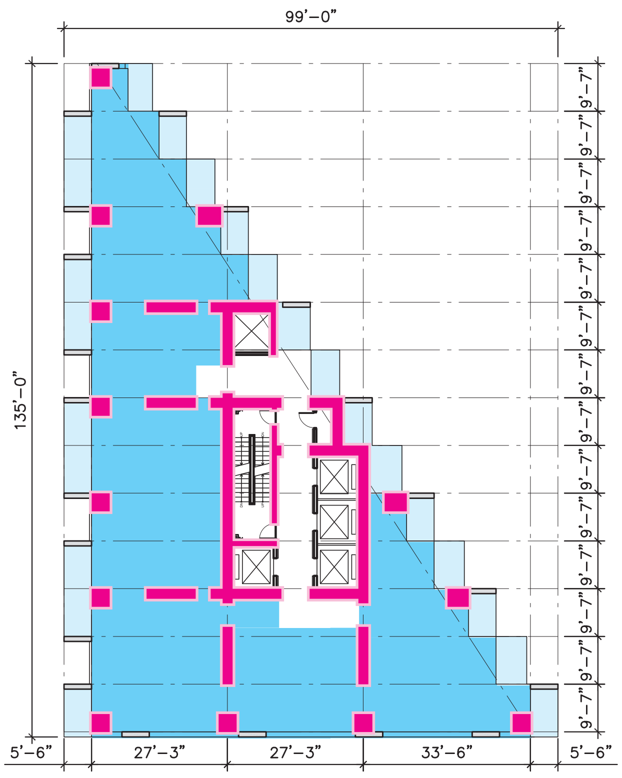
STRUCTURAL ANALYSIS

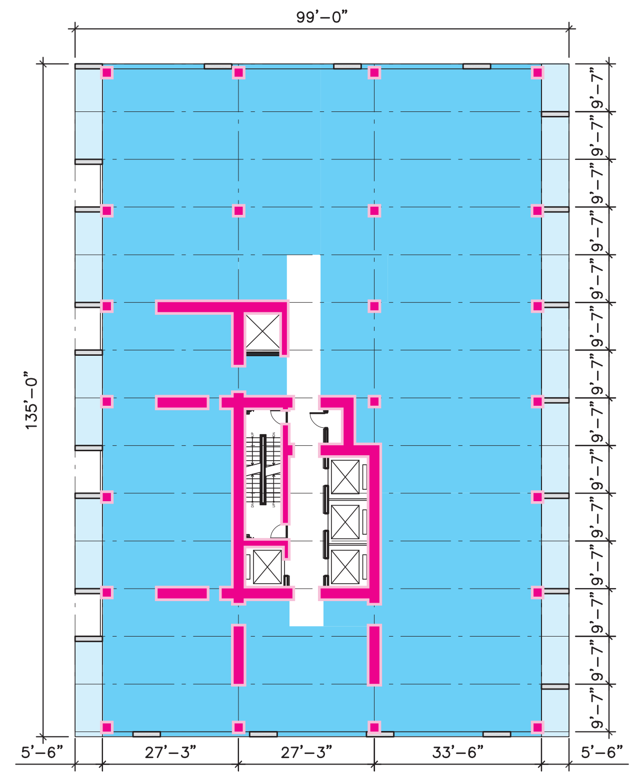
BEACH AND HOWE WILL UTILIZE A STRUCTURAL SYSTEM PRIMARILY OF CAST-IN-PLACE REINFORCED CONCRETE. LATERAL STABILITY WILL BE PROVIDED BY A DUCTILE, VERTICALLY POST-TENSIONED, CONCRETE CORE WITH ADJACENT WALLS, PIERS CONNECTED BY DIAGONALLY REINFORCED LINK BEAMS AT EACH FLOOR.

MAIN GEOMETRY

THE FOOTPRINT OF THE BUILDING CHANGES FROM TRIANGULAR AT THE BASE TO RECTANGULAR AT THE TOP. TYPICAL FLOOR PLATES WITH PRELIMINARY STRUCTURAL ARRANGEMENTS OF COLUMNS AND SHEAR WALLS ARE SHOWN IN FIGURE 1.



