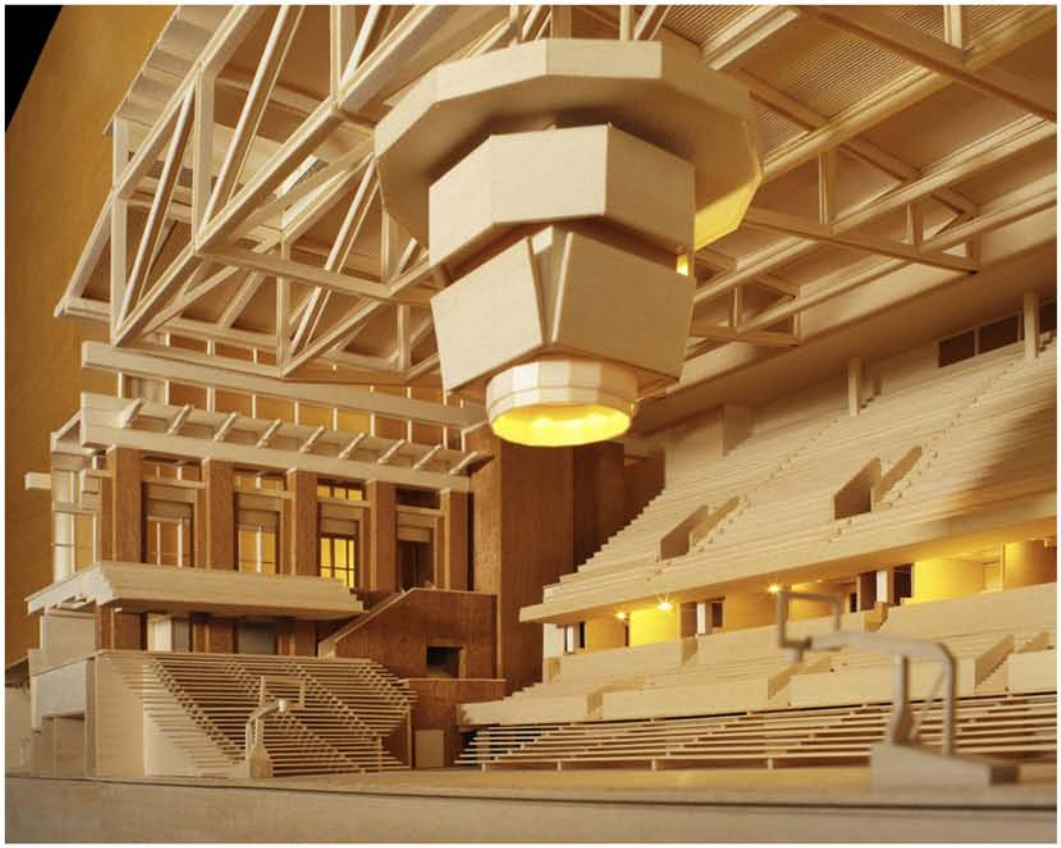
JOHN PAUL JONES ARENA

CHARLOTTESVILLE, VIRGINIA



LOGAN BROWN

LIGHTING / ELECTRICAL OPTION

TECHNICAL REPORT ONE:

LIGHTING EXISTING CONDITIONS & DESIGN CRITERIA

OCTOBER 6, 2008

ADVISOR: DR. RICHARD MISTRICK

LIGHTING EXISTING CONDITIONS & DESIGN CRITERIA REPORT

EXECUTIVE SUMMARY

The John Paul Jones Arena on the campus of The University of Virginia has a lighting system that mimics the grandiose and monumental colonnade that gives the building its identity. Through various interior spaces and environments, the architects were able to create a space that feels comfortable and functional, yet at the same time compliment the sheer size and impact the building has on the surrounding campus.

The lighting design accentuates and enhances the exterior features while providing for the occupants on the interior by guiding them through the space and giving them a visually articulate experience.

Tech Report One is used to discuss the existing conditions that make up the John Paul Jones Arena and how an analysis of these systems reveals the IESNA criteria used in the designing process. The report also presents a critique of four designated spaces and how well each one follows these criteria through their design, layout and overall connection to the building as a whole.

TABLE OF CONTENTS

PART ONE: EXISTING CONDITIONS

OVERALL BUILDING DESCRIPTION:

The John Paul Jones Arena, situated on the campus of The University of Virginia, is a perfect match between the classic architectural style founded by Thomas Jefferson over 200 years ago and the modern amenities of a top-of-the-line performance venue. One enters the arena through a monumental colonnade accented by 16 Doric style columns covered by a pergola style roof system. After passing through the entrance, the lobby and upper concourse level become visible. This large opening allows the spectator to get a sneak peek into the court area, yet at the same time create a bit of mystery as to what lies beyond.

As one moves around the concourse, there are team shops, numerous concession stands, restrooms and executives suites. Across the arena from the main entrance is the second most important architectural feature, an elevated terrace with another colonnade that mimics its monumental counterpart. This feature is rare to see in an arena because it allows an increased level of exterior lighting into the actual court and seating area. The theme of bringing the outside in is one that is successfully achieved in the JPJ.

The arena is broken up into 3 main floors: the event level, which is where the court and team locker rooms are located; the lower concourse, which has an athletic dining room and the Hall of Fame museum and finally the upper concourse, which is the main level of entry through the colonnade and where access to all the seating is located.

Most of the spaces throughout the building are more than a standard floor height which eliminates the use of indirect lighting. The majority of luminaires are direct recessed or surfaced mounted, with the lamping either compact fluorescent or metal halide. The lighting design is one that tries to take the dullness away from the grey concrete structure and give it live and create an inviting feel to all those who enter the space.

LARGE WORK SPACE: ACADEMIC CENTER, READING ROOM

Description:

The academic center is located on the event floor and faces the western elevation. It is broken up into multiple spaces including individual study rooms, tutor rooms, offices, a classroom and the reading room. The reading room is approximately 12' x 40' with exact dimensions being hard to figure out due to the curved exterior wall and spaces being broken up into irregular shapes. The main entrance is situated on the northern side of the building right outside of the elevator lobby. It is an open floor-plan located in the center of the academic center surrounded by the offices and tutor rooms. The space is broken up with tables and chairs that allow for individual or group tasks. It is also used as a circulation space due to the surrounding spaces on the perimeter of the space.

There is no direct light from the exterior because the event level is located below grade. The entire space is artificially lit by fluorescent fixtures.

Drawings:

Available in Appendix 1.1

Surface Materials:

Wall A (East Wall): Is an interior wall that separates the reading room from the offices behind and breaks up the open plan. It is a painted (material PT-21) plastic glazing assembly over a steel stud support. There is a steel sign located on the lower half of the wall toward the center of the room.

Wall B (South Wall): This wall is broken up with an opening for a study area. It is finished with two different paint colors (PT-21, PT-24) and opens to a wall finished in wooden panels.

Wall c (West Wall): The West wall is the most interesting of the entire space. It is the wall that houses the individual tutor rooms. Each of the room's walls alternates between an etched glass (GL-1) and clear glass (GL-2). Above the doors there is painted wood veneer (PT-23)

Wall D (North Wall): Is a common wall for the academic center that the reading room uses. It is painted (PT-20) gypsum board over a metal stud support system.

Floor: The entire floor is stained concrete (STC-3).

Ceiling: The ceiling is painted gypsum wall board (PT-21) over the reading room, with parts of the academic center being exposed.

A material schedule and description is located in Appendix 4.1.

Lighting Hardware:

The reading room is lit by two types of fixtures, Circular down-lights and direct linear luminaires. The down-lights (fixture F2) are 32W triple tube compact fluorescents with a low iridescent finish to eliminate rainbowing. They are recessed in the ceiling grid. The Direct fixtures (fixture J6) are pendant mounted over the tables and spaced evenly with the down-lights mixed in-between. They have a satine acrylic lens with a silver finish. Each pendant has (1) 54W T5HO lamp.

A luminaire schedule is located in Appendix 2.1

Furniture:

The space is furnished with typical chairs and tables that would be found in a typical classroom. There is custom cabinetry along the peripheral walls with lounge style chairs located sporadically throughout.

SPECIAL PURPOSE SPACE: ATHLETIC DINING ROOM

Description:

The dining room is located on the lower concourse on the western side of the building facing the western elevation. It is positioned right above the academic center and reading room. The entrance is on the northern side of the room right off of the elevator shaft. The Dimensions of the reading room are around 26' x 30' with exact measurements being hard to get due to cutouts, open vestibules and spatial irregularities around the perimeter of the room. The entrance leads into a reception desk that has a corridor leading to the dining room bathrooms behind. There are service storage closets that line the western wall that lead into a servery and beverage bar on the southwestern wall. Along the curved eastern wall is a projection screen that comes down from the ceiling. Exit vestibules are located on either side of the curved wall. There are no windows on the western wall due to the lower concourse level being under grade. The ceiling is made up of a pattern that mimics the carpet layout throughout the space. It consists of a low soffit at 10' with the actual ceiling height being at 11'-6". The lowest part of the ceiling, 9'-6", is on the eastern wall directly behind the projection screen. Among the open floor plan there are four structural concrete columns that go through the ceiling at the 10' soffit level.

Drawings:

Available in Appendix 1.2.

Surface Materials:

Walls: There is a combination of paint colors (PT-16, PT-17) throughout the entire space. There is no pattern to which walls are painted which color, but the majority of the western and eastern walls are PT-17 with the other two walls being PT-16.

Floor: The pattern on the floor is designated by the varied materials that mimic the soffit layout overhead. The large inner trapezoids are a multi-colored carpet (CPT-13) with the infill being a blue carpet (CPT-14). Around the outside of the room and at the reception area is a wooden cherry vinyl flooring material (VF-1).

Ceiling: A combination of painted gypsum (PT-6) and acoustical tiles (ACT-3) make up the various surfaces of the ceiling. The highest parts are the gridded ceiling and the lower ones are the painted gypsum.

A material schedule and description is located in Appendix 4.1.

Lighting Hardware:

The Dining area is lit by two different types of recessed compact fluorescent down-lights. The high ceiling areas in the middle of the space over the eating area are lit by (2) lamp 42W triple tubes housed in a low iridescent, low profile luminaire (FIXTURE F7). The other luminaire (FIXTURE F2) is the same one that is used in the reading room. This luminaire is used heavily over the reception area, in the front of the room near the eastern wall and in the back of the space recessed in the higher ceilings over the service storage.

A luminaire schedule is located in Appendix 2.2.

Furniture:

Actual furniture schedule for the dining room are not available, but it is assumed that it will be furnished with typical restaurant furniture and accessories. Wooden tables and chairs make up the majority of space in the middle of the room with wooden cabinetry on the periphery for storage. There will also be metal serving carts / trays that are used from time to time during events and parties.

CIRCULATION SPACE: WEST ENTRANCE LOBBY

Description:

The Main entrance lobby to John Paul Jones arena is the first interior space that spectators will experience while attending an event. It is located on the western side of the building through a large colonnade that defines the entrance. Once through the large glass doors, there is nearly a 3-story opening that welcomes the occupant. Large windows above the doors continue the use of glass and help to bring light into the space and create an idea of bringing the outdoors in. This theme is something that most indoor arenas are unable to achieve due to their large size and need to take up exterior surfaces for structural support. The lobby is the central circulation space that filters everyone to other parts of the arena. It that has an entrance to the University of Virginia team store, access to the ticket sales booth and most importantly an entrance to the court and seating areas. In the center of the lobby are six large concrete columns that help to support the upper level seats. It mimics the exterior colonnade and adds to the theme of bringing the outdoors in. The main attraction of the lobby is a large university logo that sits in just past the entry doors. To either side of the logo are corridors that take spectators to other areas of the arena through signs that are placed overhead.

Drawings:

Available in Appendix 1.3.

Surface Materials:

Wall A (East Wall): The wall that everyone sees as they enter the space is comprised of a cmu style wall system (CMU-1). It is a main interior wall and continues all the way around the inner concourse.

Wall B (South Wall): This wall contains the entrance to the team store and has a pattern of a basketball painted on gypsum wall board (PT-1).

Wall C (West Wall): The western wall is the interior side of the entry. It consists of brick (BR-1) columns made from the same style of brick prevalent throughout the rest of the campus and painted gypsum wall board (PT-5). There is also a metal canopy that hangs over the entry doors and protrudes into the lobby.

Wall D (North Wall): The wall mirrors that of the south wall. Except instead of an entrance to the team store, there is a window into the ticket sales office. It is a

PAINTED GYPSUM WALL BOARD (PT-1) WITH A BASKETBALL PATTERN INSCRIBED ON IT.

FLOOR: THE FLOOR OF THE ENTRY IS SPLIT BETWEEN TWO TYPES OF TERRAZZO TILE. THERE IS A 'V-SHAPE' AS THE SPECTATORS ENTER THE SPACE WITH THE CLOSEST AREA BEING DARKER (TZ-2) AND THE MAJORITY OF THE REST OF THE SPACE, INCLUDING SOME OF THE CONCOURSE BEING THE LIGHTER COLOR (TZ-1).

CEILING: SINCE THIS IS THE ENTRY AND GOES UP 3-STORIES, THE MATERIAL IS THE UNDERSIDE OF THE UPPER LEVEL SEATS. THE CONCRETE IS PAINTED (PT-6) AND THE REST OF THE SPACE IS EXPOSED.

A MATERIAL SCHEDULE AND DESCRIPTION IS LOCATED IN APPENDIX 4.1.

LIGHTING HARDWARE:

THE LOBBY IS ONE OF THE MOST IMPORTANT SPACES OF THE ARENA, THUS IT HAS NUMEROUS AMOUNTS OF LUMINAIRE TYPES. THE MAJORITY OF THE LUMINAIRES ARE METAL HALIDE DOWN-LIGHTS EITHER RECESSED IN THE CEILING OR SURFACE MOUNTED. THESE METAL HALIDES ALL HAVE CCT VALUES BETWEEN 3000K AND 3500K. THE OTHER TYPE OF LUMINAIRE IS A COMPACT FLUORESCENT DOWN-LIGHT. THE INTERIOR CANOPY (FIXTURE D5) HAS RECESSED LUMINAIRES WITH A SYMMETRICAL DISTRIBUTION AND A TEMPERED GLASS FINISH TO EASE THE SPECTATOR INTO THE SPACE FROM THE EXTERIOR. THE LOBBY THEN OPENS UP INTO THE TALLEST AREA IN THE ARENA AND IS LIT BY A RECESSED METAL HALIDE (FIXTURE M5) LUMINAIRE WITH A LOW IRIDESCENT FINISH. THIS LUMINAIRE ALSO LIGHTS THE INLAYED LOGO ON THE FLOOR. ONCE THE SPECTATOR GETS PAST THE COLUMN LINE, THERE IS A LARGER, MORE POWERFUL SURFACE MOUNTED METAL HALIDE DOWN-LIGHT (M8). THIS LUMINAIRE HAS A CLEAR SPECULAR FINISH AND IS CAST ALUMINUM. THE (M8) LUMINAIRE IS INTERMIXED WITH ANOTHER LUMINAIRE (M9) THAT HAS A RESTRIKE TIME DELAY OPTION.

A LUMINAIRE SCHEDULE IS LOCATED IN APPENDIX 2.3.

FURNITURE:

THERE IS NO SPECIFIC FURNITURE IN THIS SPACE DUE TO IT BEING A HEAVY CIRCULATION AREA.

