# COLLEGE OF ENGINEERING

# STRUCTURAL SYSTEM

Gravity Force Resisting System

- Beams, girders, and columns
- Steel vs. Mass timber
- Long spans in the courtroom

8'-0"				
*	16F-1.3E 3-1/8" X 22-1/2"	16F-1.3E 3-1/8" X 22-1/2"	16F-1.3E 3-1/8" X 22-1/2"	16F-1.3E 3-1/8" X 22-1/2"
8'-0"	16F-1.3E 3-1/8" X 22-1/2"	16F-1.3E 3-1/8" X 22-1/2"	16F-1.3E 3-1/8" X 22-1/2"	16F-1.3E 3-1/8" X 22-1/2"
8'-0"	₩ ₩ ₩ 16F-1.3E 3-1/8" X 22-1/2"	" ₩ ₩ 16F-1.3E 3-1/8" X 22-1/2"	₩ 4 × 16F-1.3E 3-1/8" X 22-1/2"	₩ 4 × 16F-1.3E 3-1/8" X 22-1/2"
8'-0"	" " " " " " " " " " " " " " " " " " "	"7/1-21 <u></u>	#7/1-21 IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	* 16F-1.3E 3-1/8" X 22-1/2" * * * * * * * * * *
	16F-1.3E 3-1/8" X 22-1/2"	16F-1.3E 3-1/8" X 22-1/2"	₩ 16F-1.3E 3-1/8" X 22-1/2"	16F-1.3E 3-1/8" X 22-1/2"
	16F-1.3E 3-1/8" X 22-1/2"	16F-1.3E 3-1/8" X 22-1/2"	16F-1.3E 3-1/8" X 22-1/2"	
8'-0"	<b>1</b> 6F-1.3E 3-1/8" X 22-1/2"	16F-1.3E 3-1/8" X 22-1/2"		16F-1.3E 3-1/8" X 22-1/2"
P.	19'-0"	19'-0"	19'-0"	18'-0"

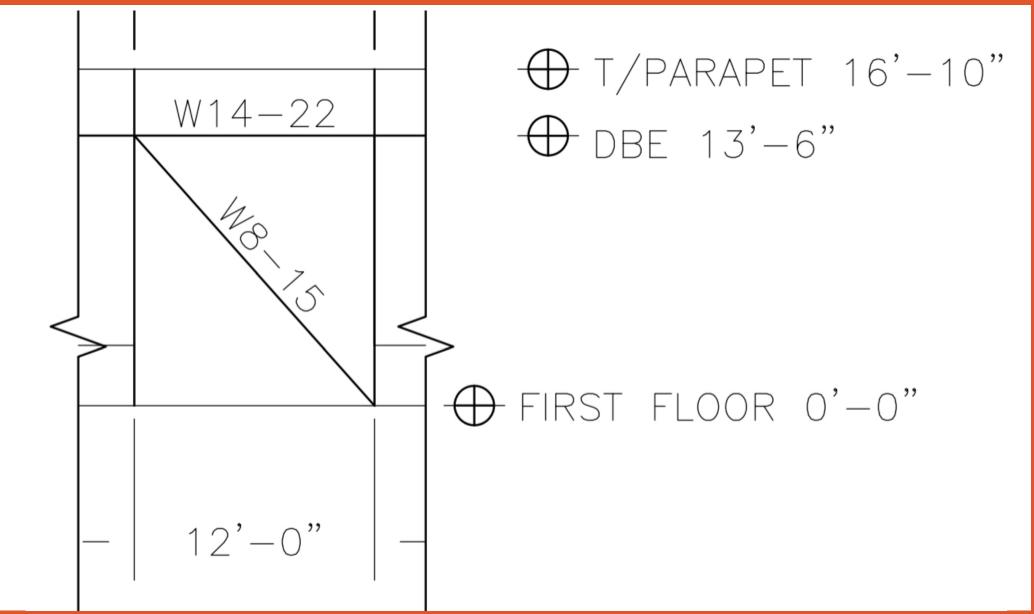
Glulam beam and column plan for the courtroom.

Material Type	Embodied Carbon (CO <sub>2</sub> e/kg)	GWP
Steel	344,142	17
Mass Timber	101,861	5

Embodied carbon and global warming potential for both courtroom gravity force resisting systems.

### Lateral Force Resisting System

#### Steel braced frames vs. Metal stud shear walls



Courtroom braced frame.



# **Civil and Construction Engineering**

# ST. HELENS PUBLIC SAFETY BUILDING

# Sustainability – Cost Efficiency - Safety

# **PROJECT DESCRIPTION**

The Public Safety Building (PSB) in St. Helens, Oregon is being designed as a new build police station with an assembly area.

