

June 17, 2025

Clemson Mercy Housing

Structural Narrative

Clemson, South Carolina

The project is for the construction of five three-story, multifamily, residential buildings on Old Greenville Highway in Clemson, SC. Each building will be wood framed construction. Building 1 will house 30 units. Building 2 will house a community room, fitness room, laundry room, lobby, and leasing offices along with 27 units. Building 3 will be L shaped and house 30 units. Building 4 will house 48 units, and building 5 will house 33 units.



Site Layout

The framing will consist of load bearing demising walls between the units with beams and load bearing walls within the units supporting open web wood floor joists. The demising walls will consist of double stud walls with an air space for sound isolation between units. The units are stacked vertically with an exterior breezeway along the center of the building. Each unit will have their own balcony. The roof will consist of gabled elements constructed with pre engineered wood trusses and stick built for pop out gables.

There will be stairwells at each end of each building. The stairwell cores will be constructed with concrete masonry walls (CMU). There will be a community room on the ground floor of building 2 that will require steel framing to achieve clear span space while supporting the housing units above. Mechanical equipment will be located on housekeeping pads to be located by the mechanical engineer.

The governing building code for the project is the International Building Code, 2021 Edition with South Carolina Amendments.

This narrative is based schematic drawings provided by Goode Van Slyke dated May 01, 2025, and coordination emails with Goode Van Slyke.

DESIGN CRITERIA

Design Floor Loads

Live Loads (reduced as allowed by the Building Code):

▪ First Floor General Areas and Amenities	100 psf
▪ Corridors - First Floor	100 psf
▪ Corridors - Above First Floor	40 psf
▪ Residential	40 psf
▪ Residential Balconies	60 psf

Dead Loads (in addition to the structure self-weight):

▪ Miscellaneous	3 psf
▪ Ceiling/MEP	6 psf
▪ Floor Topping	15 psf

Design Roof Loads

Live Loads (reduced as allowed by the Building Code):

▪ Roof	20 psf
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Dead Loads (in addition to the structure self-weight):

▪ Miscellaneous	3 psf
▪ Ceiling/MEP	6 psf
▪ Roofing	9 psf

Snow Loads:

▪ Ground Snow Load	10 psf
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Rain Loads:

▪ Rain Load, R (60 min)	3.4 in/h
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Design Wind Loads

▪ Basic Wind Speed	108 mph
▪ Exposure	B

Design Seismic Loads

▪ Seismic Factors S_s , S_1 , and Soil Profile Type were determined using applicable building code tables and figures.	
▪ 0.2 Sec. Design Spectral Response Acceleration	$S_s = 0.381$
▪ 1.0 Sec. Design Spectral Response Acceleration	$S_1 = 0.102$
▪ Risk Category	II
▪ Site Class	D
▪ 0.2 Sec. Design Spectral Response Acceleration	$S_{Ds} = 0.38$

▪ 1.0 Sec. Design Spectral Response Acceleration	$S_{D1} = 0.163$
▪ Seismic Design Category	C
▪ Analysis Procedure	Equivalent Lateral Force Procedure

Residential - Wood Framed Lateral System

▪ Structural Systems	
Basic Structural System	Bearing Wall System
Seismic Resisting System	Light Framed Wood Walls with Structural Wood Shear Panels
R	6.5
C_d	4
Overstrength Factor	3

MATERIAL PROPERTIES

Reinforcement

▪ Reinforcing Steel	ASTM A615, Grade 60
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Normal-Weight Concrete

▪ Foundation elements	3,000 psi
▪ Slab-on-Grade	4,000 psi

Concrete Masonry Units

▪ Minimum compressive strength	2,000 psi
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Structural Steel

▪ W, C, Shapes	ASTM A992, 50 ksi
▪ M, S, MC, L Shapes	ASTM A36
▪ Round Hollow Tubing	ASTM A500, GRADE C, 46 ksi
▪ Shaped Steel Tubing Walls	ASTM A500, GRADE C, 50 ksi
▪ Misc. Plates	ASTM A36
▪ Non-High Strength Bolts	ASTM A307
▪ Anchor Bolts	ASTM 1554, 36 ksi

Wood

▪ Southern Pine	No. 2 or Better
▪ Bending Stress	Per NDS 2015
▪ Maximum Moisture Content	15%
▪ Parallam Parallel Strand Lumber (PSL)	$F_b = 2,900$ psi $E = 2,000,000$ psi