BUILDING FAÇADE: WEST ELEVATION

Description:

The west exterior elevation is the most prominent feature of the John Paul Jones Arena. There are 16 Doric style columns that mimic the style and architectural theme of the University of Virginia campus. The initial campus was designed by Thomas Jefferson and the architects have done everything in their power to honor the traditions of one of the oldest schools in the nation as well as one of our founding fathers. The columns are stepped away from the front of the building and topped with a pergola like structure. Each column is 30' tall and weighs close 21,000 pounds. The exterior is also comprised of close to 600,000 "old-Virginia" style bricks, while at the same time being able to incorporate a modern touch with metal curtain wall systems.

Drawings:

Available in Appendix 1.4.

Surface materials:

The exterior is comprised of a mixture of finishes. There is an off-white stucco (STUCCO), the majority of the building is covered in the 'Old-Virginia' style brick (BR-1), metal wall panel systems (MTL1, MTL-2) that surround and accent most of the glass around the building and sealed concrete columns (SL-3) that make up the colonnade at the entry.

A material schedule and description is located in Appendix 4.1.

Lighting Hardware:

There are three types of luminaires used on the exterior façade of the arena. One is a recessed metal halide (FIXTURE M17) that is mounted on the underside of each horizontal member of the pergola above the columns. It is a 100W PAR38 spot in a black painted baffle. The other metal halide luminaire is located on the underside of the main exterior entry canopies. It is similar to the metal halide down-lights used in the entry lobby. The last type of luminaire used is a recessed compact fluorescent down-light that accent the secondary entry canopies to the left and right of the main canopies.

A luminaire schedule is located in Appendix 2.3.

PART TWO: DESIGN CRITERIA / CONSIDERATIONS

ACADEMIC CENTER, READING ROOM:

This space will be primarily used as a general educational facility (reading, writing, paper tasks).

IESNA Very Important Criteria:
- Reflected Glare
- Horizontal Illuminance: Category D (30 FC)

IESNA Important Criteria:
- Daylighting Integration and Control
- Direct Glare
- Flicker (and Strobe)
- Light Distribution on Surfaces
- Luminances of Room Surfaces
- Point(s) of interest
- Source / Task / Eye Geometry
- Surface Characteristics

IESNA Somewhat Important Criteria:
- Appearances of Space and Luminaires
- Color Appearance (and Color Contrast)
- Light Distribution on Task Plane (Uniformity)
- Modeling of Faces or Objects
- Shadows
- System Control and Flexibility

ASHRAE / IESNA 90.1 Standards:

Table 9.6.1 allows for a light power density of 1.4 W/ft² for a classroom / lecture / training space. If necessary, an additional 1.0 W/ft² can be applied to the design for any decorative lighting that may be used.

Discussion:

The IESNA criteria provide recommendations for the way spaces should be lit based on the tasks being performed, the environment that needs to be set and the overall general logistics for how a space is laid out. Although they are recommendations, certain items may be need to be looked at in more depth depending on the space and context in relation to surrounding areas. For an academic center, but more specifically a reading room, the most important criteria are related to the distribution of light across the horizontal surfaces, the glare and reflections that occur due to materials and surface characteristics and the relationship of the light source to task plane.

The reading room in the JPJ arena is at the heart of the academic center and acts as a connection between offices, study rooms and a classroom. This makes it a rather important space that needs to be uniformly lit with limited shadow and visual discomfort. A level of 30 FC (horizontal) should be met in order to accomplish all the tasks on the work plane and assure uniformly distributed light throughout the space. The color appearance of the space should be uniform due to the openness of the floor plan and importance of visual tasks. Visual clarity is a key factor when it comes to an academic center. A warm CCT would be ideal because it creates a relaxed environment that at the same time allows for work to be done. Because of the level of work that is accomplished on in the space, the eye-task geometry is important. Luminaires should be placed in relation to the desks as to create no overhead shadows or veiling reflections on the work plane while at the same time limiting the glare from surrounding surfaces. They should be spaced evenly as to not create visual discomfort when it comes to the hierarchy of the space. Their appearance does not need to be the focal point of the space, just one that accomplishes the goals of the reading room while at the same time being appealing to the eye. The direct glare from the luminaires should be low due to the majority of the space being lit by downlights and a direct pendant fixture.

Dealing with the modeling of faces and other vertical tasks is important to the space because of group work, tutoring and face-to-face communication. A uniform level of vertical illuminance, around 5 FC, should be planned into the design. The luminance of the room surfaces will need to be looked at in order to account for the dark painted walls and how the stained concrete floor will deal with the amount of direct light that is present in the room. The controls for the space should be varied enough to deal with amount of people in the room at one time and to account for the tasks that occur during the day. Creating a setting that allows for movement through the space while no one is using the tables is important, but at the same time being able to control part of the room for task plane usage when there are only a few occupants.

Since there are no windows in the space due to it being located below grade, dealing with daylighting is not an issue because the space is entirely artificially lit. There are no real points of interest throughout the reading room other than the etched glass walls that are at the

rear of the study rooms on the western wall. This allows for a limited need for accent or focused lighting.

ATHLETIC DINING ROOM:

This space will be used primarily as a dining service facility.

IESNA Very Important Criteria:
- Color Appearance (and Color Contrast)

IESNA Important Criteria:
- Appearance of Space and Luminaires
- Direct Glare
- Point(s) of Interest
- System Control and Flexibility

IESNA Somewhat Important Criteria:
- Daylighting Integration and Control
- Light Distribution on Surfaces
- Light Distribution on Task Plane (Uniformity)
- Modeling of Faces or Objects
- Sparkle / Desirable Reflected Highlights
- Horizontal Illuminance: Category C (10 FC)
- Vertical Illuminance: Category A (3 FC)

ASHRAE / IESNA 90.1 Standards:

Table 9.6.1 allows for a light power density of 1.4 W/ft² for a dining Area – bar lounge / leisure dining. If necessary, an additional 1.0 W/ft² can be applied to the design for any decorative lighting that may be used.

Discussion:

The athletic dining room located on the lower concourse level is one of the most dynamic spaces in the JPJ arena. It accounts for a lot of heavy traffic and continual usage. This space is used before, during and after each game or event to feed the players, celebrities and boosters for the university.

It is important for this space to be well lit and come off as one of the more professional looking areas around the arena. One of the most important criteria is selecting a proper CCT to account for the varying uses. A warm CCT with a high CRI would be ideal to create a space that is inviting and has a uniform level of visual clarity without creating any visual contrast. A high CRI will allow for people to see each other in the best possible way for face-to-face communication, while also putting an emphasis on the floor space through a mixture of vinyl-wood flooring and University of Virginia themed colored carpet. To account for the face-to-face aspect of the room, a vertical illuminance level of 3 FC should be sufficient in the design. An analysis of the

control system and its flexibility is important to take into consideration because there is a projection screen located on the eastern side of the room. Being able to account for high volumes of traffic and eating at the work plane is a very different lighting scenario when compared to dealing with a dark room for movie projection. The projection setting will have to give enough light on the periphery to allow for occupant traffic, but at the same time limit the glare and veiling reflections on the screen as to not take away from the presentation. There are also numerous flat screen televisions located around the room that will have to be accounted for when it comes to lighting the walls and exterior of the space.

One of the major architectural features of the space is the varied level of the ceiling grids. The ceiling ranges in height from 8'-6" to 11'-6". This is pivotal to consider during the design because a uniform level of light is important on the task plane, as well as on the other surfaces around the room. The space is for eating and the food should look as good as it can under a compact fluorescent lighting system. A horizontal illuminance level of around 10 FC would be suggested for the task plane.

The appearance of the space according to the IESNA is important, but since there are no pendant fixtures and every fixture is recessed in the ceiling, only the finishes and coating of the housings will need to be looked at closely. With the fixtures being recessed and primarily downlights, direct glare should be considered and designed for, but will not really be an issue unless a lamp is aimed improperly or an incorrect fixture finish is selected. There are a few points of interest that need to be designed for. A reception desk at the entrance is important to put emphasis on to direct occupants toward as they are initially introduced to the space. It is also important to put focus along the western wall because that's where the food service located and when needed, put a focus on the projection screen.

Since the space is again located below grade like the reading room, the integration of daylight and the controls will not need to be designed for.

WEST ENTRANCE LOBBY:

This space is going to be considered a museum – lobby / general gallery area / corridor because of the points of interest (trophy cases, concession stands and hall of fame space) located in close proximity to the entry vestibule. It is also important to use these criteria because of the amount of walking that takes place around the arena.

IESNA Very Important Criteria:

- Appearance of Space and Luminaires
- Daylighting Integration and Control
- Points(s) of Interest

IESNA Important Criteria:

- Modeling of Faces or Objects
- Surface Characteristics
- Horizontal Illuminance: Category C (10 FC)
- Vertical Illuminance: Category A (3 FC)

IESNA Somewhat Important Criteria:

- Color Appearance (and Color Contrast)
- Direct Glare
- Flicker (and Strobe)
- Light Distribution on Surfaces
- Light Distribution on Task Plane (Uniformity)
- Luminances of Room Surfaces
- Source / Task / Eye Geometry
- System Control and Flexibility

ASHRAE / IESNA 90.1 Standards:

Table 9.6.1 allows for a light power density of 3.3 W/ft² for a lobby – Performing Arts Theater. This is because there are performances that occur in the arena throughout the year and may require varying light levels depending on the intended audience for the show. If necessary, an additional 1.0 W/ft² can be applied to the design for any decorative lighting that may be used.

Discussion:

Aside from the main gymnasium and court area, the entrance lobby is the most important space that people will first see when they enter the JPJ arena. Thus it is important to look closely at all the design criteria.

The appearance of the space and the luminaires is one of the most important things to look at. The lobby space is nearly three stories tall, so a fixture needs to be selected that can adequately light the floor with a level of 10 FC, while at the same time set an appearance

of the space that is inviting and relaxed. The majority of fixtures over the main part of the entry lobby are metal halide with a CRI between 3000-3500k. There are compact fluorescents right as one enters the space to create a lighting hierarchy that draws the visitors through the space toward the main gym area. Another important aspect of the entrance is the curtain wall that makes up the entire western wall. This will be pivotal in the design of daylighting and control systems. Because the architects of the space want to say they 'brought the outside in' in a space that does not usually account for exterior light, daylighting will be a strong criteria for events and performances that occur early in the day. Once darkness falls on the arena, the fixtures need to be able to cover the light that is being brought in from the daylight. The last main criterion to design for is dealing with points of interest that are present in the space. There is a large university emblem embedded in the middle of the lobby that is the main focal point and needs to be lit with uniformity and shown its prominence within the space. Along the exterior of the space is the entrance to the team store and a ticket window that both require uniformity and some type of visual distinction from the surrounding spaces.

One important criterion to look at is the light distribution on the task plane. Since walking is the main task of the space, the floor needs to be uniformly lit and not have dark spots that could be considered a hazard to occupants. The lights should be able to create movement through the space as to draw people around the arena and to the concession stands and other areas that surround the court. The floor is a combination of terrazzo tile which would possibly create glare and visual discomfort if incorrect lamps are chosen. Terrazzo tile is a reason that color appearance and color contrast is important to look at it. The space is vibrantly colored and if it is lit incorrectly could take away from the overall appearance of the space and make it less inviting. Color contrast should be covered in the fact that most of the lights are metal halide in the main area and the compact fluorescents are kept to the immediate entry area.

Controlling the system is not really an issue because the space is used primarily for walking and traffic flow. If there was to be an event held here, there may need to some alternative controls to set a more relaxed and personal feel, but the main purpose to move people from one area to another. This setting may be required to

HAVE A LEVEL OF VERTICAL ILLUMINANCE CLOSE TO 3-5 FC TO ENSURE AN ADEQUATE AMOUNT OF LIGHT FOR FACE-TO-FACE COMMUNICATION.

OVERALL THE SPACE NEEDS TO BE LIT WITH UNIFORMITY AND VISUAL CLARITY AS TO ALLOW THE OCCUPANTS TO MOVE EASILY THROUGH THE SPACE, WHILE AT THE SAME TIME PUTTING PROMINENCE ON THOSE OBJECTS THAT NEED TO STAND OUT.

WEST ELEVATION:

This space is categorized as a building exterior – prominent structure because of the importance of the colonnade as a focal point and its relation to the overall campus theme.

IESNA Very Important Criteria:
- Appearance of Space and Luminaires
- Light Distribution on Surfaces
- Light Pollution / Trespass
- Point(s) of Interest
- Reflected Glare
- Shadows
- Source / Task / Eye Geometry
- Surface Characteristics
- Vertical Illuminance: Category A (3 FC)

IESNA Important Criteria:
- Color Appearance (and Color Contrast)
- Direct Glare
- Modeling of Faces or Objects
- Horizontal Illuminance: Category B (5 FC)

IESNA Somewhat Important Criteria:
- Peripheral Detection
- Sparkle / Desirable Reflected Highlights

ASHRAE / IESNA 90.1 Standards:

Table 9.4.5 allows for a light power density of 0.2 W/ft² for a building façade or 5.0 W per linear foot for each illuminated wall. It also states that on building grounds, walkways 10' wide or greater / plaza areas are allowed 0.2 W/ft². Building entrances and exits at main entry points are granted 30 w per linear foot of door width.

Discussion:

The exterior façade is the focal point for the JPJ arena. It stands out due a large colonnade and the use of "Old Virginia" style red bricks that are prevalent throughout the rest of the campus. These features make the lighting design very important as to convey the feelings and emotions of the university.

IESNA lays out very important design criteria that are necessary to the design of this space. The appearance of space and the luminaires are important because they do not want to detract from the overall look of the pure white columns and brick façade. But the space at the same time needs to be lit well enough to assert the

dominance and show the magnitude to which the architects were trying to achieve. This is done by ensuring a uniform light distribution on all surfaces, with a vertical illuminance around 3 FC and limiting the shadows that occur from the overhanging roof members. Shadows are one of the hardest things to design for and need to be taken care of during the aiming and placement phase of design. By limiting the shadows, the façade can take on a whole new appearance and create a strong visual.

Creating an appearance with clean lines and uniformity through a system of spot lights with a mid-range CRI (3000-3500K) to match the interior lighting system. The last very important criterion that deals with the façade is taking into account the points of interest that accent the exterior. There are two spaces that need to stand out and not take away from the overall exterior: the ticket window and the entry doors. Each space needs to be lit with proper horizontal illuminance (5 FC) on the task planes in order to allow for the occupants to use the space properly without visual discomfort or glare. Fixtures need to be placed to limit reflected glare from the curtain wall and the direct glare from any other overhead fixtures in the peripheral of the user.

Color appearance and contrast are important to look at because the design specifically calls out the use of a brick color from around campus. The color of the brick needs to match all the others and create a visual unity from building to building. The large white columns also require a proper CRI due to the relation of the arena to the first building built on campus, the library. A strong colonnade is a focal point to all the major buildings on campus.

Light trespass needs to be designed for and looked at because it can detract from any exterior, but since the arena is located in an area on campus by itself, there is limited trespass from surrounding buildings. And due to the majority of the exterior being downlit, the light pollution is negligible.

PART THREE: ANALYSIS OF EXISTING SYSTEM

OVERALL BUILDING:

The general building lighting system is one that appears to be pretty standard and uniform due to the amount of compact fluorescent and metal halide fixtures. The large public spaces are all lit by metal halide fixtures that create a sense of unity because the fixtures are not changing lamp type or CRI. Compact fluorescents can be seen in the majority of private rooms and other areas beside the main corridors and circulation spaces. The combination of these two systems creates uniform CRI values and an overall feeling of the building being relaxed.

From the exterior to the interior, there is uniformity through the similarity in lighting systems and applications. Downlights are very common due to the high ceilings and need for light on the horizontal surfaces. These systems also allow for certain desired vertical illuminances to be achieved.

