BLOOMINGTON
WELL HEAD
SEE NOTE 4

EXISTING CONCRETE WATER
STORAGE RESERVOIR

POWDER MOUNTAIN
WATER AND SEWER
IMPROVEMENT DISTRICT
EASEMENT LINE

SEE NOTE 1

EXISTING HIDDEN
LAKE WELL HEAD

EXISTING OVERFLOW
OUTLET STRUCTURE

SEE NOTE 1

PROPOSED POWDER
MOUNTAIN WATER AND
SEWER IMPROVEMENT
DISTRICT EASEMENT LINE

SEE NOTE 2

EXISTING DRAIN
COLLECTION VAULT

EXISTING HIDDEN
LAKE PUMP STATION

8875.49 CONC
8874.75 FG

8874.5±
EX-FG

8874.36±
EX-FG

RE-GRADE AND ROUTE
DRAINAGE SWALE AROUND
NEW PUMP HOUSE

8873.78±
EX-FG

WEBER STATE UNIVERSITY
PROPERTY LINE

PROPOSED GRAVEL ROAD,
SEE NOTE 5

8874.25
FG

8872.5
FG

8872.0 FG

EXISTING
AIR VALVE
AND VAULT

8871.5 FG

10' X 20' PARKING AREA
(TYP OF 2)

8871.75 FG

8872.0
FG

INSTALL SILT FENCE AND
STRAWBALES AS NECESSARY
C 2015 C 2016 C 2280

EXISTING DRAIN OUTLET
STRUCTURE

8872.5
TOC

POWDER MOUNTAIN
WATER AND SEWER
IMPROVEMENT DISTRICT
EASEMENT LINE

EXISTING RIPRAP CHANNEL

8871.5
FG

8864.24
FG

8871.5
FG

8871.5
FG

BLOOMINGTON
PUMP STATION
FF 8876.50

8860.8
FG

8868.65
FG

INSTALL SILT FENCE AND
STRAWBALES AS NECESSARY
C 2015 C 2016 C 2280

PROPOSED POWDER
MOUNTAIN WATER AND
SEWER IMPROVEMENT
DISTRICT EASEMENT LINE

PROPOSED GRAVEL ROAD,
SEE NOTE 5

8860.4
FG

8858.32±
EX-FG

8858.29±
EX-FG

EXISTING DIRT ROAD

8900 8895 8890 8885 8880 8875 8870 8865 8860

N

10 0 20 40
SCALE IN FEET

NOTES:

1. ALL NON-ROAD AREAS DISTURBED DURING CONSTRUCTION SHALL BE RE-SEEDED. ALL GRAVEL ROADS SHALL BE REPAIRED TO MATCH EXISTING, SEE C 2004
2. PRESERVE AND PROTECT EXISTING RIP RAP CHANNEL.
3. SEE DRAWING C-01 FOR BENCHMARKS.
4. CONTRACTOR SHALL COORDINATE FINAL LOCATION OF WELL HEAD WITH WELL DRILLER.
5. GRAVEL ROAD C 2004

PLAN REVIEW ACCEPTANCE

FOR COMPLIANCE WITH THE APPLICABLE CONSTRUCTION CODES IDENTIFIED BELOW.

[X] BUILDING	[X] STRUCTURAL
[X] MECHANICAL	[X] PLUMBING
[X] ELECTRICAL	[X] ENERGY
[ ] ACCESSIBILITY	[ ] FIRE

PLAN REVIEW ACCEPTANCE OF DOCUMENTS DOES NOT AUTHORIZE CONSTRUCTION TO PROCEED IN VIOLATION OF ANY FEDERAL, STATE, OR LOCAL REGULATIONS.

BY: MEM DATE: 08/14/19

WEST COAST CODE CONSULTANTS, INC.

STRUCTURE COORDINATES

POINT NO.	NORTHING	EASTING	DESCRIPTION
1	3658104.72	1568181.96	NORTHWEST CORNER OF OUTSIDE FOUNDATION WALL
2	3658129.33	1568206.56	NORTHEAST CORNER OF OUTSIDE FOUNDATION WALL

BOWEN COLLINS & ASSOCIATES

NO.	DATE	REV. BY	DESCRIPTION
A	5/2019	EN	VE CHANGES

REVISIONS

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING

SUMMIT MOUNTAIN HOLDING GROUP
BLOOMINGTON WELL PROJECT
WEBER COUNTY, UTAH

DESIGN E. NEIL
DRAWN R. GARCIA
CHECKED J. BECKMAN
APPROVED E. NEIL
REVIEW

CIVIL
GRADING PLAN

PROJECT NUMBER 347-17-01
DATE: MAY 2019

DRAWING NO. C-02
SHEET 6 OF 46

P:\Powder Mountain\347-17-01 Bloomington Well Equiping\Design Phase\Drawings\Sht\Old\3471701_C-02_Revised Entry 7-22-19.dwg Plotted: 7/22/2019 11:58 AM By: Eric Neil

GENERAL STRUCTURAL NOTES

MATIX
Matix Corporation
Salt Lake City, UT
Phone: (385) 226-5966

GENERAL

1. THE SPECIFICATIONS AND REQUIREMENTS INDICATED ON THIS SHEET ARE INTENDED AS A BASIC SUMMARY OF THE MATERIAL CONSTRUCTION AND INSPECTION REQUIREMENTS FOR THIS PROJECT, AS INCLUDED IN THE PROJECT SPECIFICATIONS. ADDITIONAL AND MORE STRINGENT REQUIREMENTS ARE GIVEN IN THOSE SPECIFICATIONS. IN THE EVENT OF A CONFLICT BETWEEN THESE GENERAL NOTES AND THE REQUIREMENTS GIVEN IN THE PROJECT SPECIFICATIONS, THE PROJECT SPECIFICATIONS GOVERN.
2. FOR LOCATION AND DIMENSIONS OF SLEEVES, CURBS, OPENINGS, AND DEPRESSIONS NOT SHOWN ON THE STRUCTURAL DRAWINGS, SEE ARCHITECTURAL, CIVIL, MECHANICAL, AND ELECTRICAL DRAWINGS. THE CONTRACTOR SHALL VERIFY AND COORDINATE PENETRATIONS SHOWN ON THE OTHER PROJECT DRAWINGS, WHETHER THEY ARE SHOWN ON THE STRUCTURAL DRAWINGS OR NOT.
3. EMBEDDED ITEMS, SUCH AS PIPE SLEEVES, CONDUITS, AND INSERTS SHALL ALL BE RIGIDLY INSTALLED IN PLACE BEFORE CONCRETE IS POURED. SEE ARCHITECTURAL, CIVIL, MECHANICAL, AND ELECTRICAL DRAWINGS FOR ITEMS REQUIRING SLEEVES AND EMBEDMENTS IN CONCRETE, WHICH ARE NOT SHOWN ON THE STRUCTURAL DRAWINGS.
4. NO STRUCTURAL MEMBER SHALL BE CUT FOR PIPES, DUCTS, ETC. UNLESS SPECIFICALLY DETAILED OR APPROVED IN WRITING BY THE ENGINEER.
5. DESIGN DETAILS AS SHOWN ON THE DRAWINGS ARE INTENDED TO BE TYPICAL AND APPLY TO ALL SIMILAR SITUATIONS OCCURRING ON THE PROJECT, WHETHER OR NOT THEY ARE SPECIFICALLY REFERENCED IN EACH LOCATION. CONSULT THE ENGINEER FOR CONCURRENCE PRIOR TO CONSTRUCTION.
6. SUBMIT DRAWINGS AND RECEIVE REVIEW OF ALL STRUCTURAL RELATED SHOP DRAWINGS PRIOR TO ERECTION OR CONSTRUCTION.
7. APPLICABLE BUILDING CODE FOR THE PROJECT IS THE 2015 EDITION OF THE INTERNATIONAL BUILDING CODE (IBC) AND AMERICAN CONCRETE INSTITUTE (ACI) 350-06, "CODE RQUIREMENTS FOR ENVIRONMENTAL ENGINEERING CONCRETE STRUCTURES."

FOUNDATIONS

A

1. GEOTECHNICAL INVESTIGATION REPORT BY IGES, INC, NO. 01628-003, DATED NOV 9 2012, AND ADDENDUM DATED DEC 6, 2012.
2. PROVIDE AND PLACE 2'-0" MINIMUM COMPACTED THICKNESS OF STRUCTURAL FILL BENEATH ALL SLABS/FOOTINGS. COMPACTED GRANULAR STRUCTURAL FILL TO EXTEND FROM BOTTOM OF SLAB/FOOTING DOWN TO UNDISTURBED EARTH AND TO EXTEND MINIMUM 2'-0" HORIZONTALLY BEYOND THE EDGE OF ALL FOOTINGS OR SLABS. WHEN A MOISTURE BARRIER IS CALLED FOR UNDER A FLOOR SLAB, PLACE THE BARRIER IMMEDIATELY ON TOP OF 2'-0" OF STRUCTURAL FILL. PLACE 2" OF SAND IMMEDIATELY OVER THE MOISTURE BARRIER AND PLACE CONCRETE ON THE SAND.
3. FOUNDATIONS ARE DESIGNED FOR NET ALLOWABLE BEARING PRESSURE OF 4200 PSF.
4. DO NOT PLACE BACKFILL AGAINST CANTILEVERED WALLS UNTIL THE CONCRETE IN THOSE WALLS HAS ATTAINED 100% OF ITS SPECIFIED COMPRESSIVE STRENGTH.
5. PLACE NO BACKFILL AGAINST WALLS THAT ARE TIED TO ELEVATED SLABS OR DECKS UNTIL THE SLABS HAVE ATTAINED 100% OF THEIR SPECIFIED COMPRESSIVE STRENGTH AND ALL SLABS OR DECKING IS IN PLACE AND WELDED OR SCREWED AS SPECIFIED.
6. DESIGN AND INSTALL ALL REQUIRED SHORING TO PREVENT SUBSIDENCE OR DAMAGE TO ADJACENT EXISTING STRUCTURES, STREETS, UTILITIES, ETC.
7. OBTAIN APPROVAL OF FOUNDATION BEARING SURFACES BY ENGINEER/SPECIAL INSPECTOR PRIOR TO PLACING STRUCTURAL FILL.

FORMWORK, SHORING, AND BRACING

1. CONFORM TO ACI 347 "RECOMMENDED PRACTICE FOR CONCRETE FORMWORK" FOR DESIGN AND CONSTRUCTION OF CONCRETE FORMWORK AND BRACING. CONTRACTOR IS RESPONSIBLE FOR DESIGN AND CONSTRUCTION OF FORMWORK AND BRACING.
2. STRUCTURES AS SHOWN ON THESE DRAWINGS INDICATE THE FINAL CONDITION ONLY AND DO NOT INCLUDE THE NECESSARY COMPONENTS OR EQUIPMENT FOR STRUCTURAL STABILITY DURING CONSTRUCTION. CONTRACTOR IS RESPONSIBLE FOR WORK RELATED TO CONSTRUCTION ERECTION METHODS, BRACING, SHORING, RIGGING, GUYS, SCAFFOLDING, FORMWORK, AND OTHER WORK AIDS REQUIRED TO SAFELY PERFORM THE WORK SHOWN.
3. TEMPORARY SHORING TO REMAIN IN PLACE UNTIL ELEVATED CONCRETE SLABS HAVE REACHED 28-DAY DESIGN STRENGTH AS DETERMINED BY CYLINDER BREAKS.

CONCRETE

1. ALL CONCRETE CONSTRUCTION TO CONFORM TO ACI 350 "CODE REQUIREMENTS FOR ENVIRONMENTAL ENGINEERING CONCRETE STRUCTURES," INCLUDING BAR BENDS AND HOOKS UNLESS SPECIFICALLY DETAILED OTHERWISE ON THESE DRAWINGS.

A

2. CAST-IN-PLACE STRUCTURAL CONCRETE SHALL COMPLY WITH ACI EXPOSURE CLASS F2 AND HAVE A MINIMUM 28-DAY COMPRESSIVE STRENGTH OF 4,500 PSI.
3. NON-STRUCTURAL ELEMENTS, SUCH AS ENCASEMENTS, CURBS, SIDEWALKS AND LEAN CONCRETE TO HAVE A MINIMUM 28-DAY COMPRESSIVE STRENGTH OF 3000 PSI.
4. USE CEMENT CONFORMING TO ASTM C150, TYPE II, LOW ALKALI.
5. ALL CONSTRUCTION JOINTS, EXPANSION JOINTS, AND OTHER TYPES OF JOINTS, OTHER THAN THOSE SPECIFICALLY SHOWN ON THE DRAWINGS TO BE APPROVED BY THE ENGINEER PRIOR TO PLACING CONCRETE.
6. INSTALL CONTINUOUS WATERSTOPS IN ALL EXPANSION, CONTRACTION, CONTROL, AND CONSTRUCTION JOINTS OF WATER-HOLDING BASINS, CHANNELS, AND BELOW-GRADE STRUCTURES UNLESS SPECIFICALLY NOTED OTHERWISE.
7. PROVIDE 3/4-INCH CHAMFER AT ALL EXPOSED EDGES AND CORNERS UNLESS NOTED OTHERWISE.
8. BEFORE PLACING THE SECOND POUR AT CONSTRUCTION JOINTS, THOROUGHLY CLEAN AND ROUGHEN ALL JOINT SURFACES TO A MINIMUM AMPLITUDE OF 1/4 INCH.

REINFORCEMENT STEEL

1. PROVIDE REINFORCEMENT STEEL CONFORMING TO ASTM A615, GRADE 60 EXCEPT WHERE WELDING IS PERMITTED BY THE ENGINEER. PROVIDE STEEL CONFORMING TO ASTM A706 WHEN WELDING IS PERMITTED.
2. PROVIDE WELDED WIRE FABRIC CONFORMING TO ASTM A185.
3. DIMENSIONS GIVEN FOR REINFORCING BARS ARE TO BAR CENTERS UNLESS NOTED OTHERWISE. BAR COVER IS THE CLEAR DISTANCE BETWEEN BAR AND CONCRETE SURFACE. CLEARANCE FOR REINFORCEMENT BARS PER THE FOLLOWING UNLESS SHOWN OTHERWISE:

WHEN PLACED AGAINST GROUND	3"
INTERIOR SURFACES OF WATER-BEARING STRUCTURES	2"
ELEVATED SLABS	1"
ALL OTHER CONCRETE SURFACES	2"

4. CONTINUE WALL CORNER AND WALL INTERSECTION REINFORCEMENT BARS AROUND CORNERS AND THROUGH COLUMNS OR PILASTERS. EXTEND REINFORCEMENT INTO CONNECTING WALLS AND LAP ON THE OPPOSITE FACE OF THE CONNECTING WALLS.
5. UNLESS OTHERWISE NOTED, ALL HOOKS SHOWN ARE 90° STANDARD HOOK AS DEFINED IN ACI 350-06.
6. LAP VERTICAL WALL BARS WITH DOWELS FROM BELOW AND EXTEND THROUGH SLABS ABOVE TO TOP FACE. BEND AND/OR LAP TO TOP SLAB REINFORCEMENT AS INDICATED.
7. UNLESS OTHERWISE INDICATED, CONTRACTOR MAY SPLICE CONTINUOUS SLAB OR LONGITUDINAL BEAM BARS AT LOCATIONS OF HIS CHOOSING, EXCEPT THAT TOP BAR SPLICES ARE TO BE LOCATED AT MIDSPAN AND BOTTOM BAR SPLICES ARE TO BE LOCATED AT SUPPORTS. MINIMUM LAP REQUIREMENTS ARE AS FOLLOWS UNLESS OTHERWISE INDICATED.

LAP LENGTHS - GRADE 60

BAR SIZE	#4	#5	#6	#7	#8	#9	#10	#11
CONCRETE DESIGN STRENGTH = 4500 PSI								
LAP LENGTH	1'-8"	2'-0"	2'-4"	3'-4"	4'-0"	4'-9"	6'-0"	7'-0"

STRUCTURAL STEEL

1. UNLESS NOTED OTHERWISE, PROVIDE STRUCTURAL STEEL CONFORMING TO ASTM A36. ROLLED WIDE FLANGE SHAPES TO CONFORM TO ASTM A992. PIPE TO CONFORM TO ASTM A53, TYPE E OR S, GRADE B. STRUCTURAL TUBING TO CONFORM TO ASTM A500, GRADE B. FABRICATE AND ERECT ALL STRUCTURAL STEEL IN CONFORMANCE WITH AISC SPECIFICATIONS.
2. PROVIDE ANCHOR BOLTS CONFORMING TO ASTM F1554, GRADE 36.
3. USE ONLY CERTIFIED WELDERS FOR ALL WELDING WORK. USE FILLER METAL HAVING A MINIMUM TENSILE STRENGTH OF 70 KSI AND PERFORM ALL WORK IN ACCORDANCE WITH THE CURRENT STRUCTURAL WELDING CODE (AWS D1.1).
4. UNLESS OTHERWISE NOTED, COAT ALL STRUCTURAL STEEL COMPONENTS WITH PAINT OF OTHER PROTECTIVE COATINGS AS SPECIFIED IN THE PROJECT SPECIFICATIONS.
5. MINIMUM THICKNESS FOR GUSSET PLATES IS 3/8 INCH.
6. STRUCTURAL STEEL, WHICH IS TO BE EMBEDDED INTO CONCRETE TO BE CLEAN AND FREE OF PAINT, OIL, OR DIRT.
7. PERFORM ALL WELDED OR BOLTED CONNECTIONS IN ACCORDANCE WITH THE DETAILS, SPECIFICATIONS, AND THE THIRTEENTH EDITION OF THE AISC HANDBOOK OF FRAMED BEAM CONNECTIONS. USE ASTM 3/4-INCH A325N BOLTS UNLESS OTHERWISE NOTED.

STAINLESS STEEL

1. WHERE REQUIRED, PROVIDE STAINLESS STEEL SHAPES, PLATES, BARS, AND RODS CONFORMING TO ASTM A666 AND A276, TYPE 316 OR 316L.
2. PROVIDE STAINLESS STEEL BOLTS AND NUTS CONFORMING TO ASTM F593 AND F594.

