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Multi-Story Building with a Rooftop Patio

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LPA

MULTI-STORY BUILDING WITH A ROOFTOP PATIO

SWOLÉ SOLUTIONS - STRUCTURAL TEAM S5 *(February 28th, 2013)*

SWOLÉ
INTEGRATED SUSTAINABLE SOLUTIONS

Project Manager: Izzad "Izzy" Loh | Design Engineers: Andy Nguyen, Alan Mendoza, Alexander Six, James Cummings, Ricardo Supan
Client Consultants: Daniel Wang, S.E., Danniel Kang, P.E. (LPA, Inc.) | Faculty Advisor: Farzin Zareian, Ph.D. | Team Contact: iloh@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.

GOOGLE SKETCHUP MODEL

EXTRUDED SAP2000 MODEL

ARCHITECTUAL RENDERING
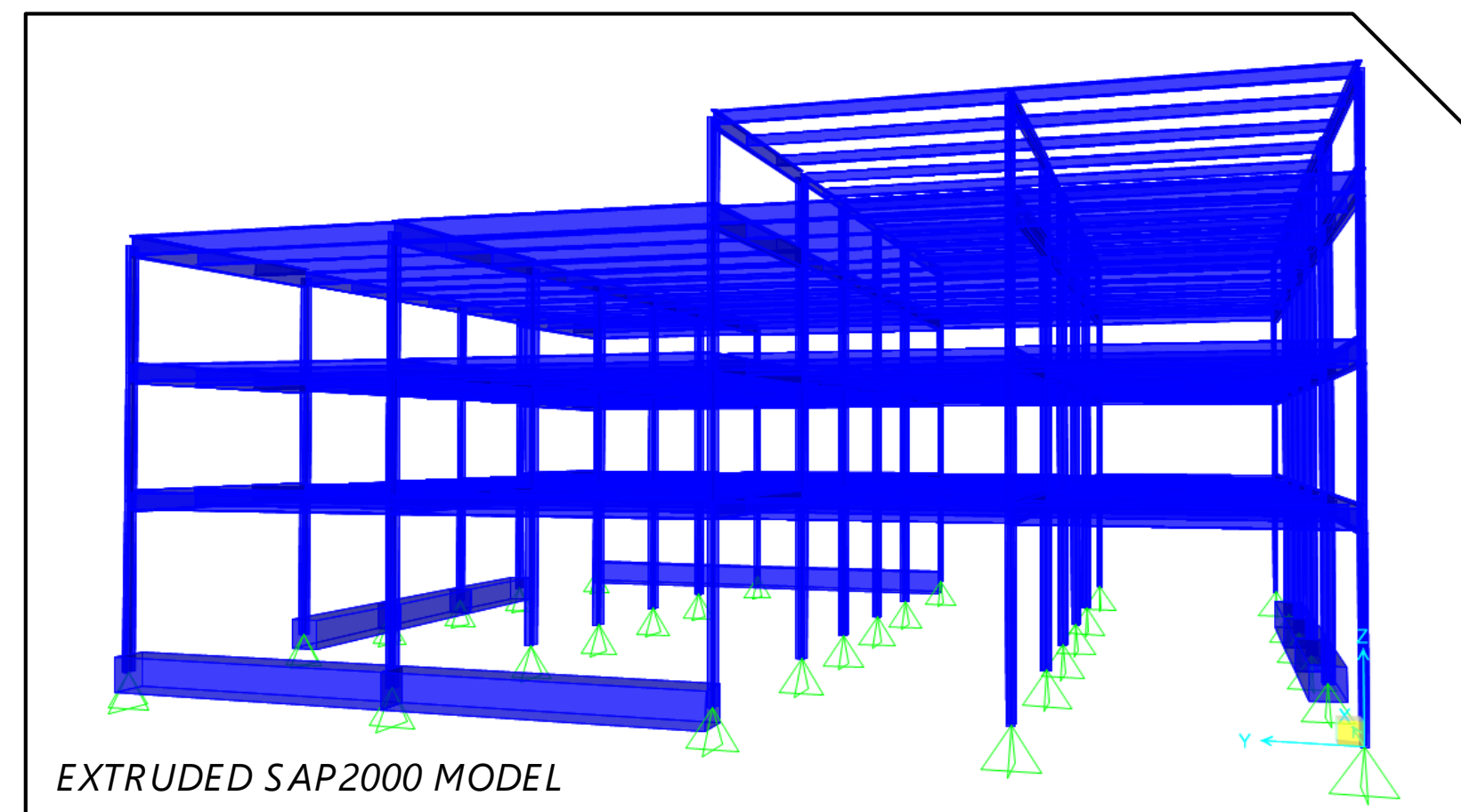
DESIGN CONSTRAINTS AND PARAMETERS