Each space throughout the arena is designed to account for its own purpose. From private boxes that require a more enriched and classy feel, to a practice gym that requires functionality over appearance and even a hall of fame museum that is designed to show off the accolades and progress of a college over the past 200 years.

ACADEMIC CENTER, READING ROOM:

The design of the academic center is one that is successful in dealing with the rigors of planning for reading and writing at the task plane. The overall illuminance values are within the IESNA criteria, with the max / min values being a bit off because of the direct downlight pendants used over the tables. The current level of light on the task plane is 36.45 FC, with the desired being around 30. This high value is due to one hot spot per each fixture that skews the final values.

The values for illuminance may change due to light trespass from the surrounding corridors and spaces, but overall the reading room does a good job of lighting for the desired tasks. A series of control experiments could be used to see how the space would look under different uses and how they relate to the appropriate illuminance levels.

The recessed downlights are successful in providing uniformity on the floor of the space because it also acts as a circulation space for the academic center. They also do a good job of highlighting the varied wall types and glass partitions that are a part of the tutor spaces along the west side of the reading room.

Color temperature and color contrast are adequate for the required usages of the space. The compact fluorescent downlight and pendant fixtures give enough light to all the surfaces and features.

The choice of fixtures for the space reflects the theme of learning and progress. There is nothing fancy about what is done in the space, it is a space meant for work and collaboration. The fixtures do not detract from the learning environment that is achieved through the systems.

ATHLETIC DINING ROOM:

The overall feel of the dining room is successful, but could be done better. The spacing of the luminaires creates various scalloping and irregularities along the exterior surfaces and throughout areas on the floor. This may be a result of the strict use of downlight in the space or just because the placement is erratic and non-uniform.

The illuminance levels of the room are a bit high for the IESNA criteria. A designed level of 10 FC would be ideal, but the actual for the space is 34.6 FC. This is due to the lamps not being on a dimmed control and putting out their full output. The space could possibly use some pendant fixtures and a more indirect/direct feel then strictly downlight. There is not much room for variations among the system. With the system that is in place currently, it would be very difficult to properly light the space for use of a projection screen. A varied control system needs to be implemented to adequately handle the project system.

With the system being totally compact fluorescent, the vinyl wood flooring that is used as a complement to the carpeting may not be fully realized. Wood requires a high CRI and warm CCT that may be not be able to be achieved due to the fluorescent lamping.

There needs to be more emphasis placed on the entry and reception area for the space. The kiosk that is located by the doors does not have any accent or focal lighting to make it stand out. This space is all about calling out the important features that have been designed: projection screen, flat-screen televisions and the service areas. More emphasis should be on the periphery of the room to allow for the service spaces to be adequately lit as well as taking into account lighting the televisions as to not create a glare or veiling reflection.

A visual hierarchy needs to be established to showcase the varied ceiling heights and break up the space into different regions based on those heights. It is a strong architectural feature that gets lost through the consistent use of recessed downlights.

WEST ENTRANCE LOBBY:

The lobby does a good job of creating movement and a lighting hierarchy through the space. As one enters the area, the space is lit by compact fluorescents, but as they move through and toward the court, the lighting turns to metal halide and higher ceilings. The movement pulls the occupant through the space and begins them on the path to either their seats in the gym or to the concession stands that line the concourse levels.

The curtain wall system is not directly lit, but at night the spill from the exterior spot lights and downlights add to the glow of the space. It is hard to tell the difference between exterior and interior when standing in the lobby. The design does a good job of coordinating the spaces and making a seamless transition from one to the other. This creates little strain on the occupant and achieves the visual uniformity and comfort set out by the IESNA considerations.

Since computer analysis was not done on the lobby, it would be interesting to see if the required light levels were met in the design. Due to it being such a large space with metal halide fixtures, the actual values should be close to the design values.

The focal points of the lobby are lit well and not so well. The main logo in the center of the lobby is lit by 6 downlights that are setback in a circular cove that sits at directly above. Along with the logo, the ticket window and team store entrance are not properly lit. Some type of system needs to be installed to put focus on these areas. It just adds to the dimension of the lobby and makes it a space that is useful – yet practical.

WEST ELEVATION:

The lighting on the elevation is very successful in making it a monumental structure and accenting the colonnade, while at the same time making it inviting to all those who come up to the exterior. The match of color temperature from interior to exterior is the main reason everything looks so coherent. It is a nice comparison between the circulation inside and the clean, yet strong lines of the exterior.

There could be more light focused on the ground plane for walking and approaching the arena. This may detract from the strong statement of the all white columns, but in the sense of safety it is required.

Even though the entry is not uniform due to an exterior ticket booth and the entrance doors, the way each is lit does not take away from the exterior. It shows that there are important features that need to be accented without putting the focus on each one individually.

One change that could be made to the exterior would be to add an application that changes the color of the façade lighting. Although strictly for visual appeal, it could enhance the exterior and give an insight to people passing the arena what type of event or performance is going on inside.

PART FOUR: RELEVANT COMPUTER FILES

All files are located on the cd-rom that accompanies the written report under the 'relevant computer files' folder.

CAD DRAWINGS:

A101C – FLOOR PLAN EVENT LEVEL QUAD C
A103B – FLOOR PLAN LOWER CONCOURSE QUAD B
A103C – FLOOR PLAN LOWER CONCOURSE QUAD C
A104B – FLOOR PLAN UPPER CONCOURSE QUAD B
A104C – FLOOR PLAN UPPER CONCOURSE QUAD C
A201C – RCP EVENT LEVEL QUAD C
A203B – RCP LOWER CONCOURSE QUAD B
A203C – RCP LOWER CONCOURSE QUAD C
A204B – RCP UPPER CONCOURSE QUAD B
A204C – RCP UPPER CONCOURSE QUAD C
A301 – ELEVATIONS
A716 – ENLARGED PLAN ACADEMIC CENTER
A790 – FLOORING MATERIAL PLAN LOWER CONCOURSE
A793 – FLOORING MATERIAL PLAN UPPER CONCOURSE
A817 – INTERIOR ELEVATIONS
A827 – INTERIOR ELEVATIONS LOWER CONCOURSE LEVEL
A828 – INTERIOR ELEVATIONS LOWER CONCOURSE LEVEL
A831 – INTERIOR ELEVATIONS UPPER CONCOURSE LEVEL
A833 – INTERIOR ELEVATIONS UPPER CONCOURSE LEVEL
E301C – EVENT LEVEL LIGHTING PLAN QUAD C
E303B – LOWER CONCOURSE LIGHTING PLAN QUAD B
E303C – LOWER CONCOURSE LIGHTING PLAN QUAD C
E304B – UPPER CONCOURSE LIGHTING PLAN QUAD B
E304C – UPPER CONCOURSE LIGHTING PLAN QUAD C

AGI32 MODELS:

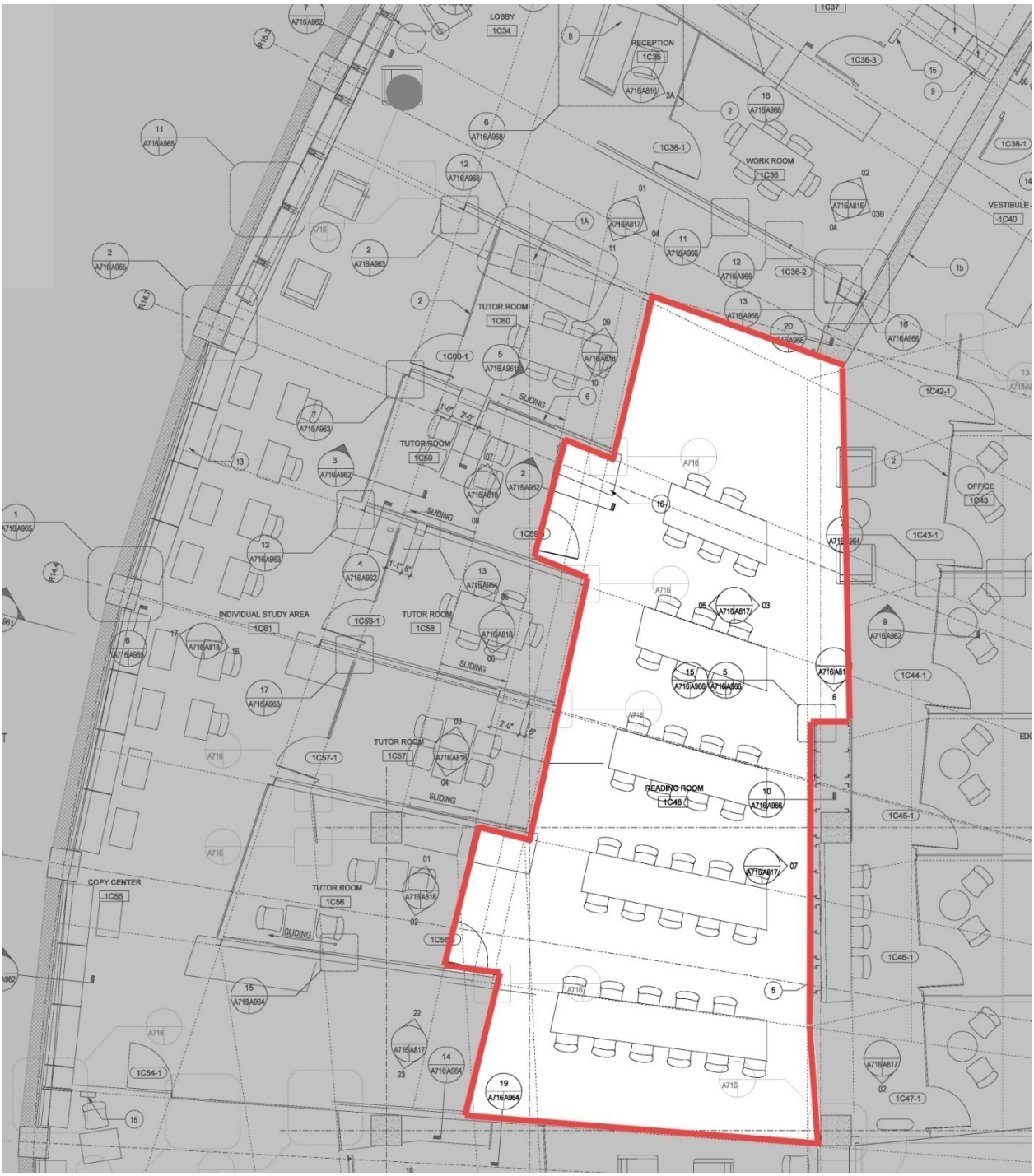
ACADEMIC CENTER, READING ROOM
DINING ROOM

OTHER FILES:

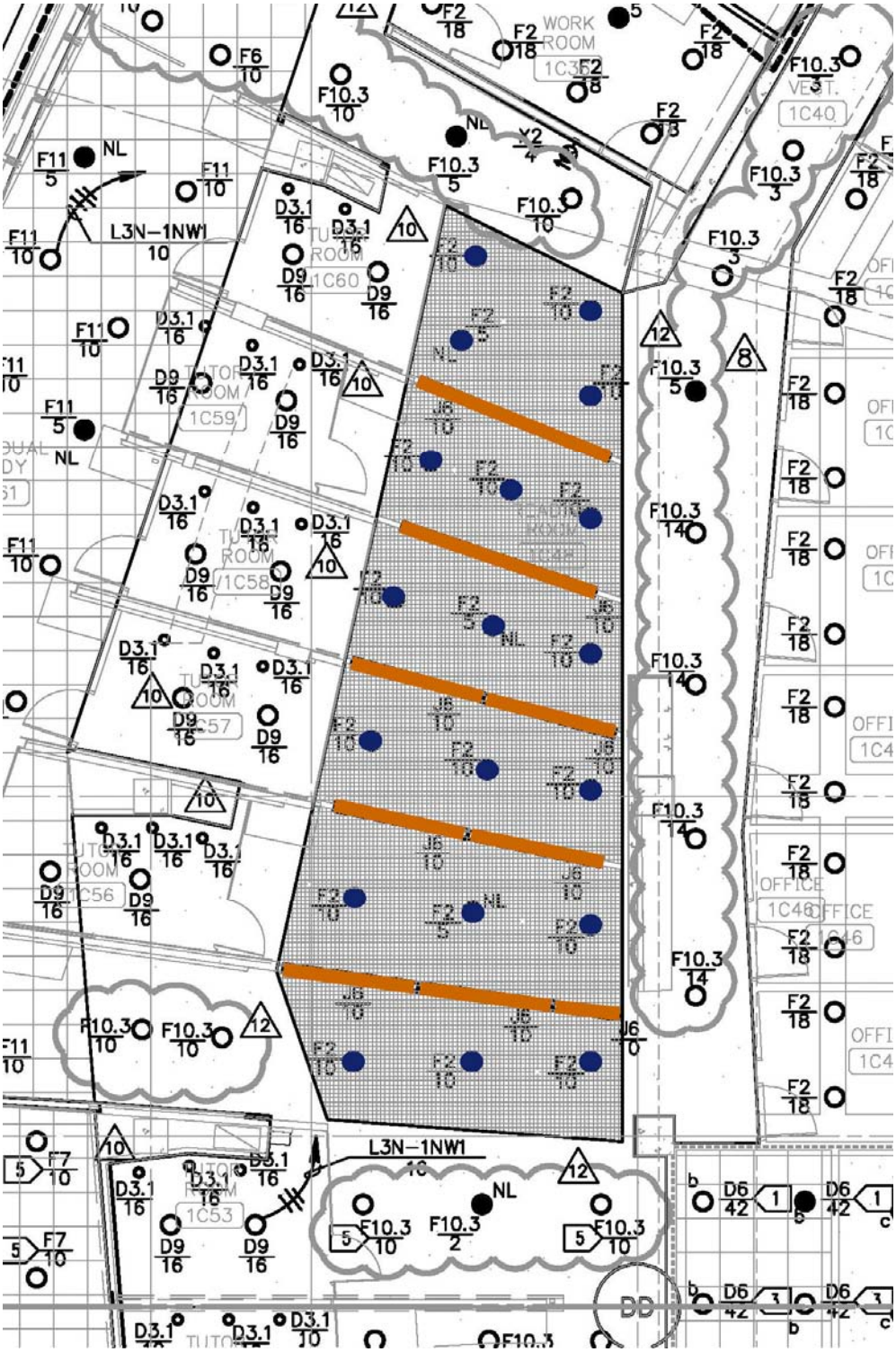
Ies Files
Light Loss.xlsx
Room Lighting Schedules.xlsx