ALUMINUM

1. WHERE REQUIRED, PROVIDE ALLOY 6061-T6 FOR ALL ALUMINUM STRUCTURAL MATERIALS.
2. COAT ALL ALUMINUM SURFACES IN CONTACT WITH CONCRETE OR DISSIMILAR METALS AS DETAILED IN THE SPECIFICATIONS TO PREVENT ALUMINUM-CONCRETE REACTION OR ELECTROLYTIC ACTION.
3. PERFORM ALUMINUM WELDING TO CONFORM TO THE PROVISIONS OF THE LATEST STRUCTURAL WELDING CODE (AWS D1.2).

LUMBER

1. SAWN FRAMING LUMBER SHALL COMPLY WITH THE LATEST EDITION OF THE GRADING RULES OF THE WESTERN WOOD PRODUCTS ASSOCIATION (WWPA) OR THE WEST COAST LUMBER INSPECTION BUREAU (WCLIB). ALL SAWN LUMBER SHALL BE STAMPED WITH THE GRADE MARK OF AN APPROVED LUMBER GRADING AGENCY. SAWN LUMBER SHALL HAVE THE FOLLOWING MINIMUM GRADE, UNLESS NOTED OTHERWISE IN CONSTRUCTION DOCUMENTS.

MEMBER	DESIGNATION
TIMBER BEAMS & HEADERS	DF/L #2 & BTR
WALL PLATES & OTHER STRUCTURAL SAWN MEMBERS NOT SPECIFIED ABOVE	DF/L CONSTRUCTION & BTR

2. LAMINATED-VENEER LUMBER (LVL) TO PROVIDE MINIMUM VALUES AS FOLLOWS:

PARAMETER	VALUE
Fb	2600 PSI
E	2,000,000 PSI

3. LAMINATED-STRAND LUMBER (LSL) TO PROVIDE MINIMUM VALUES AS FOLLOWS:

PARAMETER	VALUE
Fc	1835 PSI
Fb	1700 PSI
E	1,300,000 PSI

4. LUMBER RESTING ON CONCRETE SHALL BE TREATED WITH A PRESERVATIVE IN ACCORDANCE WITH AMERICAN WOOD PROTECTION ASSOCIATION (AWPA) REQUIREMENTS. FIELD TREATMENT OF END CUTS AND BORINGS IS REQUIRED ON MEMBERS OVER 2-IN THICK.

A

5. FASTENERS USED IN PRESERVATIVE-TREATED WOOD SHALL BE HOT-DIPPED GALVANIZED IN ACCORDANCE WITH ASTM A153.
6. WOOD CONNECTORS SHOWN ON THESE DRAWINGS SHALL BE PRODUCTS OF SIMPSON STRONG-TIE, INC. UNLESS NOTED OTHERWISE. HARDWARE BY OTHER MANUFACTUERES MAY BE USED PROVIDED THEY ARE OF EQUIVALENT CAPACITY FOR THE INTENDED APPLICATION AND HAVE CURREND ICC-ES APPROVALS. SUBSTITUTIONS MUST BE APPROVED BY THE STRUCTURAL ENGINEEER. INSTALL ALL CONNECTORS WITH ALL FASTENERS REQUJIRED BY THE MANUFACTURER'S SPECIFICATIONS UNLESS NOTED OTHERWISE.
7. ALL NAILS SHALL BE SINKER NAILS WITH THE FOLLOWING PROPERTIES:

NAIL SIZE	SHANK ø	LENGTH
8d SINKER	0.113"	2⅜"
10d SINKER	0.120"	2⅞"
12d SINKER	0.135"	3⅜"
16d SINKER	0.148"	3¼"

8. ALL STRUCTURAL WOOD PANELS SHALL BE STRUCTURAL I APA RATED SHEATHING, AND MUST CONFORM TO THE FOLLOWING NOMINAL THICKNESS AND SPAN RATING, UNLESS NOTED OTHERWISE:

THICKNESS	SPAN RATING
7/16"	32 / 16
23/32	48 / 24

9. FULL WIDTH SHEATHING PANELS SHALL BE USED WHENEVER POSSIBLE.
10. ALL SHEAR WALL BOTTOM PLATE ANCHOR BOLTS SHALL HAVE A MINIMUM 0.25" x 3" x 3" SQUARE PLATE WASHER PLACED BETWEEN THE NUT AND WOOD SURFACE. EDGE OF PLATE TO BE WITHIN 1/2" OF SHEATHING EDGE.
11. ALL FRAMING AT ADJOINING PANEL EGES IN SHEAR WALLS SHALL BE DOUBLE 2x MEMBERS OR GREATER. BLOCKING MEMBERS AT PANEL EDGES MAY BE LAID FLAT AT THE CONTRACTOR'S OPTION.

LOADING CRITERIA

A

1. RISK CATEGORY IV
2. DEAD LOAD CALCULATED FROM UNIT WEIGHT
3. LIVE LOADS:
   - STAIRS/PLATFORMS 100 PSF
   - FLOORS/SLABS NOT INDICATED 50 PSF
4. LATERAL EARTH PRESSURE (EFP)
   - NON SATURATED 60 PCF
5. TRAFFIC SURCHARGE 2 FT OF EARTH
6. HYDROSTATIC FLUID PRESSURE 62.4 PCF
7. WIND LOAD:
   - BASIC WIND SPEED 120 MPH
   - EXPOSURE C
8. SNOW LOAD:
   - GROUND SNOW LOAD 280 PSF
   - FLAT ROOF SNOW LOAD 236 PSF
   - SNOW EXPOSURE COEFFICIENT 1.0
   - IMPORTANCE FACTOR 1.2
   - THERMAL FACTOR 1.0
9. SEISMIC LOAD:
   - IBC MCE SPECTRA
   - 2% EXCEEDANCE IN 50 YEARS.
   - MAX ACC FOR 0.2 SEC PERIOD (Ss) 0.812g
   - MAX ACC FOR 1.0 SECOND PERIOD (S1) 0.269g
   - SITE CLASS C
   - SEISMIC DESIGN CATEGORY D
   - IMPORTANCE FACTOR 1.50
10. FROST DEPTH 40 INCHES

PLAN REVIEW ACCEPTANCE

FOR COMPLIANCE WITH THE APPLICABLE CONSTRUCTION CODES IDENTIFIED BELOW.

☒ BUILDING	☒ STRUCTURAL
☒ MECHANICAL	☒ PLUMBING
☒ ELECTRICAL	☒ ENERGY
☐ ACCESSIBILITY	☐ FIRE

PLAN REVIEW ACCEPTANCE OF DOCUMENTS DOES NOT AUTHORIZE CONSTRUCTION TO PROCEED IN VIOLATION OF ANY FEDERAL, STATE, OR LOCAL REGULATIONS.

BY MEM DATE 08/14/19

WEST COAST CODE CONSULTANTS, INC.

BOWEN COLLINS & ASSOCIATES

PROFESSIONAL STRUCTURAL ENGINEER
No. 7753350-2203
CHRIS D. PATTEN
STATE OF UTAH
7/30/19

REVISIONS

NO.	DATE	REV. BY	DESCRIPTION
A	7/29/19	CDP	GENERAL REVISION

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING

SUMMIT MOUNTAIN HOLDING GROUP
BLOOMINGTON WELL PROJECT
WEBER COUNTY, UTAH

DESIGN: DESIGN C. PATTEN; DRAWN C. PATTEN
REVIEW: CHECKED E. NEIL; APPROVED C. PATTEN

STRUCTURAL
GENERAL STRUCTURAL NOTES

PROJECT NUMBER 347-17-01
DATE: AUGUST 2018

DRAWING NO. GS-01
SHEET 23 OF 46

C:\Users\ChrisPatten\OneDrive - Matix Corporation\700 - Projects\10037 Bloomington Well House\3-Engineering\3.4-Drawings\dwg\347-17-01 GS-01.dwg Plotted: 7/30/2019 7:44 AM By: Chris Patten

SPECIAL INSPECTIONS

1. SPECIAL INSPECTION IN ACCORDANCE WITH APPROPRIATE SECTIONS OF IBC 2015, CHAPTER 17 IS REQUIRED FOR THIS PROJECT.

2. THE SPECIAL INSPECTOR SHALL SUBMIT A FINAL SIGNED REPORT TO THE BUILDING OFFICIAL AND ENGINEER STATING THE WORK REQUIRING SPECIAL INSPECTION WAS, TO THE BEST OF THE INSPECTOR'S KNOWLEDGE, IN CONFORMANCE WITH THE APPROVED PLANS AND SPECIFICATIONS AND THE APPLICABLE WORKMANSHIP PROVISIONS OF THE CODE.

3. SPECIAL INSPECTION ITEMS REQUIRED ARE INDICATED IN THE LIST BELOW. CONTINUOUS (C) OR PERIODIC (P) INSPECTIONS IS SO DESIGNATED.

SOILS:	TABLE 1705.6, 2015 IBC	
A.	VERIFY MATERIALS BELOW FOOTINGS ARE ADEQUATE	P
B.	VERIFY EXCAVATIONS ARE TO PROPER DEPTH AND SUBGRADE IS PROPERLY PREPARED	P
C.	VERIFY MATERIALS, DENSITIES AND LIFT THICKNESS OF COMPACTED FILL	P
CONCRETE:	TABLE 1705.3, 2015 IBC	
A.	VERIFY CONCRETE MIX BEING USED	P
B.	SAMPLING CONCRETE FOR STRENGTH TESTS	C
C.	CURING TECHNIQUES AND APPLICATION	P
STEEL:	1705.2, 2015 IBC – AISC 360	
A.	CERTIFICATION FOR FASTENERS	P
B.	FASTENERS MARKED ACCORDING TO ASTM REQUIREMENTS	P
C.	VERIFY CORRECT FASTENER FOR JOINT (GRADE, TYPE, LENGTH)	P
D.	VERIFY FASTENER ASSEMBLIES ARE PLACED IN ALL HOLES	P
E.	DOCUMENT ACCEPTANCE/REJECTION OF BOLTED CONNECTIONS	C
F.	VISUALLY INSPECT GALVANIZED COATINGS	P

STRUCTURAL OBSERVATION

BOWEN COLLINS & ASSOCIATES SHALL BE NOTIFIED BY THE CONTRACTOR 5 BUSINESS DAYS BEFORE THE COMPLETION OF THE ITEMS LISTED IN THIS SECTION SO THAT STRUCTURAL OBSERVATION MAY BE PERFORMED IN ACCORDANCE WITH IBC SECTION 1704.5. OBSERVATIONS WILL BE PERFORMED AT THE DISCRETION OF BOWEN COLLINS & ASSOCIATES. COMPLETED OBSERVATION REPORTS WILL BE SUBMITTED TO THE BUILDING OFFICIAL.

1. REINFORCEMENT PRIOR TO PLACEMENT OF CONCRETE.
2. FRAMING PRIOR TO PLACEMENT OF WALL AND ROOFING MATERIALS.

PLAN REVIEW ACCEPTANCE

FOR COMPLIANCE WITH THE APPLICABLE CONSTRUCTION CODES IDENTIFIED BELOW.

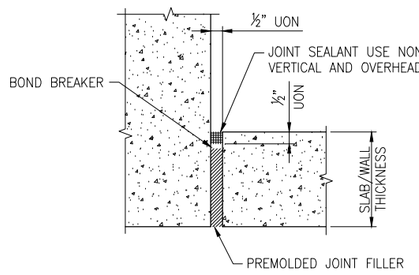
- [X] BUILDING
- [X] STRUCTURAL
- [X] MECHANICAL
- [X] PLUMBING
- [X] ELECTRICAL
- [X] ENERGY
- [ ] ACCESSIBILITY
- [ ] FIRE

PLAN REVIEW ACCEPTANCE OF DOCUMENTS DOES NOT AUTHORIZE CONSTRUCTION TO PROCEED IN VIOLATION OF ANY FEDERAL, STATE, OR LOCAL REGULATIONS.

BY: MEM DATE: 08/14/19

WEST COAST CODE CONSULTANTS, INC.

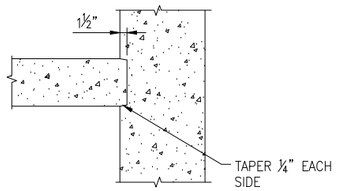
A



NOTE:
DISCONTINUE ALL REINFORCING AT JOINT.
REINFORCING IS NOT SHOWN FOR CLARITY.

EXPANSION JOINT

NOT TO SCALE — S 4012

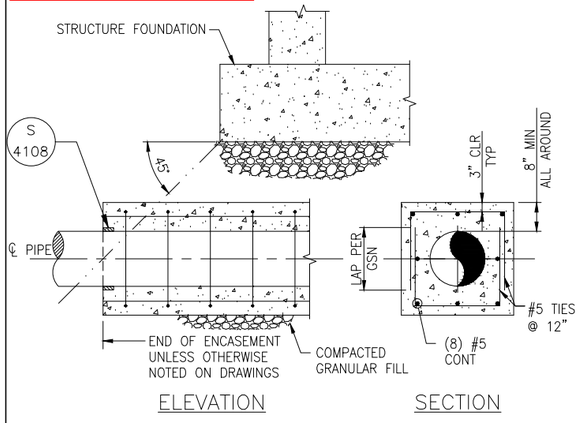


NOTES:

1. CONSTRUCTION JOINT SHOWN APPLIES FOR BOTH VERTICAL AND HORIZONTAL JOINTS, KEYWAYS TO BE CONTINUOUS.
2. REINFORCING NOT SHOWN FOR CLARITY. USE BAR COUPLERS AT THIS JOINT AND LAP/EMBED REINFORCING ON EACH SIDE OF JOINT.

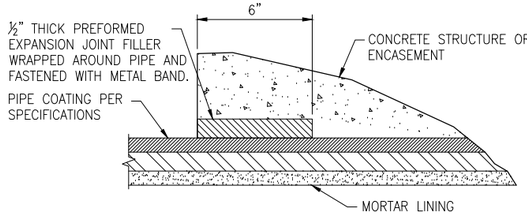
CONSTRUCTION JOINT

NOT TO SCALE — S 4028



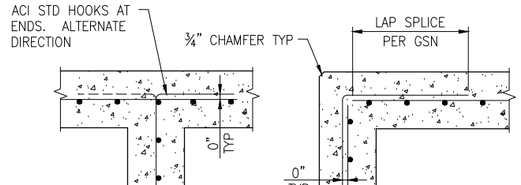
PIPE ENCASEMENT END

NOT TO SCALE — S 4107

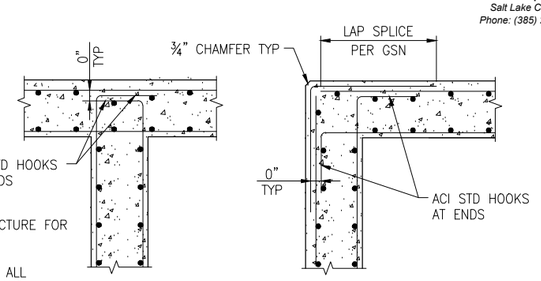


PIPE ENCASEMENT END

NOT TO SCALE — S 4108



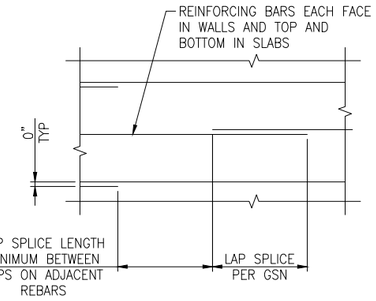
SINGLE-CURTAIN REINFORCING



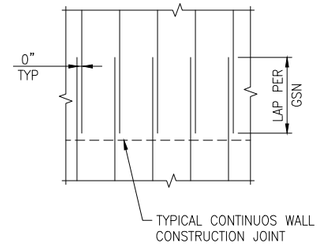
DOUBLE-CURTAIN REINFORCING

WALL REINFORCING AT CORNERS AND JUNCTIONS

NOT TO SCALE — S 4039



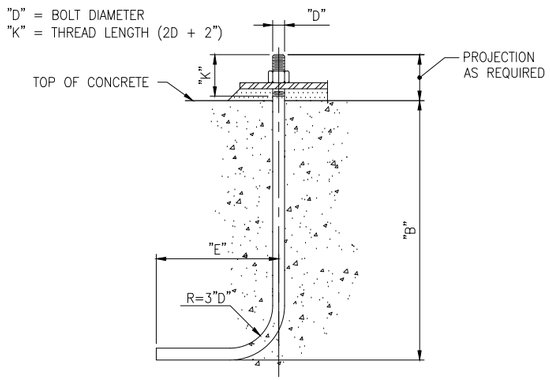
HORIZONTAL REINFORCING



VERTICAL REINFORCING

REINFORCING STEEL LAP SPLICES

NOT TO SCALE — S 4040



ANCHOR BOLT SCHEDULE			
"D"	"E"	"B"	REMARKS
⅜"	3"	8"	
½"	3"	10"	
⅝"	4"	12"	
¾"	5"	14"	
⅞"	7"	16"	
1"	8"	20"	

NOTE:
ANCHOR BOLT TYPE VI IS TO BE USED UNLESS OTHER ANCHORS ARE SPECIFICALLY CALLED FOR ON THE DRAWINGS.

