



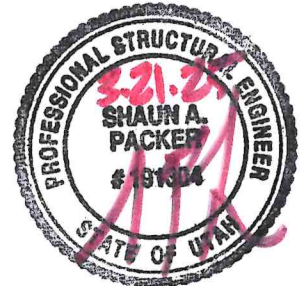
CALDER RICHARDS
CONSULTING ENGINEERS

MISCELLANEOUS STRUCTURAL CALCULATIONS

Structural Drawings and Calculations Submitted for Band and Choral Room Remodel

DATE: March 21, 2025

FOR: FFKR Architects
730 Pacific Avenue
Salt Lake City, UT 84104



PREPARED BY: Calder Richards Consulting Engineers, LLC
1805 South Redwood Road, Suite 102
Salt Lake City, UT 84104

CLIENT: Indian Hills Band & Choral Remodel
1180 East Sanders Road
Sandy, UT 84094

DISCLOSURE STATEMENT

CALDER RICHARDS CONSULTING ENGINEERS' scope of service was to provide a design of specific items pertaining to this project. Scope of services contains only design of items addressed in calculations for compliance with current building code requirements. All other items not addressed in calculations are the responsibility of OTHERS for determining compliance.



JOB TITLE: Indian Hills MS - 2025 Remodel
SUBJECT: Load Sheet

BY: JQ
CHECKED:

DATE: 12/09/24
SHEET: 1

CODE: 2021 INTERNATIONAL BUILDING CODE

RISK CATEGORY: III

ROOF LOADS

DEAD LOAD:

Roof Deck	= 2.5 psf
Roofing	= 6.0 psf
Rigid Insulation	= 1.0 psf
Framing	= 4.0 psf
Ceiling	= 3.0 psf
Mech./Misc	= 3.5 psf
Solar	= 8.0 psf

 $\Sigma = 20.0 \text{ psf (Typ)}$

SNOW LOAD:

TYPICAL ROOF:

P_g	= 35 psf
I_s	= 1.1
C_e	= 1.0
C_t	= 1.0
P_f	= 27 psf

→ USE 30 psf min

ROOF LIVE LOAD:

RLL = 20 psf

FLOOR LOADS

DEAD LOAD:

20Ga B Deck	= 2.5 psf
4" NW Conc	= 36.5 psf
Framing	= 5.0 psf
Ceiling	= 2.8 psf
Mech/Misc	= 8.2 psf

 $\Sigma = 55.0 \text{ psf}$

LIVE LOAD:

Light Storage	= 125 psf
Mechanical Room	= 125 psf

SEISMIC

S_S	= 1.460
S_1	= 0.537
S_{DS}	= 0.973
S_{D1}	= 0.631
I_e	= 1.25
Seismic Design Category	= D
Soil Site Class	= D

LATERAL FORCE RESISTING SYSTEM:

Intermediate Reinforced Masonry Shear Walls

R	= 3.50
Ω_o	= 2.5
C_d	= 2.25

Special Reinforced Masonry Shear Walls

R	= 5.0
Ω_o	= 2.5
C_d	= 3.5

WIND

V = 109 mph
Exposure Category = C

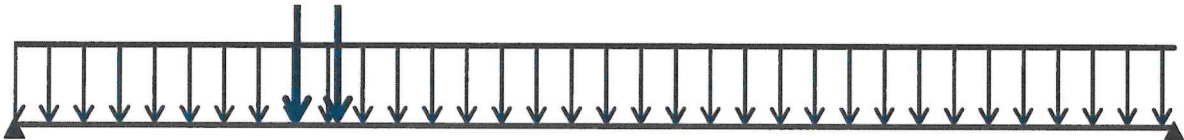
SOILS

Allowable Soil Bearing Pressure = 2000 psf (Per Geotech Report 1160598 by AGECE, dated 10-3-2016)

Frost Depth = N/A (interior footings)