PART FIVE: APPENDIX ONE - DRAWINGS

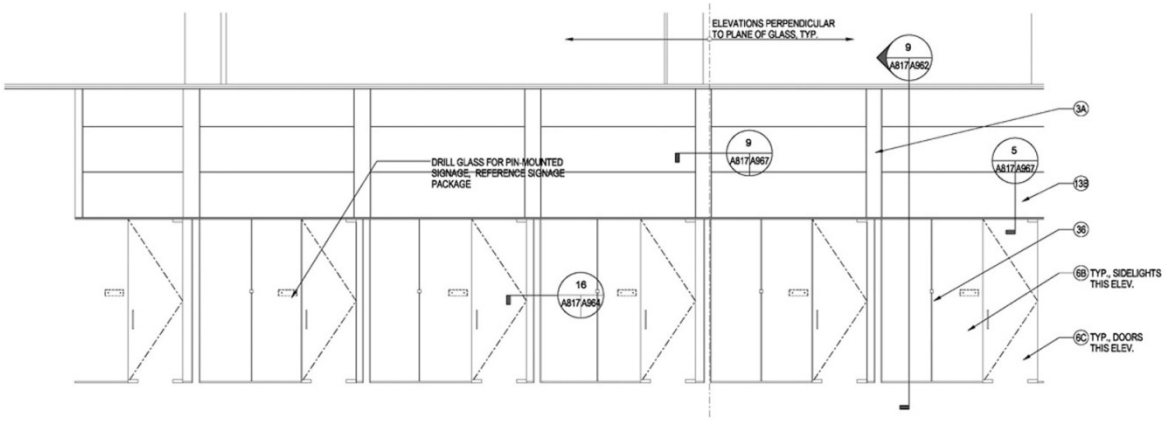
SECTION 1.1: READING ROOM



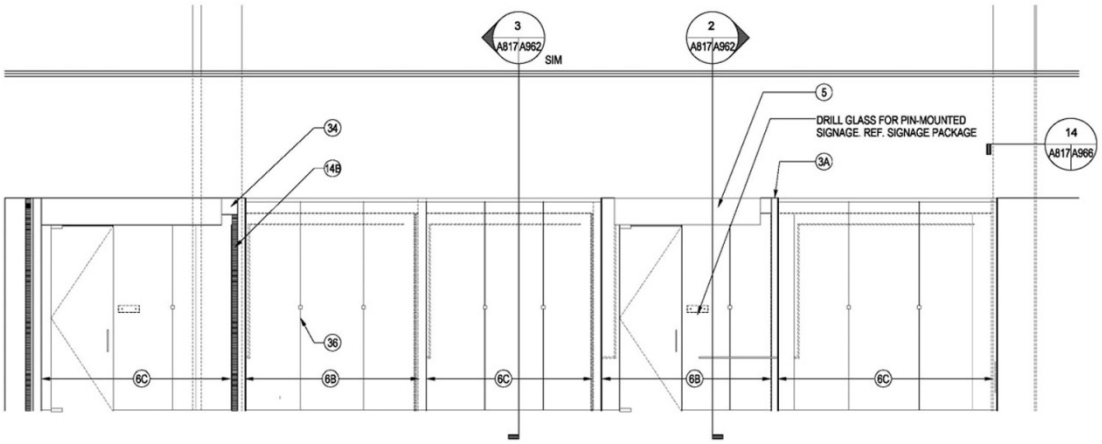
1.1A: FLOOR PLAN



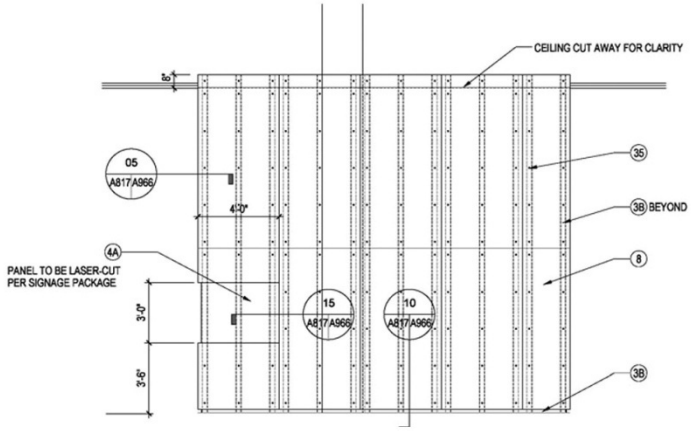
1.1B: LUMINAIRE LAYOUT



EAST WALL (NTS)



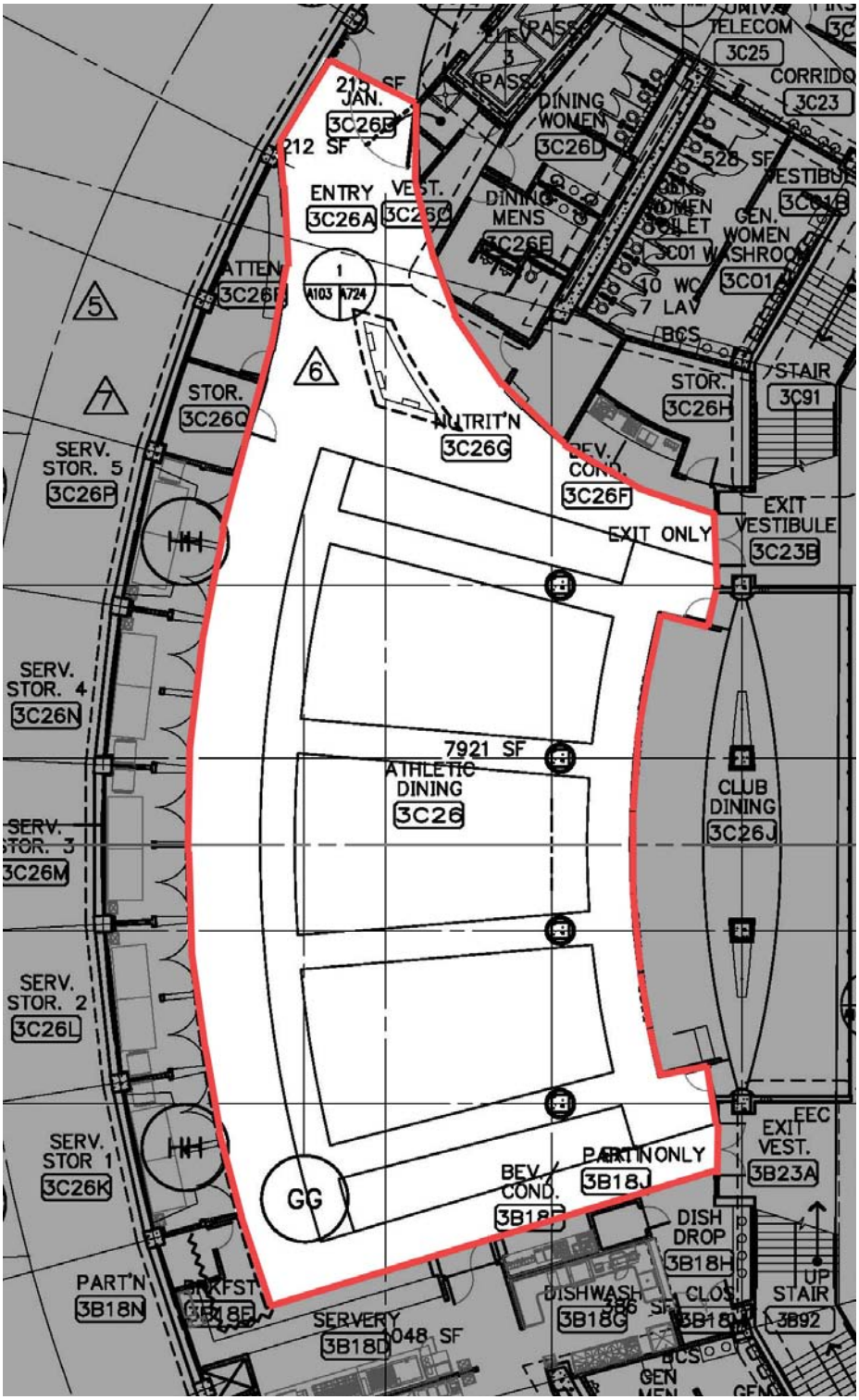
WEST WALL (NTS)



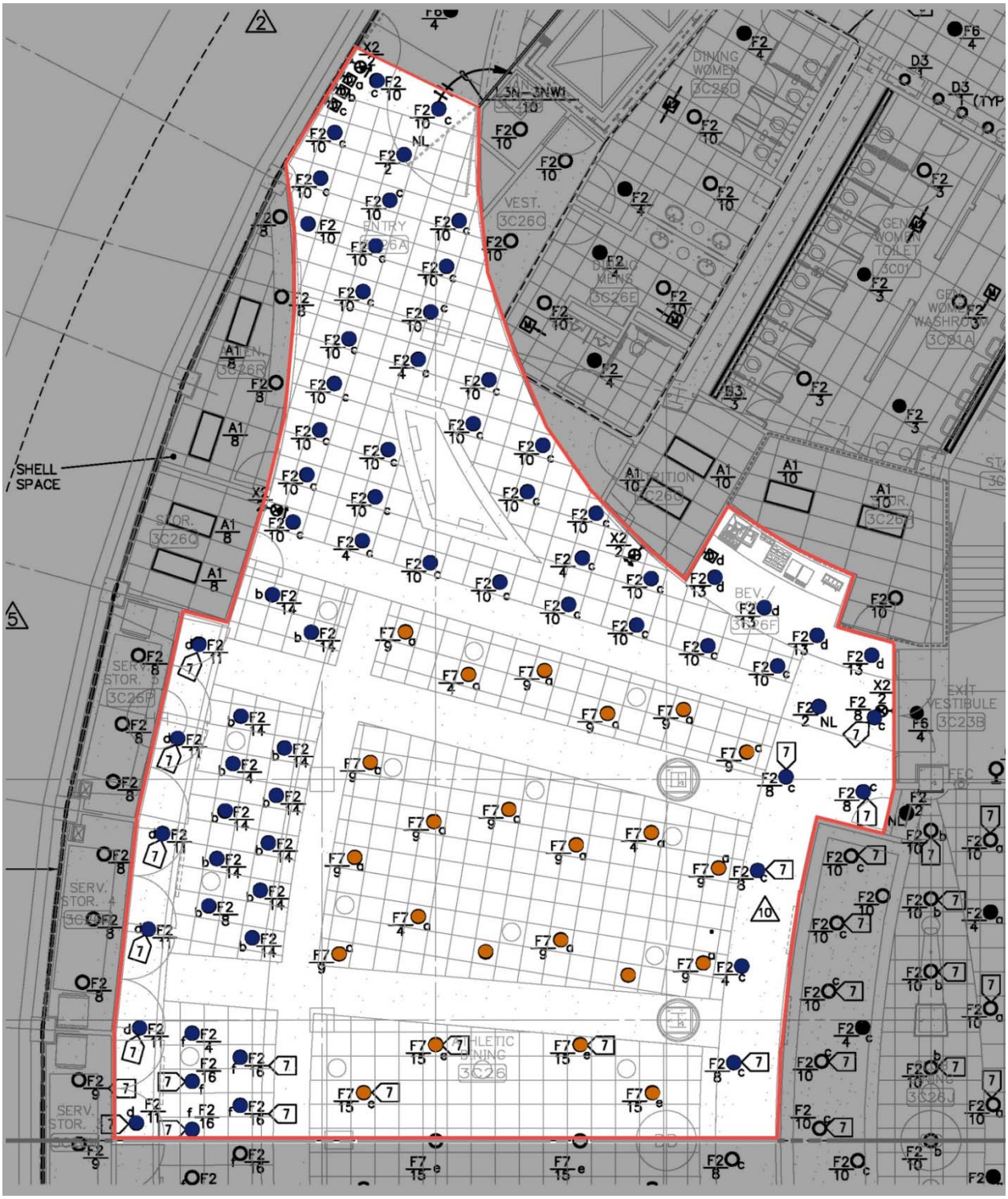
SOUTH WALL (NTS)

