
THE PIXEL
Towards an adaptive future
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Student Leadership Council
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THE PIXEL
Towards an adaptive future

Architectural and Environmental:

Form Generation

The idea is to create a modular design that can adapt to various needs and is flexible to change, to increase floor area if needed.
This is done by creating a grid (beams and columns) that extends upwards and horizontally if needed.

Figure 1: existing structure.

Figure 2: required extension.

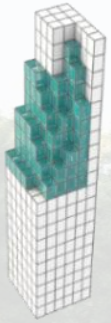


Figure 3: pixilation to maximize sun exposure.

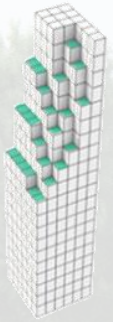
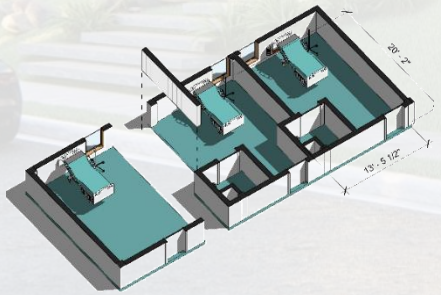


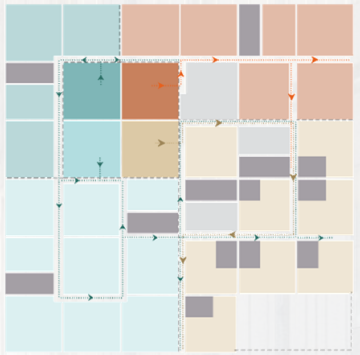
Figure 4: adding healing gardens.

Figure 5: chance for extension.

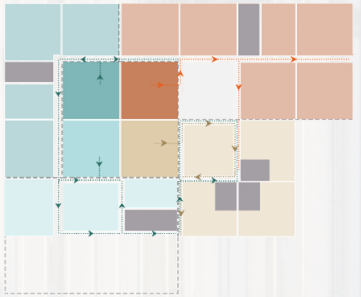
Modular Design

Our plan design is based on a modular grid **with fixed structural supports and prefabricated walls that are installed based on need offering various space solutions** (even a ward in case of large number of patients).

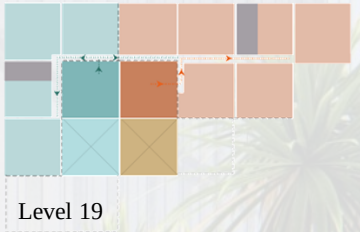




Level 12



Level 16



Level 19

- During Pandemics:

Two zones to lower the risk of virus transmission, between patients and covid-19 patients.

- Patients' rooms+ external clinics+ Healing center
- Covid-19 patients' rooms

- During Regular Days:

- Patients' rooms+ external clinics+ Healing center

LEED

Water Efficiency Strategies Applied:

1- Collect rainwater that fall along the façade.

2- Three-pipe systems enable non-potable water to be used.

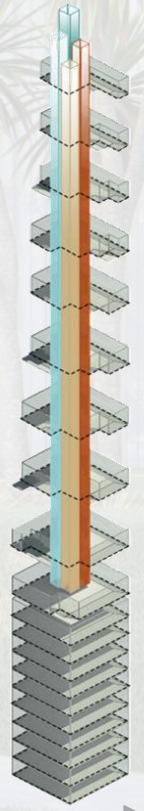
3- Greywater recycling system.

Materials and resource Strategies Applied:

1- Flexibility in design (Modular Design).

2- Acoustic materials and acoustic treatment.

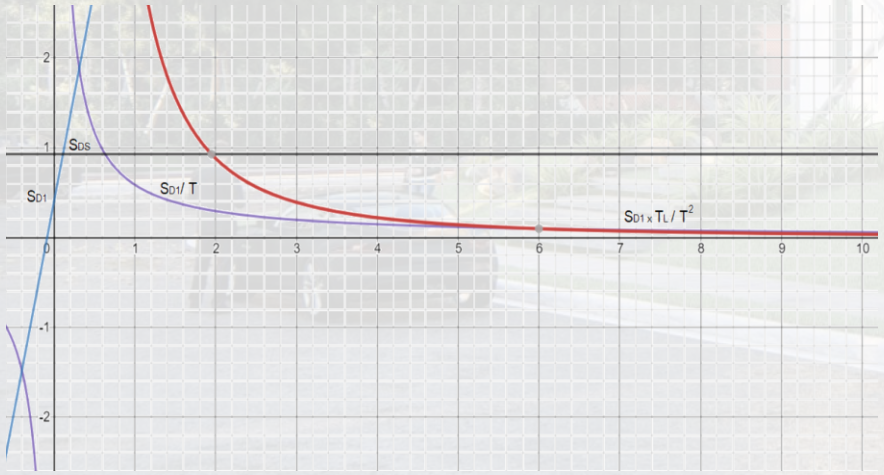
3- Reduce the release of (PBTs).



