13-#7	7.63	664	15.6	634
13'-6"	30	13	11-#8	8.54	764	16.9	683
14'-0"	31	13	12-#8	9.19	865	18.8	732
14'-6"	32	14	13-#8	9.74	972	20.8	782
15'-0"	33	14	11-#9	10.48	1085	22.9	834
15'-6"	34	14	12-#9	11.19	1224	25.2	887
16'-0"	35	15	12-#9	11.79	1285	27.7	941
16'-6"	36	15	13-#9	12.53	1414	30.3	996
17'-0"	37	16	14-#9	13.16	1571	33.0	1053
17'-6"	38	16	14-#9	13.94	1618	35.9	1112
18'-0"	38	17	16-#9	15.10	1904	38.0	1176
18'-6"	39	17	16-#9	15.93	1958	41.2	1237
19'-0"	41	17	17-#9	16.23	2139	45.7	1294
19'-6"	41	18	14-#10	17.55	2289	48.1	1363
20'-0"	42	18	15-#10	18.43	2517	51.9	1428

Notes: 1. Epoxy-coated bars of the same size and number may be used except where an "*" is printed. In which case, use: smaller bars (with increased number of bars); hooked or headed bars; increased f'_c , or larger footing.
 2. Reinforcing steel quantities do not include footing dowels.



PROJECT

**KHR HOLDINGS - WAREHOUSE METAL
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FRAME 11

**MIN FOOTING SIZE FOR VERTICAL DOWNWARD LOAD BASED ON 24" THICK
 FOOTING**

$$B \text{ MIN} = \sqrt{33/(0.15 \times 2)} = 10\text{-FT}$$

10'-0" X 10'-0" X 24" WITH #5 @ 12" O.C. EACH WAY TOP AND BOTTOM

ENDWALL COLUMN: BASIC COLUMN REACTIONS (k)

Frm Line	Col Line	Dead Vert	Collat Vert	Live Vert	Snow Vert	Wind_Left1		Wind_Right1		Wind_Left2		Wind_Right2		Wind Press Horz
						Horz	Vert	Horz	Vert	Horz	Vert	Horz	Vert	
1	K	0.9	0.7	2.6	3.4	0.0	-3.1	0.0	-2.1	0.0	-2.0	0.0	-1.0	-3.0
1	J	1.8	1.8	7.3	9.4	-2.1	-11.5	0.0	-2.4	-2.1	-9.0	0.0	0.2	-6.1
1	G	1.6	1.6	6.3	8.2	0.0	-5.7	2.1	-7.0	0.0	-3.4	2.1	-4.7	-6.7
1	F	2.1	1.6	6.6	8.5	0.0	-5.7	0.0	-4.7	0.0	-3.4	0.0	-2.3	-7.1
1	E	2.1	1.6	6.5	8.4	0.0	-4.1	0.0	-4.1	0.0	-2.1	0.0	-2.1	-7.6
1	D	2.1	1.6	6.6	8.5	0.0	-4.7	0.0	-5.7	0.0	-2.3	0.0	-3.4	-7.1
1	C	1.6	1.6	6.3	8.2	-2.1	-7.0	0.0	-5.7	-2.1	-4.7	0.0	-3.4	-6.7
1	B	1.8	1.8	7.3	9.4	0.0	-2.4	2.1	-11.5	0.0	0.2	2.1	-9.0	-6.1
1	A	0.9	0.7	2.6	3.4	0.0	-2.1	0.0	-3.1	0.0	-1.0	0.0	-2.0	-3.0

Frm Line	Col Line	Wind Suct Horz	Wind_Long1		Wind_Long2		Seis_Left		Seis_Right		-MIN_SNOW--		E1UNB_SL_L-	
			Horz	Vert	Horz	Vert	Horz	Vert	Horz	Vert	Horz	Vert		
1	K	3.5	0.0	-3.5	0.0	-2.1	0.0	0.1	0.0	-0.1	0.0	2.7	0.0	3.4
1	J	6.8	0.0	-8.3	-0.6	-5.8	-8.3	-10.0	0.0	10.7	0.0	7.3	0.0	9.4
1	G	7.4	0.6	-8.5	0.0	-3.8	0.0	9.7	8.3	-10.4	0.0	6.3	0.0	8.0
1	F	7.8	0.0	-8.4	0.0	-4.4	0.0	0.2	0.0	-0.2	0.0	6.6	0.0	14.9
1	E	8.3	0.0	-5.7	0.0	-5.7	0.0	0.0	0.0	0.0	0.0	6.5	0.0	9.0
1	D	7.8	0.0	-4.4	0.0	-8.4	0.0	-0.2	0.0	0.2	0.0	6.6	0.0	1.7
1	C	7.4	0.0	-3.8	-0.6	-8.5	-8.3	-10.4	0.0	9.7	0.0	6.3	0.0	2.7
1	B	6.8	0.6	-5.8	0.0	-8.3	0.0	10.7	8.3	-10.0	0.0	7.3	0.0	2.8
1	A	3.5	0.0	-2.1	0.0	-3.5	0.0	-0.1	0.0	0.1	0.0	2.7	0.0	1.0

MAXIMUM UPLIFT AT FRAME 1 AND J

$$P = 0.6 \times (1.8 + 1.8) + (-11.5) = 9.34 \text{ K} - \text{EQ 16-15}$$

$$B \text{ MIN} = \sqrt{9.34/(0.15 \times 1.5)} = 6.4\text{-FT}$$

MAXIMUM DOWN AT FRAME 1 AND J

$$P = 1.8 + 1.8 + 9.4 = 13 \text{ K} - \text{EQ 16-10}$$

$$B \text{ MIN} = \sqrt{13/3} = 2\text{-FT}$$

USE 6'-6" X 4'-6" X 18" WITH #5 @ 16" O.C. EACH WAY TOP AND BOTTOM



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MAXIMUM UPLIFT AT FRAME 1 AND G

$$P = 0.6*(1.6 + 1.6) + (-5.7) = 3.78 \text{ K} - \text{EQ 16-15}$$

$$B \text{ MIN} = \sqrt{3.78/(0.15 \times 1.5)} = 4\text{-FT}$$

MAXIMUM DOWN AT FRAME 1 AND G

$$P = 1.6 + 1.6 + 8.2 = 11.4 \text{ K} - \text{EQ 16-10}$$

$$B \text{ MIN} = \sqrt{11.4/3} = 2\text{-FT}$$

USE 4'-0" X 4'-0" X 18" WITH #5 @ 16" O.C. EACH WAY TOP AND BOTTOM



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MAXIMUM HORIZONTAL FORCE AT GRIDS 2 -11

H MAX = 116 K (SERVICE)

H MAX = 116 X 1.6 = 186 K

OF BARS TO RESIST FORCES = $186 \text{ K} / (0.9 \times 60) = 3.44 \text{ K}$

USE #5 BARS

OF BARS REQUIRED = $3.44 / 0.31 = 11 \text{ BARS}$

USE (12) #5 BARS

MIN DEPTH OF TRENCH

2" CLEAR FROM TOP OF SLAB

3" CLEAR FROM BOTTOM OF SLAB

1" BETWEEN BARS