1.1C: ELEVATIONS

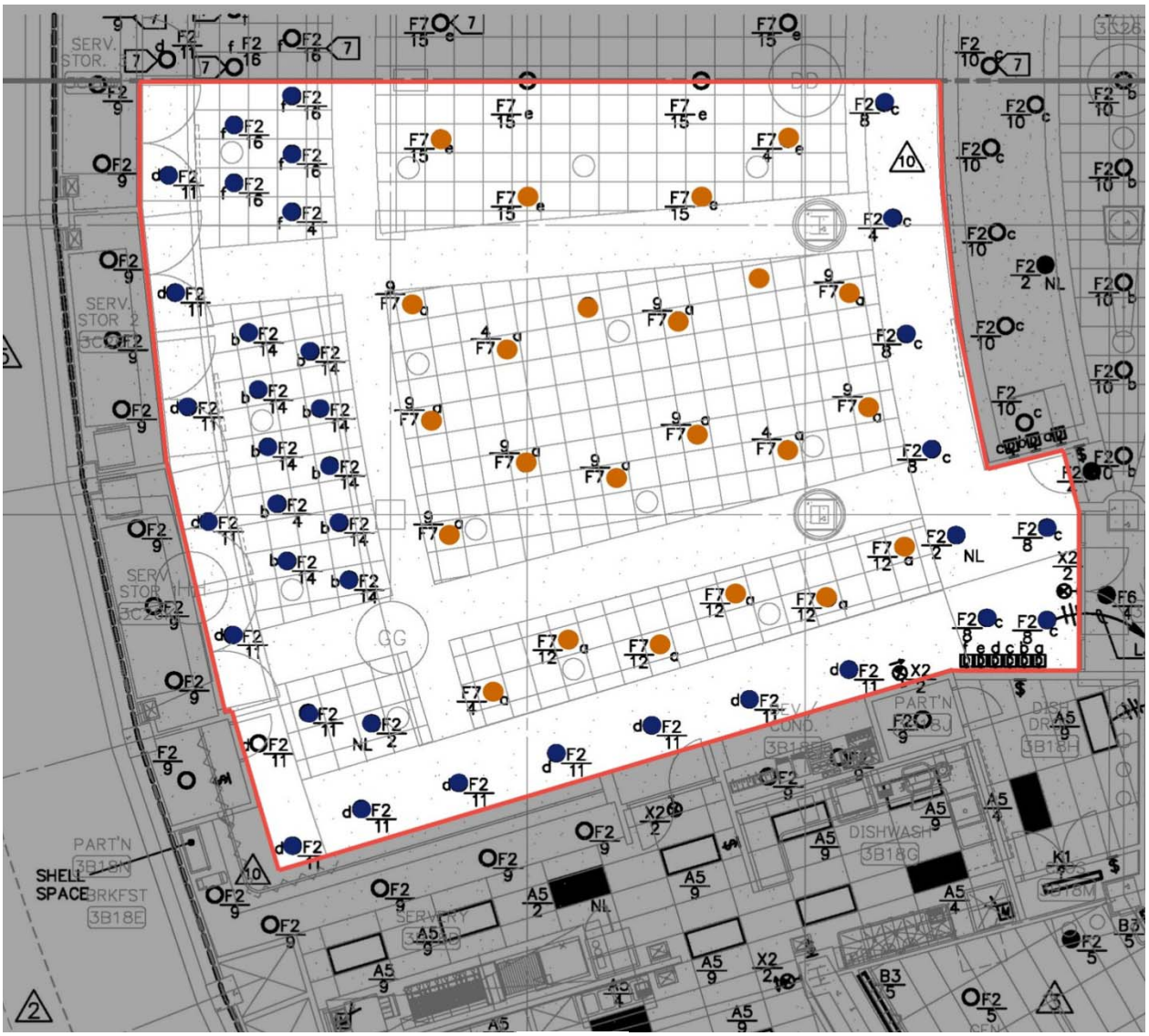
SECTION 1.2: DINING ROOM



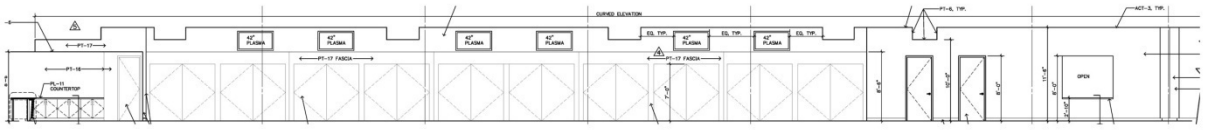
1.2A: FLOOR PLAN



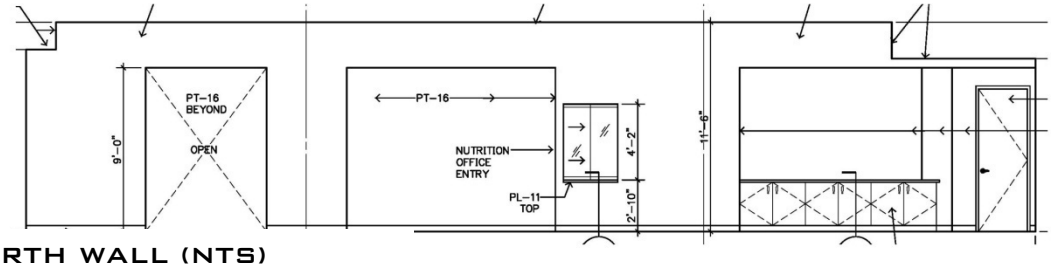
1.2B: LUMINAIRE LAYOUT NORTH SIDE



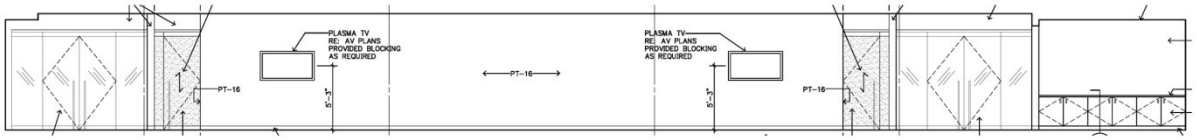
1.2C: LUMINAIRE LAYOUT SOUTH SIDE



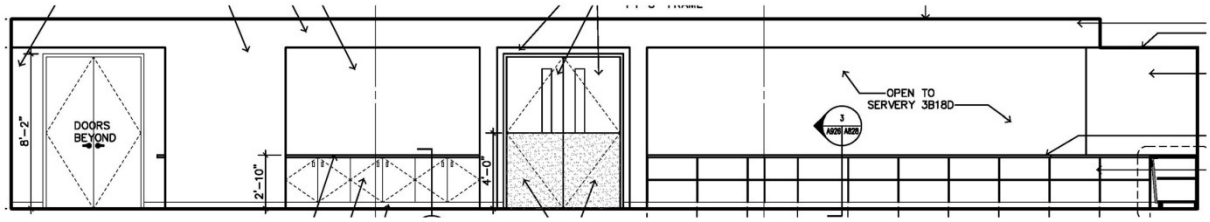
WEST WALL (NTS)



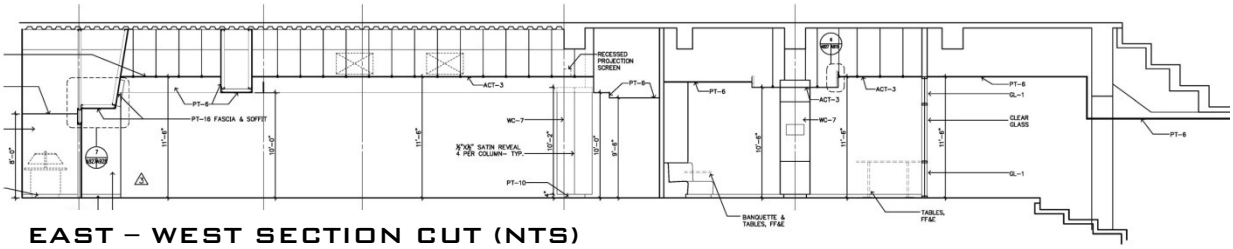
NORTH WALL (NTS)



EAST WALL (NTS)



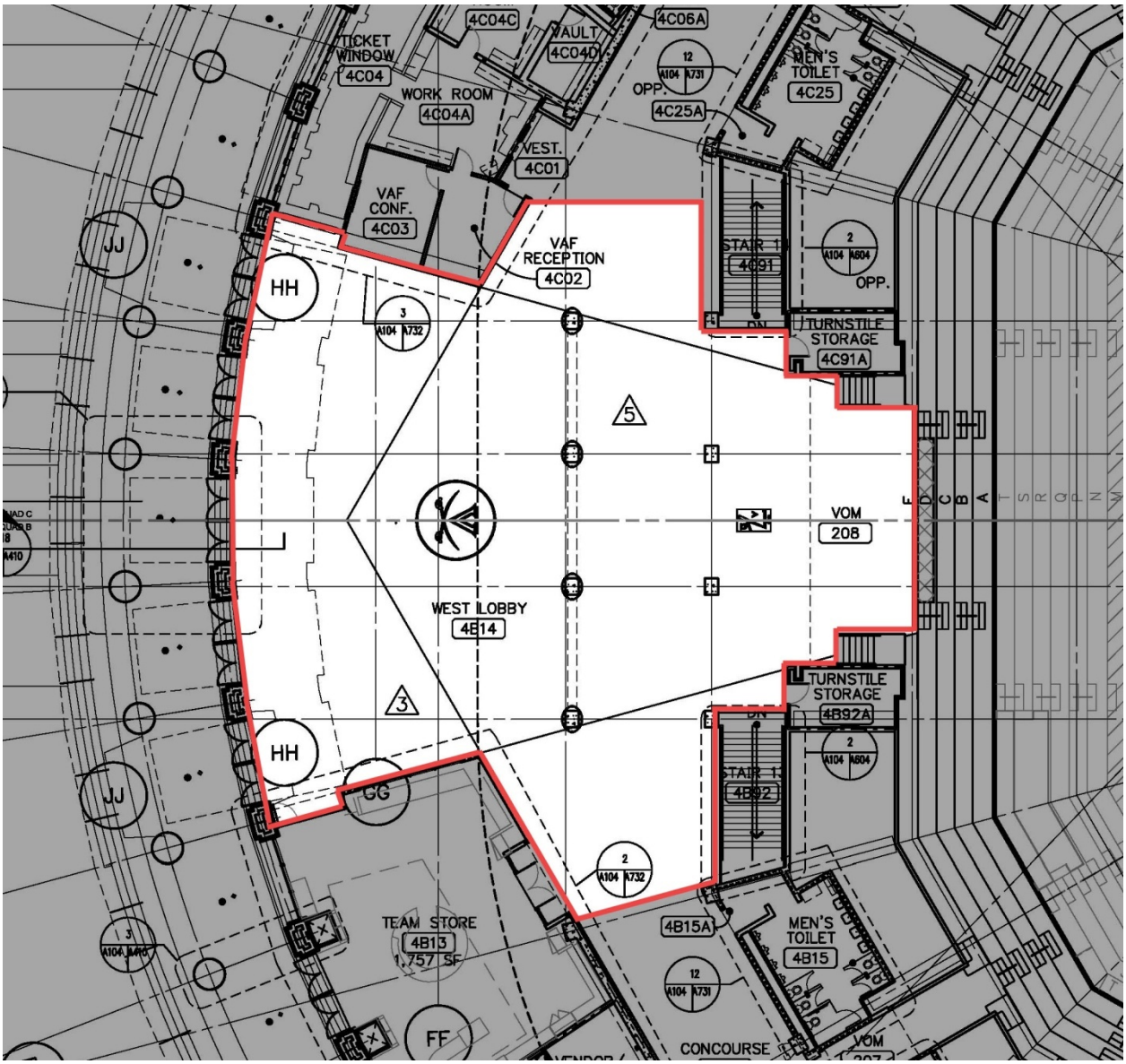
SOUTH WALL (NTS)



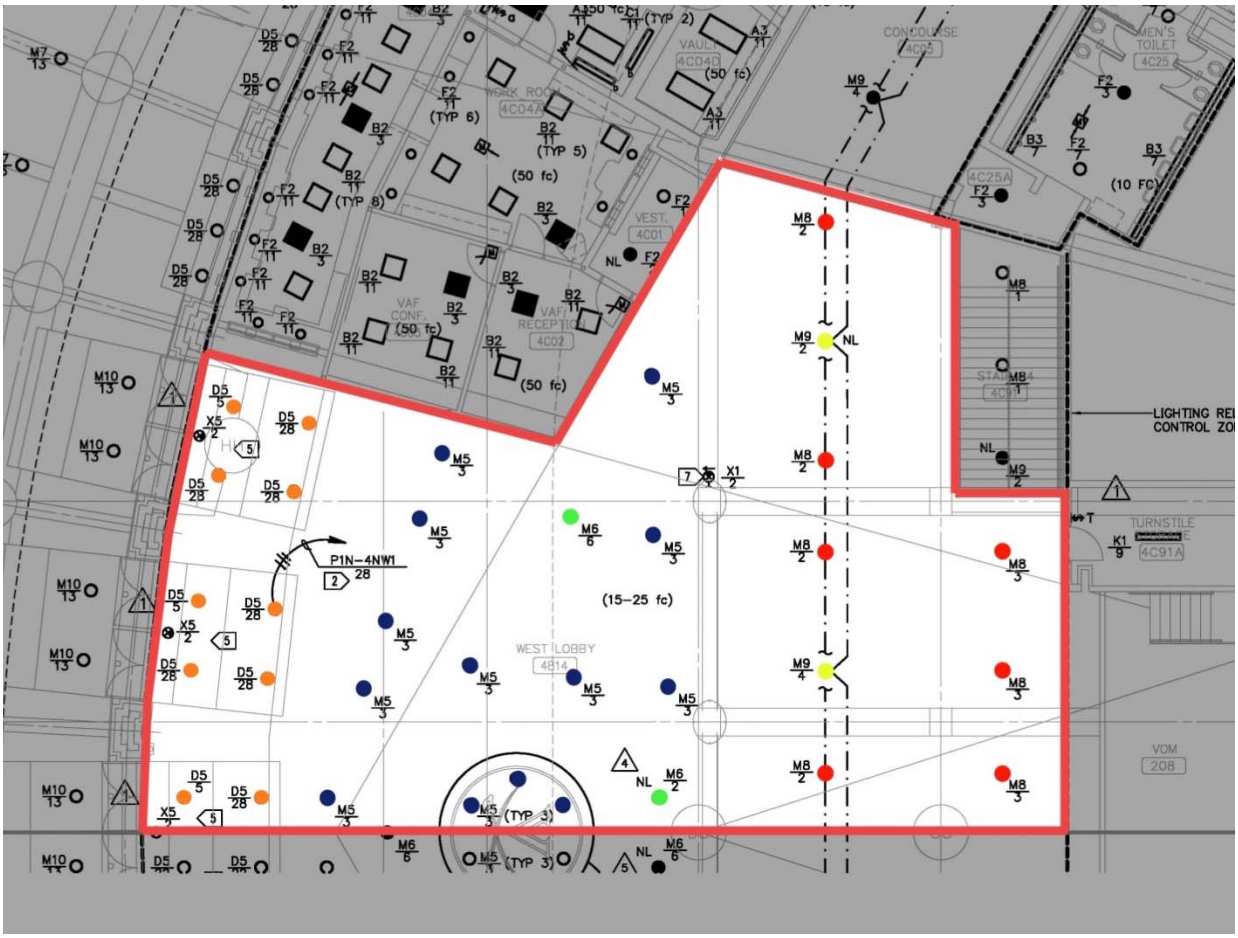
EAST – WEST SECTION CUT (NTS)