ANCHOR BOLT (TYPE VI)

NOT TO SCALE — S 4124

MATIX
Matix Corporation
Salt Lake City, UT
Phone: (385) 226-5966

BOWEN COLLINS & ASSOCIATES

PROFESSIONAL STRUCTURAL ENGINEER — No. 7753350-2203 — CHRIS D. PATTEN — STATE OF UTAH — 7/30/19

REVISIONS

NO.	DATE	REV. BY	DESCRIPTION
A	7/29/19	CDP	GENERAL REVISION

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING

SUMMIT MOUNTAIN HOLDING GROUP
BLOOMINGTON WELL
WEBER COUNTY, UTAH

REVIEW — CHECKED E. NEIL — APPROVED C. PATTEN

DESIGN C. PATTEN — DRAWN C. PATTEN

STRUCTURAL
GENERAL STRUCTURAL NOTES AND DETAILS 1
DATE: AUGUST 2018 — PROJECT NUMBER 347-17-01

DRAWING NO. GS-02
SHEET 24 OF 46

C:\Users\ChrisPatten\OneDrive - Matix Corporation\700 - Projects\10037 Bloomington Well House\3-Engineering\3.4-Drawings\dwg\347-17-01 GS-02.dwg Plotted: 7/30/2019 7:43 AM By: Chris Patten

Bloomington Well Pump Station

Weber County, UT

Structural Calculations

August 2018

PLAN REVIEW ACCEPTANCE

FOR COMPLIANCE WITH THE APPLICABLE CONSTRUCTION CODES IDENTIFIED BELOW.

[X] BUILDING	[X] STRUCTURAL
[X] MECHANICAL	[X] PLUMBING
[X] ELECTRICAL	[X] ENERGY
[ ] ACCESSIBILITY	[ ] FIRE

PLAN REVIEW ACCEPTANCE OF DOCUMENTS DOES NOT AUTHORIZE CONSTRUCTION TO PROCEED IN VIOLATION OF ANY FEDERAL, STATE, OR LOCAL REGULATIONS.

BY: MEM DATE: 08/14/19

WEST COAST CODE CONSULTANTS, INC.

PROFESSIONAL STRUCTURAL ENGINEER
No. 7753350-2203
CHRIS D. PATTEN
04/11/17
STATE OF UTAH

Directed by: Chris Patten, SE
Professional Structural Engineer

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www.bowencollins.com

INDEX OF REVISIONS			
Rev	**Description**	**Date**	**By**
A	Issued for Information	08/22/18	C. Patten

INDEX OF REFERENCES			
No	**Description**	**Date**	**Document Number**

TABLE OF CONTENTS

PART I – DESIGN CRITERIA

1 BASIS OF DESIGN

1.1 OWNER AND LOCATION

Owner:	Summit Mountain Holding Group
Location:	Weber County, UT

1.2 CODES, STANDARDS, AND RESOURCES

Codes, standards, and resources used throughout these calculations are as follow:

IBC 2015, International Building Code
ASCE 7-10, Minimum Design Loads for Buildings and Other Structures
NDS 2015, National Design Specification for Wood Construction
ACI 318-14, Building Code Requirements for Structural Concrete
AISC 360-10, Specification for Structural Steel Buildings

1.3 DESIGN CRITERIA

1.3.1 Risk Category

Risk Category IV according to ASCE 7-10 Table 1.5-1.

1.3.2 Dead Loads

Dead loads are calculated from unit weight or self-weight of components, members, material, equipment, or other sources as included in these calculations.

1.3.3 Live Loads

Live loads are in accordance with ASCE 7-10 Table 4-1.

Stairs/Platforms:	100 psf
Floors/Slabs:	50 psf

1.3.4 Snow Loads

Snow loads are in accordance with ASCE 7-10 §6 and the Utah Snow Load Study.

Ground Snow Load, Pg:	280 psf
Flat Roof Snow Load, Pf:	236 psf
Exposure Factor, Ce:	1.0
Thermal Factor, Ct:	1.0
Importance Factor, I_S:	1.2

1.3.5 Wind Load

Wind loads are in accordance with ASCE 7-10 §28 as follows:

Wind Speed:	120 mph
Exposure Category:	C

1.3.6 Seismic Loads

Seismic loads are in accordance with ASCE 7-10 §11 as follows:

Mapped Accelerations:	S_S (0.2 sec):	0.812 g
	S_1 (1.0 sec):	0.269 g
Soil Site Class:	Site Class C	
Design Accelerations:	S_{DS} (0.2 sec):	0.582 g
	S_{D1} (1.0 sec):	0.275 g

Seismic Design Category (SDC):	D
Importance Factor, I_E:	1.5

1.4 FOUNDATION

Foundations are designed in accordance with the Geotechnical Investigation Report (No. AUA 13-046-00) by Raba Kistner Infrastructure dated June 26, 2013.

Description: Spread and continuous footings and slab-on-grade.

Minimum Embedment Depth:	42 inches
Allowable Soil Bearing Pressure - Footings:	4,200 psf
Allowable Soil Bearing Pressure - Mats:	2,500 psf
Modulus Subgrade Reaction:	240 psi/in
Allowable Increase for Transient Loads:	33%

Lateral Earth Pressures: Equivalent Lateral Pressures

At-Rest:	60 psf/ft
Coefficient of Soil Friction:	0.40

1.5 MATERIALS

1.5.1 Concrete

Normal weight concrete (145 pcf), Type II cement, with 28 day compressive strength of 4,500 psi.

1.5.2 Steel Reinforcement

Concrete reinforcment is design to meet ASTM A615 Gr 60.

1.5.3 Wood Lumber

Reference values based on NDS 2015 and as listed in Lumber notes in drawings.

ASCE Snow Loads

File = C:\Users\CHRISP~1\ONEDRI~1\700-PR~1\10037B~1\3-ENGI~1\3FCE8~1.2-T\WELLHO~1.EC6
ENERCALC, INC. 1983-2018, Build:10.18.1.31, Ver:10.18.1.31

Lic. # : KW-06008993 **Licensee : MATIX**

Description : Design Snow Load

Flat Roof Snow Loads

Description : Snow Load

per ASCE 7-10

Ground Snow Load, per Fig 7-1	280.00 psf	Roof Slope, Sec .7.3.4	9.50
Terrain Category	C (see ASCE 7-10 Section 26.7)	W : Horiz. Distance from eave to ridge	22.00 ft
Exposure of Roof	Partially Exposed	Roof Configuration	Monoslope
Ce : Exposure Factor, Table 7-2	1.00		
Ct : Thermal Factor	1.0 : All not otherwise defined	pm, Minimum required	**24.00** psf
Risk Category, per Table 1.5-1	**IV**	pf, Calculated Snow Load per Equation 7-1	**235.20** psf
Importance Factor, Is, Table 1.5-2	1.20	pf, Design Snow Load Max(pm min, pf calc)	**235.20** psf

ASCE 7-10 Wind Forces Chpt 28, Pt2 & Chpt 30, Pt2

Lic. # : KW-06008993 **Licensee : MATIX**

Description : Wind Criteria

Analytical Values

Calculations per ASCE 7-10

V : Basic Wind Speed per Sect 26.5-1 A, B or C	**120.0** mph	
Roof Rise:Run Ratio	2:12	
Occupancy per Table 1.5-1	IV	Buildings and other structures designated as essential
Exposure Category per 26.7	Exposure C	
MRH : Mean Roof Height	12.0 ft	*"Lambda" is interpolated between height tablular values.*
Lambda : per Figure 28.6-1, Page 305	**1.21**	
Effective Wind Area of Component & Cladding	100.0 ft^2	
Roof pitch for cladding pressure	0 to 7 degrees	
User specified minimum design pressure	psf	
Topographic Factor Kzt per 26.8	**1.00**	
LHD : Least Horizontal Dimension	**22.790** ft	
a = max (0.04 * LHD, 3, min(0.10 * LHD, 0.4*MRH))	**3.00** ft	max (0.04 * LHD, 3, min(0.10 * LHD, 0.4*MRH))

Design Wind Pressures

Minimum Additional Load Case per 28.4.4 = 16 PSF on entire vertical plane

Horizontal Pressures . . .

Zone: A =	31.22 psf	Zone: C =	20.69 psf	:: Use 23 psf average pressure	
Zone: B =	8.00 psf	Zone: D =	8.00 psf		

Vertical Pressures . . .

Zone: E =	-33.15 psf	Zone: G =	-23.11 psf
Zone: F =	-20.33 psf	Zone: H =	-15.61 psf

Overhangs . . .

Zone: Eoh =	-46.46 psf	Zone: Goh =	-36.42 psf

Component & Cladding Design Wind Pressures

*Design Wind Pressure = Lambda * Kzt * Ps30 per Eq 30.5-1*

Roof Zone 1 :	Positive :	10.043 psf
	Negative :	-28.677 psf
Roof Zone 2 :	Positive :	10.043 psf
	Negative :	-34.001 psf
Roof Zone 3 :	Positive :	10.043 psf
	Negative :	-34.001 psf
Wall Zone 4 :	Positive :	26.620 psf
	Negative :	-29.282 psf
Wall Zone 5 :	Positive :	26.620 psf
	Negative :	-32.549 psf
Roof Overhang Zone 2:		-49.852 psf
Roof Overhang Zone 3:		-24.926 psf

Minimum Additional Load Case per 28.4.4 = 16 PSF on entire vertical plane

ASCE Seismic Base Shear

Seismic Criteria

Risk Category

Calculations per ASCE 7-10

Risk Category of Building or Other Structure : "IV" : Buildings and other structures designated as essential facilities. *ASCE 7-10, Page 2, Table 1.5-1*

Seismic Importance Factor = 1.5 *ASCE 7-10, Page 5, Table 1.5-2*

USER DEFINED Ground Motion

ASCE 7-10 11.4.1

Max. Ground Motions, 5% Damping :

S_S = 0.8120 g, 0.2 sec response

S_1 = 0.2690 g, 1.0 sec response

Site Class, Site Coeff. and Design Category

Site Classification "C" : Shear Wave Velocity 1,200 to 2,500 ft/sec = C *ASCE 7-10 Table 20.3-1*

Site Coefficients Fa & Fv (*using straight-line interpolation from table values*) Fa = 1.08, Fv = 1.53 *ASCE 7-10 Table 11.4-1 & 11.4-2*

Maximum Considered Earthquake Acceleration

$S_{MS} = Fa * Ss$ = 0.873 *ASCE 7-10 Eq. 11.4-1*

$S_{M1} = Fv * S1$ = 0.412 *ASCE 7-10 Eq. 11.4-2*

Design Spectral Acceleration

$S_{DS} = S_{MS} * 2/3$ = 0.582 *ASCE 7-10 Eq. 11.4-3*

$S_{D1} = S_{M1} * 2/3$ = 0.275 *ASCE 7-10 Eq. 11.4-4*

Seismic Design Category = D *ASCE 7-10 Table 11.6-1 & -2*

Resisting System

ASCE 7-10 Table 12.2-1

Basic Seismic Force Resisting System . . . Bearing Wall Systems
Light-framed walls sheathed w/wood structural panels rated for shear resistance or steel sheets.

Response Modification Coefficient " R " = 6.50
System Overstrength Factor " Wo " = 2.50
Deflection Amplification Factor " Cd " = 4.00

NOTE! See ASCE 7-10 for all applicable footnotes.

Building height Limits :

Category "A & B" Limit:	No Limit
Category "C" Limit:	No Limit
Category "D" Limit:	Limit = 65
Category "E" Limit:	Limit = 65
Category "F" Limit:	Limit = 65

Lateral Force Procedure

ASCE 7-10 Section 12.8.2

Equivalent Lateral Force Procedure

The "Equivalent Lateral Force Procedure" is being used according to the provisions of ASCE 7-10 12.8

Determine Building Period

Use ASCE 12.8-7

Structure Type for Building Period Calculation : All Other Structural Systems

" Ct " value = 0.020 " hn " : Height from base to highest level = 12.0 ft

" x " value = 0.75

" Ta " Approximate fundemental period using Eq. 12.8-7 : Ta = Ct * (hn ^ x) = 0.129 sec

"TL" : Long-period transition period per ASCE 7-10 Maps 22-12 -> 22-16 8.000 sec

Building Period " Ta " Calculated from Approximate Method selected = 0.129 sec

" Cs " Response Coefficient

ASCE 7-10 Section 12.8.1.1

S_{DS}: Short Period Design Spectral Response	=	0.582	From Eq. 12.8-2, Preliminary Cs	=	0.134
" R " : Response Modification Factor	=	6.50	From Eq. 12.8-3 & 12.8-4 , Cs need not exceed	=	0.491
" I " : Seismic Importance Factor	=	1.5	From Eq. 12.8-5 & 12.8-6, Cs not be less than	=	0.038

User has selected ASCE 12.8.1.3 : Regular structure,
Less than 5 Stories and with T <<= 0.5 sec, SO Ss <= 1.5 for Cs calculation

Cs : Seismic Response Coefficient = = 0.1343

Seismic Base Shear

ASCE 7-10 Section 12.8.1

Cs = 0.1343 from 12.8.1.1

W (see Sum Wi below) = 70.00 k

Seismic Base Shear V = Cs * W = 9.40 k

Vertical Distribution of Seismic Forces

ASCE 7-10 Section 12.8.3

" k " : hx exponent based on Ta = 1.00

Table of building Weights by Floor Level...

Level #	Wi : Weight	Hi : Height	(Wi * Hi^k)	Cvx	Fx=Cvx * V	Sum Story Shear	Sum Story Moment
1	70.00	12.00	840.00	1.0000	9.40	9.40	0.00

Sum Wi = 70.00 k Sum Wi * Hi = 840.00 k-ft Total Base Shear = 9.40 k

Base Moment = 112.8 k-ft

Diaphragm Forces : Seismic Design Category "B" to "F"

ASCE 7-10 12.10.1.1

Level #	Wi	Fi	Sum Fi	Sum Wi	Fpx : Calcd	Fpx : Min	Fpx : Max	Fpx	Dsgn. Force
1	70.00	9.40	9.40	70.00	9.40	12.22	24.45	12.22	12.22

Wpx . . . . . Weight at level of diaphragm and other structure elements attached to it.

Fi . . . . . Design Lateral Force applied at the level.

Sum Fi . . . . . Sum of "Lat. Force" of current level plus all levels above

MIN Req'd Force @ Level . . . . . 0.20 * S_{DS}^{*} I * Wpx

MAX Req'd Force @ Level . . . . . 0.40 * S_{DS}^{*} I * Wpx

Fpx : Design Force @ Level . . . . . Wpx * SUM(x->n) Fi / SUM(x->n) wi, x = Current level, n = Top Level

PART II – STRUCTURAL CALCULATIONS

2 GRAVITY

Wood Stud Wall

NDS 2018 (ASD Design)

General Design Criteria

Stud Wall Location: **Ext Stud Wall**

Stud Length: 11.6
Int Zone Spacing: 16'' o.c.
End Zone Spacing: 16'' o.c.
Stud Grade: LSL
Stud Size: Custom 1.5 x 5.5
D < l_e/ 240
l_e/d = 25

Blocking

X-X Bracing	Y-Y Bracing
Cont.	Unbraced

Wind Loads	Vert (psf)	Horiz (psf)
Int Zones:	12.0	32.0
End Zones:	12.0	32.0
End Zone Length:	6.0 ft	

Seismic Loads
Fp (psf): 5.0
E_v (plf): 39.3

Snow Drift
S_{drift} (plf): 0.0

Gravity Loads	D (psf)	S/L (psf)	Trib (ft)	D (plf)	S/L (plf)	Int W (plf)	End W (plf)
Roof (S):	20	236	13.4	268.4	3167.1	161.04	161.04
Floor:	0	0	0.0	0.0	0.0	---	---
Corridor:	0	0	0.0	0.0	0.0	---	---
Wall:	12	---	5.8	69.5	---	---	---
Misc:	20	---	0.0	0.0	---	---	---

Design Results

Wall Studs

Load Combinations	Compression + Bending + Shear Stresses (psi) Int f_c	End f_c	Int f_b	End f_b	Int f_v	End f_v
D	55	55	-	-	-	-
D+L	55	55	-	-	-	-
D+(L_r/S)	566	566	-	-	-	-
D+0.75[L+(L_r/S)]	439	439	-	-	-	-
D+(0.6W or 0.7E)	70	70	1135	1135	45	45
D+0.75[L+(Lr/S)… +(0.6W or 0.7E)]	450	450	851	851	34	34

Load Combinations	Allowable Stresses C_D	C_P	F'c	F'b	F'v	Combined Loading Int	End	Strength Capacity
D	0.90	0.48	930	2239	279	-	-	6%
D+L	1.00	0.43	942	2488	310	-	-	6%
D+(L_r/S)	1.15	0.38	955	2861	357	-	-	59%
D+0.75[L+(L_r/S)]	1.15	0.38	955	2861	357	-	-	46%
D+(0.6W or 0.7E)	1.60	0.28	976	3980	496	0.31	0.31	31%
D+0.75[L+(Lr/S)… +(0.6W or 0.7E)]	1.60	0.28	976	3980	496	0.60	0.60	60%

Lateral Deflection

	D (in)	L/D	D (in)	L/D
W	0.23	593	0.23	593
0.7E	0.04	3798	0.04	3798

King Studs +Posts

	Int Zone Opening	End Zone Opening
2 x 6	4' 7"	4' 8"
(2) 2 x 6	9' 3"	9' 4"
(3) 2 x 6	14' 0"	14' 0"
(4) 2 x 6	18' 8"	18' 8"
4 x 6	10' 10"	10' 10"
6 x 6	17' 1"	17' 1"

Design Checks

Strength: **O.K.**
Deflection: **O.K.**
Overall: **O.K.**

General Design Criteria

Stud Wall Location: **Int Stud Wall**

Stud Length: 10.0
Int Zone Spacing: 16'' o.c.
End Zone Spacing: 16'' o.c.
Stud Grade: DF No. 2
Stud Size: 2 x 6
D < l_e/ 240
l_e/d = 22

Blocking

X-X Bracing	Y-Y Bracing
Cont.	Unbraced

Wind Loads	Vert (psf)	Horiz (psf)
Int Zones:	12.0	5.0
End Zones:	12.0	5.0
End Zone Length:	6.0 ft	

Seismic Loads	
Fp (psf):	5.0
E_v (plf):	10.1

Snow Drift	
S_{drift} (plf):	0.0

Gravity Loads	D (psf)	S/L (psf)	Trib (ft)	D (plf)	S/L (plf)	Int W (plf)	End W (plf)
Roof (S):	20	236	1.3	26.6	313.9	15.96	15.96
Floor:	0	0	0.0	0.0	0.0	---	---
Corridor:	0	0	0.0	0.0	0.0	---	---
Wall:	12	---	5.0	60.0	---	---	---
Misc:	20	---	0.0	0.0	---	---	---

