

Lomond View Designs, LLC

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Ogden, UT 84414

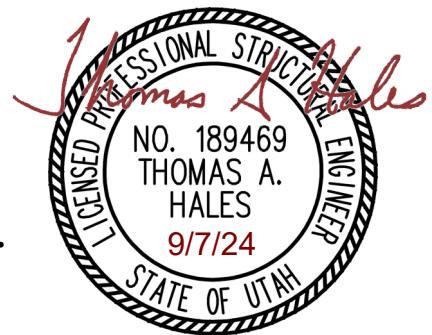
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Structural Calculations
for
Ogden City
(0-1-864 / 3-2-864 Two-Story)
for
874 E Cahoon Circle
Ogden, Utah

September 7, 2024

Note: These calculations are to be used only for the plan number and the building lot and/or address shown above. Use of these calculations for any other plan or location is prohibited unless written/signed agreement is obtained from Thomas A. Hales indicating otherwise.

Prepared By:
Thomas A. Hales, Ph.D., S.E.



Job # 24048

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DESIGN CRITERIA:

A. GOVERNING BUILDING CODE: 2021 INTERNATIONAL BUILDING CODE (IBC) AND 2021 INTERNATIONAL RESIDENTIAL CODE (IRC)

B. GRAVITY LIVE LOADING:

1. ROOF: 30 PSF SNOW LOAD
2. FLOOR: 40 PSF LIVE LOAD
3. DECK: 60 PSF LIVE LOAD

C. EARTHQUAKE: $V = S_{ds} * I * W / R = 2/3 * S_{ms} * I * W / R$

1. S_{ms} = USE 1.6 (SDC = 'D2')
2. I, IMPORTANCE FACTOR = 1.0
3. R, BUILDING TYPE = 6.5 (USE 6)
4. W, WEIGHT OF STRUCTURE

D. WIND:

1. VELOCITY: 115 MPH (LRF) * 0.775 → 90 MPH (ASD), BASIC WIND SPEED (IBC 1609.3.1)
2. EXPOSURE: TYPE C
3. IMP. FACTOR: 1.0, STANDARD OCCUPANCY

E. SOIL BEARING PRESSURE: 1500 PSF ASSUMED BY OWNER

F: SEE DRAWINGS FOR GENERAL NOTES AND CONSTRUCTION REQUIREMENTS

COLUMN AND FOOTING LOADS AND SIZES

Project: **JOB #24048**
 Allow. Soil Bearing Press. **1500 psf**

Date: **9/7/2024**
 Engineer: **Tom Hales**

CONTINUOUS FOOTINGS

Footings/Column Location: **TYP. EXTERIOR WALL (WORST CASE)**

Alt. Soil Bearing Pressure

COMMENT	TRIBUTARY AREA		WEIGHT	SUB TOTAL	CUM. TOT.
	LENGTH 1	PER 1 FT.			
ROOF SNOW LOAD	10.0 ft		30 psf	300 plf	300 plf
ROOF DEAD LOAD	10.0 ft		17 psf	170 plf	470 plf
UPPER FLOOR LIVE LOAD	7.0 ft		40 psf	280 plf	750 plf
UPPER FLOOR DEAD LOAD	7.0 ft		15 psf	105 plf	855 plf
MAIN FLOOR LIVE LOAD	12.0 ft		40 psf	480 plf	1335 plf
MAIN FLOOR DEAD LOAD	12.0 ft		50 psf	600 plf	1935 plf
TOTAL LOAD				1935 plf	
REQ'D FTG. WIDTH				1.3 ft	USE FC1.7

USE FC1.5 FOR INTERIOR BEARING WALL

Footings/Column Location:

Alt. Soil Bearing Pressure

COMMENT	TRIBUTARY AREA		WEIGHT	SUB TOTAL	CUM. TOT.	
	LENGTH 1	PER 1 FT.				
					</	

Footings/Column Location:

Alt. Soil Bearing Pressure

COMMENT	TRIBUTARY AREA		WEIGHT	SUB TOTAL	CUM. TOT.	
	LENGTH 1	PER 1 FT.				
				TOTAL LOAD	0 plf	
				REQ'D FTG. WIDTH	0.0 ft	