1.2D: ELEVATIONS

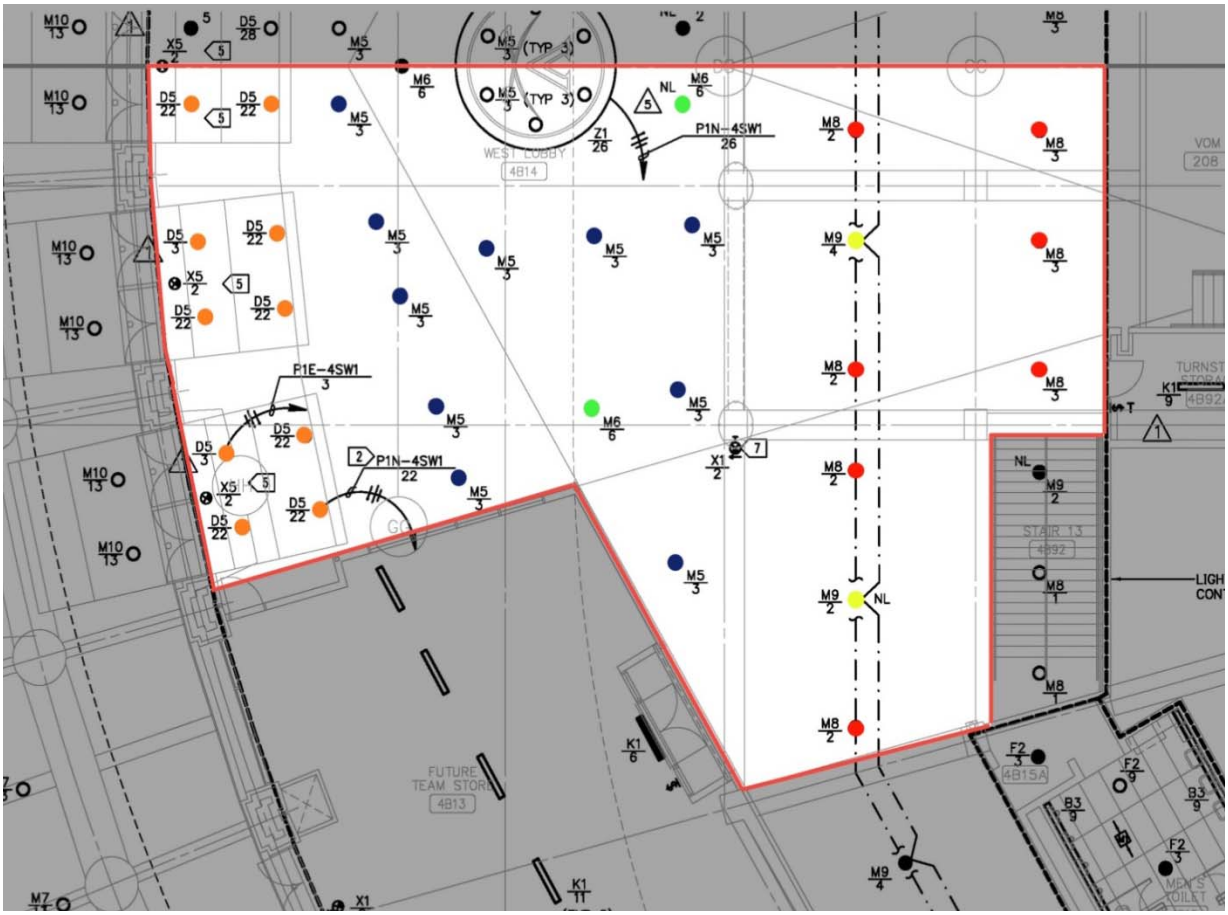
SECTION 1.3: WEST ENTRANCE



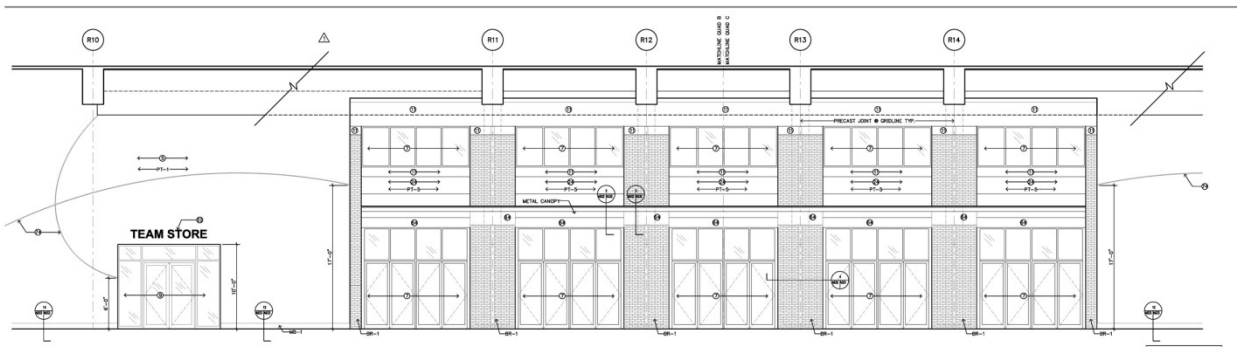
1.3A: FLOOR PLAN



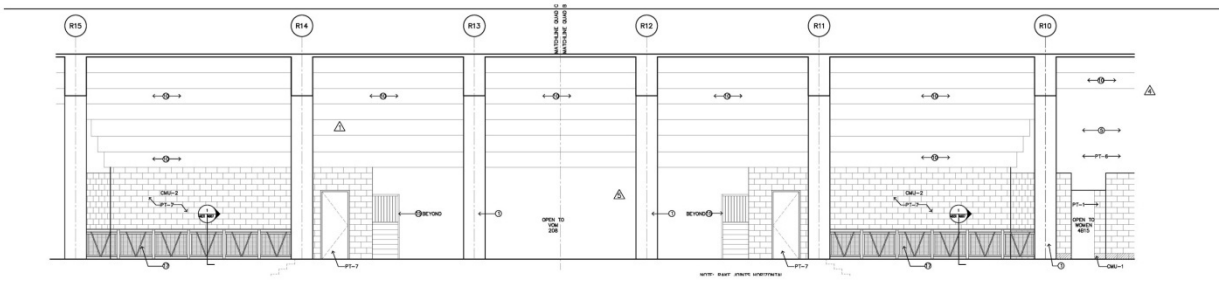
1.3B: LUMINAIRE LAYOUT NORTH SIDE



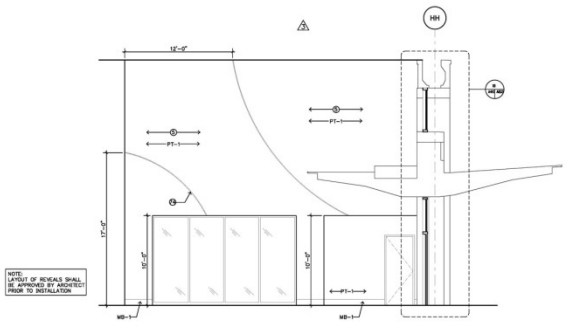
1.3C: LUMINAIRE LAYOUT SOUTH SIDE



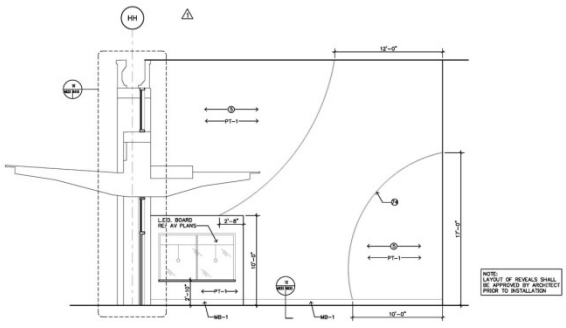
WEST WALL (NTS)



EAST WALL (NTS)



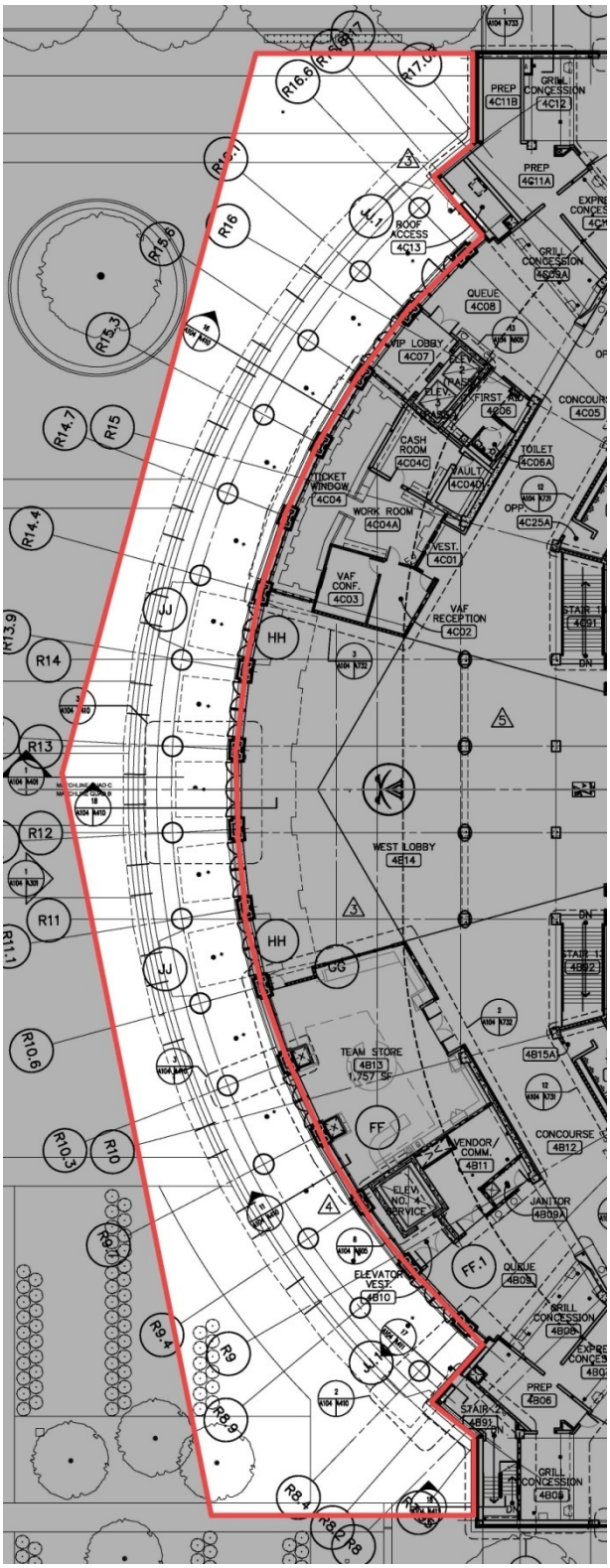
SOUTH WALL (NTS)



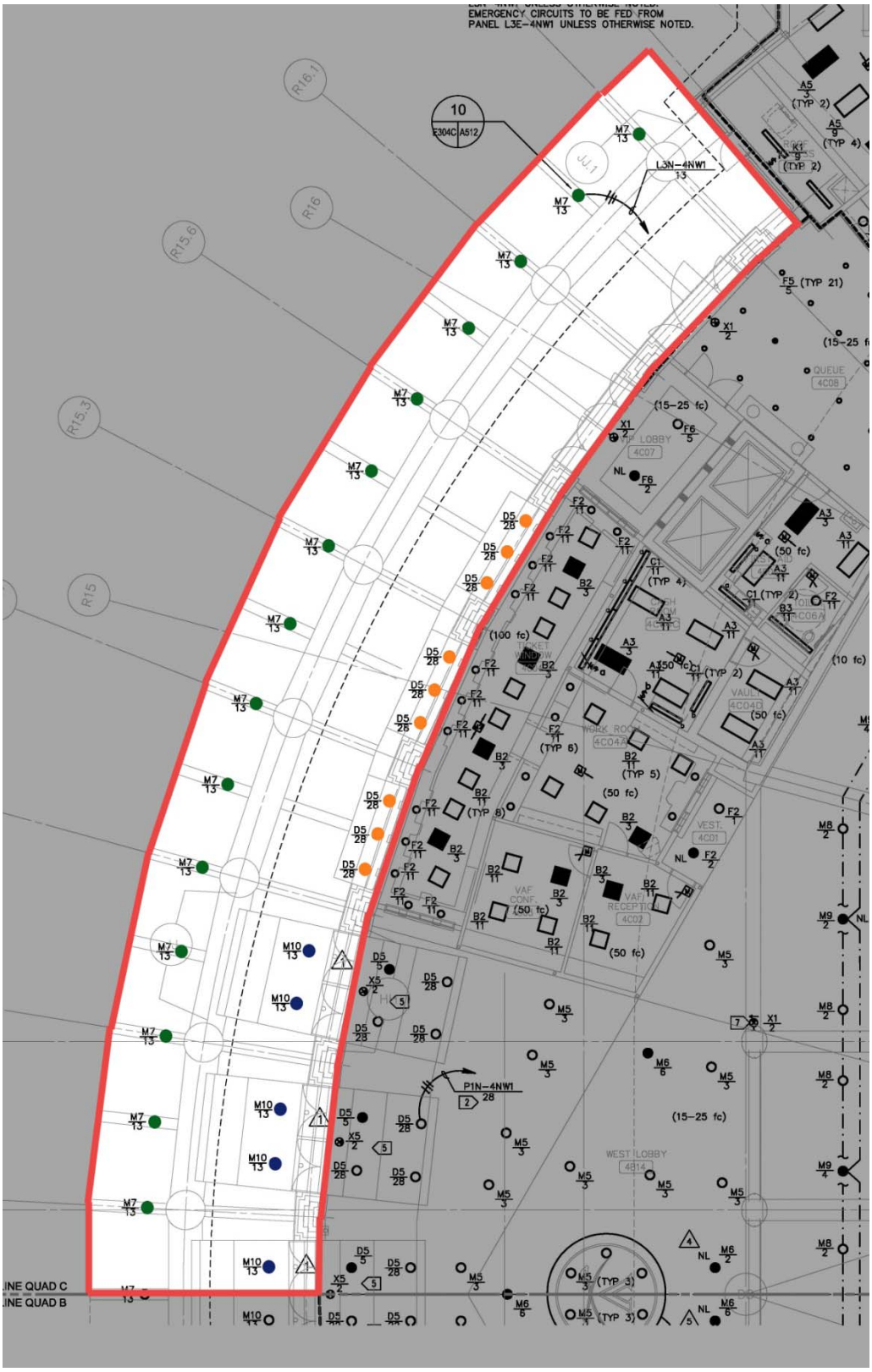
NORTH WALL (NTS)

1.3D: ELEVATIONS

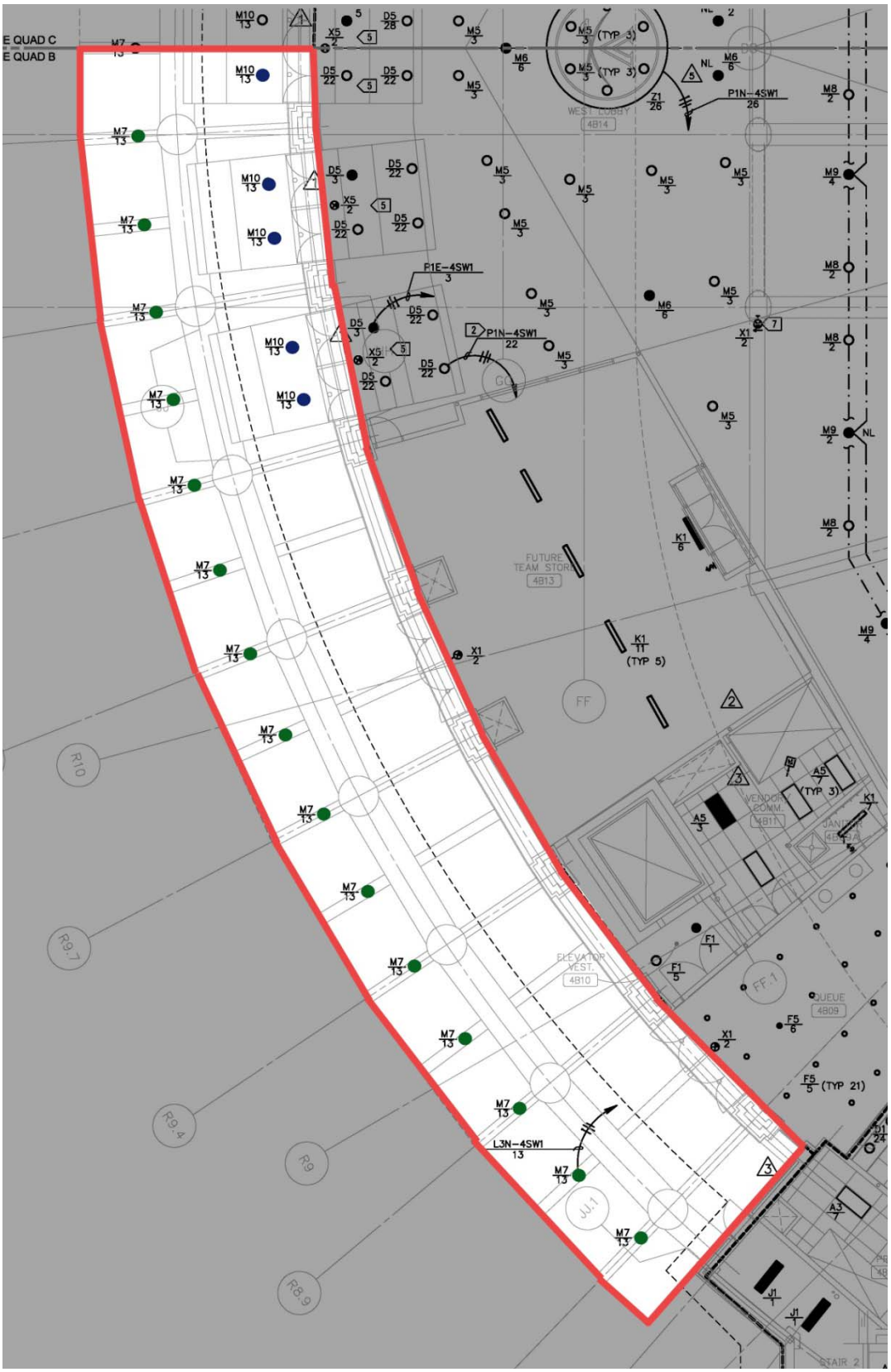
SECTION 1.4: WEST ELEVATION



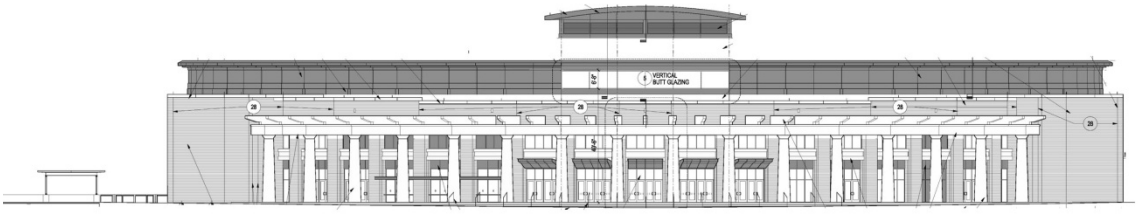
1.4A: FLOOR PLAN



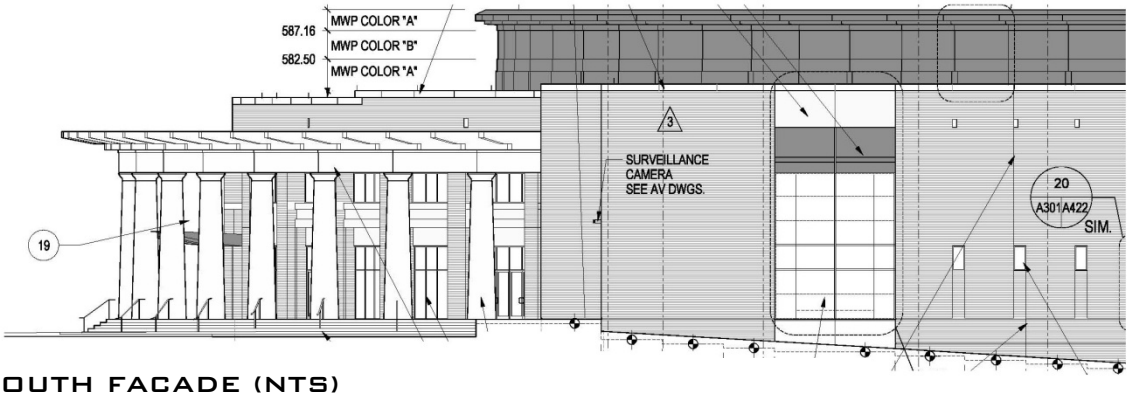
1.4B: LUMINAIRE LAYOUT NORTH SIDE



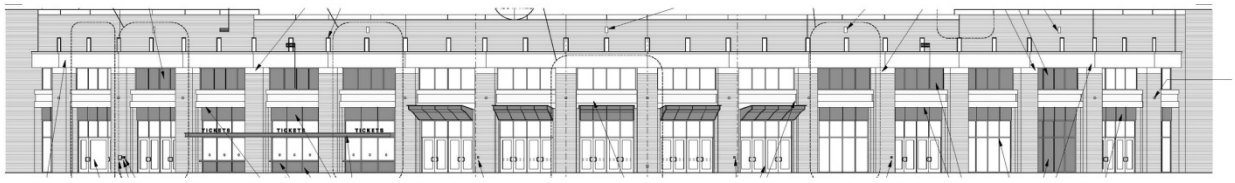
1.4C: LUMINAIRE LAYOUT SOUTH SIDE



WEST FACADE (NTS)