10TH FLOOR



48TH FLOOR

FIGURE 1:
10TH AND 48TH FLOOR PLANS SHOWING PRELIMINARY COLUMN AND SHEAR WALL LOCATIONS

FOUNDATIONS

FOUNDATIONS WILL BE DESIGNED IN ACCORDANCE WITH THE RECOMMENDATIONS FROM THE GEOTECHNICAL ENGINEERS. THE INITIAL RECOMMENDATION FROM THE PRELIMINARY GEOTECHNICAL ASSESSMENT BY IS FOR A RAFT FOUNDATION. THE FEASIBILITY OF THIS WILL BE INVESTIGATED AS THE DESIGN PROGRESSES.
THE FOUNDATIONS WILL BE DESIGNED TO RESIST THE UPLIFT AND OVERTURNING FORCES DUE TO VERTICAL LOADS AND LATERAL LOADS FROM WIND AND SEISMIC ANALYSES.

COLUMN ARRANGEMENT

IN ORDER TO TRANSITION FROM THE TRIANGULAR FLOOR PLATE AT THE BASE OF THE BUILDING TO THE RECTANGULAR ARRANGEMENT AT THE TOP IT WILL BE NECESSARY TO HAVE SLOPING OR STEPPED COLUMNS WHICH MERGE AS THEY COME TOWARDS THE BASE OF THE BUILDING. EACH OFFSET WILL INDUCE LATERAL THRUSTS INTO THE HORIZONTAL DIAPHRAGMS, WHICH WILL TRANSFER THOSE FORCES TO THE SHEAR WALL CORE. THE COLUMN ARRANGEMENT WILL BE OPTIMIZED TO MINIMIZE THIS EFFECT AND TO MINIMIZE THE TORSION INDUCED INTO THE CORE.
LOWER COLUMNS WILL BE APPROPRIATELY SIZED TO CARRY THE LOADS FROM MERGING COLUMNS ABOVE. COLUMN SIZES WILL DECREASE AS THEY RISE UP THE BUILDING.

