STRUCTURAL ENGINEERS

STRUCTURAL CALCULATIONS

MJSE Project# 25020

UCA Millcreek Head Start Renovation

336 E 3900 S
Salt Lake City, Utah 84107

PREPARED FOR:

MSR Design
Jeff Davis

April 2, 2025

BASIS FOR DESIGN

1. Governing Building Code — International Building Code 2021
2. Risk Category — II
3. Floor Live Loads
   - Uniformly Distributed Loads
     - Offices + Partitions — 50 psf + 20 psf
     - Lobbies & Main Floor Corridors — 100 psf
     - Corridor Above Main Floor — 80 psf
     - Mechanical Rooms — 150 psf
   - Concentrated Loads, all areas — 2000 lbs

STRUCTURAL ENGINEERS

ASD Design

MJ STRUCTURAL ENGINEERS

Design of Wood Beams Based on the NDS
Design of Steel Beams Based on AISC 360

Sht Number:	
Job Number:	25020
Date:	4/2/2025
By:	BH

Blue Cells Must be Entered Manually

WOOD BEAMS	WOOD	WOOD	WOOD	WOOD	WOOD	STEEL BEAMS
Species	(1) 1¾" x 11⅞" LVL					Section Type
Designation	LVL 1.9E Fb:2600					Designation
Description	Beam 1 Sistered Joist	Beam 2	Beam 3	Beam 4	Beam 5	**Description**
L_{Left_Span} (ft)						L_{Left_Span} (ft)
L_{Center_Span} (ft)	**15.50**					**L_{Center_Span} (ft)**
L_{Right_Cant} (ft)						L_{Right_Cant} (ft)
L_u (ft) | *Auto (ft)*	**1.0**					**L_b (ft)** | *Auto*
Beam Slope | α	0.0°					**Beam Slope** | α
Include Self Wt.	**No**					**Include Self Wt.**
γ_{wood} (lb/ft³) | **w_{Self} (lb/ft)**	1					γ_{Steel} (lb/ft³) | **w_{Self} (lb/ft)**
PSF_{DL} | PSF_{LL} (lb/ft²)						**PSF_{DL} | PSF_{LL} (lb/ft²)**
Trib Width (ft) | Auto	2					**Trib Width (ft)** | *Auto*
Factored PLF_{DL} | PLF_{LL}						**Factored PSF_{DL} | PSF_{LL}**
PSF_{DL} | PSF_{LL} (lb/ft²)	**20.0** **50.0**					**PSF_{DL} | PSF_{LL} (lb/ft²)**
Trib Width (ft) | *Auto*	**1.33**					**Trib Width (ft)** | *Auto*
Start|End Dist frm Left	3 **0.0** **12.0**					**Start|End Dist frm Left**
Factored PLF_{DL} | PLF_{LL}	**26.6** **66.5**					**Factored PSF_{DL} | PSF_{LL}**
PSF_{DL} | PSF_{LL} (lb/ft²)						**PSF_{DL} | PSF_{LL} (lb/ft²)**
Trib Width (ft) | *Auto*						**Trib Width (ft)** | *Auto*
Start|End Dist frm Left	4					**Start Dist frm Left**
Factored PLF_{DL} | PLF_{LL}						**Factored PSF_{DL} | PSF_{LL}**
Incr PSF_{DL}|PSF_{LL} (lb/ft²)						**Incr PSF_{DL}|PSF_{LL} (lb/ft²)**
Trib Width (ft) | *Auto*						**Trib Width (ft)** | *Auto*
Max at L or R | *Auto*	5					**Max at L or R** | *Auto*
Start|End Dist frm Left						**Start|End Dist frm Left**
Factored $Incr_{DL}$ | $Incr_{LL}$						**Factored $Incr_{DL}$ | $Incr_{LL}$**
Incr PSF_{DL}|PSF_{LL} (lb/ft²)						**Incr PSF_{DL}|PSF_{LL} (lb/ft²)**
Trib Width (ft) | *Auto*						**Trib Width (ft)** | *Auto*
Max at L or R | *Auto*	6					**Max at L or R** | *Auto*
Start|End Dist frm Left						**Start|End Dist frm Left**
Factored $Incr_{DL}$ | $Incr_{LL}$						**Factored $Incr_{DL}$ | $Incr_{LL}$**
Pt 1 Dead | Live (lbs)						**Pt 1 Dead | Live (lbs)**