SOUTH FACADE (NTS)



WEST FACADE WITHOUT COLUMNS (NTS)

1.4D: ELEVATIONS

PART FIVE: APPENDIX TWO – LUMINAIRE SCHEDULES

SECTION 2.1: READING ROOM

Type Letter	Fixture Type	Mounting	Lamps	Description / Light Control	Manufacturer / Catalog #	Watts / Volts
D9	Compact Flourescent Downlight	Surface	1 Lamp - 18W G24q-2	3.5" Diameter Chrome Finish	Schmitz-Lighting 15488.46	18/277
F2	Compact Flourescent Downlight	Recessed in Grid or Gyp. Ceiling	1 Lamp - 32W Phillips Triple Tube RE 835	6-7" Diameter Low Iridescent Clear	Portfolio / C6132-E-615-LI	37/277
F6	Compact Flourescent Downlight	Recessed in Grid or Gyp. Ceiling	2 Lamp - 32W Phillips Triple Tube RE 835	9-10" Low Incandescent Clear	Portfolio / C9232-E-9251-LI-1	37/277
F11	Compact Fluorescent Pendant	Pendant	1 Lamp - 42W, GX24q-4 RE 835	7" Diameter Glass Tube	Schmitz-Lighting 16981.06/2830	43/277
J6	Flourescent Linear Direct	Pendant	1 Lamp - 54W T5HO RE 835	Linear Direct Silver Finish, Satine Acrylic Lens - 4', 8' and 12' Lengths	Se'lux / M60-1T5HO-SD-RS-X-SV (Field verify fixture lengths)	68 per 4'/277
X2	LED Sign	As Required	L.E.D.	Die-Cast Aluminum Housing w/Brushed Aluminum Face & Red Letters	Lithonia / "signature" Series	5/277

SECTION 2.2: DINING ROOM

Type Letter	Fixture Type	Mounting	Lamps	Description / Light Control	Manufacturer / Catalog #	Watts / Volts
F2	Compact Flourescent Downlight	Recessed in Grid or Gyp. Ceiling	1 Lamp - 32W Phillips Triple Tube RE 835	6-7" Diameter Low Iridescent Clear	Portfolio / C6132-E-615-LI	37/277
F7	Compact Flourescent Downlight	Recessed in Grid or Gyp. Ceiling	2 Lamp - 42W Phillips Triple Tube RE 835	9-10" Low Iridescent Clear	Capri / CF102H42D2-T582	94/277
X2	LED Sign	As Required	L.E.D.	Die-Cast Aluminum Housing w/Brushed Aluminum Face & Red Letters	Lithonia / "signature" Series	5/277

SECTION 2.3: WEST ENTRANCE

Type Letter	Fixture Type	Mounting	Lamps	Description / Light Control	Manufacturer / Catalog #	Watts / Volts
D5	Compact Fluorescent Downlight	Recessed in Grid or Gyp. Ceiling	1 Lamp - 9W PLC RE 835	6" Diameter White Tempered Glass w/ Symmetrical Distribution	Bega 1286P/565 w/ guard	10/120
F2	Compact Fluorescent Downlight	Recessed in Grid or Gyp. Ceiling	1 Lamp - 32W Phillips Triple Tube RE 835	6-7" Diameter Low Iridescent Clear	Portfolio / C6132-E-615-1-LI	37/277
M5	Metal Halide Downlight	Recessed	1 Lamp - 150W MH-ED17 3000-3500k	7-8" Diameter Low Iridescent	Portfolio / MD7-780-7701	188/277
M6	Metal Halide Downlight	Recessed	1 Lamp - 150W MH-ED17 3000-3500k 1 Lamp - 100W T-4	7-8" Diameter Low Iridescent Quartz Restrike Time Delay Option	Portfolio / MD7-780-7701 ISL 150MH	330/277
M8	Metal Halide Downlight	Surface	1 Lamp - 175W E28 MH 3000-3500k	9-10" Diameter Clear Specular	Omega / OM10-175E28MH SC-CS-FZ277-120/277	220/277
M9	Metal Halide Downlight	Surface	1 Lamp - 175W E28 MH 3000-3500k 1 Lamp - 100W T-4	9-10" Diameter Clear Specular Quartz Restrike Time Delay Option	Omega / OM10-175E28MH SC-CS-FZ277-120/277 w/ Quartz Restrike	320/277
X5	LED Edge Lit Exit Sign	As Required	L.E.D.	Architectural Edge-Lit Red Letters in Clear Injection-molded acrylic panel Fire Alarm Flashing Interface	Lithonia / 'Precise' Series	5/277

SECTION 2.4: WEST ELEVATION

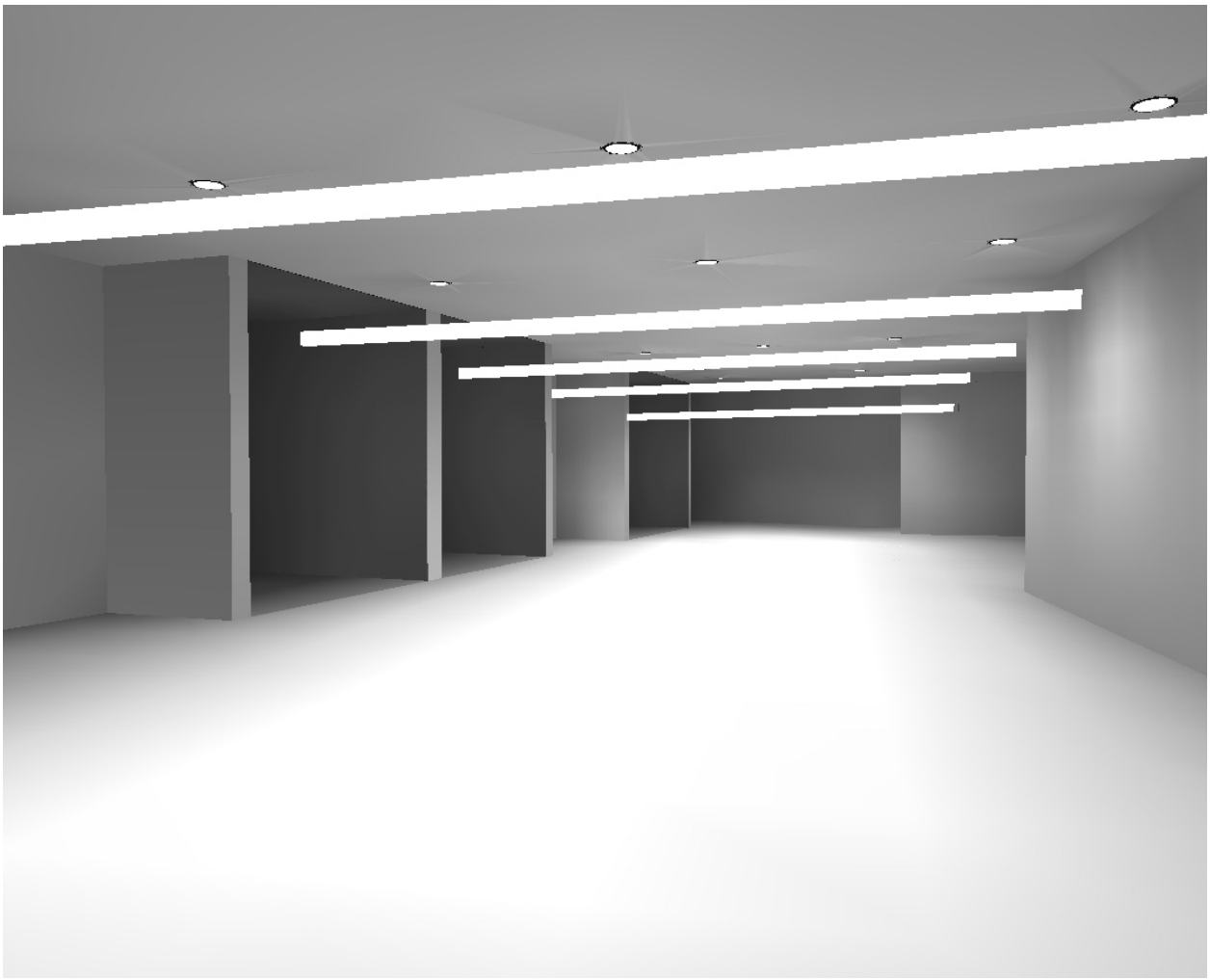
Type Letter	Fixture Type	Mounting	Lamps	Description / Light Control	Manufacturer / Catalog #	Watts / Volts
D5	Compact Fluorescent Downlight	Recessed in Grid or Gyp. Ceiling	1 Lamp - 9W PLC RE 835	6" Diameter White Tempered Glass w/ Symmetrical Distribution	Bega 1286P/565 w/ guard	10/120
M7	Metal Halide Downlight	Surface	1 Lamp - 100W MH PAR38 SPOT	7-8" Diameter Black Baffle	Gardco / 300-O-C-B-P100MH(SPOT)-277-SC	125/277
M10	Metal Halide Downlight	Recessed w/ Slope Adapter	1 Lamp - 150W MH ED17 3000-3500k	7-8" Diameter Low Iridescent w/ Unpainted Spun Aluminum 15 Deg. Slope Adapter	Portfolio / MD7-780-7701 w/ HAS-7-15DEG	188/277

SECTION 2.5: LIGHT LOSS FACTORS

LIGHT LOSS FACTORS						
FIXTURE	BF	LLD	LDD		RSDD	TOTAL
F2	0.96	0.86	Category IV	0.923	0.98	0.747
F7	0.98	0.848	Category IV	0.923	0.975	0.748
J6	1	0.973	Category II	0.957	0.98	0.913
SIX MONTH CLEANING CYCLE						
CLEAN ENVIRONMENT						

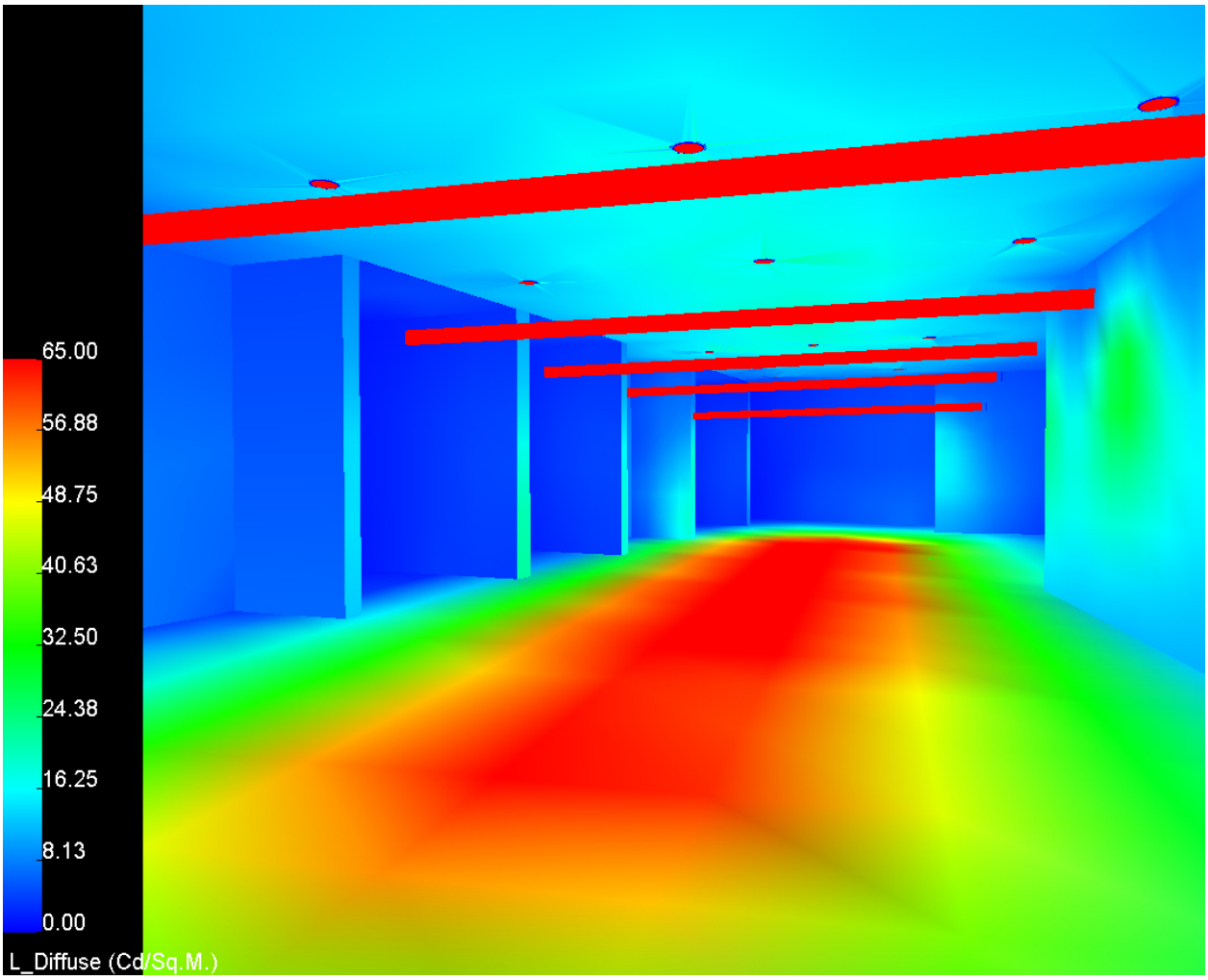
PART FIVE: APPENDIX THREE – AGI32 RENDERINGS