DESCRIPTION OF STRUCTURAL SYSTEM

Site Preparation for Residential Building Pad

- The elevation of the first floor is assumed to be at current grade elevation

- The contractor shall proofroll the building area to identify soft soils.
- If exposed subgrade is unstable, the contractor shall stabilize using one of the following methods:
 - Scarify, dry, and recompact the exposed soils.
 - Undercut existing soil and use crushed stone or crushed gravel to improve subgrade stability.
 - Chemical modification of unstable soils using portland cement or class C fly ash.
- Cut and fill slopes for the project shall not be steeper than 2.5 horizontal and 1 vertical. Cut slopes in uncontrolled fill areas may experience stability issues and it may be necessary to overcut slopes in these areas and incorporate geogrid and geotextiles to minimize long term stability issues.

Foundations

- Foundation design is based on the recommendations in the Geotechnical Report prepared by Terracon dated April 11, 2025.
- Foundations will include shallow spread footings bearing on suitable soil capable of supporting 3000 psf.
- Foundations shall bear a minimum of 12" below grade at the exterior perimeter of the building and 12" below grade at the interior of the building. Top of footings will be set to correspond to brick coursing
- Load bearing wall foundations are anticipated to be 3 feet wide by 12" deep and load bearing shear wall foundations are anticipated to be 4 feet wide by 24" deep.
- Exterior load bearing stud walls foundations are anticipated to be 2.33 feet wide by 12-inch deep continuous concrete strip footing.
- Exterior stud wall with brick veneer will be supported on a turned down slab edge supported on a 2.5 feet wide by 12-inch deep continuous concrete strip footing.

First Floor Structure

- The typical floor slab will be a soil-supported 4-inch-thick concrete slab with WWF 6x6 - W1.9xW1.9 reinforcing in the townhomes.
- The floor slab at service areas including mechanical rooms and storage rooms will be a soil-supported 5" thick concrete slab with WWF 6x6 - W2.9xW2.9 reinforcing.
- The public stairs will be wood construction within the open breezeway corridors.

Lateral Load Resisting System (LLRS)

- The LLRS will be wood shear walls consisting of 2x6 wood studs spaced at 16" o.c. with ½" thick Structural II Southern Pine plywood sheathing at interior demising walls and 5/8" thick Structural II Southern Pine plywood sheathing at exterior walls.

Elevated Floor Levels 2 and 3

- The floor deck will be supported by wood open web joists spaced at 16" o.c. maximum with 18" depths. Joists will span to load bearing wood walls and Parallam LVL beams. Load bearing walls occur between units. Units greater than 24 feet will require intermediate bearing walls. Red Built type W joists were used as the basis of design.
- The corridors will be framed with 2x8 conventional wood framing or wood joists spanning to the load bearing shear walls on each side of the corridor. Consistent joist depths allow for a typical wall height while wood joists allow for greater ceiling heights in the corridors.
- The floor deck will consist of ¾" tongue and groove Structural II Southern Pine plywood sheathing. Gypcrete topping will included in the floor assembly.
- Shear and load bearing walls will consist of 2x6 wood studs spaced at 16" o.c. with ½" thick Structural II Southern Pine plywood sheathing at interior demising and corridor walls and 5/8" thick Structural II Southern Pine plywood sheathing at exterior walls. Exterior walls will be 2x6 studs. Non load bearing walls and corridor walls can be 2x4 wood studs except at plumbing walls and mechanical closets which will be framed with 2x6 walls. See architectural drawings for non-structural walls.
- Fire retardant treated wood framing is required at the building exterior bearing walls and firewalls.
- Portions of the building include brick veneer. Areas of the brick that are greater than 28 feet in height will require a brick relief angle. Brick panels that originate at grade will require a relief angle at level 3.

Balconies

- All balcony framing will be require pressure treated material.
- Posts supporting balconies are anticipated to be 6x6 wood members

Roof Structure

- The roof deck will be supported by pre engineered wood trusses with 2x6s for the top chord and bottom chord. There will be overbuild framing to create the intersection dormer roof. Trusses will span to the exterior load bearing walls. Trusses will be spaced at 24" o.c. maximum .
- The roof deck will consist of 5/8" Structural II Southern Pine plywood sheathing with insulation.