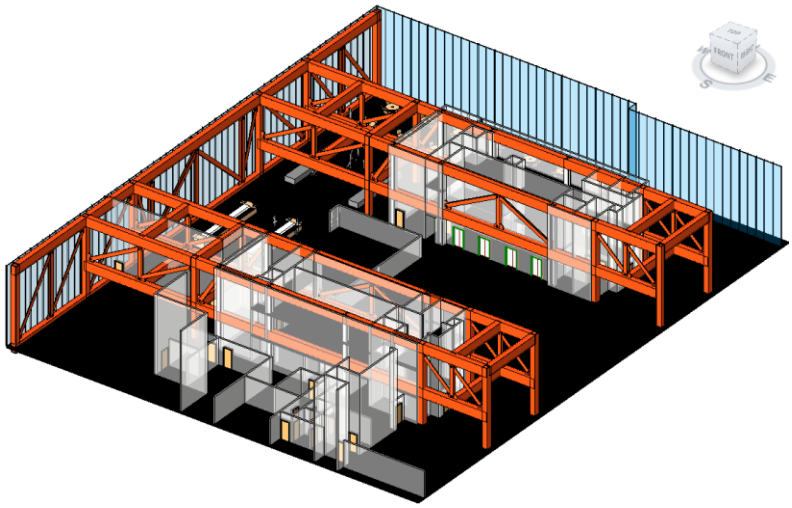
Architectural Breadth Study

The 5th level of the John Jay College Expansion Project is used as the facilities dining area. The space is compromised of a kitchen with offices and support areas, a large servery, a café, and a student, faculty, and staff dining area. There is also access to the campus commons, which is a green space located on the roof of the low-rise cascade. The campus commons contain a wide variety of plants, and several areas for students to gather.

By changing the location of the transfer trusses of the John Jay College Expansion Project from the penthouse level to the 5th level, the architecture is dramatically changed. The original design called for 30 foot high transfer trusses which were hidden in the penthouse level, which is primarily mechanical equipment, and not for the public to see. Moving the transfer system to the 5th level requires the system to be exposed and open to the occupants of the expansion project. Not only does the new transfer system need to meet structural requirements, but it also needs to fit the architectural requirements of the 5th level and the entire building.

Since the 5th level is a public space and will be used by mostly everyone on the John Jay College of Criminal Justice campus, it was very important for the design allow pedestrians to circulate throughout the space without any obstruction from the trusses. To allow building occupants to circulate without any obstructions, trusses 2 and 3 are elevated 10 feet. This required trusses 2 and 3 to be 20 feet in depth to efficiently control the axial forces in the top and bottom chords of each truss.



Due to the heavy loads associated with transferring 10 levels of the expansion project using the transfer trusses at the 5th level, the truss members had to be custom steel sections. Parallel plates were designed for the web compression members and single plates were designed for the web tension members. Top and bottom chords are constructed using W-shapes with filler plates or built-up box sections. These custom shapes must be protected from fire using intumescent paint. For this study, a dark orange color was used to paint the trusses. This color was chosen because most of the accents in the building are dark orange.

Building Height Discussion

The original floor-to-floor height of the 5th level was 20 feet. There is also a 5th level mechanical mezzanine, which consists of four air-handling-units, inside of the braced frame core (see Appendix B). However, the new transfer system requires a total depth of 30 feet, which increases level 5 by 10 feet, as well as the total height of the building by 10 feet to 249'-10". The John Jay College Expansion Project is within C6-2 zoning requirements of Manhattan, which has no maximum building height and a maximum setback height of 85 feet. For C6-2 zones, the Sky Exposure Plane (see Figure 49) is defined by a vertical to horizontal distance ratio of 7.6 to 1. At the existing design height of 239'-10", the required setback is approximately 20' and the existing design only provides approximately 15'. Therefore, it is being assumed that a variance was obtained to override this setback requirement or the zoning was changed. This would allow increasing the building height by 10 feet.

