

Executive Summary

The Dormitory, a four story tall dormitory in the Northeast United States with a walk-out basement is constructed mostly out of wood framing. Primarily, the Dormitory consists of an open web wood floor truss system supported by 2x6 wood stud walls. For lateral support, the primary system consists of either oriented strand board (OSB) or gypsum wall board (GWB) on wood studs.

As global warming continues to become a larger issue for the world, soon it will be a concern for a structural engineer in the form of increased wind and weather loads. This loading was then considered by creating a scenario in which the State College of Florida, Manatee-Sarasota facility wanted the Dormitory built on their campus.

Proper loads were first determined according to the Florida Building Code 2010, and ASCE 7-10, where applicable according to the code, resulting in a design wind speed of 150 mph. To withstand this load, two lateral system redesigns were considered. An oriented strand board shear wall design was completed on the wings resulting in only the walls between the suites to be changed from two layers of 5/8 inch gypsum wall board to 1 layer of 5/16 inch oriented strand board with 3 inch nail spacing at the edge. In addition, a steel braced frame design was undertaken. For a steel lateral system design, it was deemed logical to also design the gravity system using steel. This redesign made use of W8x31 columns at the four corners of each suite and a braced frame using 2 inch by 2 inch angles of differing thicknesses for the braces between each suite.

An electrical breadth study was completed on the new Dormitory where photovoltaic solar shingles were designed to partially remove the Dormitory from the grid and to provide backup power in the case of an emergency. In addition, a façade breadth was undertaken to design a new building enclosure system that would perform under the heat of the Florida sun and debris impacts during hurricanes.