MULTI-STORY BUILDING WITH A ROOFTOP PATIO
SWOLÉ SOLUTIONS - STRUCTURAL TEAM S5 (February 28th, 2013)

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Client Consultants: Daniel Wang, S.E., Danniel Kang, P.E. (LPA, Inc.) | Faculty Advisor: Farzin Zareian, Ph.D. | Team Contact: lloh@uci.edu

PROJECT DESCRIPTION
Swolé Solutions (S5) is working with LPA, Inc. to design a four-story steel structure with a publicly accessible roof-top patio. The building will be used as a culinary school. Special moment frames will be designed and placed to resist lateral loads (i.e., earthquakes). The project will consist of gravity, seismic, and moment frame design and analysis. The ground lobby will be 20 feet tall, with subsequent floors being 15 feet. The most important information for this design project that must be considered includes soil reports and allowable element deflection as per governing building codes and design manuals.

DESIGN APPROACH AND ALTERNATIVES

1. Gravity Design
   - Dead / Live Loads
   - Loading Combinations
   - Roof And Floor Layouts
   - Member Sizes For Beams / Columns
   - Column Footings
   - Connection Design

2. Lateral Design (Moment Frame SLRS)
   - Base Shear
   - Story Forces
   - Diaphragm Forces
   - Moment Frame System
   - Sap Modeling

3. Foundation Design
   - Mat Foundation

Design Alternatives
- Steel Brace Frames
- Concrete Shear Walls
- Concrete Moment Frames
- CMU Shear Walls

DESIGN CONSTRAINTS AND PARAMETERS

STANDARDS USED
- ASCE 7-10
- AISC 360-10
- AISC 341-10
- ACI 318-11
- AISI, &CBC 2013

PARAMETERS
- Four-Story Steel Frame
- Seismic Load Resistance
- Adjacent Buildings

DESIGNED COLLECTORS

BEAM SCHEDULE

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<tr>
<th>Beam</th>
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<tbody>
<tr>
<td>B1</td>
<td>W22x55</td>
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<tr>
<td>B2</td>
<td>W21x48</td>
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<tr>
<td>B3</td>
<td>W16x50</td>
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<tr>
<td>B4</td>
<td>W21x44</td>
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<td>B5</td>
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<td>B7</td>
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<tr>
<td>G1</td>
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<tr>
<td>G2</td>
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COLUMN SCHEDULE

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<td>W21x48</td>
</tr>
<tr>
<td>C3</td>
<td>W18x50</td>
</tr>
</tbody>
</table>

Note: Beam and column size selections based only on gravity design.

COMPLETED TASKS
Design of Gravity Beam, Gravity Column, Column Base Plate, Gravity Beam / Column Connection (Reduced Beam Sections), Preliminary SAP2000 Model

REMAINING TASKS
- Composite Metal Deck / Composite Beam Design, Diaphragm, Moment Frames, Collectors, Connection Details, SAP2000 Model for Loading Analysis, Foundation Design, Construction Documents, Project Schedule

ENVIRONMENTAL DOCUMENTATION
This structure is planned for California, so a CEQA checklist will be conducted to determine if an EIR will be necessary, forthcoming in the 30% PDR.

COST ESTIMATION
The estimated building cost is based on the assumption that 1 ton of steel = $4,000. The current design incorporates approximately 700 tons of steel. The cost of that steel is then increased by 10% for connections, and an additional $2 Million is included for concrete. Estimated structural cost of the building: $5,084,000.00. A detailed break down will be included in the 30% PDR.

*The cost of architectural finish will be forthcoming in the final report after a finalized design has been selected.