WOOD BEAM DESIGN FOR UNIFORM LOADING CONDITIONS

Project: JOB #24048
Description: 3'-0" UPPER FLOOR WITH GIRDER TRUSS PT LD

Date: 9/7/2024
Engineer: TAH

INPUT:

Length of Span - L (ft): 3.5
Distance from Support to Calc. Shear - d (in): 9

Roof Loads:

Trib. Length (ft): 26
Snow Load (psf): 30
Dead Load (psf): 17

Linear Loads:

Snow Load (plf): 0
Live Load (plf): 0
Dead Load (plf): 0

Floor Loads:

Trib. Length (ft): 0
Live Load (psf): 40
Dead Load (psf): 15

Total Load Deflection Criteria (Span/ Δ) - Δ : 240
Live Load Deflection Criteria (Span/ Δ) - Δ : 360

Total Load (plf): 1222 plf
Total Live Load (plf): 780 plf

Beam	DL=	773.5 lbs
Reactions:	LL=	1365 lbs
	TL=	2138.5 lbs

OUTPUT:

DOUGLAS FIR-LARCH

Allowable Shear Stress - Fv (psi): 95
Modulus of Elasticity - E (ksi): 1600
Allowable Bending Stress - Fb (psi): 1313 2x4
1139 2x6
1052 2x8
961 2x10
845 2x12

I (TL) (in⁴): 14.74
I (LL) (in⁴): 14.11
A (in²): 19.29
S (in³) 2x4: 17.10
2x6: 19.71
2x8: 21.34
2x10: 23.37
2x12: 26.57

3-2x6's (0.87)
2-2x8's (0.89)
2-2x10's (0.7)
2-2x12's (0.57)

GLUED-LAMINATED (24F-V4)

Allowable Shear Stress - Fv (psi): 190
Modulus of Elasticity - E (ksi): 1800
Allowable Bending Stress - Fb (psi): 2400

I (TL) (in⁴): 13.10
I (LL) (in⁴): 12.54
A (in²): 9.65
S (in³): 9.36

3.125 x 6 GLB (0.51)
5.125 x 6 GLB (0.31)

MICRO-LAM

Allowable Shear Stress - Fv (psi): 285
Modulus of Elasticity - E (ksi): 1900
Allowable Bending Stress - Fb (psi): 2600

EI (TL) k-in²: 23577
EI (LL) (k-in²): 22574
Shear (lbs): 1222
Moment (ft-lb): 1871

(2)-1.75 x 5.5 M-L (0.44)

VERSA-LAM

Allowable Shear Stress - Fv (psi): 285
Modulus of Elasticity - E (ksi): 2000
Allowable Bending Stress - Fb (psi): 2800

EI (TL) k-in²: 23577
EI (LL) (k-in²): 22574
Shear (lbs): 1222
Moment (ft-lb): 1871

(2)-1.75 x 5.5 V-L (0.42)

NOTE: A LOAD DURATION FACTOR OF 1.0 IS USED FOR ALL BEAMS

**WOOD BEAM DESIGN
FOR UNIFORM LOADING CONDITIONS**

Project: JOB #24048
Description: 5'-0" KITCHEN WINDOW HEADER

Date: 9/7/2024
Engineer: TAH

INPUT:

Length of Span - L (ft): 5.5
Distance from Support to Calc. Shear - d (in): 9

Roof Loads:

Trib. Length (ft): 12
Snow Load (psf): 30
Dead Load (psf): 17

Linear Loads:

Snow Load (plf): 0
Live Load (plf): 0
Dead Load (plf): 0

Floor Loads:

Trib. Length (ft): 7
Live Load (psf): 40
Dead Load (psf): 15

Total Load Deflection Criteria (Span/ Δ) - Δ : 240
Live Load Deflection Criteria (Span/ Δ) - Δ : 360

Total Load (plf): 949 plf
Total Live Load (plf): 640 plf

Beam	DL=	849.75 lbs
Reactions:	LL=	1760 lbs
	TL=	2609.8 lbs

OUTPUT:

DOUGLAS FIR-LARCH

Allowable Shear Stress - Fv (psi): 95
Modulus of Elasticity - E (ksi): 1600
Allowable Bending Stress - Fb (psi): 1313 2x4
1139 2x6
1052 2x8
961 2x10
845 2x12

