Considerations of Lighting Influencing Design: A Community Center For Fremont

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This is to certify that I have examined this copy of a master's thesis by

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and have found that it is complete and satisfactory in all respects,
and that any and all revisions required by the final
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Section 1: Introduction

"Most modern buildings would provide far superior interior environments for their occupants if they had been consciously designed from the inside out."

-William M. C. Lam, Perception and Lighting as Formgivers for Architecture

In order to conceptualize an architectural design, one must consider lighting and perception. Humans are visual creatures; the main perception of an architectural space is heavily influenced by light. Light defines the character of a space, through color, brightness, and contrast, as well as other factors.

By considering lighting as one of the main design concepts for a building, a new method of architectural design can be explored. This method concerns the design of a building *from the inside out*, always considering human use, needs, and perception.

While this project is ostensibly an architectural design, it is more appropriately the *concept* of a building, used as a basis for the lighting design.

From its inception, this project was thought to be an exploration of new design methods, using lighting considerations. It is hoped that these new methods and explorations will yield a different kind of building, one that is based in the perceptions and experiences of its users.

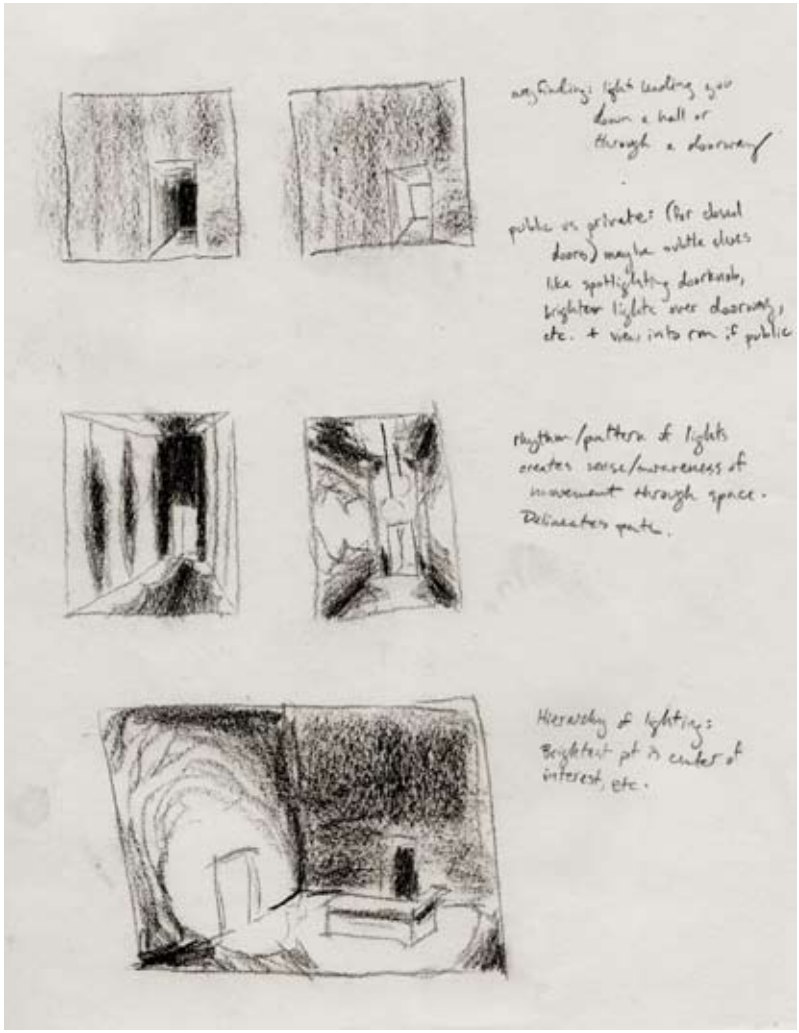


Figure 1.01: Early ideas about lighting, a pre-design exercise.