 CALDER RICHARDS CONSULTING ENGINEERS	JOB TITLE	INDIAN HILLS MS - 2025 REMODEL	BY	JQ	DATE	12/10/2024
	SUBJECT	BEAM CALCULATOR	CHECKED		SHEET	3

Name:
 NEW B1
 Code:
 2021 IBC
 LRFD
 Design:
 OK
 DCR
 0.90
 SAVED



L_cant1:	ft	L_span1:	42.25 ft	L_span2:	ft	L_span3:	ft	L_cant2:	ft
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Slope trib a b D D _{adj} L L _r S W _v E _v	Uniform		Distributed				Point					Triangular				ft ft ft psf/lbf psf/lbf psf/lbf psf/lbf psf/lbf psf/lbf
	1	2	1	2	3	4	1	2	3	4	5	1	2	3	4	
	0/12	0/12	0/12	0/12	0/12	0/12	0/12	0/12	0/12	0/12	0/12	0/12	0/12	0/12	0/12	
	1.0															
							10.25	11.75								
	119						9430	15000								
	119						9430	15000								
							10940	15050								

UNFACTORED REACTIONS (kip)									FACTORED SHEAR/MOMENT (kip/kip-ft)						
	D	L	L _r	S	W _v	E _v	Total	Connection		V _{max}	LC	M _{max}	LC	M _{min}	LC
R1	20.48			19.15			39.63	Shear Tab	Cant1						
R2	8.97			6.84			15.81	Shear Tab	Span1	55.22	6	595.72	6		1
R3								0	Span2						
R4								0	Span3						
TOTAL	29.46			25.99			55.45		Cant2						

Interior Spans		Cantilever Spans		d _{limit} (in):	80	Wood Design Value Adjustment Factors					
Top Bracing (ft):	30.5	Top Bracing (ft):	0	Δ _{LL} Limit	L/240	C _r :	1.15	C _L :	1.00	C _F /C _V :	1.00
Bot Bracing (ft):	30.5	Bot Bracing (ft):	0	Δ _{TL} Limit	L/180	C _i :	1.00	C _t :	1.00	C _c :	1.00
						C _{fu} :	1.00	C _M :	1.00	C _j :	1.00

HSS 5x5x3/16
66.2k > 39.6k

5x5 Footing
50.0k > 39.6k

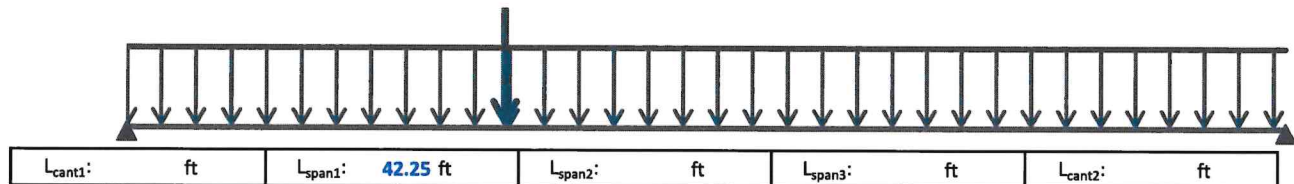
4x4 Footing
32.0k > 15.8k

DESIGN OPTIONS						SELECTED DESIGN				
W Shape		Economical Suggestions (DCRs)				Manual Select	W18X119			
Controlling Span	SHAPE	W24X104	W21X111	W24X117	W33X118	W18X119	Demand	Capacity	DCR	
	V	0.15	0.16	0.14	0.11	0.15	55.22	373.35	0.15	kip
	M+	0.95	0.89	0.78	0.99	0.90	595.72	663.72	0.90	kip-ft
	M-									kip-ft
	ΔLL	0.27	0.31	0.24	0.14	0.38	0.81	2.11	0.38	in
Controlling Cant.	ΔTL	0.43	0.50	0.37	0.22	0.60	1.70	2.82	0.60	in
	V									kip
	M+									kip-ft
	M-									kip-ft
	ΔLL									in
	ΔTL									in