I (TL) (in⁴): 44.41
I (LL) (in⁴): 44.92
A (in²): 29.97
S (in³) 2x4: 32.80
2x6: 37.81
2x8: 40.93
2x10: 44.81
2x12: 50.96

3-2x10's (0.72)
2-2x12's (0.89)

GLUED-LAMINATED (24F-V4)

Allowable Shear Stress - Fv (psi): 190
Modulus of Elasticity - E (ksi): 1800
Allowable Bending Stress - Fb (psi): 2400

I (TL) (in⁴): 39.47
I (LL) (in⁴): 39.93
A (in²): 14.98
S (in³): 17.94

3.125 x 6 GLB (0.96)
5.125 x 6 GLB (0.58)

MICRO-LAM

Allowable Shear Stress - Fv (psi): 285
Modulus of Elasticity - E (ksi): 1900
Allowable Bending Stress - Fb (psi): 2600

EI (TL) k-in²): 71050
EI (LL) (k-in²): 71874
Shear (lbs): 1898
Moment (ft-lb): 3588

(2)-1.75 x 5.5 M-L (0.84)

VERSA-LAM

Allowable Shear Stress - Fv (psi): 285
Modulus of Elasticity - E (ksi): 2000
Allowable Bending Stress - Fb (psi): 2800

EI (TL) k-in²): 71050
EI (LL) (k-in²): 71874
Shear (lbs): 1898
Moment (ft-lb): 3588

(2)-1.75 x 5.5 V-L (0.8)

NOTE: A LOAD DURATION FACTOR OF 1.0 IS USED FOR ALL BEAMS

**WOOD BEAM DESIGN
FOR UNIFORM LOADING CONDITIONS**

Project: JOB #24048
Description: 8'-0" COVERED PORCH BEAM

Date: 9/7/2024
Engineer: TAH

INPUT:

Length of Span - L (ft): 8
Distance from Support to Calc. Shear - d (in): 9

Roof Loads:

Trib. Length (ft): 6
Snow Load (psf): 30
Dead Load (psf): 17

Linear Loads:

Snow Load (plf): 0
Live Load (plf): 0
Dead Load (plf): 0

Floor Loads:

Trib. Length (ft): 0
Live Load (psf): 40
Dead Load (psf): 15

Total Load Deflection Criteria (Span/ Δ) - Δ : 240
Live Load Deflection Criteria (Span/ Δ) - Δ : 360

Total Load (plf): 282 plf
Total Live Load (plf): 180 plf

Beam	DL=	408 lbs
Reactions:	LL=	720 lbs
	TL=	1128 lbs

OUTPUT:

DOUGLAS FIR-LARCH

Allowable Shear Stress - Fv (psi): 95
Modulus of Elasticity - E (ksi): 1600
Allowable Bending Stress - Fb (psi): 1313 2x4
1139 2x6
1052 2x8
961 2x10
845 2x12

I (TL) (in⁴): 40.61
I (LL) (in⁴): 38.88
A (in²): 14.47
S (in³) 2x4: 20.62
2x6: 23.77
2x8: 25.73
2x10: 28.17
2x12: 32.04

2-2x8's (0.98)

2-2x10's (0.66)

2-2x12's (0.51)

GLUED-LAMINATED (24F-V4)

Allowable Shear Stress - Fv (psi): 190
Modulus of Elasticity - E (ksi): 1800
Allowable Bending Stress - Fb (psi): 2400

I (TL) (in⁴): 36.10
I (LL) (in⁴): 34.56
A (in²): 7.24
S (in³): 11.28

3.125 x 6 GLB (0.64)

5.125 x 6 GLB (0.39)

MICRO-LAM

Allowable Shear Stress - Fv (psi): 285
Modulus of Elasticity - E (ksi): 1900
Allowable Bending Stress - Fb (psi): 2600

EI (TL) k-in²): 64973
EI (LL) (k-in²): 62208
Shear (lbs): 917
Moment (ft-lb): 2256

(2)-1.75 x 5.5 M-L (0.71)

VERSA-LAM

Allowable Shear Stress - Fv (psi): 285
Modulus of Elasticity - E (ksi): 2000
Allowable Bending Stress - Fb (psi): 2800

EI (TL) k-in²): 64973
EI (LL) (k-in²): 62208
Shear (lbs): 917
Moment (ft-lb): 2256