Design Results

Wall Studs

Load Combinations	Compression + Bending + Shear Stresses (psi) Int f_C	End f_C	Int f_b	End f_b	Int f_v	End f_v
D	14	14	-	-	-	-
D+L	14	14	-	-	-	-
D+(L_r/S)	65	65	-	-	-	-
D+0.75[L+(L_r/S)]	52	52	-	-	-	-
D+(0.6W or 0.7E)	15	15	132	132	6	6
D+0.75[L+(Lr/S)… +(0.6W or 0.7E)]	53	53	99	99	5	5

Load Combinations	Allowable Stresses C_D	C_P	F'c	F'b	F'v	Combined Loading Int	End	Strength Capacity
D	0.90	0.58	781	891	162	-	-	2%
D+L	1.00	0.54	808	990	180	-	-	2%
D+(L_r/S)	1.15	0.49	839	1139	207	-	-	8%
D+0.75[L+(L_r/S)]	1.15	0.49	839	1139	207	-	-	6%
D+(0.6W or 0.7E)	1.60	0.38	894	1584	288	0.09	0.09	9%
D+0.75[L+(Lr/S)… +(0.6W or 0.7E)]	1.60	0.38	894	1584	288	0.07	0.07	7%

Lateral Deflection

	D (in)	L/D	D (in)	L/D
W	0.03	4342	0.03	4342
0.7E	0.03	4342	0.03	4342

King Studs +Posts

Int Zone Opening	End Zone Opening

Design Checks

Strength: **O.K.**
Deflection: **O.K.**
Overall: **O.K.**

Wood Column Capacity (kips)

NDS 2018 - Assumes column is braced in the weak axis

Wood Species: DF No. 2

C_D: 1.00

COLUMN	PLATE CRUSHING	COLUMN LENGTH (FT)								
		8	9	10	11	12	13	14	15	16
2 x 4	3.28	2.98	2.42	2.00	1.67	1.42	1.22	1.05	Slender	Slender
(2) 2 x 4	6.56	5.97	4.85	4.00	3.35	2.84	2.43	2.11	Slender	Slender
(3) 2 x 4	9.84	8.95	7.27	6.00	5.02	4.26	3.65	3.16	Slender	Slender
(4) 2 x 4	13.13	11.93	9.69	8.00	6.69	5.68	4.87	4.22	Slender	Slender
4 x 4	7.66	6.96	5.66	4.67	3.90	3.31	2.84	2.46	Slender	Slender
2 x 6	5.16	8.68	7.65	6.67	5.79	5.04	4.40	3.86	3.41	3.03
(2) 2 x 6	10.31	17.37	15.31	13.34	11.58	10.07	8.79	7.72	6.82	6.06
(3) 2 x 6	15.47	26.05	22.96	20.01	17.37	15.11	13.19	11.58	10.23	9.09
(4) 2 x 6	20.63	34.73	30.61	26.68	23.16	20.14	17.59	15.44	13.64	12.11
4 x 6	12.03	20.26	17.86	15.56	13.51	11.75	10.26	9.01	7.96	7.07
6 x 6	18.91	17.99	16.91	15.66	14.32	12.96	11.67	10.47	9.41	8.46
6 x 8	24.92	25.77	25.08	24.24	23.25	22.13	20.88	19.55	18.19	16.84

C_D: 1.15

COLUMN	PLATE CRUSHING	COLUMN LENGTH (FT)								
		8	9	10	11	12	13	14	15	16
2 x 4	3.28	3.04	2.45	2.02	1.69	1.43	1.22	1.06	Slender	Slender
(2) 2 x 4	6.56	6.07	4.91	4.04	3.37	2.85	2.45	2.12	Slender	Slender
(3) 2 x 4	9.84	9.11	7.36	6.06	5.06	4.28	3.67	3.18	Slender	Slender
(4) 2 x 4	13.13	12.14	9.82	8.07	6.74	5.71	4.89	4.24	Slender	Slender
4 x 4	7.66	7.08	5.73	4.71	3.93	3.33	2.85	2.47	Slender	Slender
2 x 6	5.16	9.30	8.05	6.92	5.96	5.15	4.47	3.91	3.45	3.06
(2) 2 x 6	10.31	18.60	16.10	13.85	11.91	10.29	8.95	7.83	6.90	6.12
(3) 2 x 6	15.47	27.90	24.16	20.77	17.87	15.44	13.42	11.74	10.35	9.17
(4) 2 x 6	20.63	37.20	32.21	27.70	23.82	20.58	17.89	15.66	13.79	12.23
4 x 6	12.03	21.70	18.79	16.16	13.90	12.01	10.44	9.13	8.05	7.14
6 x 6	18.91	20.00	18.53	16.89	15.22	13.60	12.12	10.80	9.65	8.64
6 x 8	24.92	29.19	28.23	27.07	25.72	24.21	22.57	20.90	19.24	17.65

C_D: 1.60

COLUMN	PLATE CRUSHING	COLUMN LENGTH (FT)								
		8	9	10	11	12	13	14	15	16
2 x 4	3.28	3.13	2.51	2.05	1.71	1.44	1.23	1.07	Slender	Slender
(2) 2 x 4	6.56	6.26	5.02	4.11	3.42	2.89	2.47	2.13	Slender	Slender
(3) 2 x 4	9.84	9.39	7.53	6.16	5.12	4.33	3.70	3.20	Slender	Slender
(4) 2 x 4	13.13	12.52	10.04	8.21	6.83	5.77	4.94	4.27	Slender	Slender
4 x 4	7.66	7.30	5.85	4.79	3.99	3.37	2.88	2.49	Slender	Slender
2 x 6	5.16	10.49	8.78	7.37	6.24	5.34	4.61	4.01	3.52	3.11
(2) 2 x 6	10.31	20.99	17.55	14.75	12.49	10.68	9.21	8.02	7.04	6.22
(3) 2 x 6	15.47	31.48	26.33	22.12	18.73	16.01	13.82	12.03	10.56	9.33
(4) 2 x 6	20.63	41.97	35.11	29.49	24.98	21.35	18.42	16.04	14.07	12.44
4 x 6	12.03	24.48	20.48	17.20	14.57	12.46	10.75	9.36	8.21	7.26
6 x 6	18.91	24.80	22.07	19.37	16.92	14.77	12.93	11.38	10.06	8.95
6 x 8	24.92	38.61	36.54	34.12	31.47	28.71	26.01	23.48	21.17	19.11

Wood Beam

Lic. # : KW-06008993 Licensee : MATIX

Description : Typical Roof Joist (LVL)

CODE REFERENCES

Calculations per NDS 2015, IBC 2015, CBC 2016, ASCE 7-10
Load Combination Set : IBC 2015

Material Properties

Analysis Method : Allowable Stress Design
Load Combination : IBC 2015

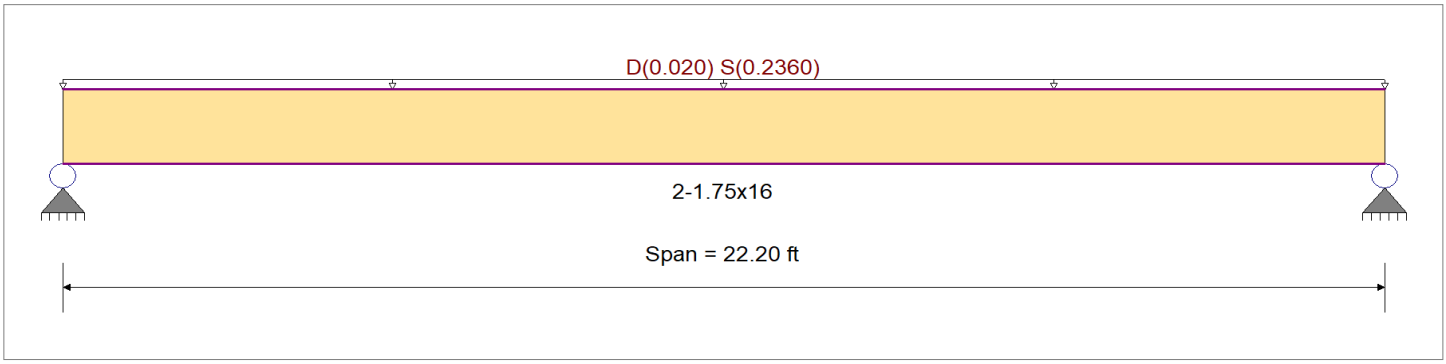
Wood Species : Trus Joist
Wood Grade : MicroLam LVL 1.9 E

Beam Bracing : Beam is Fully Braced against lateral-torsional buckling

Fb +	2,600.0 psi
Fb -	2,600.0 psi
Fc - Prll	2,510.0 psi
Fc - Perp	750.0 psi
Fv	285.0 psi
Ft	1,555.0 psi

E : Modulus of Elasticity

Ebend- xx	1,900.0 ksi
Eminbend - xx	965.71 ksi
Density	42.0 pcf



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Loads on all spans...
Uniform Load on ALL spans : D = 0.020, S = 0.2360 k/ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.441 : 1	Maximum Shear Stress Ratio	=	0.205 : 1
Section used for this span		2-1.75x16	Section used for this span		2-1.75x16
fb : Actual	=	1,267.30 psi	fv : Actual	=	67.23 psi
FB : Allowable	=	2,875.28 psi	Fv : Allowable	=	327.75 psi
Load Combination		+D+S+H	Load Combination		+D+S+H
Location of maximum on span	=	11.100 ft	Location of maximum on span	=	20.904 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.572 in	Ratio =	466 >=360
Max Upward Transient Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	0.620 in	Ratio =	429 >=240
Max Upward Total Deflection	0.000 in	Ratio =	0 <240

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+S+H	1	0.6200	11.181		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	2.842	2.842
Overall MINimum	2.620	2.620
+D+H	0.222	0.222
+D+L+H	0.222	0.222
+D+Lr+H	0.222	0.222
+D+S+H	2.842	2.842
+D+0.750Lr+0.750L+H	0.222	0.222
+D+0.750L+0.750S+H	2.187	2.187

Wood Beam

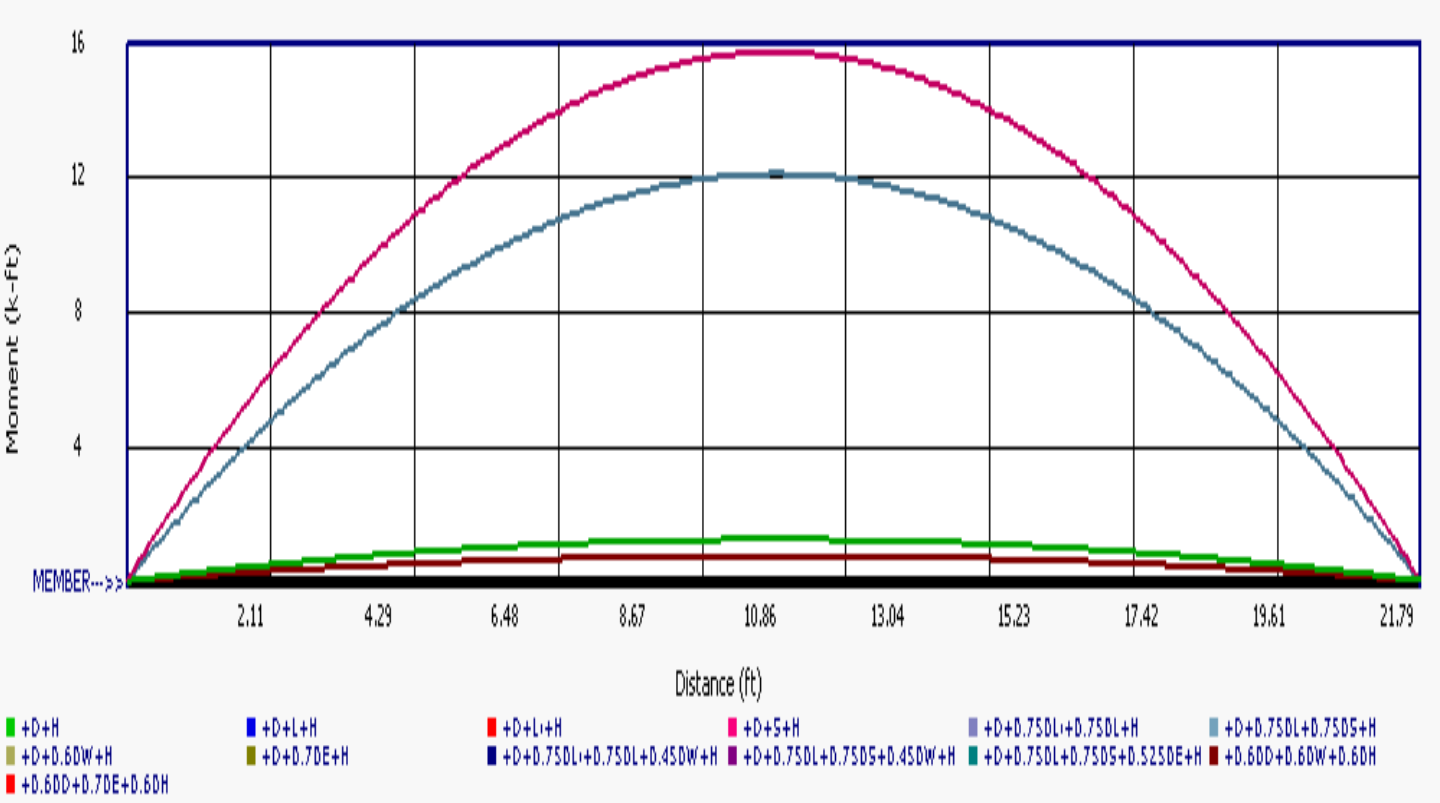
Lic. # : KW-06008993 Licensee : MATIX

Description : Typical Roof Joist (LVL)

Vertical Reactions

Support notation : Far left is #1 Values in KIPS

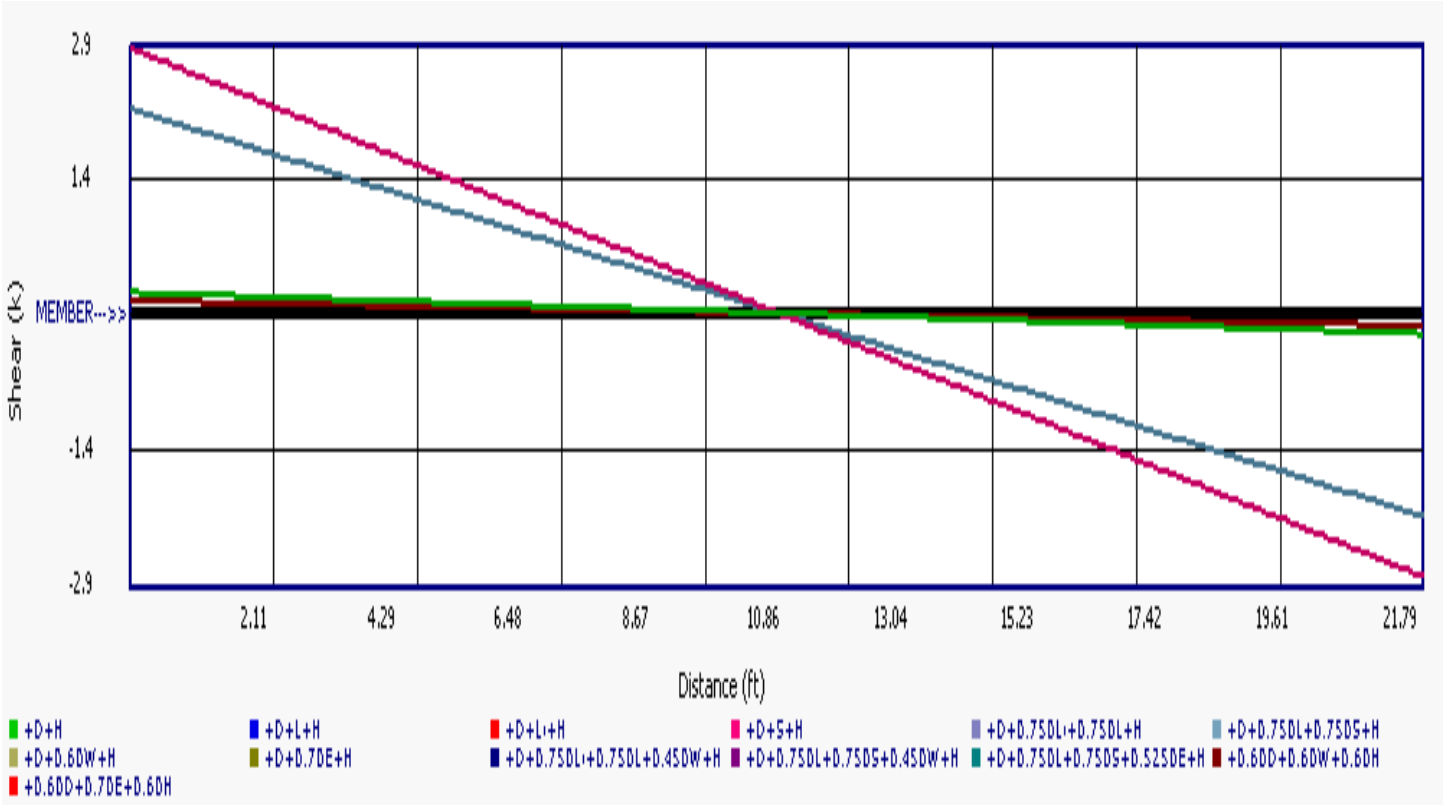
Load Combination	Support 1	Support 2
+D+0.60W+H	0.222	0.222
+D+0.70E+H	0.222	0.222
+D+0.750Lr+0.750L+0.450W+H	0.222	0.222
+D+0.750L+0.750S+0.450W+H	2.187	2.187
+D+0.750L+0.750S+0.5250E+H	2.187	2.187
+0.60D+0.60W+0.60H	0.133	0.133
+0.60D+0.70E+0.60H	0.133	0.133
D Only	0.222	0.222
Lr Only		
L Only		
S Only	2.620	2.620
W Only		
E Only		
H Only		