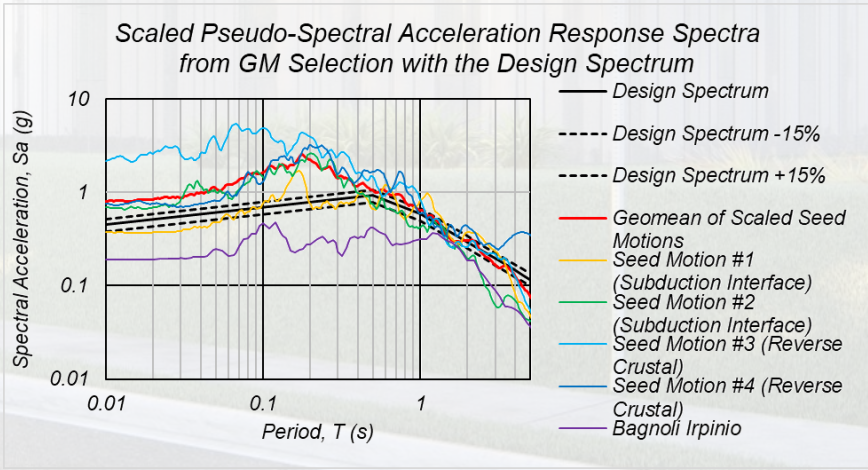
Geotechnical and Seismicity Analysis:

- Seattle, Washington, lies within the pudge sound lowland, an elongate structural and topographic basin between the Cascade Range and Olympic Mountains.
- **The building under study is located approximately 700 ft. from Elliot Bay on a plain coastal land where the soil is characterized by tide flat deposits (Qtf) which contain silt, sand, organic sediments, and detritus accompanied with shells.** The land is modified with artificial fill (af) of gravel, sand, silt, concrete, slag, and other miscellaneous materials.
- **Based on the boring log, the soil under study is generally loose to medium dense soil. Without ground improvement, the site class is F.**
- The risk category is **(IV)**, as the hospital is an essential facility.

Response spectrum curve for the building location:

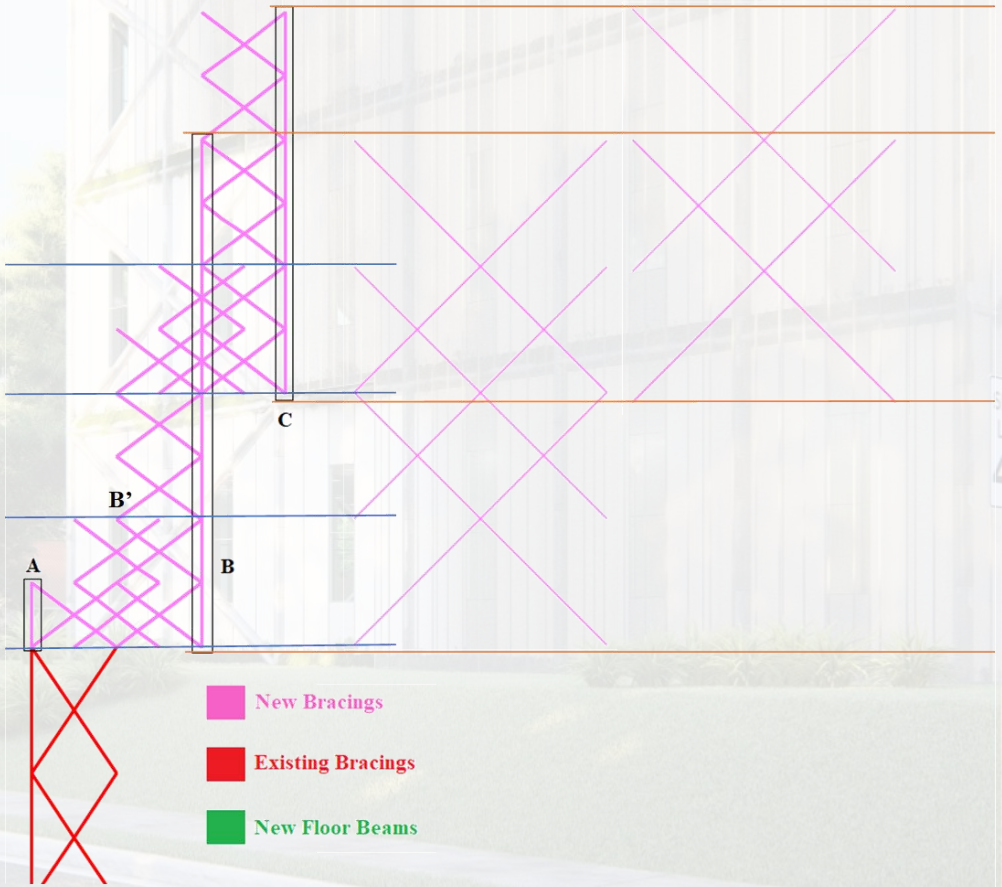


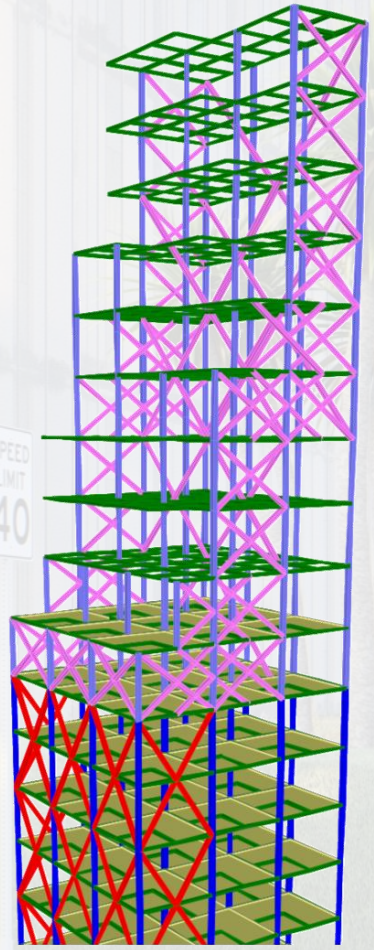
Scaled Time Histories for Future Analyses:



Structural Analysis and Design:

- **Transfer trusses were placed at the 14th & 15th floors as a transition zone** to transfer the lateral loads effect in the E/W direction from the additional floors to the middle portion (B to B′) of the building at the given view.
- Giving the tapered nature of the building**,** **we had to make another transition at the 10th & 11th floors to transfer the loads to the main lateral supporting system in the existing building.** Bracing systems A, B, and C were placed to transfer the lateral effect in the N/S direction to the main existing system as well.
- The main and additional bracings work with the framing action resulting from the beam-column connections as well in the lateral resistance of earthquakes.





Retrofitting:

- Our retrofitting technique included the following:
  1. **Mirroring the existing lateral supporting system (Fig.1), which led to the distribution of loads into both directions** (East and West) and reduced the torsional moment effect. Consequently, the members of the existing structure experienced less critical straining actions, which led the D/C values to decrease significantly. The mirrored system continued until the 20th floor with the same bracing orientation.
  2. **Adding two intermediate bracings at axes 3 and 5 from the floor 18 to the roof between axes E and G (Fig.2).**
  3. In order to avoid the high inter-story drift ratios, we added two intermediate bracing systems at the axes C and E. These systems also continued until the columns stop or the 20th floor, whichever first.
- The previous technique has led the building to be safe against both D/C checks (according to the NDS) and inter-story drift ratios in all ground motions (T1, T2, T3, and T4).

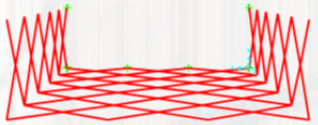


Figure 1: Existing lateral supporting system.

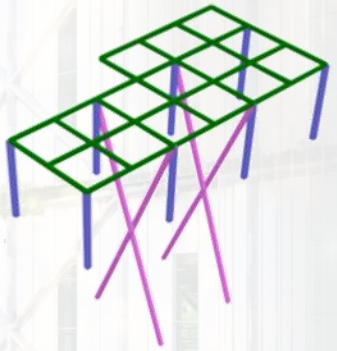


Figure 2