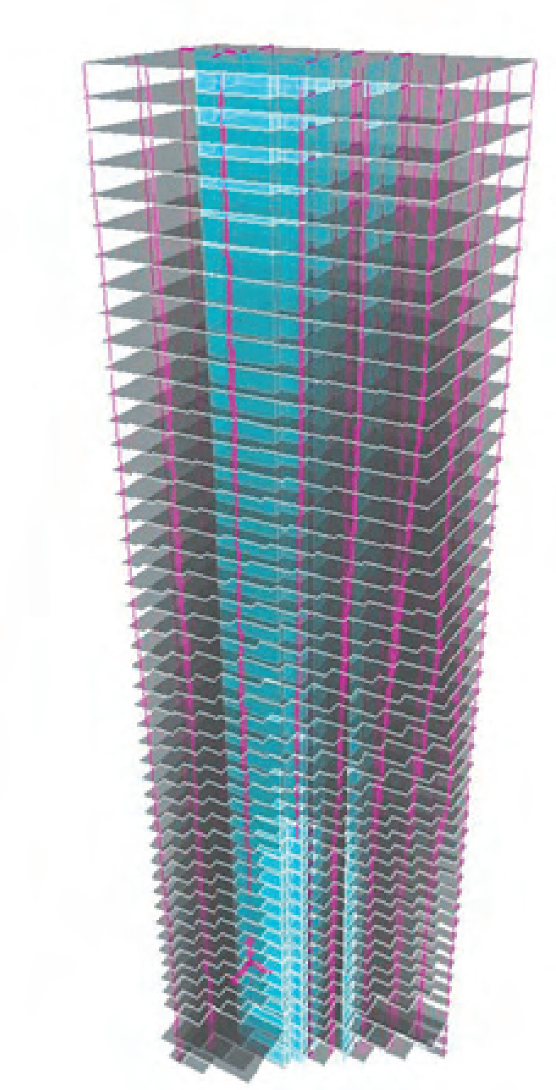


FIGURE 2:
PRELIMINARY STRUCTURAL CONCEPT STUDY MODEL

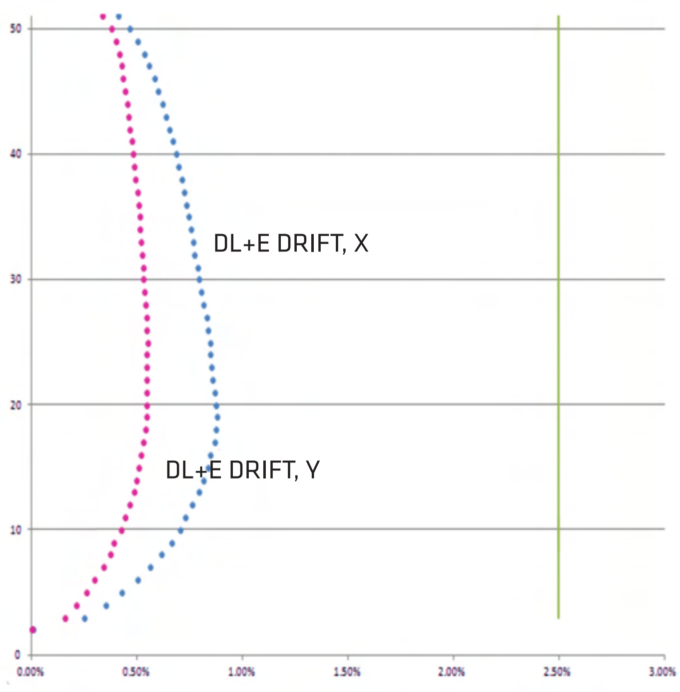
FIGURE 3:
RENDERING OF PRELIMINARY STRUCTURAL MODEL WITH STEPPED COLUMNS

FLOORS

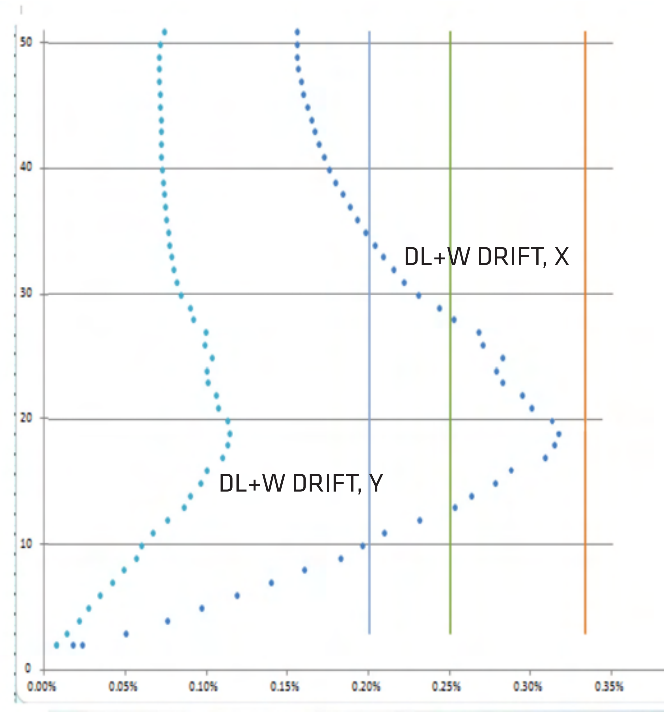
FLOORS WILL TYPICALLY BE 8" POST-TENSIONED FLAT SLABS AND WILL ACT AS DIAPHRAGMS TO TRANSFER LATERAL LOADS TO THE SHEAR WALLS. ADDITIONAL FORCES WILL BE INTRODUCED INTO THE DIAPHRAGMS AT COLUMN STEP LOCATIONS.