Δ_r = .22
NO CAMBER

 CALDER RICHARDS CONSULTING ENGINEERS	JOB TITLE	INDIAN HILLS MS - 2025 REMODEL	BY	JQ	DATE	12/10/2024
	SUBJECT	BEAM CALCULATOR	CHECKED		SHEET	1

Name: **NEW B2** Code: 2021 IBC LRFD Design: OK DCR 0.90 SAVED



	Uniform		Distributed				Point					Triangular			
	1	2	1	2	3	4	1	2	3	4	5	1	2	3	4
Slope	0/12	0/12	0/12	0/12	0/12	0/12	0/12	0/12	0/12	0/12	0/12	0/12	0/12	0/12	0/12
trib	1.0														
a							13.75								
b															
D	119						21050								
Dadj	119						21050								
L															
Lr															
S							24400								
Wv															
Ev															

UNFACTORED REACTIONS (kip)									FACTORED SHEAR/MOMENT (kip/kip-ft)						
	D	L	L _r	S	W _v	E _v	Total	Connection		V _{max}	LC	M _{max}	LC	M _{min}	LC
R1	16.71			16.46			33.17	Shear Tab	Cant1						
R2	9.36			7.94			17.31	Shear Tab	Span1	46.39	6	624.12	6		1
R3								0	Span2						
R4								0	Span3						
TOTAL	26.08			24.4			50.48		Cant2						

Interior Spans		Cantilever Spans	
Top Bracing (ft):	28.5	Top Bracing (ft):	0
Bot Bracing (ft):	0	Bot Bracing (ft):	0

d_{limit} (in): 80
 Δ_{LL} Limit: L/240
 Δ_{TL} Limit: L/180

HSS 5x5x3/16
66.2k > 33.2k

5x5 Footing
 50.0k > 33.2k
 4x4 Footing
 32.0k > 17.3k

Wood Design Value Adjustment Factors

C_r: 1.15 C_L: 1.00 C_{F/Cv}: 1.00
 C_i: 1.00 C_t: 1.00 C_c: 1.00
 C_{fu}: 1.00 C_M: 1.00 C_j: 1.00

DESIGN OPTIONS

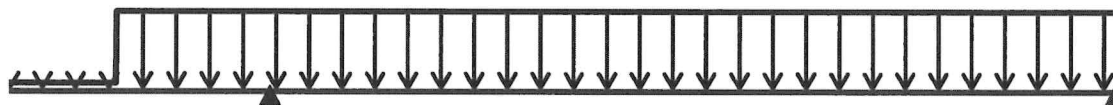
SELECTED DESIGN

W Shape		Economical Suggestions (DCRs)				Manual Select	W18X119				
Controlling Span	SHAPE	W24X104	W21X111	W24X117	W33X118	W18X119		Demand	Capacity	DCR	
	V	0.13	0.13	0.12	0.09	0.12	V	46.39	373.35	0.12	kip
	M+	0.90	0.89	0.77	0.93	0.90	M+	624.12	694.08	0.90	kip-ft
	M-						M-				kip-ft
	ΔLL	0.30	0.34	0.26	0.16	0.42	ΔLL	0.88	2.11	0.42	in
Controlling Cant.	ΔTL	0.45	0.52	0.39	0.23	0.63	ΔTL	1.78	2.82	0.63	in
	V						V				kip
	M+						M+				kip-ft
	M-						M-				kip-ft
	ΔLL						ΔLL				in
	ΔTL						ΔTL				in

A_b = .21
 NO
 CHANGES

 CALDER RICHARDS CONSULTING ENGINEERS	JOB TITLE	INDIAN HILLS MS - 2025 REMODEL	BY	JQ	DATE	12/9/2024
	SUBJECT	BEAM CALCULATOR	CHECKED		SHEET	5