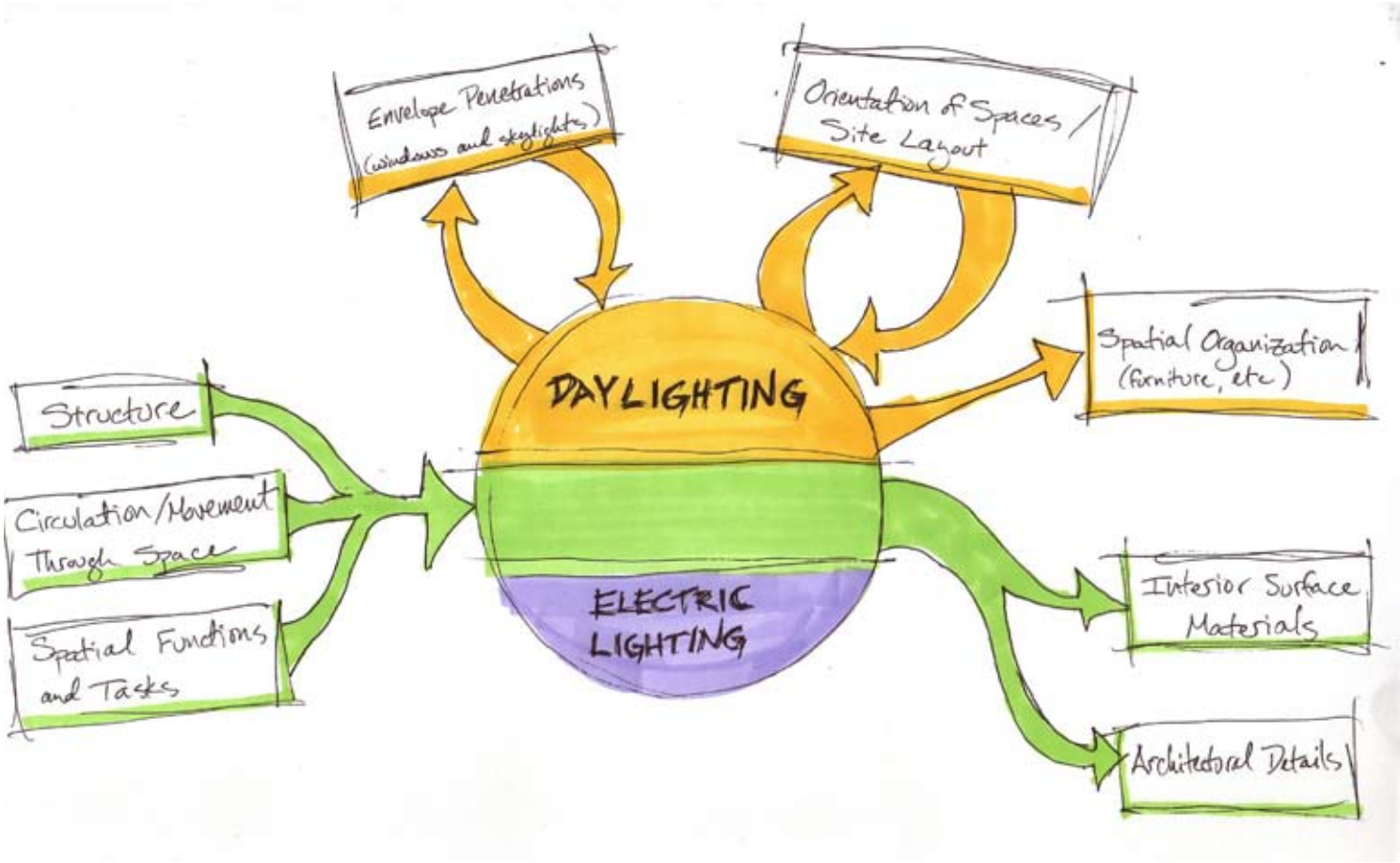


Figure 1.02: Current best-case scenario design decisions, as related to lighting.

Current methods of architectural design may or may not consider lighting while making design decisions. Even with the recent popularity of sustainability and “green” design, quality lighting is still not a priority, even in the best cases.

Figure 1.02 illustrates the author’s perception of current best practices in design decisions as related to lighting considerations. A variety of important decisions are made before lighting is even thought about, such as Structure. A few design decisions, like Spatial Organization, are directly influenced by daylighting considerations. Some of these decisions are made in advance of lighting decisions and strongly influence the amount of daylight in the space, but they are occasionally altered to allow for better daylighting. Finally, some design decisions are directly influenced by daylighting and electric lighting considerations, such as Interior Surface Materials.

One of the goals of this project is to attempt to create an architectural design with lighting considered throughout the process, even in the conceptual and schematic phases. This new method will hopefully allow lighting to be more fully integrated into a building, better serving user needs and creating a cohesive design concept.