SHEAR WALLS

THE SHEAR WALLS WILL BE ARRANGED TO ALIGN THE CENTER OF RIGIDITY AS CLOSE AS POSSIBLE TO THE CENTER OF MASS AND WILL ALSO FORM A TORSIONALLY STIFF BOX AROUND THE ELEVATORS AND STAIR. THIS WILL BOTH MINIMIZE THE TORSIONAL BEHAVIOR OF THE STRUCTURE AND ALLOW THE SHEAR WALLS TO MOST EFFICIENTLY RESIST LATERAL FORCES. ADDITIONAL SHEAR WALLS WILL BE ARRANGED OUTSIDE THIS BOX IN ORDER TO FURTHER IMPROVE THE DYNAMIC CHARACTERISTICS OF THE TOWER AND TO ENSURE AMPLE STRENGTH AND STIFFNESS IS PROVIDED TO CONTROL SWAY AND RESIST LATERAL FORCES FROM WIND AND SEISMIC LOADING.
SHEAR WALLS WILL BE THICKEST AT THE BASE WITH THICKNESS DECREASING UP THE HEIGHT. WHERE OPENINGS ARE REQUIRED IN SHEAR WALLS THE ADJACENT PIERS WILL BE CONNECTED BY DUCTILE, DIAGONALLY REINFORCED LINK BEAMS OVER THE OPENINGS.
DUCTILE DETAILING IN ACCORDANCE WITH CSA A23.3 WILL BE ADOPTED FOR THE SHEAR WALLS, AS REQUIRED BY THE BUILDING CODE FOR BUILDINGS OF THIS HEIGHT IN VANCOUVER.



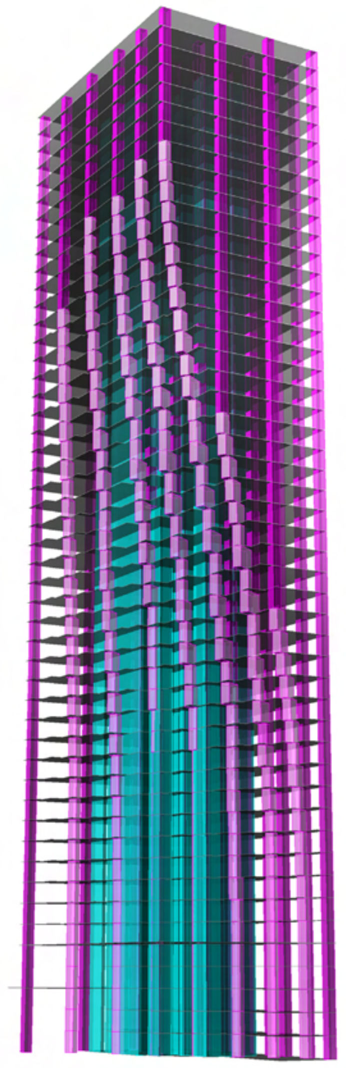
DRIFT FROM DL+E = H/120



DRIFT FROM DL+W = H/320

MATERIALS

HIGH STRENGTH CONCRETE WILL BE USED FOR COLUMNS AND SHEAR WALLS. THE STRENGTH WILL BE REDUCED PERIODICALLY UP THE BUILDING. POST-TENSIONING WILL BE USED FOR THE CONCRETE FLOORS. IT WILL ALSO BE USED AS PART OF THE VERTICAL REINFORCING IN THE SHEAR WALLS IN ORDER TO ELIMINATE CRACKING, DECREASE THE NET OVERTURNING FROM THE ECCENTRIC DEAD LOAD FORCES, AND LIMIT LATERAL DISPLACEMENT OF THE BUILDING.



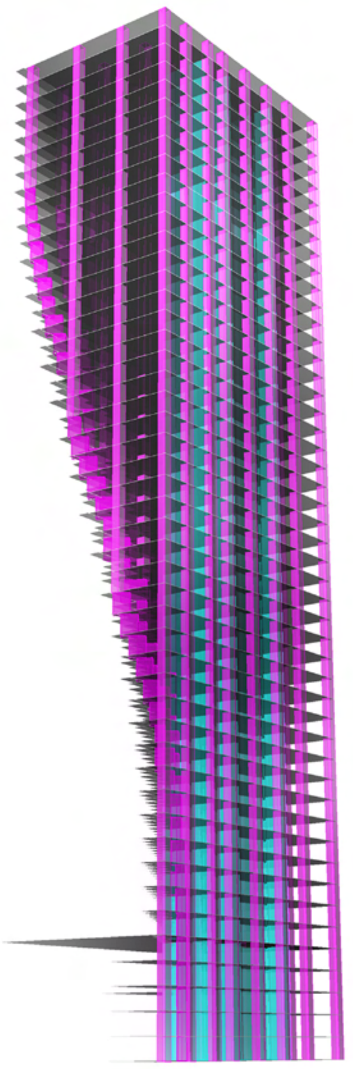


FIGURE 4:
MODEL SHOWING STEPPED COLUMN GEOMETRY