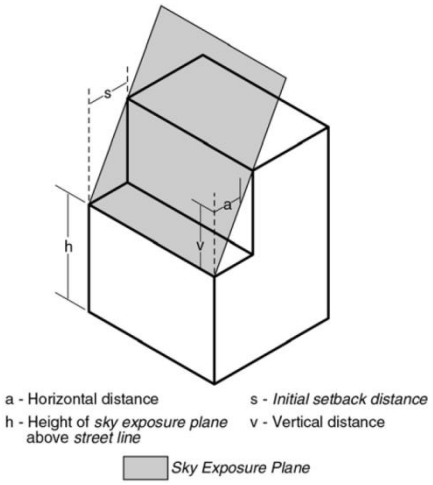


Figure 49 – Sky Exposure Plane

Architectural Plans

The architectural floor plans had to be slightly modified to incorporate the transfer trusses designed for the 5th level. Figure 50a displays the 5th level with the transfer trusses shown in orange. Truss 1 and 4 are the only trusses that span 30 feet from floor-to-ceiling, but they are along the edges of the building, and the floor plan remains open. Therefore, the original goal of permitting the building occupants to circulate throughout the 5th level without obstruction was met.

More architectural changes were made at the 5th floor mezzanine level (see Figure 50b), which was changed from a 10 foot floor-to-floor height to a 20 foot floor-to-floor height. The existing 5th floor mezzanine level has 2 air-handling-units to the East and West of the braced frame core (see Appendix B). To make use of the increased floor-to-floor height for the 5th level transfer trusses, these two air-handling-units were stacked on top of each other in the new 20 foot high mechanical mezzanine space. See Section 3 for a view through the 5th level mechanical mezzanine.

Trusses 2 and 3 span through the building's central core, which created two minor areas of concern. The first area of concern is that the trusses slightly reduce the cross-sectional area of the mechanical ducts running through the core. This reduction in cross-sectional area may cause some velocity problems with the air passing through the ducts, but this problem is not within the scope of this project. It should be noted that this is a consideration which should be examined early in the design process by the mechanical engineer.

The second area of concern is that the truss chords passing through the stairwells reduce the size of the stair landings. Each landing requires a 6 foot radius to be unobstructed for exiting purposes. The horizontal distance between Truss 2 and Truss 3 chords is 24 feet and the horizontal distance required for each stair riser is 10 feet. This allows 7 feet for each landing, which exceeds the minimum requirements.