Design Requirements

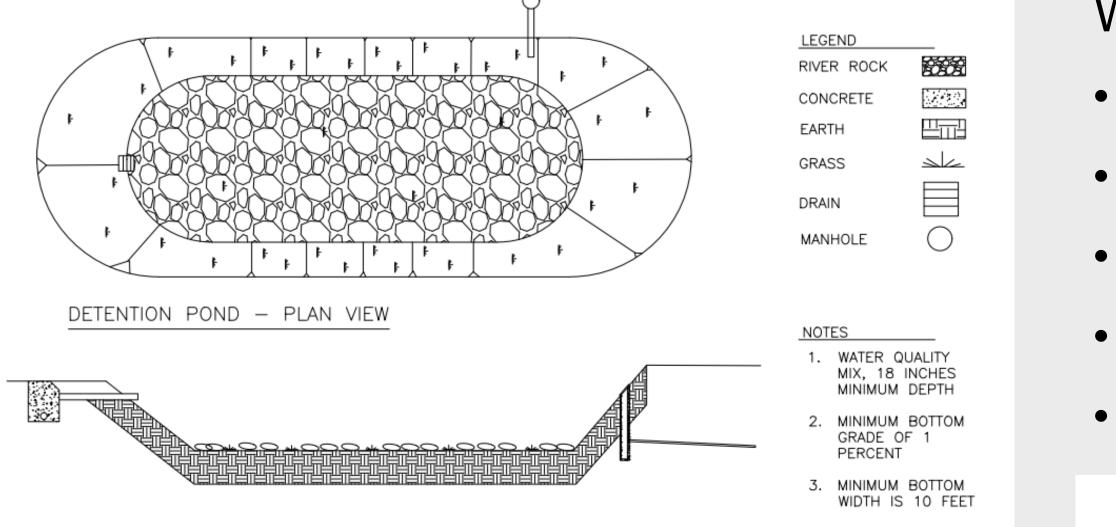
- 22,000 square foot building
- 35 public spaces
- 48 secure parking spaces

Our two groups have prepared two different structural, stormwater and building envelope designs to compare for sustainability.

Disciplines

- Building Envelope
- Water Resources
- Structural

# WATER RESOURCES



DETENTION POND - ELEVATION VIEW

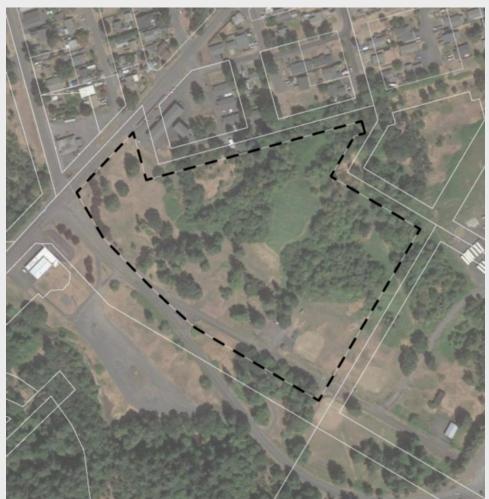
Detail of water detention pond.

### Rain Gardens

- Combined water detention/water quality
- Filtration rain gardens
- Offers native planting
- Sustainable and efficient  $\bullet$



Rendering of the proposed building (Mackenzie).