Dist from Left | *Auto*	7					**Dist from Left** | *Auto*
Factored PT_{DL} | PT_{LL}						**Factored PT_{DL} | PT_{LL}**
Pt 2 Dead | Live (lbs)						**Pt 2 Dead | Live (lbs)**
Dist from Left | *Auto*	8					**Dist from Left** | *Auto*
Factored PT_{DL} | PT_{LL}						**Factored PT_{DL} | PT_{LL}**
Pt 3 Dead | Live (lbs)						**Pt 3 Dead | Live (lbs)**
Dist from Left | *Auto*	9					**Dist from Left** | *Auto*
Factored PT_{DL} | PT_{LL}						**Factored PT_{DL} | PT_{LL}**
C_D | C_r	**1.00** **1.15**					**C_b** | D.N.A.
C_t | C_i	**1.00** **1.00**					D.N.A.
Wet Use (Y/N)?						D.N.A.
F'_v (psi) | f_v (psi)	285.00 49.42					A_w (in²) | Ω_v
V_{ALL} | $1.5V_{max}$ (kip)	5.92 1.03					V_n/Ω | V_{max} (kip)
Shear Chk	**17.3%**					**Shear Check**
F'_{b_TT} | F'_{b_CT} (psi)	2947 2947.04					F_y (ksi) | Ω_b
S (in³) | I_x (in⁴)	41.13 244.2					Z_x (in³) | I_x (in⁴)
M_{ALL} (k*ft) + | -	10.10 10.10					M_n/Ω (k*ft) + | -
M_{max} (k*ft) + | -	2.52 0.00					M_{max} (k*ft) + | -
Bending Chk	**24.9%** **0.0%**					**Bending Check**
Max LL | TL Δ Ratio	**L/ 480** **L/ 240**					**Max LL | TL Δ Ratio**
Allowable LL | TL Δ						**Allowable LL | TL Δ**
Δ_{Live_Left} | Δ_{Tot_Left} (in)						Δ_{Live_Left} | Δ_{Tot_Left} (in)
Δ_{Live_Cntr} | Δ_{Tot_Cntr} (in)	0.16 0.23					Δ_{Live_Cntr} | Δ_{Tot_Cntr} (in)
Δ_{Live_Cant} | Δ_{Tot_Cant} (in)						Δ_{Live_Cant} | Δ_{Tot_Cant} (in)
Actual LL | TL Δ Ratio	**L/ 1133** **L/ 809**					**Actual LL | TL Δ Ratio**
R_L (lbs) $R_{L\,DL}$ / $R_{L\,LL}$	**685** 196 / 489					**R_L (lbs)** $R_{L\,DL}$ / $R_{L\,LL}$
R_C (lbs) $R_{C\,DL}$ / $R_{C\,LL}$						**R_C (lbs)** $R_{C\,DL}$ / $R_{C\,LL}$
R_R (lbs) $R_{R\,DL}$ / $R_{R\,LL}$	**432** 124 / 309					**R_R (lbs)** $R_{R\,DL}$ / $R_{R\,LL}$
$F'_{C\text{-}Perp}$ (psi) | Brg Chk	750 **DNA**					D.N.A.
Req'd Brg L | Brg Cap	**3/4 "** **DNA**					**D.N.A.**
Req'd Brg C | Brg Cap						**D.N.A.**
Req'd Brg R | Brg Cap	**1/2 "** **DNA**					**D.N.A.**
Reactions are Service Level	**Adequate**					*Reactions are Service Level*
# Plys | Span/Depth	1 15.66					Shape | Span/Depth
Nailing Requirements (If More Than 1 PLY) Or Bearing Requirements (I-Joist Only)	None Required					D.N.A.
Query	DESIGN	DESIGN	DESIGN	DESIGN	DESIGN	
Location | Type						**Location | Type**
Query Result						**Query Result**
Load/Unload Live	LEFT SPAN LOADED	LEFT SPAN LOADED	LEFT SPAN LOADED	LEFT SPAN LOADED	LEFT SPAN LOADED	*Load/Unload Live*
Loads from Spans ---->	CENTER SPAN LOADED	CENTER SPAN LOADED	CENTER SPAN LOADED	CENTER SPAN LOADED	CENTER SPAN LOADED	*<---- Loads from Spans*
	CANTILEVER LOADED	CANTILEVER LOADED	CANTILEVER LOADED	CANTILEVER LOADED	CANTILEVER LOADED	

ASD Design

MJ STRUCTURAL ENGINEERS

Design of Wood Beams Based on the NDS
Design of Steel Beams Based on AISC 360

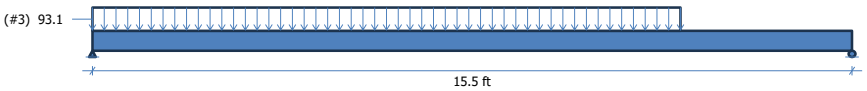
Sht Number:	
Job Number:	25020
Date:	4/2/2025
By:	BH