(2)-1.75 x 5.5 V-L (0.67)

NOTE: A LOAD DURATION FACTOR OF 1.0 IS USED FOR ALL BEAMS

WOOD BEAM DESIGN FOR UNIFORM LOADING CONDITIONS

Project: JOB #24048
Description: 13'-0" DINING ROOM BEAM

Date: 9/7/2024
Engineer: TAH

INPUT:

Length of Span - L (ft): 14
Distance from Support to Calc. Shear - d (in): 9

Roof Loads:

Trib. Length (ft): 0
Snow Load (psf): 30
Dead Load (psf): 17

Linear Loads:

Snow Load (plf): 0
Live Load (plf): 0
Dead Load (plf): 0

Floor Loads:

Trib. Length (ft): 11
Live Load (psf): 40
Dead Load (psf): 15

Total Load Deflection Criteria (Span/ Δ) - Δ : 240
Live Load Deflection Criteria (Span/ Δ) - Δ : 360

Total Load (plf): 605 plf
Total Live Load (plf): 440 plf

Beam	DL=	1155 lbs
Reactions:	LL=	3080 lbs
	TL=	4235 lbs

OUTPUT:

DOUGLAS FIR-LARCH

Allowable Shear Stress - Fv (psi): 95
Modulus of Elasticity - E (ksi): 1600
Allowable Bending Stress - Fb (psi): 1313 2x4
1139 2x6
1052 2x8
961 2x10
845 2x12

I (TL) (in⁴): 466.91
I (LL) (in⁴): 509.36
A (in²): 59.70
S (in³) 2x4: 135.47
2x6: 156.16
2x8: 169.08
2x10: 185.09
2x12: 210.50

GLUED-LAMINATED (24F-V4)

Allowable Shear Stress - Fv (psi): 190
Modulus of Elasticity - E (ksi): 1800
Allowable Bending Stress - Fb (psi): 2400

I (TL) (in⁴): 415.03
I (LL) (in⁴): 452.76
A (in²): 29.85
S (in³): 74.11

3.125 x 13.5 GLB (0.78)
5.125 x 10.5 GLB (0.92)

MICRO-LAM

Allowable Shear Stress - Fv (psi): 285
Modulus of Elasticity - E (ksi): 1900
Allowable Bending Stress - Fb (psi): 2600

EI (TL) k-in²): 747054
EI (LL) (k-in²): 814968
Shear (lbs): 3781
Moment (ft-lb): 14823

(2)-1.75 x 11.875 M-L (0.88)

VERSA-LAM

Allowable Shear Stress - Fv (psi): 285
Modulus of Elasticity - E (ksi): 2000
Allowable Bending Stress - Fb (psi): 2800

EI (TL) k-in²): 747054
EI (LL) (k-in²): 814968
Shear (lbs): 3781
Moment (ft-lb): 14823

(2)-1.75 x 11.25 V-L (0.98)

NOTE: A LOAD DURATION FACTOR OF 1.0 IS USED FOR ALL BEAMS

**WOOD BEAM DESIGN
FOR UNIFORM LOADING CONDITIONS**

Project: JOB #24048
Description: 5'-0" BSMT BEARING WALL HEADER

Date: 9/7/2024
Engineer: TAH

INPUT:

Length of Span - L (ft): 5.5
Distance from Support to Calc. Shear - d (in): 9

Roof Loads:

Trib. Length (ft): 0
Snow Load (psf): 30
Dead Load (psf): 17

Linear Loads:

Snow Load (plf): 0
Live Load (plf): 0
Dead Load (plf): 0

Floor Loads:

Trib. Length (ft): 11
Live Load (psf): 40
Dead Load (psf): 15

Total Load Deflection Criteria (Span/ Δ) - Δ : 240
Live Load Deflection Criteria (Span/ Δ) - Δ : 360

Total Load (plf): 605 plf
Total Live Load (plf): 440 plf

Beam	DL=	453.75 lbs
Reactions:	LL=	1210 lbs
	TL=	1663.8 lbs

OUTPUT:

DOUGLAS FIR-LARCH

Allowable Shear Stress - Fv (psi): 95
Modulus of Elasticity - E (ksi): 1600
Allowable Bending Stress - Fb (psi): 1313 2x4
1139 2x6
1052 2x8
961 2x10
845 2x12