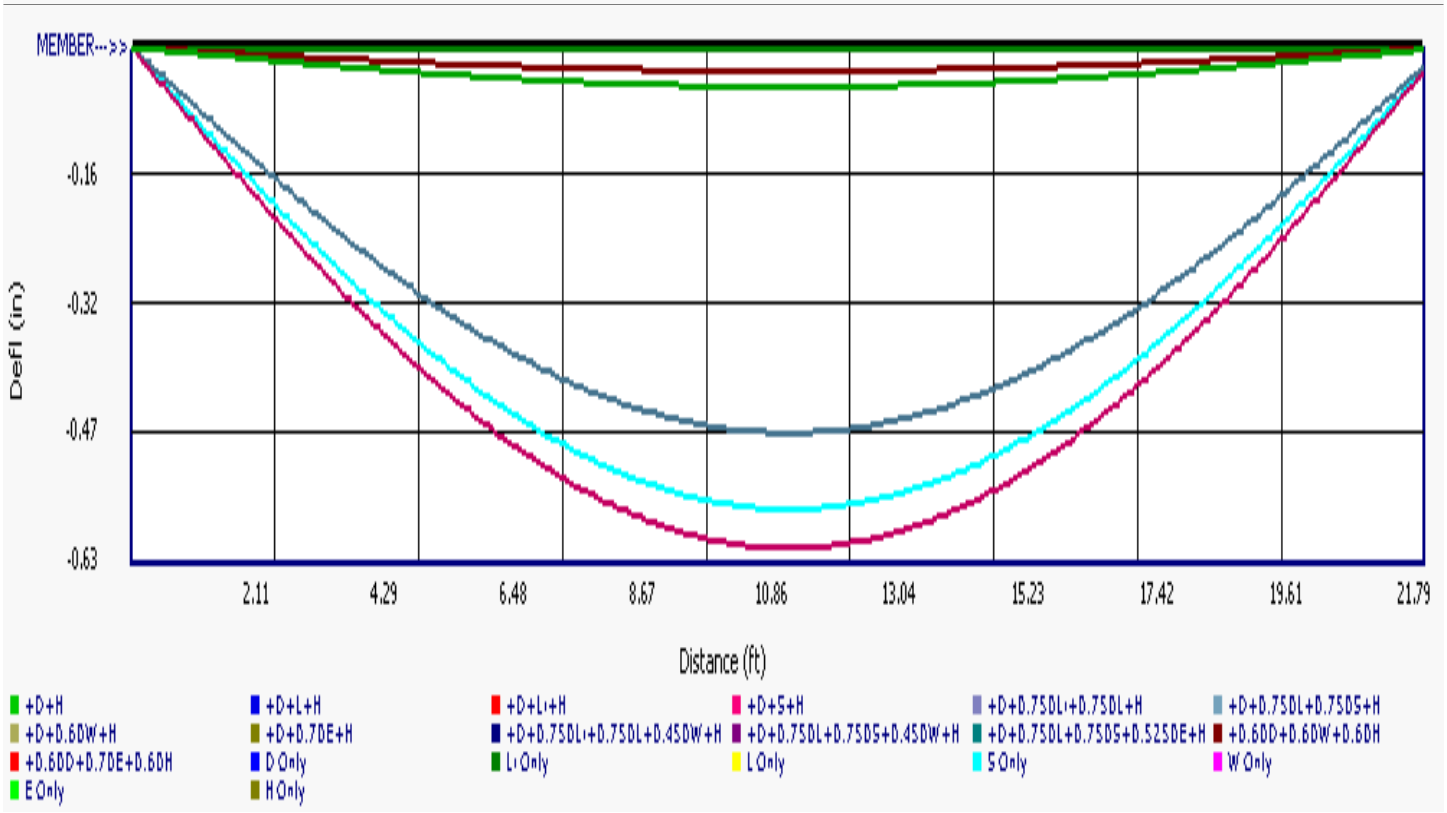


Wood Beam

Lic. # : KW-06008993 **Licensee : MATIX**

Description : Typical Roof Joist (LVL)





Wood Beam

Lic. # : KW-06008993 Licensee : MATIX

Description : Cantilever Roof Joist (LVL)

CODE REFERENCES

Calculations per NDS 2015, IBC 2015, CBC 2016, ASCE 7-10
Load Combination Set : IBC 2015

Material Properties

Analysis Method : Allowable Stress Design
Load Combination : IBC 2015

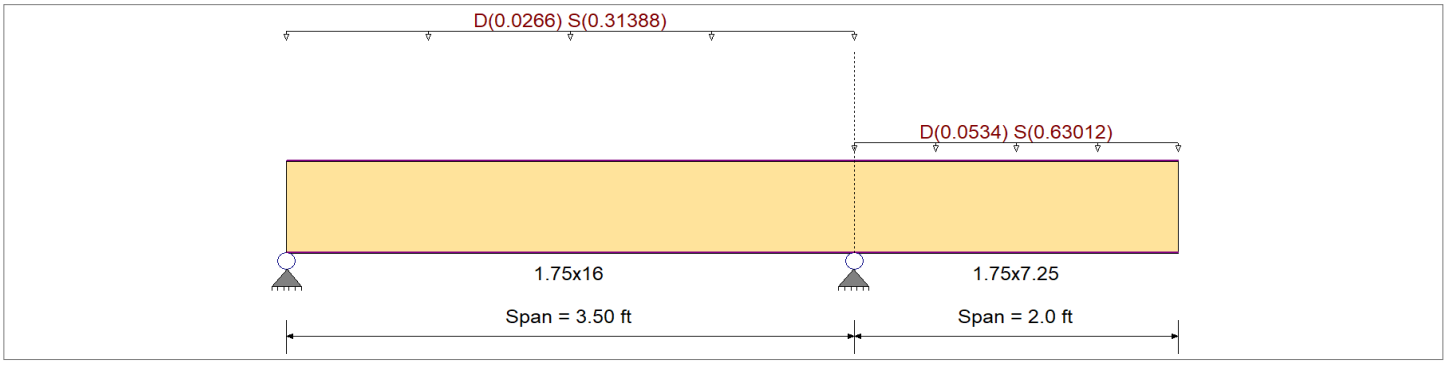
Wood Species : Trus Joist
Wood Grade : MicroLam LVL 1.9 E

Beam Bracing : Beam is Fully Braced against lateral-torsional buckling

Fb +	2,600.0 psi
Fb -	2,600.0 psi
Fc - Prll	2,510.0 psi
Fc - Perp	750.0 psi
Fv	285.0 psi
Ft	1,555.0 psi

E : Modulus of Elasticity

Ebend- xx	1,900.0 ksi
Eminbend - xx	965.71 ksi
Density	42.0 pcf



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Load for Span Number 1
Uniform Load : D = 0.020, S = 0.2360 ksf, Tributary Width = 1.330 ft
Load for Span Number 2
Uniform Load : D = 0.020, S = 0.2360 ksf, Tributary Width = 2.670 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.358 : 1	Maximum Shear Stress Ratio	=	0.344 : 1
Section used for this span		1.75x7.25	Section used for this span		1.75x7.25
fb : Actual	=	1,070.04 psi	fv : Actual	=	112.86 psi
FB : Allowable	=	2,990.00 psi	Fv : Allowable	=	327.75 psi
Load Combination		+D+S+H	Load Combination		+D+S+H
Location of maximum on span	=	0.000 ft	Location of maximum on span	=	0.000 ft
Span # where maximum occurs	=	Span # 2	Span # where maximum occurs	=	Span # 2

Maximum Deflection

Max Downward Transient Deflection	0.023 in	Ratio =	2058 >=360
Max Upward Transient Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	0.025 in	Ratio =	1896 >=240
Max Upward Total Deflection	0.000 in	Ratio =	0 <240

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
	1	0.0000	0.000	+D+S+H	-0.0007	2.405
+D+S+H	2	0.0253	2.000		0.0000	2.405

Vertical Reactions

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2	Support 3
Overall MAXimum	0.205	2.353	
Overall MINimum	0.189	2.170	
+D+H	0.016	0.184	
+D+L+H	0.016	0.184	
+D+Lr+H	0.016	0.184	

Wood Beam

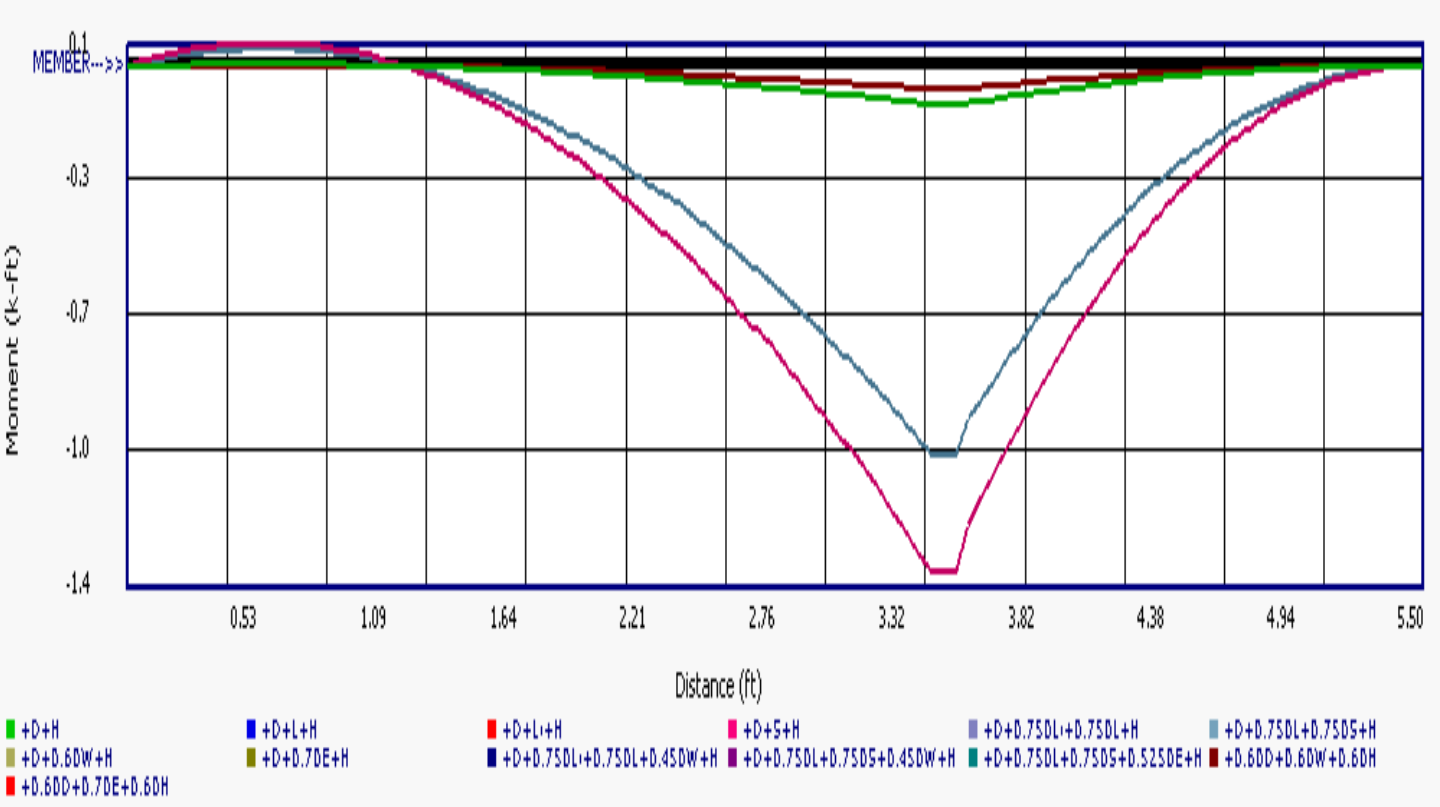
Lic. # : KW-06008993 **Licensee : MATIX**

Description : Cantilever Roof Joist (LVL)

Vertical Reactions

Support notation : Far left is #1 Values in KIPS

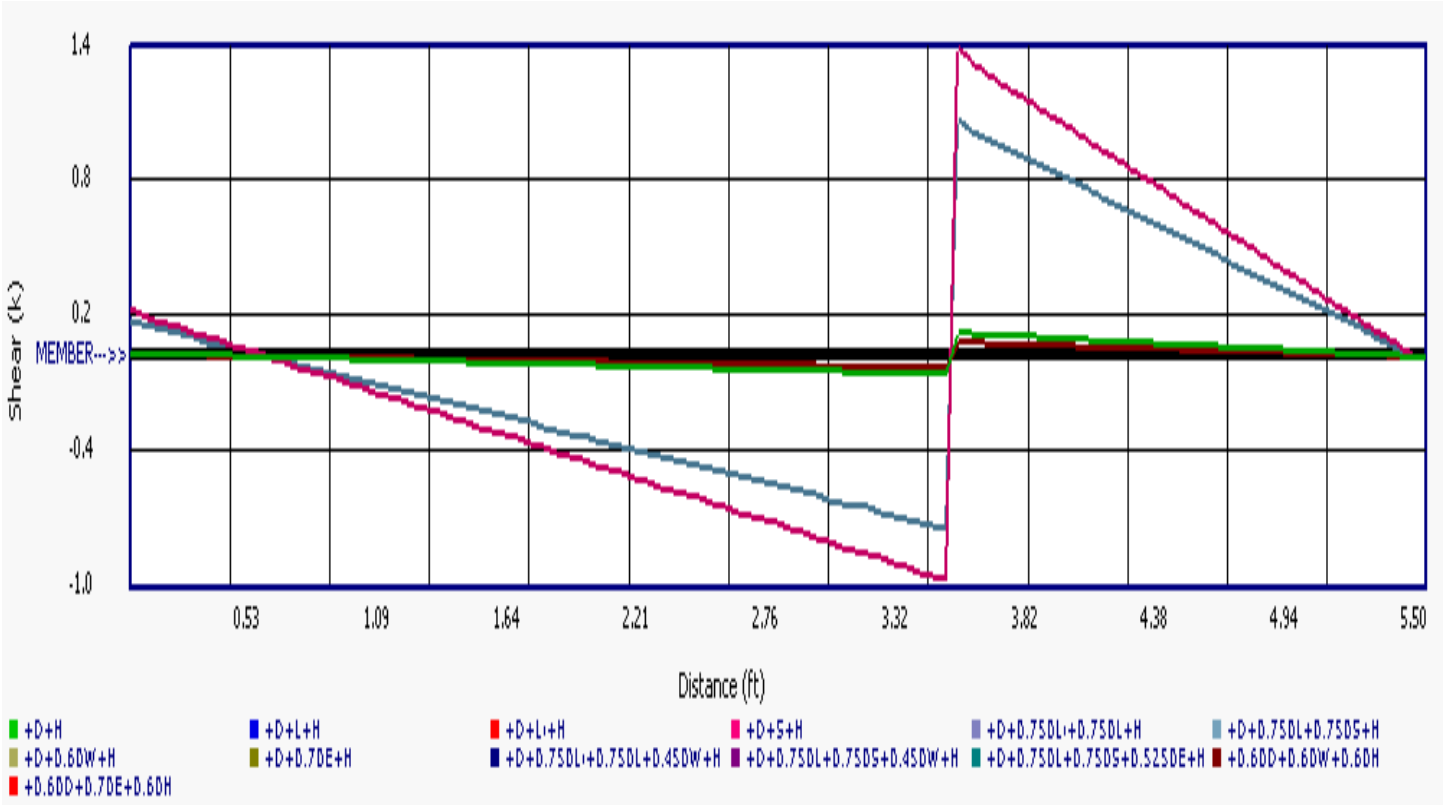
Load Combination	Support 1	Support 2	Support 3
+D+S+H	0.205	2.353	
+D+0.750Lr+0.750L+H	0.016	0.184	
+D+0.750L+0.750S+H	0.158	1.811	
+D+0.60W+H	0.016	0.184	
+D+0.70E+H	0.016	0.184	
+D+0.750Lr+0.750L+0.450W+H	0.016	0.184	
+D+0.750L+0.750S+0.450W+H	0.158	1.811	
+D+0.750L+0.750S+0.5250E+H	0.158	1.811	
+0.60D+0.60W+0.60H	0.010	0.110	
+0.60D+0.70E+0.60H	0.010	0.110	
D Only	0.016	0.184	
Lr Only			
L Only			
S Only	0.189	2.170	
W Only			
E Only			
H Only			