Section 2: Site

In order to begin to explore architectural lighting design, certain aspects of the architecture must be decided upon first. Before lighting concepts may be applied, a building must be conceptualized.

The first decision involves the building type. A community center was chosen because of the program flexibility inherent in this building type. Certain program elements, such as classrooms or activity rooms, require specific illumination levels and have very specific tasks (e.g. reading and writing). Other spaces allow for a certain flexibility and playfulness in the lighting design. Spaces like lobbies and game rooms fit this criteria.

With a building type chosen, the next step is to find a site. The neighborhood was narrowed down to Fremont, as one of the Seattle neighborhoods that had an existing neighborhood plan with requirements for a community center. The Fremont plan was especially intriguing, as it called for a “community-arts center,” in keeping with the character of the neighborhood. The called-for program was also very flexible, with the understanding that program elements would be included or deleted depending on space availability on the site.

Four sites were proposed as possibilities in the Fremont neighborhood plan (see Appendix A for full text). For this project, the site on N 36th St was chosen.

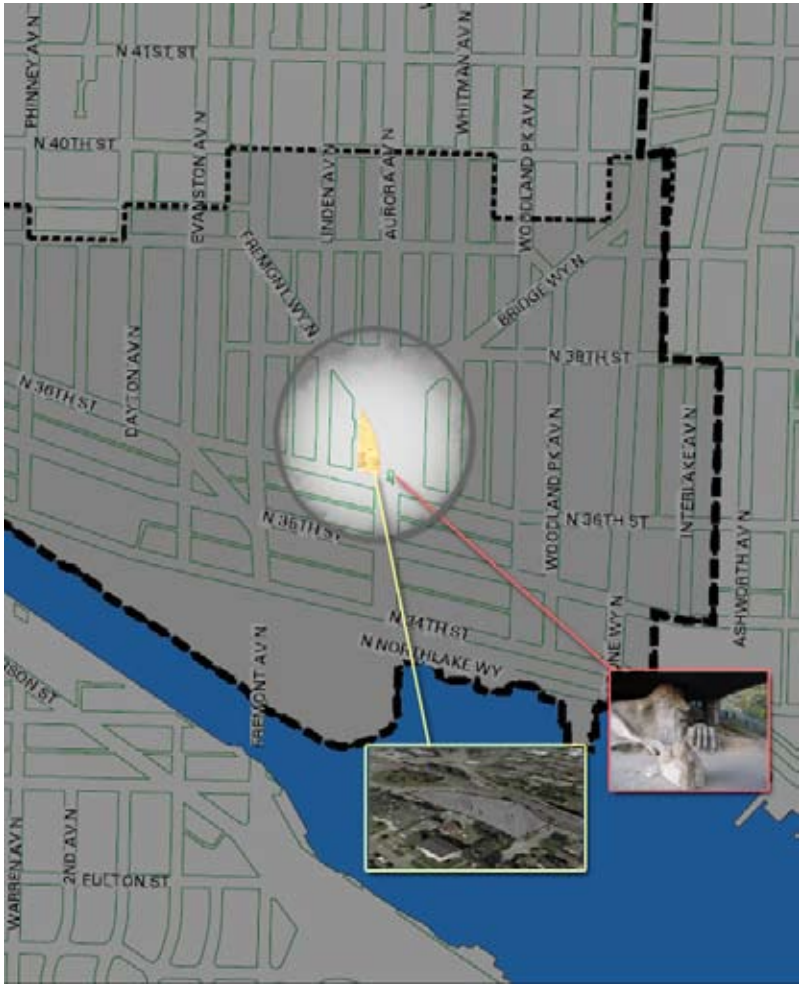


Figure 2.01: Proposed Site Location - a triangular lot on N 36th St between Linden Ave N and Troll Ave N, near the Fremont Troll sculpture.

The triangular site, while rather small, was the only available choice that presented a “blank slate”, as it was a completely undeveloped piece of land.

The site is approximately 300 ft long (running North-South) and 100 ft wide at the N 36th St side. The footprint then tapers to a point on the North end, following the barrier wall of the Aurora Ave ramp. There is an elevation change of 25 ft, with the low point at the Southeast corner of the site, and the high point at the Northwest corner. The site is bounded by N 36th St to the South, an unnamed small road to the West, and the Aurora ramp to the North and East. A pedestrian stairway is a divider between the site and the Troll sculpture to the East. Figures 2.01 through 2.04 show the location and different views of the site.