I (TL) (in⁴): 28.31
I (LL) (in⁴): 30.88
A (in²): 19.11
S (in³) 2x4: 20.91
2x6: 24.10
2x8: 26.09
2x10: 28.57
2x12: 32.49

2-2x8's (0.99)

2-2x10's (0.69)

2-2x12's (0.57)

GLUED-LAMINATED (24F-V4)

Allowable Shear Stress - Fv (psi): 190
Modulus of Elasticity - E (ksi): 1800
Allowable Bending Stress - Fb (psi): 2400

I (TL) (in⁴): 25.16
I (LL) (in⁴): 27.45
A (in²): 9.55
S (in³): 11.44

3.125 x 6 GLB (0.61)

5.125 x 6 GLB (0.37)

MICRO-LAM

Allowable Shear Stress - Fv (psi): 285
Modulus of Elasticity - E (ksi): 1900
Allowable Bending Stress - Fb (psi): 2600

EI (TL) k-in²): 45296
EI (LL) (k-in²): 49413
Shear (lbs): 1210
Moment (ft-lb): 2288

(2)-1.75 x 5.5 M-L (0.54)

VERSA-LAM

Allowable Shear Stress - Fv (psi): 285
Modulus of Elasticity - E (ksi): 2000
Allowable Bending Stress - Fb (psi): 2800

EI (TL) k-in²): 45296
EI (LL) (k-in²): 49413
Shear (lbs): 1210
Moment (ft-lb): 2288

(2)-1.75 x 5.5 V-L (0.51)

NOTE: A LOAD DURATION FACTOR OF 1.0 IS USED FOR ALL BEAMS

IBC LATERAL ANALYSIS

Project: JOB #24048
Description: UPPER FLOOR LATERAL

Date: 9/7/2024
Engineer: Tom Hales

Seismic ($V=2/3 \cdot S_{ms} \cdot I \cdot W/R \cdot (1/1.4)$)

$I = 1$

$S_{ms} = F_a \cdot S_s = 1.6$ NOTE: Site Class D is assumed

$R = 6$

$2/3 \cdot S_{ms} \cdot I / R / 1.4 = 0.1270$ (ASD)

Wind 90 mph Basic Wind Speed

Exposure = C

Exp Coef = 1.21

$K_{zt} = 1$

$I_w = 1$

roof height = 5.0 ft (top of wall to ridge)

	p_{s30}	p_s
A =	14.4 psf	17.4 psf
B =	9.9 psf	12.0 psf
C =	11.5 psf	13.9 psf
D =	7.9 psf	9.6 psf

Building Info.

Veneer

Wall Weight = 15 psf					
Roof Weight = 17 psf					
Seismic snow =					
Total Roof Weight = 17 psf	Wall	Weights (pounds)	Veneer	Total Weights (pounds)	Dir. perp. to width
Floor to Roof Height = 8 ft	Wall	2160	0	19008	Dir. perp. to length
Building Width = 24 ft	Roof	14688		21888	Tot. Building Wt.
Building Length = 36 ft			Vmid =	2779.4	
Building Height = 13 ft					
a = 3.0 ft					

Seismic Shear Forces

Diaphragm Shears: (per side)	pounds	plf		350 plf req'd length
Walls perpendicular to building width:	1115	31	CONTROLS=>	3.2 ft
Walls perpendicular to building length:	1207	50		3.4 ft

Mid-Ht Wall Shears: (per side)	pounds	plf		
Walls perpendicular to building width:	1390	39	CONTROLS=>	4.0 ft
Walls perpendicular to building length:	1390	58		4.0 ft

USE 7/16" SHEATHING w/8d NAILS @ 6" o.c. G.F. 170plf

SHEARWALLS

Wind Shear Forces

Diaphragm Shears: (per side)	pounds	plf		490 plf req'd length
Walls perpendicular to building width:	1379	38	CONTROLS=>	2.8 ft
Walls perpendicular to building length:	2006	84		4.1 ft

Mid-Ht Wall Shears: (per side)	pounds	plf		
Walls perpendicular to building width:	1379	38		2.8 ft
Walls perpendicular to building length:	2006	84	CONTROLS=>	4.1 ft

USE 7/16" SHEATHING w/8d NAILS @ 6" o.c. G.F. 240plf

Note: Veneer is assumed to resist it's own in-plane shear.