SECTION 3.1: READING ROOM

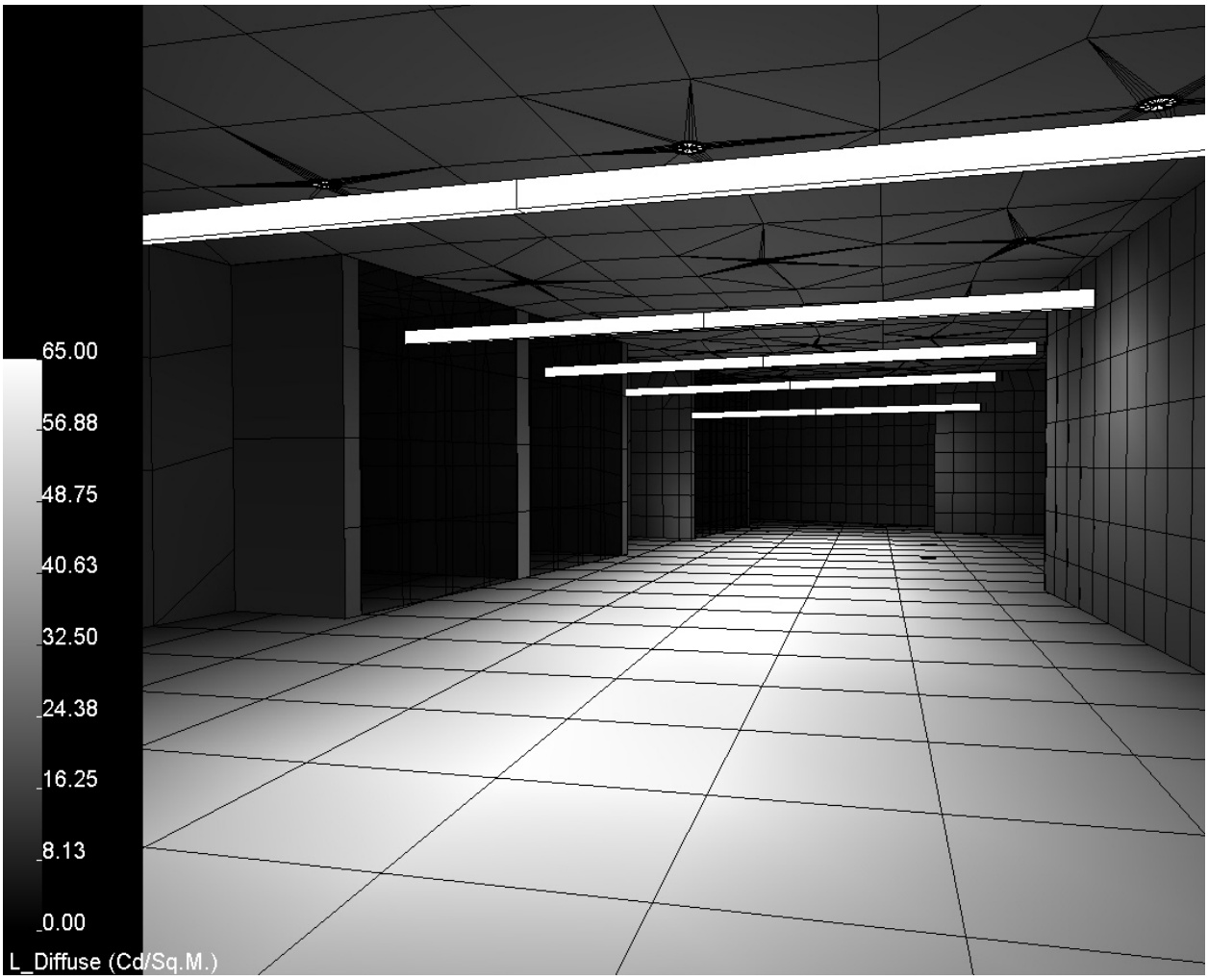


Calculation Summary								
Label	CalcType	Units	Avg	Max	Min	Avg/Min	Max/Min	CV
CalcPts 1	Illuminance	Fc	36.45	180	2.5	14.58	71.96	N.A.

3.1A: NORMAL PERSPECTIVE



3.1B: PSEUDO COLOR (LUMINANCE) PERSPECTIVE

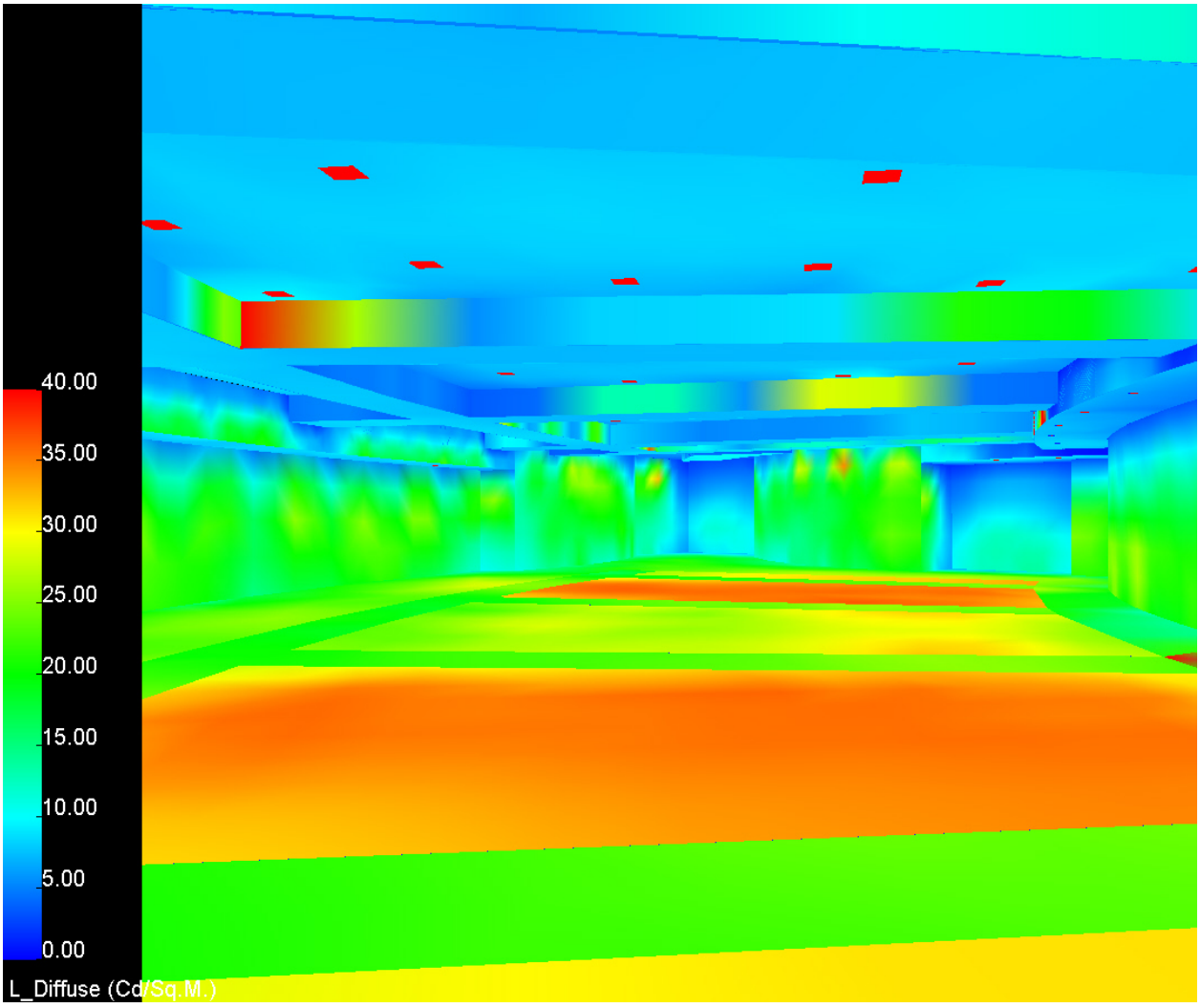


3.1C: GRAYSCALE - GRIDED PERSPECTIVE

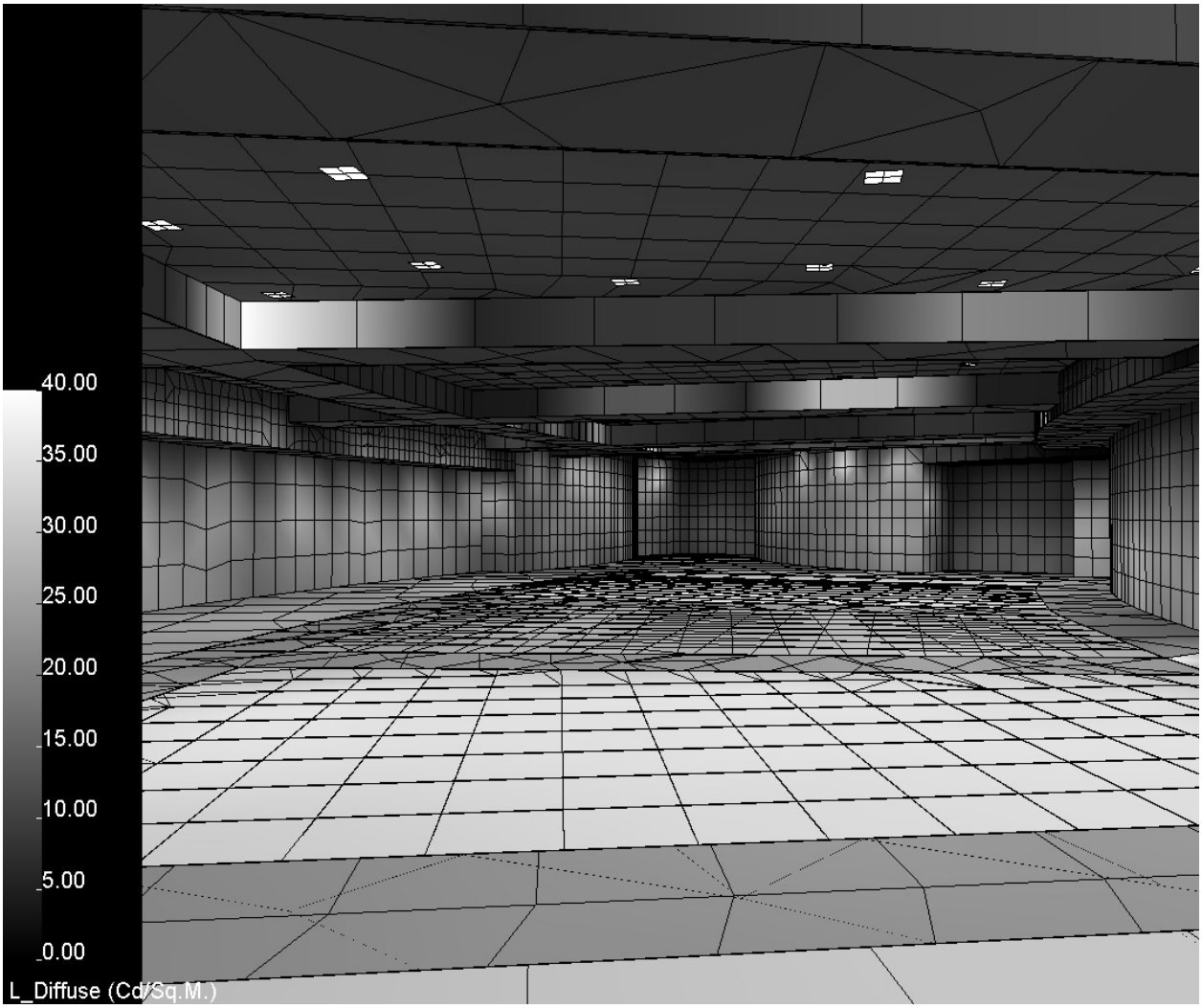
SECTION 3.2: DINING ROOM

Calculation Summary								
Label	CalcType	Units	Avg	Max	Min	Avg/Min	Max/Min	CV
floor1_1_main floor	Illuminance	Fc	0.00	0.0	0.0	N.A.	N.A.	N.A.
CalcPts	Illuminance	Fc	34.62	50.3	0.0	N.A.	N.A.	N.A.

3.2A: NORMAL PERSPECTIVE



3.2B: PSEUDO COLOR (LUMINANCE) PERSPECTIVE



3.2C: GRAYSCALE - GRIDED PERSPECTIVE

PART FIVE: APPENDIX FOUR – MATERIAL LEGEND & SCHEDULE

SECTION 4.1:

Space	Surface	Material Tag	Description	Properties	Color
Reading Room	Floor	STC-3	Stained Concrete	LRV: .40	
	Wall A	PT-21	Landmark Gray SW Paint	LRV: .45	Medium Grey
	Wall B	PT-21	Landmark Gray SW Paint	LRV: .45	Medium Grey
		PT-24	Pilgrimage Foliage SW Paint	LRV: .20	Dark Orange
	Wall C	PT-23	Blackened Blue	LRV: .04	Blue
		GL-1	Glass-Times Square Option D, 1/2" Laminated	Transmittance: .75	Etched Glass
		GL-2	Glass - Clear	Transmittance: .95	Clear
	Wall D	PT-20	Vellum SW Paint	LRV: .73	Light Grey
	Ceiling	PT-21	Landmark Gray SW Paint	LRV: .45	Medium Grey
Space	**Surface**	**Material Tag**	**Description**	**Properties**	**Color**
Athletic Dining Room	Floor	CPT-13	Kerala 50771	LRV: .25	Multi-Color
		CPT-14	Utopian BL 50515	LRV: .20	Blue
		VF-1	Natural Creations Woods Collection	LRV: .40	Amber Cherry Warm
	Wall A,B,C,D	PT-16	Pittsburgh Paints - The Voice of Color, Calvary	LRV: .33	Dark Blue
		PT-17	Pittsburgh Paints - The Voice of Color, Spiced Vinegar	LRV: 0.93	Medium beige
	Ceiling	PT-6	Pittsburgh Paints - The Voice of Color, Milk Paint	LRV: .95	Off-White

Space	Surface	Material Tag	Description	Properties	Color
Entrance Lobby	Floor	TZ-1	Terrazzo Tile	LRV: .35	Grey
		TZ-2	Terrazzo Tile	LRV: .3	Blue
	Wall A	PT-6	Pittsburgh Paints - The Voice of Color, Milk Paint	LRV: .95	Off-White
		PT-7	Pittsburgh Paints - The Voice of Color, Sand Fossil	LRV: .90	Light Tan
	Wall B	PT-1	Pittsburgh Paints - The Voice of Color, Victory Blue	LRV: .33	"UVA Blue"
	Wall C	BR-1	Old Virginia Wood-Moulded Brick	LRV: .30	Red
	Wall D	PT-1	Pittsburgh Paints - The Voice of Color, Victory Blue	LRV: 0.33	"UVA Blue"
	Ceiling	PT-6	Pittsburgh Paints - The Voice of Color, Milk Paint	LRV: .95	Off-White
		EXP	Exposed		
Space	**Surface**	**Material Tag**	**Description**	**Properties**	**Color**
Exterior Façade	wall	STUCCO	Exterior Finish	LRV: .60	Off-White
	Wall	BR-1	Old Virginia Wood-Moulded Brick	LRV: .30	Red
	Column	SL-3	Concrete, Silane Penetrant with Fluoropolymer Sealer	LRV: .40	White
	Wall	MTL-1	Metal Wall Panel System	LRV: .65	Light Grey
	Wall	MTL-2	Metal Wall Panel System	LRV: .65	Dark Grey