Name: (E) 24X55 Code: 2021 IBC LRFD Design: OK DCR 0.36 SAVED



L _{cant1} :	7.33 ft	L _{span1} :	24.0 ft	L _{span2} :	ft	L _{span3} :	ft	L _{cant2} :	ft
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Slope trib a b D D _{adj} L L _r S W _v E _v	Uniform		Distributed				Point					Triangular				ft ft ft psf/lbf psf/lbf psf/lbf psf/lbf psf/lbf psf/lbf
	1	2	1	2	3	4	1	2	3	4	5	1	2	3	4	
	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
	0/12	0/12	0/12	0/12	0/12	0/12	0/12	0/12	0/12	0/12	0/12	0/12	0/12	0/12	0/12	
	30.0	1.0	30.0													
			3													
	20	243	-20													
	20	243	-20													
	20		-20													
	30		-30													

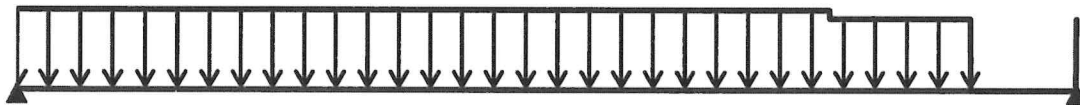
UNFACTORED REACTIONS (kip)									FACTORED SHEAR/MOMENT (kip/kip-ft)						
	D	L	L _r	S	W _v	E _v	Total	Connection		V _{max}	LC	M _{max}	LC	M _{min}	LC
R1	15.0		10.03	15.05			40.09	Shear Tab	Cant1	11.49	6		1	28.09	6
R2	9.61		6.97	10.45			27.02	Shear Tab	Span1	30.57	6	162.58	6	28.09	6
R3								0	Span2						
R4								0	Span3						
TOTAL	24.61		17.0	25.5			67.11		Cant2						

Interior Spans		Cantilever Spans		Wood Design Value Adjustment Factors	
Top Bracing (ft):	0	Top Bracing (ft):	0	C _r :	1.15
Bot Bracing (ft):	0	Bot Bracing (ft):	0	C _i :	1.00
				C _{fu} :	1.00
				C _L :	1.00
				C _F /C _v :	1.00
				C _c :	1.00
				C _M :	1.00
				C _i :	1.00

DESIGN OPTIONS						SELECTED DESIGN				
W Shape		Economical Suggestions (DCRs)				Manual Select	W24X55			
Controlling Span	SHAPE	W18X35	W16X40	W18X40	W21X44	W24X55	Demand	Capacity	DCR	
	V	0.19	0.21	0.18	0.14	0.12	V	30.57	251.69	0.12 kip
	M+	0.65	0.59	0.55	0.45	0.32	M+	162.58	502.50	0.32 kip-ft
	M-	0.11	0.10	0.10	0.08	0.06	M-	-28.09	502.50	0.06 kip-ft
	ΔLL	0.52	0.52	0.44	0.32	0.20	ΔLL	0.16	0.80	0.20 in
Controlling Cant.	ΔTL	0.66	0.65	0.55	0.40	0.25	ΔTL	0.30	1.20	0.25 in
	V	0.07	0.08	0.07	0.05	0.05	V	11.49	251.69	0.05 kip
	M+						M+			kip-ft
	M-	0.11	0.10	0.10	0.08	0.06	M-	28.09	502.50	0.06 kip-ft
	ΔLL	0.77	0.76	0.64	0.47	0.29	ΔLL	0.14	0.49	0.29 in
	ΔTL	0.95	0.93	0.79	0.57	0.36	ΔTL	0.26	0.73	0.36 in

 CALDER RICHARDS CONSULTING ENGINEERS	JOB TITLE	INDIAN HILLS MS - 2025 REMODEL	BY	JQ	DATE	12/9/2024
	SUBJECT	BEAM CALCULATOR	CHECKED		SHEET	6