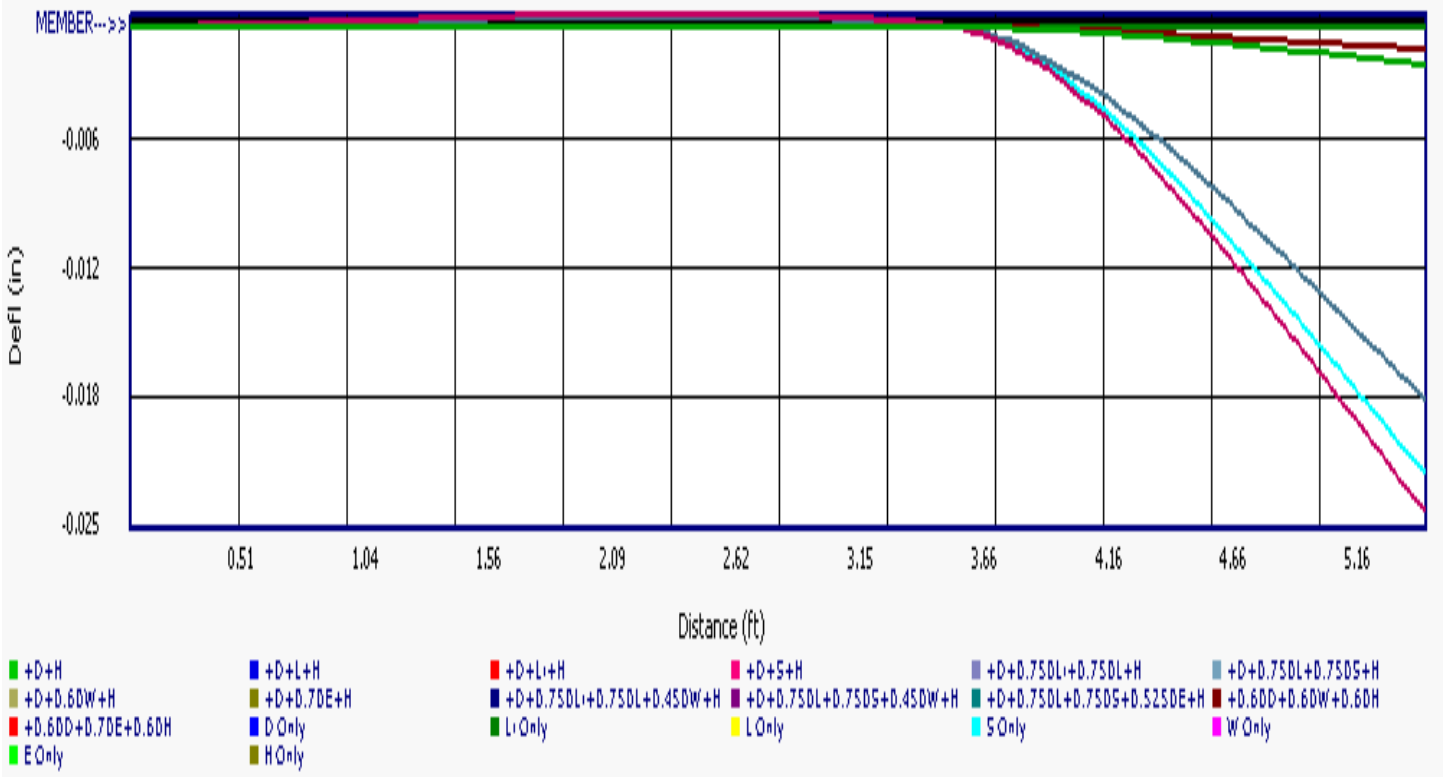


Wood Beam

Lic. # : KW-06008993 Licensee : MATIX

Description : Cantilever Roof Joist (LVL)





Wood Beam

Lic. # : KW-06008993 **Licensee : MATIX**

Description : Triple Roof Joist (LVL)

CODE REFERENCES

Calculations per NDS 2015, IBC 2015, CBC 2016, ASCE 7-10
Load Combination Set : IBC 2015

Material Properties

Analysis Method : Allowable Stress Design
Load Combination : IBC 2015

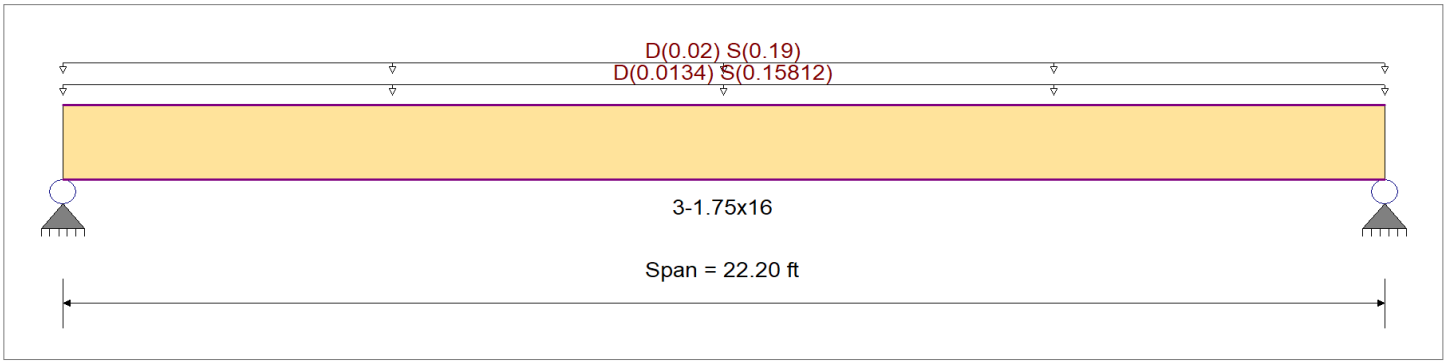
Wood Species : Trus Joist
Wood Grade : MicroLam LVL 1.9 E

Beam Bracing : Beam is Fully Braced against lateral-torsional buckling

Fb +	2,600.0 psi
Fb -	2,600.0 psi
Fc - Prll	2,510.0 psi
Fc - Perp	750.0 psi
Fv	285.0 psi
Ft	1,555.0 psi

E : Modulus of Elasticity

Ebend- xx	1,900.0 ksi
Eminbend - xx	965.71 ksi
Density	42.0 pcf



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Uniform Load : D = 0.020, S = 0.2360 ksf, Tributary Width = 0.670 ft, (Joist Side)
Uniform Load : D = 0.020, S = 0.190 , Tributary Width = 1.0 ft, (Cant Side)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.438 : 1	Maximum Shear Stress Ratio	=	0.204 : 1
Section used for this span		3-1.75x16	Section used for this span		3-1.75x16
fb : Actual	=	1,259.12 psi	fv : Actual	=	66.79 psi
FB : Allowable	=	2,875.28 psi	Fv : Allowable	=	327.75 psi
Load Combination		+D+S	Load Combination		+D+S
Location of maximum on span	=	11.100 ft	Location of maximum on span	=	20.904 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.562 in	Ratio =	473 >=360
Max Upward Transient Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	0.616 in	Ratio =	432 >=240
Max Upward Total Deflection	0.000 in	Ratio =	0 <240

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+S	1	0.6160	11.181		0.0000	0.000

Vertical Reactions

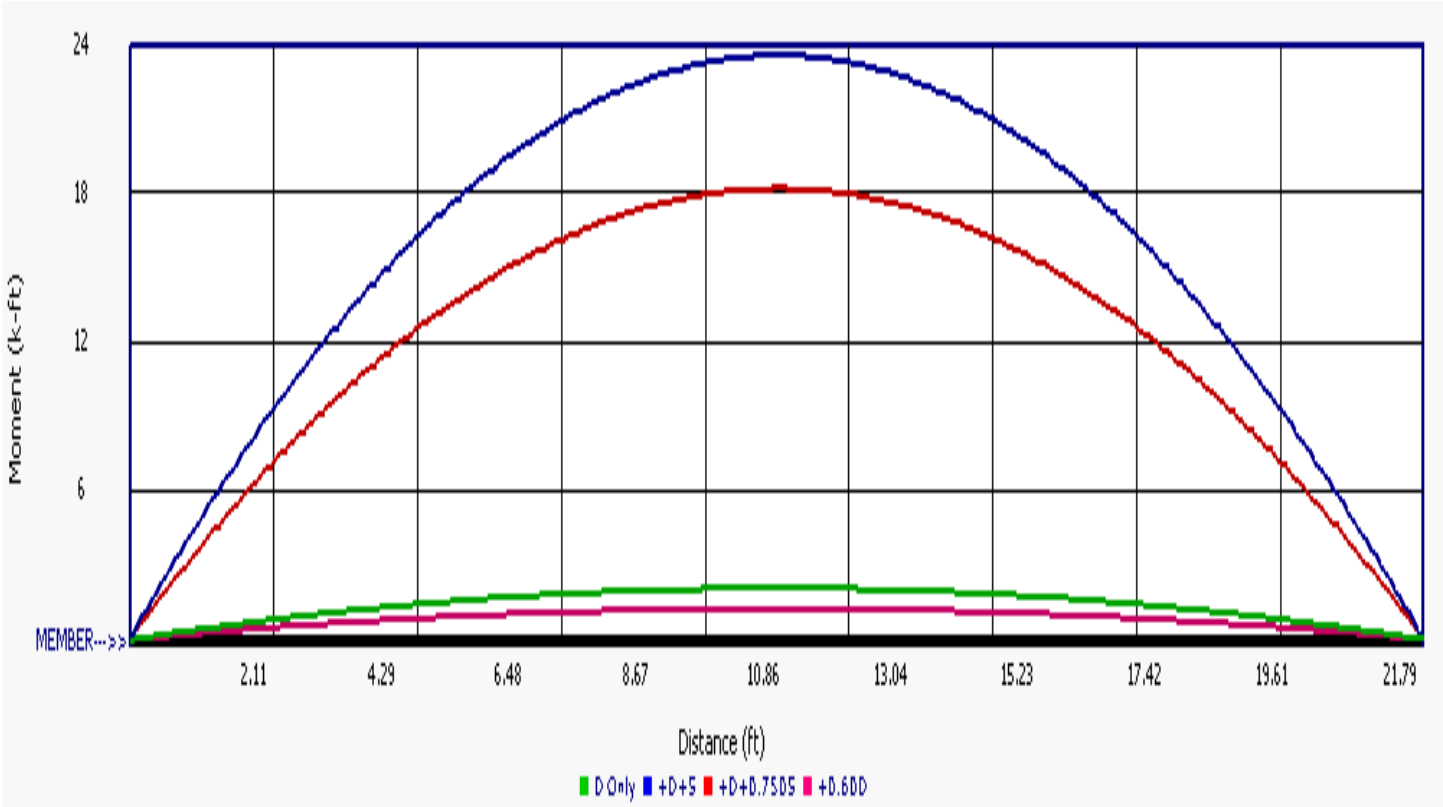
Support notation : Far left is #1 Values in KIPS

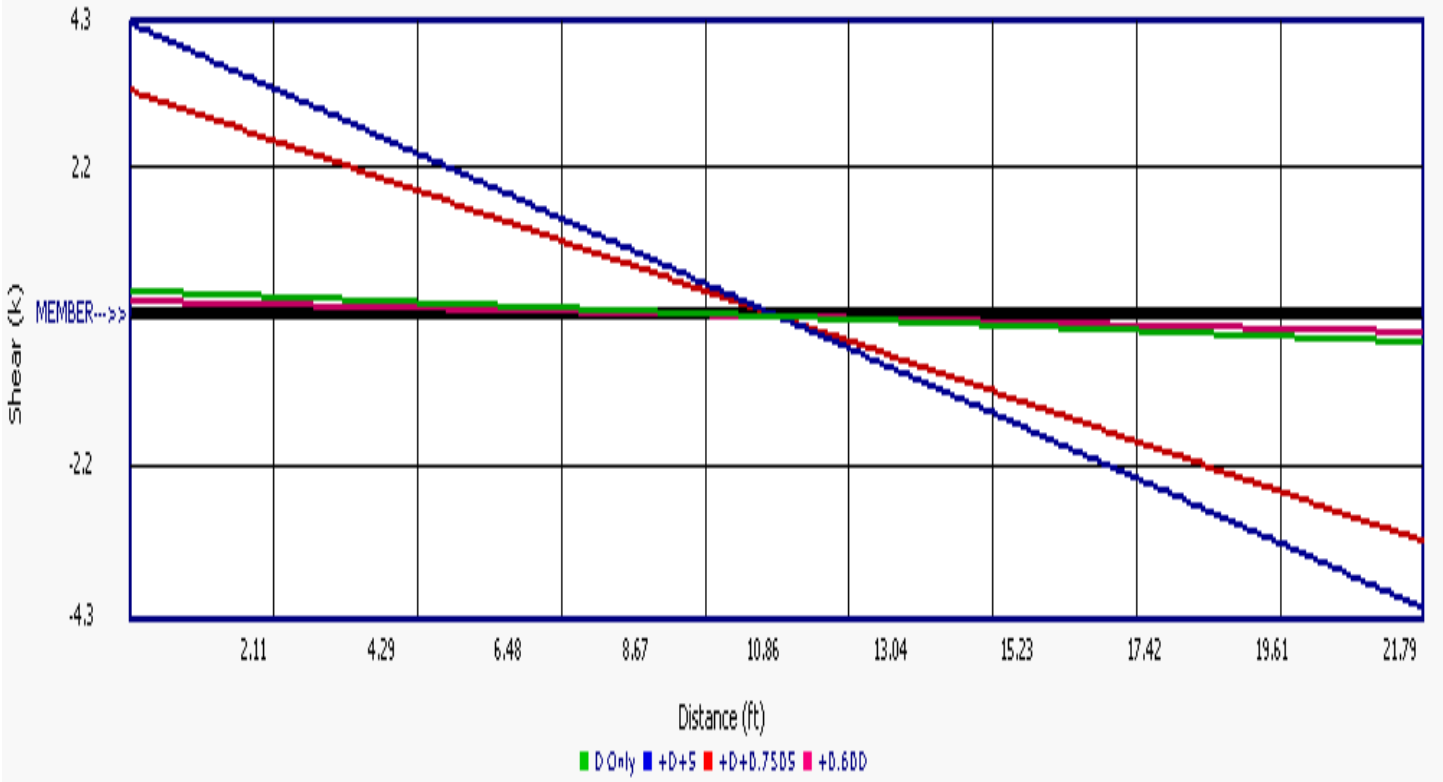
Load Combination	Support 1	Support 2
Overall MAXimum	4.235	4.235
Overall MINimum	3.864	3.864
D Only	0.371	0.371
+D+S	4.235	4.235
+D+0.750S	3.269	3.269
+0.60D	0.222	0.222
S Only	3.864	3.864

Wood Beam

Lic. # : KW-06008993 Licensee : MATIX

Description : Triple Roof Joist (LVL)

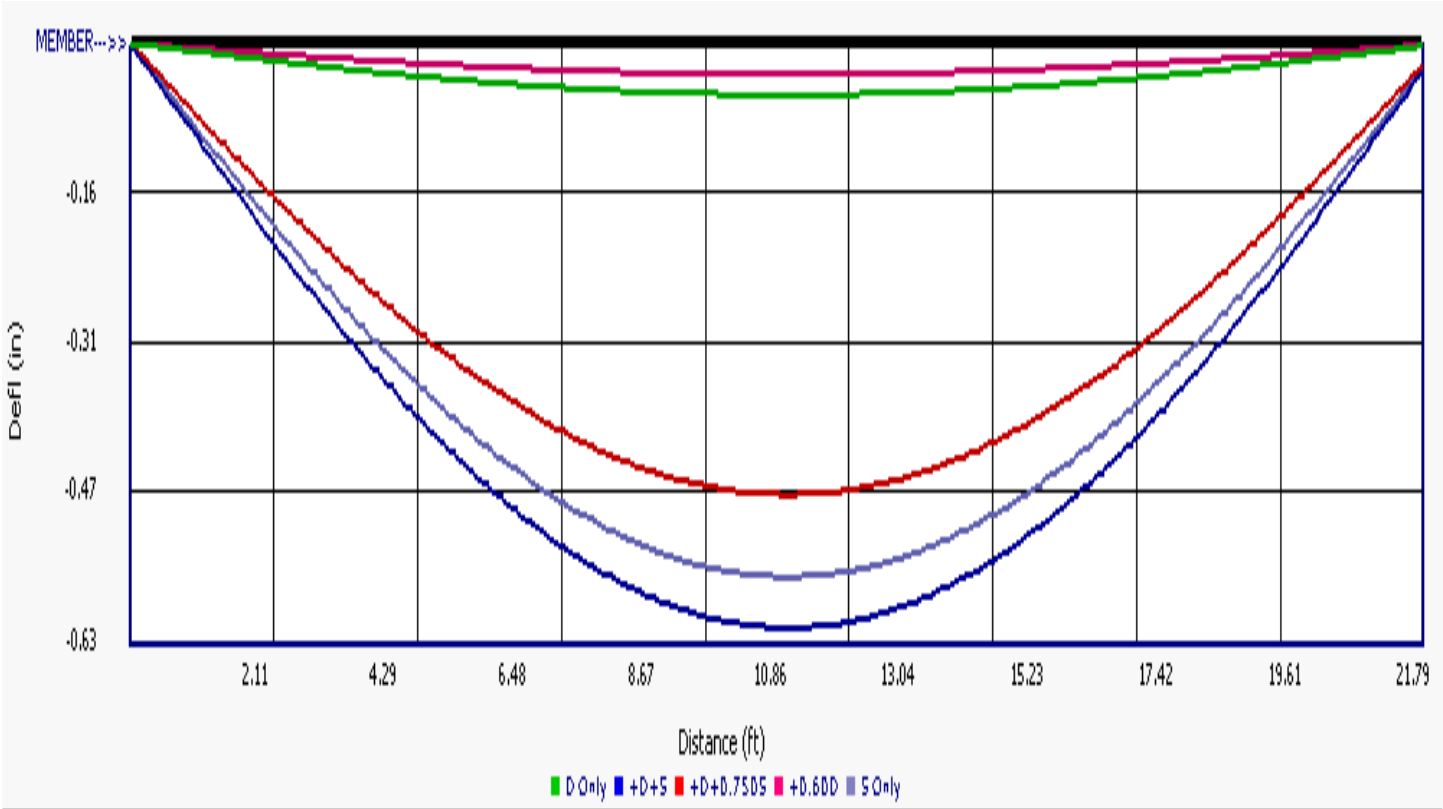




Wood Beam

Lic. # : KW-06008993 **Licensee : MATIX**

Description : Triple Roof Joist (LVL)



Simple Wood Beam

NDS 2018 (ASD Design)

DESCRIPTION: **8'-4" OPENING**

Span: 8.33 ft
Snow: Yes
Wind:
D_{TL}: L/240
D_{LL}: L/360

	Loads (psf) D	S/L	F_{RDXN}	Trib (ft)	w_D	$w_{S/Lr/L}$	$0.6w_W$	w_{TL}
Roof	20	236	---	13.42	268	3,167	0	3,436
Floor			1.00	0	0	0	---	0
Wall	12	---	---	2	24	---	---	24
Misc.		---	---	0	0	---	---	0
				Total *w*:	*292*			*3,460*