Blue Cells Must be Entered Manually
LOAD DIAGRAMS MUST BE RE-DRAWN AFTER ANY UPDATES

Load Descriptions

(Right-Click on "Factored Load" Cell to Auto Enter Description)

#
1.
2.
3.
4.
5.
6.
7.
8.
9.



Beam 1 Loading -- Sistered Joist

#
1.
2.
3.
4.
5.
6.
7.
8.
9.

Beam 2 Loading --

#
1.
2.
3.
4.
5.
6.
7.
8.
9.

Beam 3 Loading --

#
1.
2.
3.
4.
5.
6.
7.
8.
9.

Beam 4 Loading --

#
1.
2.
3.
4.
5.
6.
7.
8.
9.

Beam 5 Loading --

STRUCTURAL ENGINEERS

ASD Design

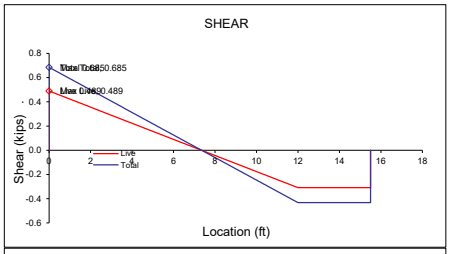
MJ STRUCTURAL ENGINEERS

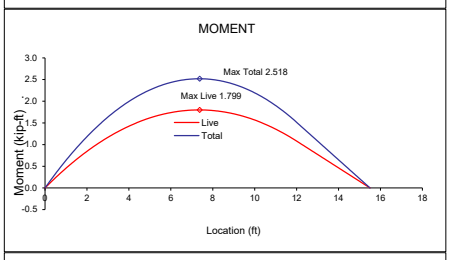
Design of Wood Beams Based on the NDS
Design of Steel Beams Based on AISC 360

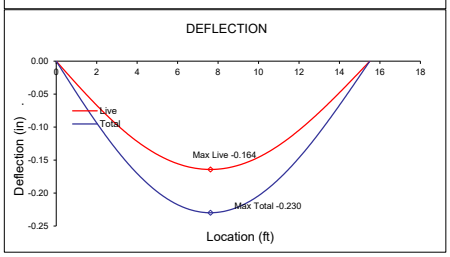
Sht Number:	
Job Number:	25020
Date:	4/2/2025
By:	BH