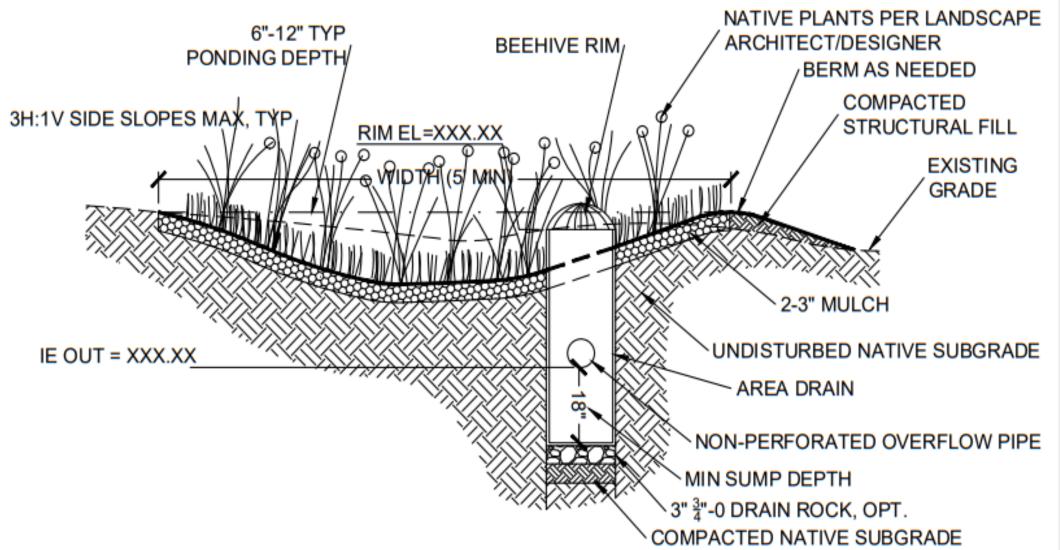
20.41/ 0

# Site

- 2.3 acres
- Tax lots (2)
- Light Industrial (LI)
- General Residential (R-5)
- 100-year and 500-year
- flood plain

Site map of the proposed location.

Water Detention Pond Combined water detention/water quality • Design Dimensions: 50ft x 100ft x 4ft • Storage Capacity: 15000 ft<sup>3</sup> • Discharge treated water into wetlands Sustainable and efficient





Design

Cel

# CE.PS.05.06

# **BUILDING ENVELOPE**

- Wall systems
- Roof systems
- Windows

## Insulation Comparison

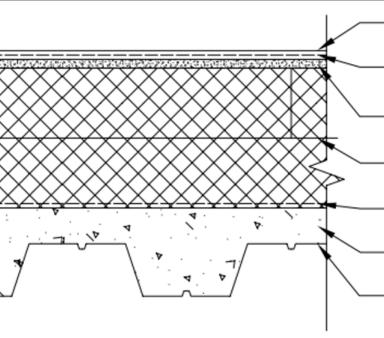
### • Cellulose vs. Batt

Гуре	Embodied Carbon	GWP
llulose	10.49 MJ/kg	0.70
Batt	28.00 MJ/kg	1.04

#### Embodied carbon and global warming potential for both building envelope designs.

	&	
$\langle \rangle$		
		§" GYP BOARD
$\square$		VAPOR RETARDER 6"METAL STUD FRAMING
$\langle \rangle$		BATT INSULATION
$\langle \rangle$		<sup>1</sup> / <sub>2</sub> " FIBERGLASS GYP BOARD
$\ge$		AIR/MOISTURE BARRIER 2X2" FOAM BOARD INSULATION; FOIL FACED
$\bigcirc$	- 1999	2" AIR GAP
$\langle \rangle$		VENEER TIE; EVERY 24"
$\ge$		MASONRY VENEER WALL

#### Detail of wall system.

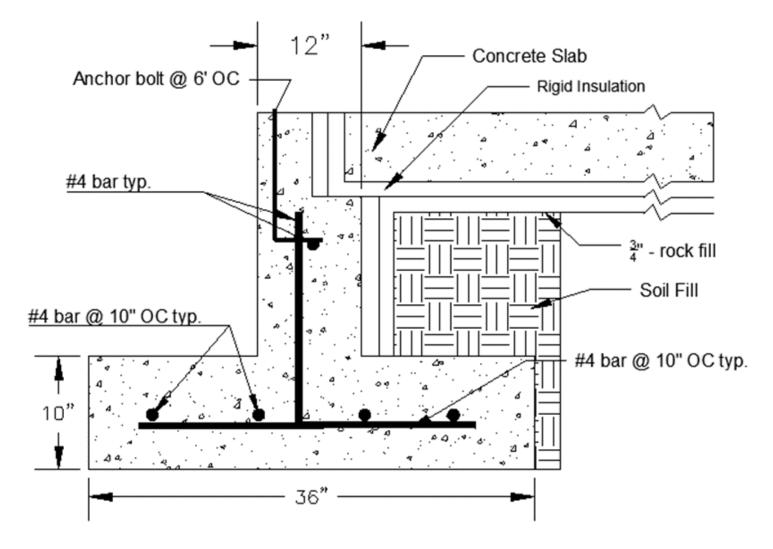


SINGLE-PLY ROOFING SYSTEM BONDING ADHESIVE - <sup>1</sup>/<sub>2</sub>" PERLITE INSULATION BOARD 2X4" RIGID INSULATION STAGGER JOINTS - VAPOR RETARDER CONCRETE ATTENUATION SLAB PER STRUCTURE - 22 GAUGE STEEL DEC

#### Detail of roof system.

### Foundation

# Shallow footing design with slab on grade vs. Spread footings



Outside perimeter footing and stem wall detail.