Temple University

Multipurpose Health Science Center

Michael Wiegmann
Structural
Faculty Advisor: Prof. Hanagan

[BUILDING STATISTICS 2]

Construction

The $150 million, 480,000 sf project is a fast track, design-build project, with Gilbane Inc. acting as general contractor and construction manager. Balliner Inc. is in charge of all design work, including architecture, structures, and MEP. Since Balliner and Gilbane are responsible for these larger portions of the project, they are able to use a fast track design process. The bids for the project were broken up by trades and the critical path. The site was a preexisting parking lot in a tight urban neighborhood. Construction began in September 2006, with much of the design and planning work beginning that previous spring. Construction is scheduled to continue to May 2009.

Electrical

The electrical requirements were fairly demanding since this is an educational medical research building; therefore, the building utilizes a medium voltage primary selective system with a back up diesel generator. The primary selective system incorporates redundancy into the system before the transformers, with two 13.2KV, 1200A lines coming in. These are fed into three substations, with one powering life safety, the other elevators and the other the rest of the buildings systems. Each is connected to the 10,000KW, 480/277 3 Ø 4w diesel generator. Power is distribute via multiple 2000A busways. There are also several motor consrol centers which run pumps, motors, heating equipment, exhaust, etc. These have 480v and 800, 1200, 2000A capacities.

Lighting

The buildings lighting is 277 V, ranging around 50 to 100 W. F32 T8 fluorescent recessed lighting is used for most the building. Asymmetric metal halide all washers are used in the large first floor common area along the outside wall with accent metal halides along the inner curved wall of this space. Auditorium lighting is achieved by recessed linear fluorescents with parabolic louvers.

Mechanical

The mechanical requirements were equally demanding for the building. A variable air volume system (VAV) is used for most areas including classrooms, laboratories and dining areas to supply adjustable quantities of heated or cooled fresh air. Most of the buildings elevator, electrical and mechanical equipment rooms are cooled using fan coil units (FCU). These are cooled with heated or cooled water.

Seven penthouse air handling units (AHU) with 35,000 and 60,000 cfm capacity supply the fresh air for the laboratory, vivarium (animal housing area) and tower offices VAV systems. They also utilize a heat recovery wheel to recover exhaust energy. Three AHU located in the basement draw in street level air for the teaching areas. Penthouse AHU Preheat and heating cycles use a 40% propylene glycol mixture. Steam is used in the basement units and to provide humidification. Both steam and chilled water are supplied from a centralized plant outside of the building. There is also capacity for three additional AHUs for future laboratories.

100% fresh air is use in the laboratory areas with ten induced radial dilutor fans placed on the penthouse level to provide exhaust. There is capacity for three additional fans to meet demands for labs added in the future.

Structural

The building is steel frame construction with typical column sizes ranging around W12 to W14 and typical beam and girder sizes ranging around W21 to W24. These beams support typical 2.5" slabs on 3"deep, 20 gage galvanized composite steel deck with 6x6-W2.9x2.9 WWF placed 1.5" from the top of the slab. The primary exception occurs in the mezzanine penthouse and penthouse level.

A braced frame lateral system is used primarily in the East-West direction which is perpendicular to the buildings long direction. F our sets of braced frames run the full height of the building. The vertical members range from W14x109 at the top to W14x550 at the bottom. Horizontal members are typically W24x55 but range from W21x44 to W27x161. Diagonal members range from W10x49 within the upper four floors to W12x190 at the bottom.

Three sets of North-South braced frames appear from the 12th, 13th mezzanine, and 13th penthouse levels in one line, with an additional set appearing in another line for only two levels. The member sizes are similar with the exception that diagonal members are comprised of 5x5L shapes.

This building also has three transfer trusses which take column point loads from above and redistribute them to offset columns at a lower level. Two of these trusses are located between the first and second floors, are 15'4" deep, and span 46.5' in order to clear space for the loading dock below. A third truss is located between the 5th and 6th floors, is 14'8" deep, and spans 62' in order to relocate columns for corridors on lower levels.

The foundation consists of a hybrid system using 40% shallow foundation footings with 1'4" to 2'8" depths and caissons with 15' to 35' depths. Most of the building's concrete is 28-day, normal weight concrete at f'c=4000 psi.

Fire Protection

The high rise building is classified as mixed use, A3 Assembly and Business (B), from the basement to the third floor. It is classified as B from the fourth floor to the penthouse. Most of the building uses a two hour rating which is achieved by spray on fire protection. The atrium is required to only have a one hour rating.

There is a requirement for chemical control area separation, with a one hour rating on floors 1 though 3, and a two hour rating for floors 4 through 11.

Automatic sprinklers and some control systems are also used in the building.

Transportation

There are two egress stairwells, one at the North and South ends of the building each. There is also a main lobby stairwell and an oval stairwell in the library space that are non egress. There are two main elevator cores, one of which contains four public elevators. The other core contains a vivarium elevator and two service elevators.