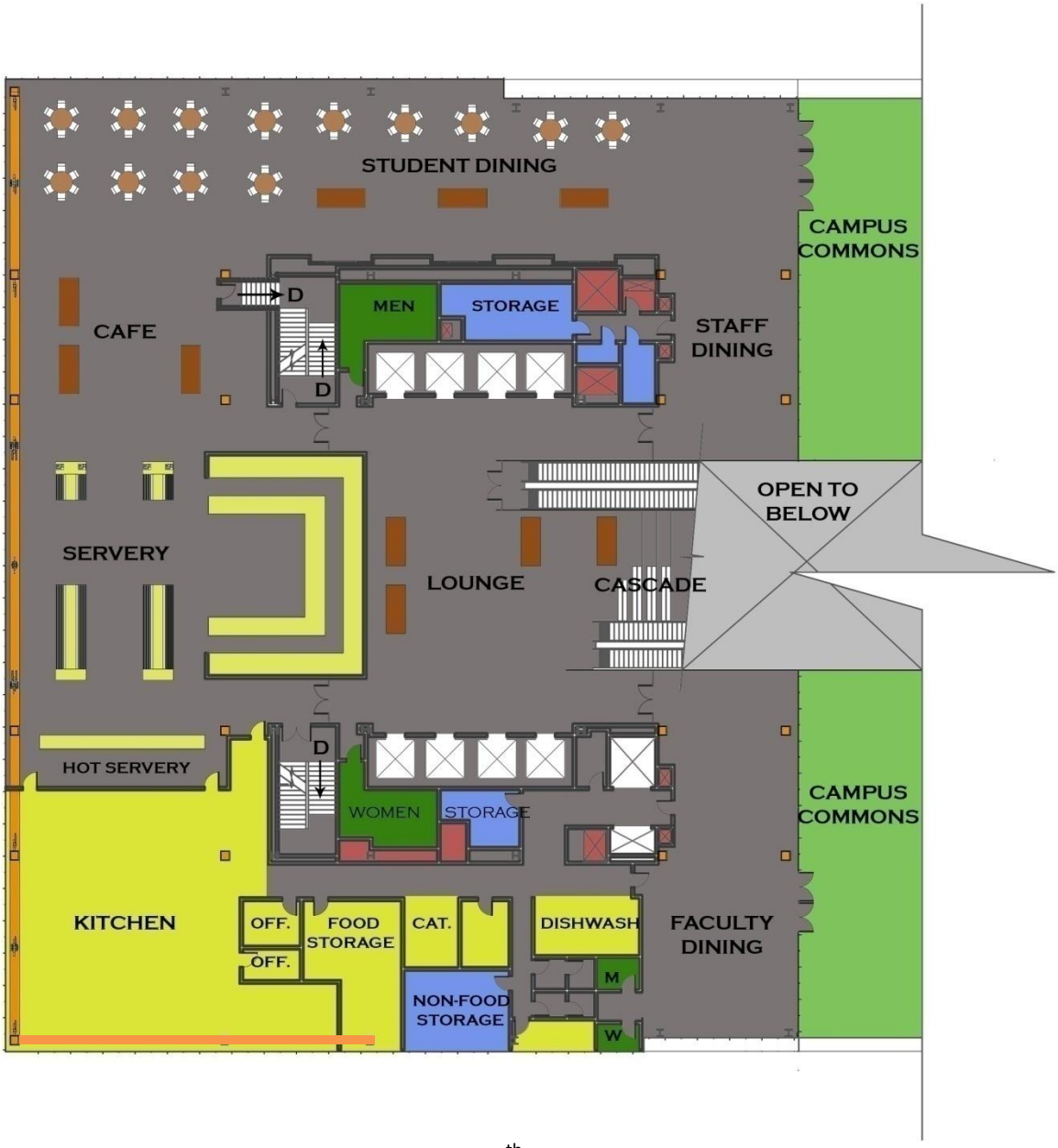


Figure 50a – 5th Level Floor Plan

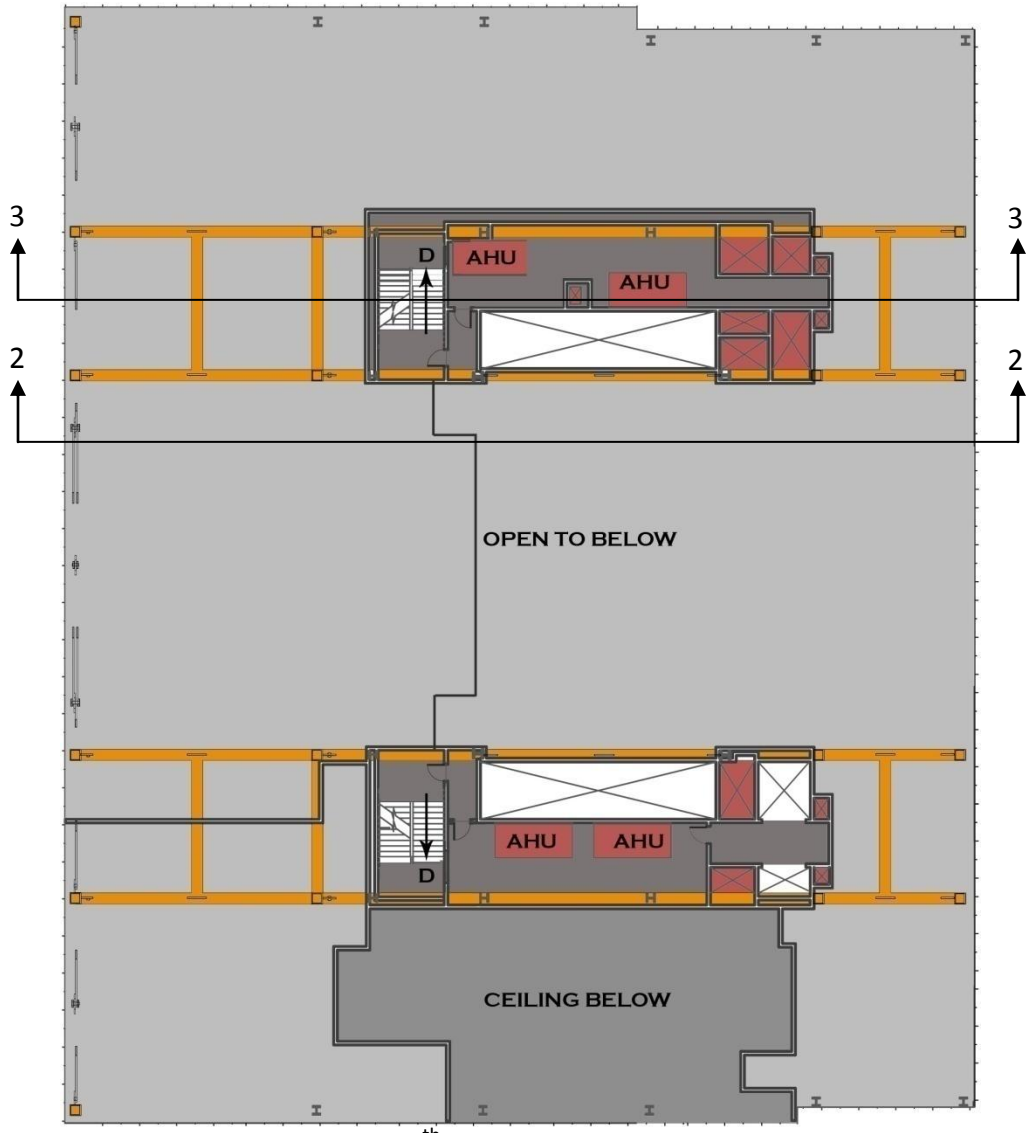
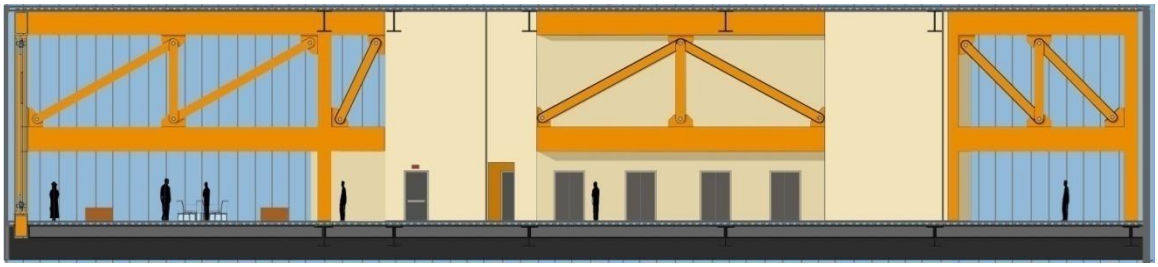


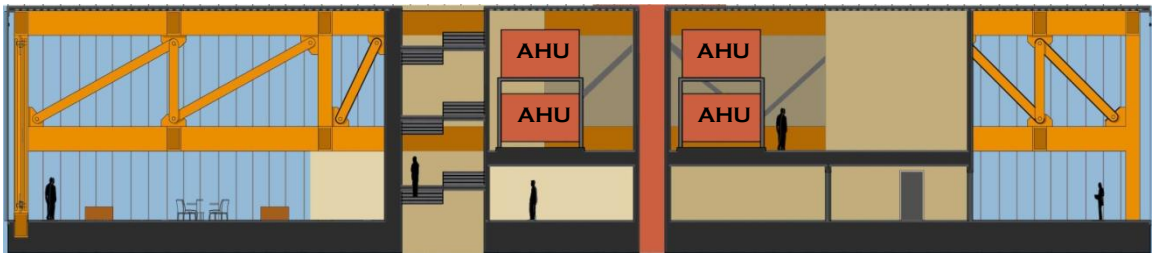
Figure 50b – 5th Level Mezzanine Floor Plan

Building Sections

After adjusting the floor plans of the 5th level and 5th level mezzanine to incorporate the transfer trusses, building sections were created to display how the trusses related 3-dimensionally to the space. Section 2 displays how Truss 3 fits within the architecture of the 5th level. Building occupants are able to pass underneath the truss with ample headroom. It also can be seen that by elevating Truss 2, the openings in the core of the building to access to the elevators, fire exits, and restrooms are avoided. Section 3 demonstrates how the 10 foot increase in floor height will be utilized. Each initial mezzanine had a floor-to-floor height of 10 feet and required 4 air-handling-units. By increasing the floor-to-floor height by 10 feet to a total of 20 feet, the air-handling-units could be stacked on top of each other using steel framing. This would have to be analyzed by the mechanical engineer and is not within the scope of this project.