Name: (E) 24X76 Code: 2021 IBC LRFD Design: OK DCR 0.36 SAVED



L _{cant1} :	ft	L _{span1} :	ft	L _{span2} :	30.0 ft	L _{span3} :	ft	L _{cant2} :	ft
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	Uniform		Distributed				Point					Triangular			
	1	2	1	2	3	4	1	2	3	4	5	1	2	3	4
Slope	0/12	0/12	0/12	0/12	0/12	0/12	0/12	0/12	0/12	0/12	0/12	0/12	0/12	0/12	0/12
trib	30.0		1.0	30.0											
a				27											
b			23	30											
D	20		243	-20											
D _{adj}	20		243	-20											
L															
L _r	20			-20											
S	30			-30											
W _v															
E _v															

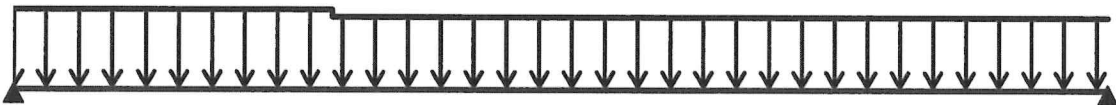
UNFACTORED REACTIONS (kip)									FACTORED SHEAR/MOMENT (kip/kip-ft)						
	D	L	L _r	S	W _v	E _v	Total	Connection		V _{max}	LC	M _{max}	LC	M _{min}	LC
R1								0	Cant1						
R2	12.36		8.91	13.37			34.63	Shear Tab	Span1						
R3	9.43		7.29	10.94			27.66	Shear Tab	Span2	36.21	6	267.44	6		1
R4								0	Span3						
TOTAL	21.79		16.2	24.3			62.29		Cant2						

Interior Spans		Cantilever Spans		d _{limit} (in): 80	Wood Design Value Adjustment Factors					
Top Bracing (ft):	0	Top Bracing (ft):	0		C _r :	1.15	C _L :	1.00	C _F /C _V :	1.00
Bot Bracing (ft):	0	Bot Bracing (ft):	0		C _i :	1.00	C _t :	1.00	C _c :	1.00
					C _{fu} :	1.00	C _M :	1.00	C _j :	1.00

DESIGN OPTIONS						SELECTED DESIGN					
W Shape		Economical Suggestions (DCRs)				Manual Select	W24X76				
Controlling Span	SHAPE	W21X44	W18X46	W21X48	W18X50	W24X76		Demand	Capacity	DCR	
	V	0.17	0.19	0.17	0.19	0.11	V	36.21	315.48	0.11	kip
	M+	0.75	0.79	0.67	0.71	0.36	M+	267.44	750.00	0.36	kip-ft
	M-						M-				kip-ft
	ΔLL	0.65	0.78	0.58	0.69	0.26	ΔLL	0.26	1.00	0.26	in
Controlling Cant.	ΔTL	0.83	0.99	0.73	0.88	0.33	ΔTL	0.50	1.50	0.33	in
	V						V				kip
	M+						M+				kip-ft
	M-						M-				kip-ft
	ΔLL						ΔLL				in
	ΔTL						ΔTL				in

 CALDER RICHARDS CONSULTING ENGINEERS	JOB TITLE	INDIAN HILLS MS - 2025 REMODEL	BY	JQ	DATE	12/9/2024
	SUBJECT	BEAM CALCULATOR	CHECKED		SHEET	7

Name:
 (E) 24X84
 Code:
 2021 IBC
 LRFD
 Design:
 OK
 DCR
 0.32
 SAVED



L _{cant1} :	ft	L _{span1} :	31.0 ft	L _{span2} :	ft	L _{span3} :	ft	L _{cant2} :	ft
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	Uniform		Distributed				Point					Triangular			
	1	2	1	2	3	4	1	2	3	4	5	1	2	3	4
Slope	0/12	0/12	0/12	0/12	0/12	0/12	0/12	0/12	0/12	0/12	0/12	0/12	0/12	0/12	0/12
trib	30.0		1.0	1.0											
a				9											
b			9	31											
D	20		243	35											
D _{adj}	20		243	35											
L															
L _r	20														
S	30														
W _v															
E _v															