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

PARAMETERES
Four-Story Steel Frame
Seismic Load Resistance
Adjacent Buildings

SAMUELI
SCHOOL OF ENGINEERING
UNIVERSITY of CALIFORNIA · IRVINE

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

PLAN VIEW OF BEAM / COLUMN LAYOUT FOR FLOORS 2 AND 3

BEAM SCHEDULE

B1	W22x55
B2	W21x68
B3	W18x50
B4	W21x44
B5	W24x94
B6	W21x55
G1	W24x94
G2	W18x55
G3	W27x94
G4	W30x99
G5	W30x108

COLUMN SCHEDULE

C1	W22x55
C2	W21x68
C3	W18x50

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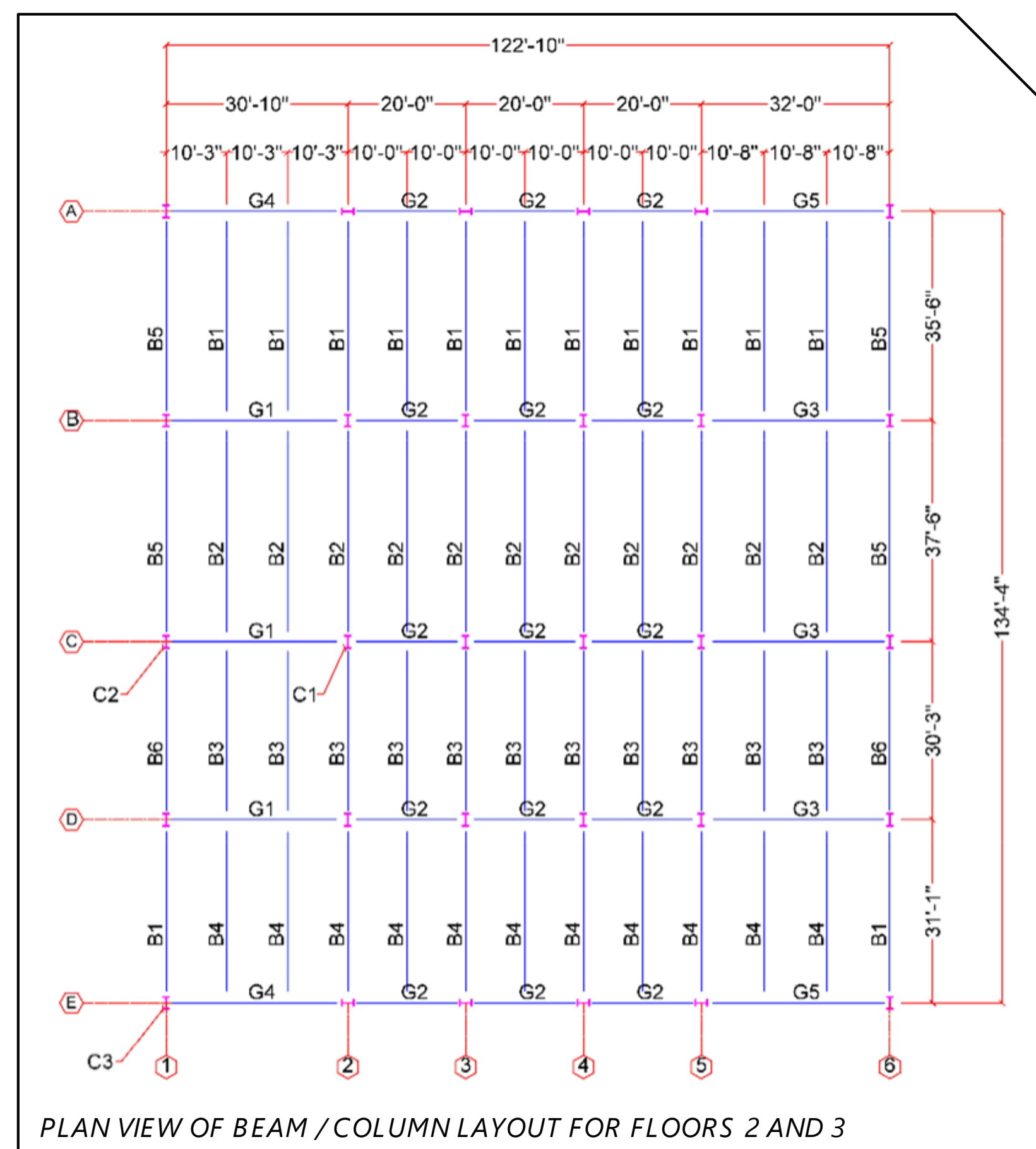
ENVIRONMENTAL DOCUMENTATION
This structure is planned for California, so a CEQA checklist will be conducted to determine if an EIR will be necessary, forthcoming in the 30% PDR.

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.

THE SWOLÉ TEAM
RIGHT TO LEFT: RICARDO SUPAN, JAMES CUMMINGS, ANDY NGUYEN, ALAN MENDOZA, ALEX SIX, IZZAD LOH