Point Loads (lbs)

D
L_r/S
L
W
$X_{L.\ END}$

	V_{MAX} (lb)	M_{MAX} (ft-lb)
D	1,218	2,536
D+L	1,218	2,536
D+(L_r/S)	14,409	30,007
D+0.75[L+(L_r/S)]	11,111	23,139
D+0.6W	1,218	2,536
D+0.75[L+(Lr/S)+0.6W]	11,111	23,139

	V_{Left} (lb)	V_{Right} (lb)	M (ft-lb)
D	1,218	1,218	2536
L_r/S	13,191	13,191	27470
L	0	0	0
W	0	0	0

Adjustment Factors

∑C: 1.15
C_D: 1.15
C_L: 1.00
C_M: 1.00
C_t: 1.00

Plies + Thickness

SS (No. Plies): 3 Ply
Glulam (Thick): 5 1/8 in
LVL (No. Plies): 3 Ply

Design Options

Beam:	Sawn	Glulam	LVL
Size		**5.125 x 15**	**5.25 x 14**
M_{CAP}		68%	72%
V_{CAP}		92%	90%
Δ_{TL}		48%	54%

Notes: 5.25 x 14

DESCRIPTION: **4'-4" OPENING**

Span: 4.33 ft
Snow: Yes
Wind:
D_{TL}: L/240
D_{LL}: L/360

	Loads (psf) D	S/L	F_{RDXN}	Trib (ft)	w_D	$w_{S/Lr/L}$	$0.6w_W$	w_{TL}
Roof	20	236	---	13.42	268	3,167	0	3,436
Floor			1.00	0	0	0	---	0
Wall	12	---	---	4	48	---	---	48
Misc.		---	---	0	0	---	---	0
				Total *w*:	*316*			*3,484*

Point Loads (lbs)

D
L_r/S
L
W
$X_{L.\ END}$

	V_{MAX} (lb)	M_{MAX} (ft-lb)
D	685	742
D+L	685	742
D+(L_r/S)	7,542	8,164
D+0.75[L+(L_r/S)]	5,828	6,308
D+0.6W	685	742
D+0.75[L+(Lr/S)+0.6W]	5,828	6,308

	V_{Left} (lb)	V_{Right} (lb)	M (ft-lb)
D	685	685	742
L_r/S	6,857	6,857	7423
L	0	0	0
W	0	0	0

Adjustment Factors

∑C: 1.15
C_D: 1.15
C_L: 1.00
C_M: 1.00
C_t: 1.00

Plies + Thickness

SS (No. Plies): 3 Ply
Glulam (Thick): 5 1/8 in
LVL (No. Plies): 3 Ply

Design Options

Beam:	Sawn	Glulam	LVL
Size		**5.125 x 9**	**5.25 x 7.25**
M_{CAP}		51%	71%
V_{CAP}		80%	91%
Δ_{TL}		31%	55%

Notes: 5.25 x 9.5

Simple Wood Beam

NDS 2018 (ASD Design)

DESCRIPTION: GEN EXHAUST OPENING

Span: 4.83 ft
Snow: Yes
Wind:
D_{TL}: L/240
D_{LL}: L/360

Loads (psf)

	D	S/L	F_{RDXN}	Trib (ft)
Roof	20	236	---	13.42
Floor			1.00	0
Wall	12	---	---	2
Misc.		---	---	0

Uniform Service Loads (plf)

	w_D	$w_{S/Lr/L}$	$0.6w_W$	w_{TL}
Roof	268	3,167	0	3,436
Floor	0	0	---	0
Wall	24	---	---	24
Misc.	0	---	---	0
Total *w* :	*292*			*3,460*

Point Loads (lbs)

D	
L_r/S	
L	
W	
$X_{L.\ END}$	

	V_{MAX} (lb)	M_{MAX} (ft-lb)
D	706	853
D+L	706	853
D+(L_r/S)	8,355	10,088
D+0.75[L+(L_r/S)]	6,443	7,779
D+0.6W	706	853
D+0.75[L+(Lr/S)+0.6W]	6,443	7,779

	V_{Left} (lb)	V_{Right} (lb)	M (ft-lb)
D	706	706	853
L_r/S	7,649	7,649	9236
L	0	0	0
W	0	0	0

Adjustment Factors

∑C: 1.15
C_D: 1.15
C_L: 1.00
C_M: 1.00
C_t: 1.00

Plies + Thickness

SS (No. Plies): 3 Ply
Glulam (Thick): 5 1/8 in
LVL (No. Plies): 3 Ply

Design Options

Beam:	Sawn	Glulam	LVL
Size		**5.125 x 9**	**5.25 x 9.5**
M_{CAP}		63%	51%
V_{CAP}		89%	77%
Δ_{TL}		43%	34%

Notes: 5.25 x 9.5

DESCRIPTION: LOUVER OPENING

Span: 1.25 ft
Snow: Yes
Wind:
D_{TL}: L/240
D_{LL}: L/360

Loads (psf)

	D	S/L	F_{RDXN}	Trib (ft)
Roof	20	236	---	13.42
Floor			1.00	0
Wall	12	---	---	2
Misc.		---	---	0

Uniform Service Loads (plf)

	w_D	$w_{S/Lr/L}$	$0.6w_W$	w_{TL}
Roof	268	3,167	0	3,436
Floor	0	0	---	0
Wall	24	---	---	24
Misc.	0	---	---	0
Total *w* :	*292*			*3,460*

Point Loads (lbs)

D	
L_r/S	
L	
W	
$X_{L.\ END}$	

	V_{MAX} (lb)	M_{MAX} (ft-lb)
D	183	57
D+L	183	57
D+(L_r/S)	2,162	676
D+0.75[L+(L_r/S)]	1,667	521
D+0.6W	183	57
D+0.75[L+(Lr/S)+0.6W]	1,667	521

	V_{Left} (lb)	V_{Right} (lb)	M (ft-lb)
D	183	183	57
L_r/S	1,979	1,979	619
L	0	0	0
W	0	0	0

Adjustment Factors

∑C: 1.15
C_D: 1.15
C_L: 1.00
C_M: 1.00
C_t: 1.00

Plies + Thickness

SS (No. Plies): 3 Ply
Glulam (Thick): 5 1/8 in
LVL (No. Plies): 3 Ply

Design Options

Beam:	Sawn	Glulam	LVL
Size	**(3)2x4**	**5.125 x 9**	**5.25 x 7.25**
M_{CAP}	74%	4%	6%
V_{CAP}	99%	23%	26%
Δ_{TL}	16%	1%	1%

Notes: (3) 2 x 4 OR 4 x 6 FLAT

Simple Wood Beam

NDS 2018 (ASD Design)

SOLID SAWN PROPERTIES

Species: DFL

F_b = 900 PSI

F_v = 180 PSI

E = 1.6E+6 PSI

BEAM	D	A (IN^2)	S (IN^3)	I (IN^4)	SELF WT (PLF)	C_F	V (LBF)	M (LB-FT)
2x4	3.50	5.3	3.1	5.4	1	1.5	630	345
2x6	5.50	8.3	7.6	20.8	2	1.1	990	619
2x8	7.25	10.9	13.1	47.6	3	1.1	1,305	1,042
2x10	9.25	13.9	21.4	98.9	3	1.0	1,665	1,651
2x12	11.25	16.9	31.6	178.0	4	1.0	2,025	2,390
(2)2x4	3.50	10.5	6.1	10.7	3	1.5	1,260	689
(2)2x6	5.50	16.5	15.1	41.6	4	1.1	1,980	1,237
(2)2x8	7.25	21.8	26.3	95.3	5	1.1	2,610	2,085
(2)2x10	9.25	27.8	42.8	197.9	7	1.0	3,330	3,303
(2)2x12	11.25	33.8	63.3	356.0	8	1.0	4,050	4,780
(3)2x4	3.50	15.8	9.2	16.1	4	1.1	1,890	790
(3)2x6	5.50	24.8	22.7	62.4	6	1.1	2,970	1,856
(3)2x8	7.25	32.6	39.4	142.9	8	1.1	3,915	3,127
(3)2x10	9.25	41.6	64.2	296.8	10	1.0	4,995	4,954
(3)2x12	11.25	50.6	94.9	533.9	12	1.0	6,075	7,170

Simple Wood Beam

NDS 2018 (ASD Design)

GLULAM BEAM PROPERTIES FOR 24F-1.8 STRESS CLASS

BEAM		D(IN)	A (IN^2)	S (IN^3)	I (IN^4)	SELF WT (PLF)	Special Reduction	100% V (LBF)	100% M (LB-FT)
3 1/8'' GLULAM	3.125 x 9	9.0	28.1	42.2	189.8	7	1.00	4,969	8,438
	3.125 x 10.5	10.5	32.8	57.4	301.5	8	1.00	5,797	11,484
	3.125 x 12	12.0	37.5	75.0	450.0	9	1.00	6,625	15,000
	3.125 x 13.5	13.5	42.2	94.9	640.7	10	1.00	7,453	18,984
	3.125 x 15	15.0	46.9	117.2	878.9	11	1.00	8,281	23,438
	3.125 x 16.5	16.5	51.6	141.8	1169.8	13	1.00	9,109	28,359
	3.125 x 18	18.0	56.3	168.8	1518.8	14	1.00	9,938	33,750
	3.125 x 19.5	19.5	60.9	198.0	1931.0	15	1.00	10,766	39,609
	3.125 x 21	21.0	65.6	229.7	2411.7	16	1.00	11,594	45,938
	3.125 x 22.5	22.5	70.3	263.7	2966.3	17	1.00	12,422	52,734
	3.125 x 24	24.0	75.0	300.0	3600.0	18	1.00	13,250	60,000
	3.125 x 25.5	25.5	79.7	338.7	4318.1	19	1.00	14,078	67,734
	3.125 x 27	27.0	84.4	379.7	5125.8	21	1.00	14,906	75,938
	3.125 x 28.5	28.5	89.1	423.0	6028.4	22	1.00	15,734	84,609
	3.125 x 30	30.0	93.8	468.8	7031.3	23	1.00	16,563	93,750
5 1/8'' GLULAM	5.125 x 9	9.0	46.1	69.2	311.3	11	1.00	8,149	13,838
	5.125 x 10.5	10.5	53.8	94.2	494.4	13	1.00	9,507	18,834
	5.125 x 12	12.0	61.5	123.0	738.0	15	1.00	10,865	24,600
	5.125 x 13.5	13.5	69.2	155.7	1050.8	17	1.00	12,223	31,134
	5.125 x 15	15.0	76.9	192.2	1441.4	19	1.00	13,581	38,438
	5.125 x 16.5	16.5	84.6	232.5	1918.5	21	1.00	14,939	46,509
	5.125 x 18	18.0	92.3	276.8	2490.8	22	1.00	16,298	55,350
	5.125 x 19.5	19.5	99.9	324.8	3166.8	24	1.00	17,656	64,959
	5.125 x 21	21.0	107.6	376.7	3955.2	26	1.00	19,014	75,338
	5.125 x 22.5	22.5	115.3	432.4	4864.7	28	1.00	20,372	86,484
	5.125 x 24	24.0	123.0	492.0	5904.0	30	1.00	21,730	98,400
	5.125 x 25.5	25.5	130.7	555.4	7081.6	32	1.00	23,088	111,084
	5.125 x 27	27.0	138.4	622.7	8406.3	34	1.00	24,446	124,538
	5.125 x 28.5	28.5	146.1	693.8	9886.6	36	1.00	25,804	138,759
	5.125 x 30	30.0	153.8	768.8	11531.3	37	1.00	27,163	153,750
6 3/4'' GLULAM	6.75 x 12	12.0	81.0	162.0	972.0	20	1.00	14,310	32,400
	6.75 x 13.5	13.5	91.1	205.0	1384.0	22	1.00	16,099	41,006
	6.75 x 15	15.0	101.3	253.1	1898.4	25	1.00	17,888	50,625
	6.75 x 16.5	16.5	111.4	306.3	2526.8	27	1.00	19,676	61,256
	6.75 x 18	18.0	121.5	364.5	3280.5	30	1.00	21,465	72,900
	6.75 x 19.5	19.5	131.6	427.8	4170.9	32	1.00	23,254	85,556
	6.75 x 21	21.0	141.8	496.1	5209.3	34	1.00	25,043	99,225
	6.75 x 22.5	22.5	151.9	569.5	6407.2	37	1.00	26,831	113,906
	6.75 x 24	24.0	162.0	648.0	7776.0	39	1.00	28,620	129,600
	6.75 x 25.5	25.5	172.1	731.5	9327.0	42	1.00	30,409	146,306
	6.75 x 27	27.0	182.3	820.1	11071.7	44	1.00	32,198	164,025
	6.75 x 28.5	28.5	192.4	913.8	13021.4	47	1.00	33,986	182,756
	6.75 x 30	30.0	202.5	1012.5	15187.5	49	1.00	35,775	202,500
	6.75 x 31.5	31.5	212.6	1116.3	17581.4	52	1.00	37,564	223,256
	6.75 x 33	33.0	222.8	1225.1	20214.6	54	1.00	39,353	245,025
	6.75 x 34.5	34.5	232.9	1339.0	23098.3	57	1.00	41,141	267,806
	6.75 x 36	36.0	243.0	1458.0	26244.0	59	1.00	42,930	291,600
	6.75 x 37.5	37.5	253.1	1582.0	29663.1	62	1.00	44,719	316,406
	6.75 x 39	39.0	263.3	1711.1	33366.9	64	1.00	46,508	342,225
	6.75 x 40.5	40.5	273.4	1845.3	37366.9	66	1.00	48,296	369,056
	6.75 x 42	42.0	283.5	1984.5	41674.5	69	1.00	50,085	396,900

Simple Wood Beam

NDS 2018 (ASD Design)

LAMINATED VENEER LUMBER (LVL) BEAM PROPERTIES

Product: Microlam

F_b = 2,600 PSI

F_v = 285 PSI

E = 1.9E+6 PSI

BEAM	D	A (IN^2)	S (IN^3)	I (IN^4)	SELF WT (PLF)	C_V	100% V (LBF)	100% M (LB-FT)
1.75 x 7.25	7.25	12.7	15.3	55.6	3.3	1.00	2,411	3,322
1.75 x 9.5	9.50	16.6	26.3	125.0	4.3	1.00	3,159	5,703
1.75 x 11.875	11.88	20.8	41.1	244.2	5.3	1.00	3,948	8,911
1.75 x 14	14.00	24.5	57.2	400.2	6.3	0.98	4,655	12,129
1.75 x 16	16.00	28.0	74.7	597.3	7.2	0.96	5,320	15,557
1.75 x 18	18.00	31.5	94.5	850.5	8.1	0.95	5,985	19,377
3.5 x 7.25	7.25	25.4	30.7	111.1	6.5	1.00	4,821	6,643
3.5 x 9.5	9.50	33.3	52.6	250.1	8.5	1.00	6,318	11,407
3.5 x 11.875	11.88	41.6	82.3	488.4	10.7	1.00	7,897	17,823
3.5 x 14	14.00	49.0	114.3	800.3	12.6	0.98	9,310	24,258
3.5 x 16	16.00	56.0	149.3	1194.7	14.4	0.96	10,640	31,114
3.5 x 18	18.00	63.0	189.0	1701.0	16.2	0.95	11,970	38,753
5.25 x 7.25	7.25	38.1	46.0	166.7	9.8	1.00	7,232	9,965
5.25 x 9.5	9.50	49.9	79.0	375.1	12.8	1.00	9,476	17,110
5.25 x 11.875	11.88	62.3	123.4	732.6	16.0	1.00	11,845	26,734
5.25 x 14	14.00	73.5	171.5	1200.5	18.9	0.98	13,965	36,387
5.25 x 16	16.00	84.0	224.0	1792.0	21.6	0.96	15,960	46,671
5.25 x 18	18.00	94.5	283.5	2551.5	24.3	0.95	17,955	58,130
7.5 x 7.25	7.25	54.4	65.7	238.2	14.0	1.00	10,331	14,236
7.5 x 9.5	9.50	71.3	112.8	535.9	18.3	1.00	13,538	24,443
7.5 x 11.875	11.88	89.1	176.3	1046.6	22.9	1.00	16,922	38,192
7.5 x 14	14.00	105.0	245.0	1715.0	27.0	0.98	19,950	51,982
7.5 x 16	16.00	120.0	320.0	2560.0	30.8	0.96	22,800	66,673
7.5 x 18	18.00	135.0	405.0	3645.0	34.7	0.95	25,650	83,042

3 LATERAL

Wood Shear Wall Schedule

SDPWS 2015 (ASD Design)

General Design Criteria

1) Seismic Design Catergory: D S_{DS}: 0.58 Ω_o: 2.5
2) Stud Framing: DF No. 2 SG: 0.5
3) Stud Spacing: 16''
4) Panel Grade: Sheathing Layout Direction: (●) Horizontal ( ) Vertical
5) Fasteners shall be common nails (staples are not permitted where not approved).
6) All panel edges shall be backed with 2-inch nominal framing unless 3-inch nominal framing is required by the footnotes. When panels edges do not receive backing shear capacity is adjusted by C_{ub} per NDS 4.3.3.
7) Bottom plates shall be 2-inch nominal members unless 3-inch nominal framing is required by the footnotes.
8) A 1/4" x 3" x 3" plate washer with a standard cut washer is required between the anchor bolt nut and sill plate.