UNFACTORED REACTIONS (kip)									FACTORED SHEAR/MOMENT (kip/kip-ft)						
	D	L	L _r	S	W _v	E _v	Total	Connection		V _{max}	LC	M _{max}	LC	M _{min}	LC
R1	11.44		9.3	13.95			34.69	Shear Tab	Cant1						
R2	10.11		9.3	13.95			33.36	Shear Tab	Span1	36.05	6	269.6	6		1
R3								0	Span2						
R4								0	Span3						
TOTAL	21.56		18.6	27.9			68.06		Cant2						

Interior Spans		Cantilever Spans		Wood Design Value Adjustment Factors	
Top Bracing (ft):	0	Top Bracing (ft):	0	C _r :	1.15
Bot Bracing (ft):	0	Bot Bracing (ft):	0	C _i :	1.00
				C _{fu} :	1.00

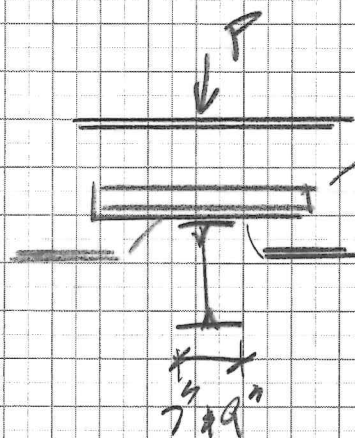
DESIGN OPTIONS						SELECTED DESIGN					
W Shape		Economical Suggestions (DCRs)				Manual Select	W24X84				
Controlling Span	SHAPE	W21X44	W21X48	W18X50	W21X50	W24X84	Demand	Capacity	DCR		
	V	0.17	0.17	0.19	0.15	0.11	V	36.05	339.81	0.11	kip
	M+	0.75	0.67	0.71	0.65	0.32	M+	269.60	840.00	0.32	kip-ft
	M-						M-				kip-ft
	ΔLL	0.74	0.65	0.78	0.63	0.26	ΔLL	0.27	1.03	0.26	in
Controlling Cant.	ΔTL	0.86	0.76	0.91	0.74	0.31	ΔTL	0.48	1.55	0.31	in
	V						V				kip
	M+						M+				kip-ft
	M-						M-				kip-ft
	ΔLL						ΔLL				in
	ΔTL						ΔTL				in

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29

DTL 5 CH & CH.1/SSP1

CH $P \approx 20(16)(20+40) + 16(150) = 30^k$ ^{BM B.M.}

CH.1 $P \approx 20(15)(20+40) + 16(150) = 28^k$
 L conservative



L4x4 $\rightarrow$ NO GOOD
 USE PL

Angle thickness

$$q = \frac{30^k}{(2)(4)(6)} = .54 \text{ ksi}$$

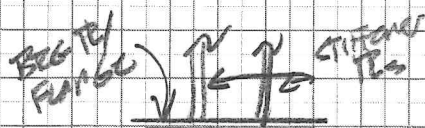
$$M = \frac{.54 \text{ ksi} (4)^2}{2} = 4.32 \text{ k.in}$$

$$Z_{reqd} = \frac{4.32 \text{ k.in} (1.67)}{36 \text{ ksi}} = \frac{1}{4} d^2 \quad d = .90$$

4" x 1" = 4'-0" OR 2'-0" PL $\rightarrow$ USE PL
W/ STIFFENERS

DTL C5

$$P = 27(20)(20+40) + 16(150) = 48^k$$



$$q = \frac{48^k}{2(4)(7)} = .86 \text{ ksi}$$

$$M = .86(5)^2/2 = 2.69 \text{ k.in}$$

$$Z_{reqd} = \frac{2.69 \text{ k.in} (1.67)}{36 \text{ ksi}} = \frac{1}{4} d^2 \quad d = .72$$