IBC LATERAL ANALYSIS

Project: JOB #24048
Description: MAIN FLOOR LATERAL

Date: 9/7/2024
Engineer: Tom Hales

Seismic ($V=2/3 \cdot S_{ms} \cdot I \cdot W/R \cdot (1/1.4)$)

$I = 1$
 $S_{ms} = F_a \cdot S_s = 1.6$ NOTE: Site Class D is assumed
 $R = 6$
 $2/3 \cdot S_{ms} \cdot I / R / 1.4 = 0.1270$ (ASD)

Wind 90 mph Basic Wind Speed

	p_{s30}	p_s
Exposure = C	A = 14.4 psf	17.4 psf
Exp Coef = 1.21	B = 9.9 psf	12.0 psf
$K_{zt} = 1$	C = 11.5 psf	13.9 psf
$I_w = 1$	D = 7.9 psf	9.6 psf

roof height = 0.0 ft (top of wall to ridge)

Building Info.

Wall Weight = 15 psf
 Roof Weight = 15 psf
 Seismic snow =
 Total Roof Weight = 15 psf
 Floor to Roof Height = 9 ft
 Building Width = 24 ft
 Building Length = 44 ft
 Building Height = 9 ft
 a = 3.0 ft

Veneer

	Weights (pounds)	Veneer	Total Weights (pounds)	
Wall	1620	0	19080	Dir. perp. to width
Wall	2970	0	21780	Dir. perp. to length
Roof	15840		25020	Tot. Building Wt.
		Vmid =	3177.1	

Seismic Shear Forces

Diaphragm Shears: (per side)	pounds	plf		req'd length
Walls perpendicular to building width:	1211	28	CONTROLS=>	3.5 ft
Walls perpendicular to building length:	1383	58	CONTROLS=>	4.0 ft

Mid-Ht Wall Shears: (per side)	pounds	plf		
Walls perpendicular to building width:	1589	36	CONTROLS=>	4.5 ft
Walls perpendicular to building length:	1589	66	CONTROLS=>	4.5 ft

USE 7/16" SHEATHING w/8d NAILS @ 6" o.c. G.F. 170plf

SHEARWALLS

Wind Shear Forces

Diaphragm Shears: (per side)	pounds	plf		req'd length
Walls perpendicular to building width:	834	19		1.7 ft
Walls perpendicular to building length:	1466	61		3.0 ft

Mid-Ht Wall Shears: (per side)	pounds	plf		
Walls perpendicular to building width:	834	19		1.7 ft
Walls perpendicular to building length:	1466	61		3.0 ft

USE 7/16" SHEATHING w/8d NAILS @ 6" o.c. G.F. 240plf

Note: Veneer is assumed to resist it's own in-plane shear.

SHEAR & OVERTURNING ANALYSIS

Project: JOB #24048
Description: MAIN FLOOR LATERAL

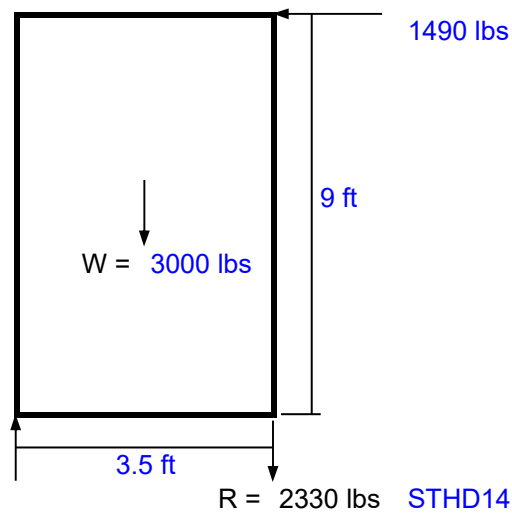
Date: 9/7/2024
Engineer: Tom Hales

SHEAR WALL CHECK

Shear Wall Capacity: 350 plf 4"O.C. EDGE NAILING
Total Shear: 2979 lbs
Req'd Wall Length: 9 ft PLENTY OF WALL AVAILABLE

WALL OVERTURNING

Description: TYP. 3'-6" FRONT WALL PIECES



WALL OVERTURNING

Description: 10'-0" SIDE WALL PIECE