General Shear Wall Schedule

				Panel Nailing		Bottom Plate Anchoring (c)		Capacity (plf)	
Panel Thickness	+ Configuration	Footnote	Nail	Edge	Field	Anchor Bolt	Nailing	Wind	Seismic
3/8	Single Sided		8d	6''	12''	0.625Φ@48''	16d@10''	364	260
7/16	Single Sided		8d	6''	12''	0.625Φ@48''	16d@10''	364	260
15/32	Single Sided		10d	6''	12''	0.625Φ@48''	16d@8''	434	310
19/32	Single Sided		10d	6''	12''	0.625Φ@48''	16d@7''	476	340
3/8	Single Sided	(a) (b)	8d	4''	12''	0.625Φ@48''	16d@7''	532	380
7/16	Single Sided	(a) (b)	8d	4''	12''	0.625Φ@48''	16d@7''	532	380
15/32	Single Sided	(a) (b)	10d	4''	12''	0.625Φ@48''	16d@5''	644	460
3/8	Single Sided	(a) (b)	8d	3''	12''	0.625Φ@46''	16d@5''	686	490
7/16	Single Sided	(a) (b)	8d	3''	12''	0.625Φ@46''	16d@5''	686	490
19/32	Single Sided	(a) (b)	10d	4''	12''	0.625Φ@44''	16d@5''	714	510
3/8	Double Sided	(a) (b)	8d	6''	12''	0.625Φ@43''	16d@5''	728	520
7/16	Double Sided	(a) (b)	8d	6''	12''	0.625Φ@43''	16d@5''	728	520
15/32	Single Sided	(a) (b)	10d	3''	12''	0.625Φ@37''	16d@4''	840	600
15/32	Double Sided	(a) (b)	10d	6''	12''	0.625Φ@36''	16d@4''	868	620
3/8	Single Sided	(a) (b)	8d	2''	12''	0.625Φ@35''	16d@4''	896	640
7/16	Single Sided	(a) (b)	8d	2''	12''	0.625Φ@35''	16d@4''	896	640
19/32	Single Sided	(a) (b)	10d	3''	12''	0.625Φ@34''	16d@4''	931	665
19/32	Double Sided	(a) (b)	10d	6''	12''	0.625Φ@33''	16d@3''	952	680
3/8	Double Sided	(a) (b)	8d	4''	12''	0.625Φ@29''	16d@3''	1064	760
7/16	Double Sided	(a) (b)	8d	4''	12''	0.625Φ@29''	16d@3''	1064	760
15/32	Single Sided	(a) (b)	10d	2''	12''	0.625Φ@29''	16d@3''	1078	770
19/32	Single Sided	(a) (b)	10d	2''	12''	0.75Φ@33''	#14 Screw@3''	1218	870
15/32	Double Sided	(a) (b)	10d	4''	12''	0.75Φ@32''	#14 Screw@3''	1288	920
3/8	Double Sided	(a) (b)	8d	3''	12''	0.75Φ@30''	#14 Screw@3''	1372	980
7/16	Double Sided	(a) (b)	8d	3''	12''	0.75Φ@30''	#14 Screw@3''	1372	980
19/32	Double Sided	(a) (b)	10d	4''	12''	0.75Φ@28''	#14 Screw@3''	1428	1020
15/32	Double Sided	(a) (b)	10d	3''	12''	0.75Φ@24''	#14 Screw@2''	1680	1200
3/8	Double Sided	(a) (b)	8d	2''	12''	0.75Φ@23''	#14 Screw@2''	1792	1280
7/16	Double Sided	(a) (b)	8d	2''	12''	0.75Φ@23''	#14 Screw@2''	1792	1280
19/32	Double Sided	(a) (b)	10d	3''	12''	0.75Φ@22''	#14 Screw@2''	1862	1330
15/32	Double Sided	(a) (b)	10d	2''	12''	0.75Φ@19''	#14 Screw@2''	2156	1540
19/32	Double Sided	(a) (b)	10d	2''	12''	0.75Φ@16''	-	2436	1740

Footnotes

a. Framing at adjoining panel edges shall be 3-inches nominal or wider and nails shall be staggered. Two 2-inch nominal members are permitted when fastened together in accordance with NDS.

b. Bottom plate members shall be 3 inches nominal or wider.

c. Anchor bolt spacing is based on seismic shear. Where wind shear is used, decrease bolt spacing by 30%.

Wood Shear Wall

SDPWS 2015 (ASD Design)

Description: Long Side - Tall Wall

Shear Wall Criteria

Wind, 0.6W (lbs):	942	Panel Thick (in):	19/32	Roof D (psf):	20
Seismic, 0.7E (lbs):	3290	Panel Grade:	Sheathing	Roof S (psf):	236
ρ:	1.0	Edge Nail Spacing:	6'' o.c.	Floor D (psf):	
☐ Structural Irregularity		Configuration:	Single Sided	Wall D (psf):	17
		Panel Edge:	Blocked		
		Cub:	1.00	Wind Uplift (psf):	0
Lumber Grade:	DF No. 2				
Stud Spacing:	16'' o.c.				

Shear Walls 15.5 ft Total

Segment No.	1	2				
Length (ft)	8.3	7.3				
Height (ft)	11.9	11.9				
Roof Trib (ft)	13.4	13.4				
Floor Trib (ft)						
Boundary Member	(2) 2 x 6	(2) 2 x 6				
+ W Uplift (lbs)						
+ W Down (lbs)						
+ S Uplift (lbs)						
+ S Down (lbs)						

Shear Wall Design

Wind Unit Shear: 61 plf

Seismic Unit Shear: 212 plf

Segment No.	1	2				
Aspect Ratio	1.4:1	1.6:1				
Shear Reduction	1.0	1.0				
W Uplift (lbs)	0	0				
W Down (lbs)	1217	1217				
S Uplift (lbs)	**1,523**	**1,645**				
S Down (lbs)	**3131**	**3131**				
Buckling	O.K.	O.K.				
Tension	O.K.	O.K.				
	Hold Downs					
Strap	CS16	CS16				
Anchor	HDU2	HDU2				
Min Stud Thick	3	3				

Shear Wall Selection: 19/32 Sheathing Panel w/ 10d at 6'' o.c. Edges + 12"o.c. Field :: Single Sided-Blocked

Seismic Capacity: 340 plf **O.K.**

Wind Capacity: 476 plf **O.K.**

Structural Irregularity: None

Wood Shear Wall

SDPWS 2015 (ASD Design)

Description: Long Side - Short Wall

Shear Wall Criteria

Wind, 0.6W (lbs):	942	Panel Thick (in):	19/32	Roof D (psf):	20
Seismic, 0.7E (lbs):	3290	Panel Grade:	Sheathing	Roof S (psf):	236
ρ:	1.0	Edge Nail Spacing:	6'' o.c.	Floor D (psf):	
☐ Structural Irregularity		Configuration:	Single Sided	Wall D (psf):	17
		Panel Edge:	Blocked		
		Cub:	1.00	Wind Uplift (psf):	0
Lumber Grade:	DF No. 2				
Stud Spacing:	16'' o.c.				

Shear Walls 19.8 ft Total

Segment No.	1					
Length (ft)	19.8					
Height (ft)	8.1					
Roof Trib (ft)	13.4					
Floor Trib (ft)						
Boundary Member	(2) 2 x 6					
+ W Uplift (lbs)						
+ W Down (lbs)						
+ S Uplift (lbs)						
+ S Down (lbs)						

Shear Wall Design

Wind Unit Shear: 48 plf

Seismic Unit Shear: 166 plf

Segment No.	1					
Aspect Ratio	0.4:1					
Shear Reduction	1.0					
W Uplift (lbs)	0					
W Down (lbs)	833					
S Uplift (lbs)	**0**					
S Down (lbs)	**1894**					
Buckling	O.K.					
Tension	O.K.					
	Hold Downs					
Strap						
Anchor						
Min Stud Thick						

Shear Wall Selection: 19/32 Sheathing Panel w/ 10d at 6'' o.c. Edges + 12"o.c. Field :: Single Sided-Blocked

Seismic Capacity: 340 plf **O.K.**

Wind Capacity: 476 plf **O.K.**

Structural Irregularity: None

Wood Shear Wall

SDPWS 2015 (ASD Design)

Description: Short Side - West Wall

Shear Wall Criteria

Wind, 0.6W (lbs):	1605	Panel Thick (in):	19/32	Roof D (psf):	20
Seismic, 0.7E (lbs):	3290	Panel Grade:	Sheathing	Roof S (psf):	236
ρ:	1.0	Edge Nail Spacing:	6'' o.c.	Floor D (psf):	
☐ Structural Irregularity		Configuration:	Single Sided	Wall D (psf):	17
		Panel Edge:	Blocked		
		Cub:	1.00	Wind Uplift (psf):	0
Lumber Grade:	DF No. 2				
Stud Spacing:	16'' o.c.				

Shear Walls 22.7 ft Total

Segment No.	1					
Length (ft)	22.7					
Height (ft)	8.1					
Roof Trib (ft)	13.4					
Floor Trib (ft)						
Boundary Member	(2) 2 x 6					
+ W Uplift (lbs)						
+ W Down (lbs)						
+ S Uplift (lbs)						
+ S Down (lbs)						

Shear Wall Design

Wind Unit Shear: 71 plf

Seismic Unit Shear: 145 plf

Segment No.	1					
Aspect Ratio	0.4:1					
Shear Reduction	1.0					
W Uplift (lbs)	0					
W Down (lbs)	1021					
S Uplift (lbs)	**0**					
S Down (lbs)	**1726**					
Buckling	O.K.					
Tension	O.K.					
	Hold Downs					
Strap						
Anchor						
Min Stud Thick						

Shear Wall Selection: 19/32 Sheathing Panel w/ 10d at 6'' o.c. Edges + 12"o.c. Field :: Single Sided-Blocked

Seismic Capacity: 340 plf **O.K.**

Wind Capacity: 476 plf **O.K.**

Structural Irregularity: None

Wood Shear Wall

SDPWS 2015 (ASD Design)

Description: Short Side - East Wall

Shear Wall Criteria

Wind, 0.6W (lbs):	1605	Panel Thick (in):	19/32	Roof D (psf):	20
Seismic, 0.7E (lbs):	3290	Panel Grade:	Sheathing	Roof S (psf):	236
ρ:	1.0	Edge Nail Spacing:	6'' o.c.	Floor D (psf):	
☐ Structural Irregularity		Configuration:	Single Sided	Wall D (psf):	17
		Panel Edge:	Blocked		
		Cub:	1.00	Wind Uplift (psf):	0
Lumber Grade:	DF No. 2				
Stud Spacing:	16'' o.c.				

Shear Walls 15.8 ft Total

Segment No.	1					
Length (ft)	15.8					
Height (ft)	8.1					
Roof Trib (ft)	13.4					
Floor Trib (ft)						
Boundary Member	(2) 2 x 6					
+ W Uplift (lbs)						
+ W Down (lbs)						
+ S Uplift (lbs)						
+ S Down (lbs)						

Shear Wall Design

Wind Unit Shear: 102 plf

Seismic Unit Shear: 209 plf

Segment No.	1					
Aspect Ratio	0.5:1					
Shear Reduction	1.0					
W Uplift (lbs)	0					
W Down (lbs)	1272					
S Uplift (lbs)	**33**					
S Down (lbs)	**2241**					
Buckling	O.K.					
Tension	O.K.					
	Hold Downs					
Strap	CS20					
Anchor	HDU2					
Min Stud Thick	3					

Shear Wall Selection: 19/32 Sheathing Panel w/ 10d at 6'' o.c. Edges + 12"o.c. Field :: Single Sided-Blocked

Seismic Capacity: 340 plf **O.K.**

Wind Capacity: 476 plf **O.K.**

Structural Irregularity: None

4 FOUNDATIONS

Cantilevered Retaining Wall

Lic. # : KW-06008993 **Licensee : MATIX**

Description : Typical Footing

Criteria

Retained Height	=	5.83 ft
Wall height above soil	=	1.00 ft
Slope Behind Wall	=	0.00 : 1
Height of Soil over Toe	=	42.00 in
Water height over heel	=	0.0 ft

Vertical component of active Lateral soil pressure options:
NOT USED for Soil Pressure.
NOT USED for Sliding Resistance.
NOT USED for Overturning Resistance.

Soil Data

Allow Soil Bearing	=	4,200.0 psf
Equivalent Fluid Pressure Method		
Heel Active Pressure	=	60.0 psf/ft
Toe Active Pressure	=	60.0 psf/ft
Passive Pressure	=	300.0 psf/ft
Soil Density, Heel	=	110.00 pcf
Soil Density, Toe	=	110.00 pcf
Friction Coeff btwn Ftg & Soil	=	0.400
Soil height to ignore for passive pressure	=	12.00 in

Calculations per ACI 318-14, ACI 530-11, IBC 2015, CBC 2016, ASCE 7-10

Surcharge Loads

Surcharge Over Heel = 0.0 psf
NOT Used To Resist Sliding & Overturning
Surcharge Over Toe = 220.0 psf
NOT Used for Sliding & Overturning

Lateral Load Applied to Stem

Lateral Load	=	0.0 plf
...Height to Top	=	0.00 ft
...Height to Bottom	=	0.00 ft
Wind on Exposed Stem	=	0.0 psf

Adjacent Footing Load

Adjacent Footing Load	=	0.0 lbs
Footing Width	=	0.00 ft
Eccentricity	=	0.00 in
Wall to Ftg CL Dist	=	0.00 ft
Footing Type		Line Load
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Axial Load Applied to Stem

Axial Dead Load	=	0.0 lbs
Axial Live Load	=	3.2 lbs
Axial Load Eccentricity	=	0.0 in

Design Summary

Wall Stability Ratios
Overturning = 6.95 OK
Sliding = 16.54 OK

Total Bearing Load	=	3,205 lbs
...resultant ecc.	=	1.87 in
Soil Pressure @ Toe	=	920 psf OK
Soil Pressure @ Heel	=	588 psf OK
Allowable	=	4,200 psf

Soil Pressure Less Than Allowable

ACI Factored @ Toe	=	1,104 psf
ACI Factored @ Heel	=	706 psf
Footing Shear @ Toe	=	0.9 psi OK
Footing Shear @ Heel	=	2.5 psi OK
Allowable	=	100.6 psi

Sliding Calcs (Vertical Component NOT Used)

Lateral Sliding Force	=	252.0 lbs
less 100% Passive Force	= -	2,887.5 lbs
less 100% Friction Force	= -	1,280.8 lbs
Added Force Req'd	=	0.0 lbs OK
....for 1.5 : 1 Stability	=	0.0 lbs OK

Load Factors

Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.600
Seismic, E	1.000

Stem Construction

		Top Stem	2nd	3rd
		Stem OK	Stem OK	Stem OK
Design Height Above Ftg	ft =	6.83	5.83	0.00
Wall Material Above "Ht"	=	Concrete	Concrete	Concrete
Thickness	in =	7.50	9.00	9.00
Rebar Size	=	# 4	# 4	# 4
Rebar Spacing	in =	12.00	12.00	12.00
Rebar Placed at	=	Center	Center	Center
Design Data				
fb/FB + fa/Fa	=	0.000	0.000	0.333
Total Force @ Section	lbs =	0.0	0.0	371.5
Moment....Actual	ft-l =	0.0	0.0	1,308.5
Moment.....Allowable	ft-l =	3,257.0	3,932.0	3,932.0
Shear.....Actual	psi =	0.0	0.0	6.9
Shear.....Allowable	psi =	100.6	100.6	100.6
Wall Weight	psf =	93.8	112.5	112.5
Rebar Depth 'd'	in =	3.75	4.50	4.50
Lap splice if above	in =	13.95	13.95	13.95
Lap splice if below	in =	13.95	13.95	3.76
Hook embed into footing	in =	13.95	13.95	3.76
Concrete Data				
f'c	psi =	4,500.0	4,500.0	4,500.0
Fy	psi =	60,000.0	60,000.0	60,000.0

Cantilevered Retaining Wall

Lic. # : KW-06008993 **Licensee : MATIX**

Description : Typical Footing

Footing Dimensions & Strengths

Toe Width	=	1.75 ft
Heel Width	=	2.50
Total Footing Width	=	4.25
Footing Thickness	=	12.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft

f'c = 4,500 psi Fy = 60,000 psi
Footing Concrete Density = 150.00 pcf
Min. As % = 0.0018
Cover @ Top 2.00 @ Btm.= 3.00 in

Footing Design Results

		Toe	Heel	
Factored Pressure	=	1,104	706	psf
Mu' : Upward	=	1,607	1,165	ft-lb
Mu' : Downward	=	1,522	1,454	ft-lb
Mu: Design	=	85	289	ft-lb
Actual 1-Way Shear	=	0.94	2.48	psi
Allow 1-Way Shear	=	100.62	100.62	psi

Toe Reinforcing = # 4 @ 12.00 in
Heel Reinforcing = # 4 @ 12.00 in
Key Reinforcing = None Spec'd

Other Acceptable Sizes & Spacings

Toe: Not req'd, Mu < S * Fr
Heel: Not req'd, Mu < S * Fr
Key: No key defined

Summary of Overturning & Resisting Forces & Moments

		.....OVERTURNING..... Force lbs	Distance ft	Moment ft-lb			.....RESISTING..... Force lbs	Distance ft	Moment ft-lb
Heel Active Pressure	=	1,399.5	2.28	3,186.1	Soil Over Heel	=	1,122.3	3.38	3,787.7
Surcharge over Heel	=				Sloped Soil Over Heel	=			
Toe Active Pressure	=	-607.5	1.50	-911.3	Surcharge Over Heel	=			
Surcharge Over Toe	=	-540.0	2.25	-1,215.0	Adjacent Footing Load	=			
Adjacent Footing Load	=				Axial Dead Load on Stem	=		2.13	
Added Lateral Load	=				* Axial Live Load on Stem	=	3.2	2.13	6.8
Load @ Stem Above Soil	=				Soil Over Toe	=	673.8	0.88	589.5
					Surcharge Over Toe	=			
					Stem Weight(s)	=	768.4	2.13	1,632.8
					Earth @ Stem Transitions	=			
Total	=	252.0	O.T.M. =	1,059.9	Footing Weight	=	637.5	2.13	1,354.7
					Key Weight	=			
					Vert. Component	=			
					Total	=	3,201.9 lbs	R.M. =	7,364.7

Resisting/Overturning Ratio = 6.95
Vertical Loads used for Soil Pressure = 3,205.1 lbs

* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.