5" max @ BM $\rightarrow$ OK

 CALDER RICHARDS CONSULTING ENGINEERS	JOB	Indian Hills Remodel		BY	DATE	1/7/2025
	SUBJECT	CONCENTRIC SPOT FOOTINGS		CHECKED	PAGE	1 OF 1

Net Allowable Bearing Pressure (psf)	2000
Average Load Factor	1.5
Factored Bearing Pressure (psf)	3000
f_y (psi)	60000
f'_c (psi)	3000
ϕ bending	0.9
ϕ shear	0.75
ρ minimum	0.0018

Square pedestal size (in)	8
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Design based upon requirements in ACI 318-19 & IBC 2021

Notes:

1. One-Way shear checked at d from support
2. Punching shear checked at d/2 from support
3. Bending checked at face of support
4. Depth d used in design is footing depth minus 4"
5. As bare minimum is 0.0018 * Width * Depth for Shrinkage Reinf
6. Reduce pedestal size accordingly, where base plates are used.

Footing Size & Reinforcement Each Direction		P allow		One-Way Shear		Punching Shear		Bending	
L & W	Depth	As min (in ²)	(kips)	Vu (kips)	ϕ Vc (kips)	Vu (kips)	ϕ Vc (kips)	Mu (k-ft)	ϕ Mn (k-ft)
2'-0" (24")	1'-0" (12")	0.52	8.0	0.00	7.68	6.67	84.13	1.33	18.07
2'-6" (30")	1'-0" (12")	0.65	12.5	1.88	9.60	13.42	84.13	3.15	22.59
3'-0" (36")	1'-0" (12")	0.78	18.0	4.50	11.52	21.67	84.13	6.13	27.10
3'-6" (42")	1'-0" (12")	0.91	24.5	7.88	13.43	31.42	84.13	10.54	31.62
4'-0" (48")	1'-0" (12")	1.04	32.0	12.00	15.35	42.67	84.13	16.67	36.14
4'-6" (54")	1'-0" (12")	1.17	40.5	16.88	17.27	55.42	84.13	24.80	40.66
5'-0" (60")	1'-2" (14")	1.51	50.0	20.00	23.99	68.25	118.31	35.21	66.02
5'-6" (66")	1'-2" (14")	1.66	60.5	26.13	26.39	84.00	118.31	48.18	72.63
6'-0" (72")	1'-4" (16")	2.07	72.0	30.00	34.55	99.67	157.74	64.00	108.81
6'-6" (78")	1'-4" (16")	2.25	84.5	37.38	37.43	118.42	157.74	82.94	117.88
7'-0" (84")	1'-6" (18")	2.72	98.0	42.00	47.02	136.92	202.44	105.29	166.79
7'-6" (90")	1'-7" (19")	3.08	112.5	48.75	53.98	157.73	226.76	131.33	202.19
8'-0" (96")	1'-8" (20")	3.46	128.0	56.00	61.42	180.00	252.39	161.33	242.25
8'-6" (102")	1'-9" (21")	3.86	144.5	63.75	69.33	203.73	279.34	195.59	287.24
9'-0" (108")	1'-10" (22")	4.28	162.0	72.00	77.73	228.92	307.60	234.38	337.45
9'-6" (114")	1'-11" (23")	4.72	180.5	80.75	86.61	255.56	337.18	277.97	393.18
10'-0" (120")	2'-0" (24")	5.18	200.0	90.00	95.96	283.67	368.07	326.67	454.70
10'-6" (126")	2'-1" (25")	5.67	220.5	99.75	105.80	313.23	400.28	380.73	522.31
11'-0" (132")	2'-2" (26")	6.18	242.0	110.00	116.12	344.25	433.80	440.46	596.28
11'-6" (138")	2'-3" (27")	6.71	264.5	120.75	126.91	376.73	468.63	506.12	676.90
12'-0" (144")	2'-4" (28")	7.26	288.0	132.00	138.19	410.67	504.78	578.00	764.46