Blue Cells Must be Entered Manually
CHARTS MUST BE RE-DRAWN AFTER ANY UPDATES

Beam 1

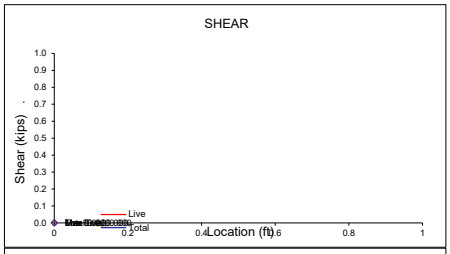


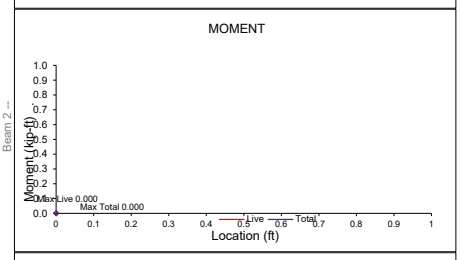


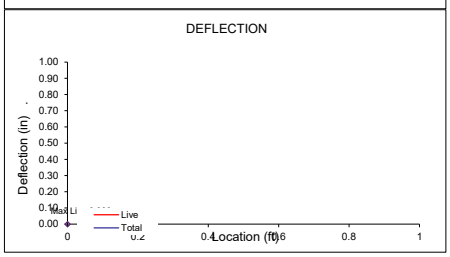


Beam 1 – Sistered Joist

Beam 2

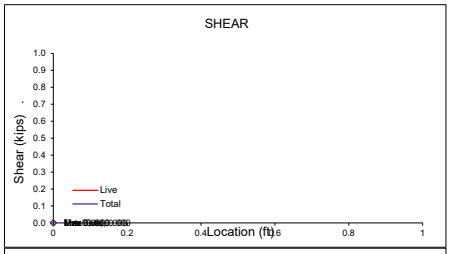


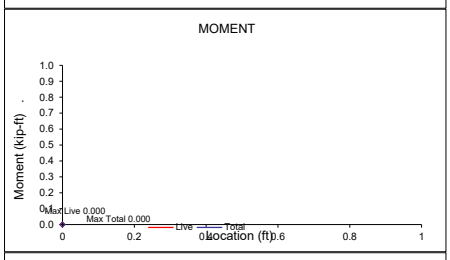


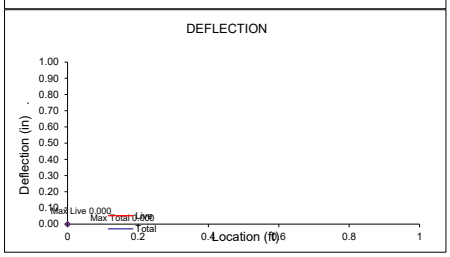


Beam 2 –

Beam 3

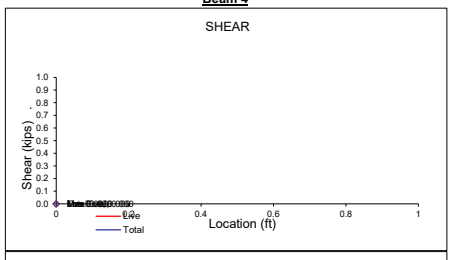


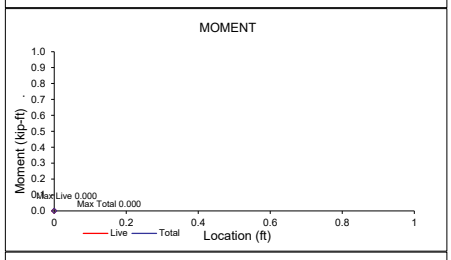


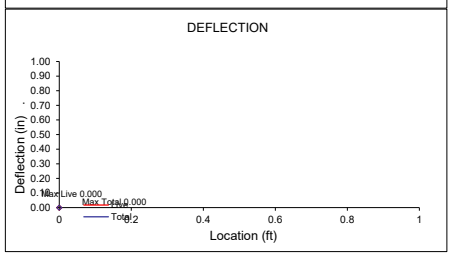


Beam 3 –

Beam 4

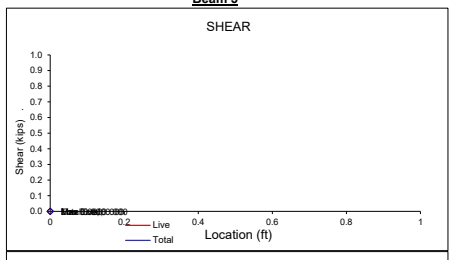


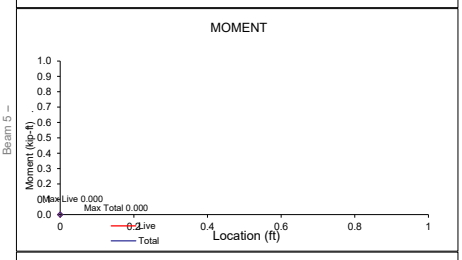


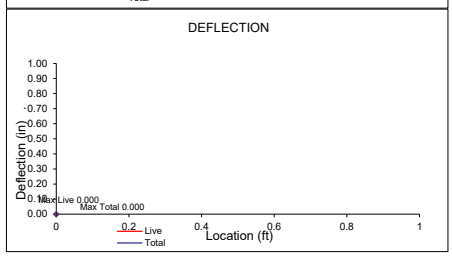


Beam 4 –

Beam 5







Beam 5 –

FLOOR SLAB THICKNESS FOR UNIFORM LINE LOADS
WITH WALL LOCATED AT INTERIOR OF SLAB - AWAY FROM JOINTS

Project UCA Headstart
Description: Wall on Existing Slab

Date: 04/02/25
Engineer: BAH

Method of Design is from "Designing for Floor Slabs on Grade", Page 55 (See Table 12)

Input:

Trial Slab Thickness - t (or h):	4.00 inches
Concrete Strength - f'c:	3,500 psi
Subgrade Modulus - k:	50 pci
Load Factor - LF (or Safety Factor - SF):	2.5

Output:

Allowable Capacity of the Slab:	**787 plf**
Ultimate Capacity of the Slab:	1,968 plf

Note: It is recommended that the slab be thickened to at least 1.25t for a distance equal to 1.5 * the width of the wall using a transition slope of 1 vertical to (3 to 6).

Pallow = 4 * f * SM * L

$f = 9*(f'c)^{1/2}$ / LF (SF): Allowable Bending Stress
$SM = 12*t^2/6$: Section modulus per foot
$L = (12k/(4EI))^{1/4}$
$E = 57000*f'c^{\wedge 1/2}$
$I = 12*t^3/12$

f =	213 psi
SM =	32 in3
E =	3,372,165 psi
I =	64 in4
L =	0.028873578