Section 2 – Looking North Along Truss 2



Section 3 – Looking North Through Core

Renderings

An AutoDesk Revit model of the 5th level was constructed to ensure the trusses fit 3-dimensionally with the space and architecture. Figure 51 displays the points at which renderings were taken from the model.

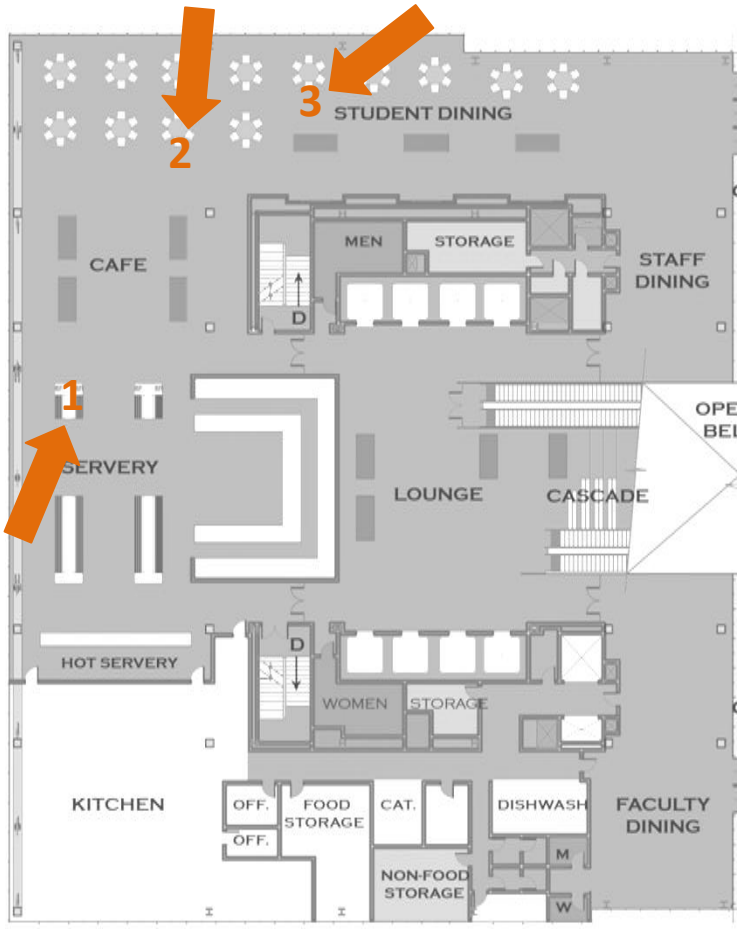


Figure 51 – Rendering Views

Rendering 1

Rendering 2

Rendering 3

The transfer trusses are also visible from the exterior of the building. To further expose Truss 1, the curtain wall was changed by removing the aluminum fins from the West side of the building at the 5th level only. This allows pedestrians from street level to view the trusses. Figure 52 displays the existing expansion project at night and was taken from SBLD Studio. Figure 53 shows the new transfer system with the modified curtain wall.

Figure 52 – Existing Exterior Rendering (From SBLD Studio)

Figure 53 – New 5th Level Transfer System Exterior Rendering

Architectural Breadth Conclusions

The new transfer trusses at the 5th level were successfully incorporated into the architecture of the 5th level. Pedestrian circulation was not disturbed by the interior trusses and the floor plan remains open. The trusses also add a sense of importance to the 5th level of the John Jay College Expansion Project, which is a nice feature because all students will use this space. One could argue that Truss 1 may block the views out of the 5th floor level. However, in Manhattan the view from the 5th floor of a building is typically of another building - and in this case the other building is a factory. After studying the architectural impacts of the new transfer system, it is still a possible option.