Figure 2.02: Panorama of site from above - proposed site (on right) and fronting street (N 36th) viewed from Aurora Ave.

Figure 2.03: Site and adjacent Troll sculpture.

Figure 2.04: Site South entry and N 36th St.

Section 3: Programming

To begin programming for the community center, a list was made of the program elements requested in the neighborhood plan. Using some of the guidelines in the Seattle Community Center Design Standards (included as Appendix B), square footage assignments were made.

Keeping in mind that the proposed site is quite small, a new programmatic element was developed for this project, labeled a "Flex Room". Flex rooms are spaces that could be used for a variety of activities throughout the day, rather than being specifically designated as classrooms, activity rooms, are other similar types of spaces.

Figure 3.01 shows an early attempt at assigning square footage requirements to the different programmatic elements. After some editing, the program elements were arranged in several different ways. One of these early arrangements is shown in Figure 3.02.

In order to begin to integrate lighting into the project, the different program elements were considered and ranked in relation to

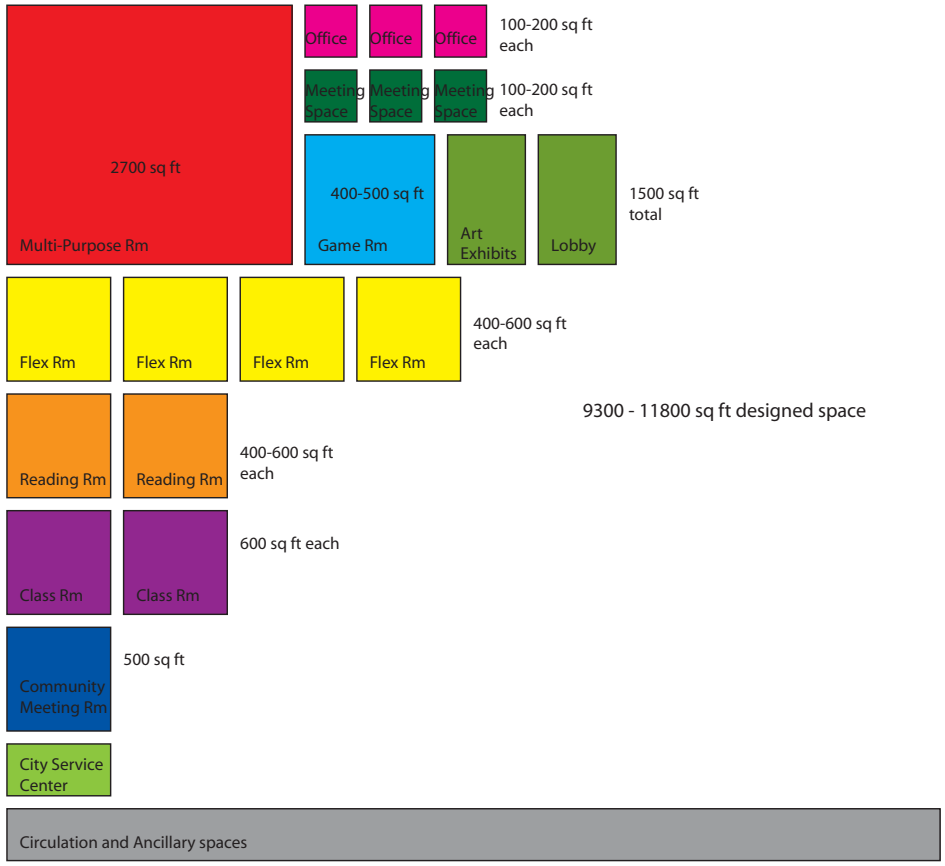


Figure 3.01: Initial space allocations.

their daylighting needs. This is shown in Table 3.01.

The table of daylighting needs helped to determine where on the site certain design elements should be in order to receive a sufficient amount of daylight. The table also made clear the fact that a single-story building would work best, allowing for skylights in almost all of the spaces. Because of the slope of the site, this could occur as a series of terraced single-story levels.

The next step is to take the requirements learned from the programming and try to integrate this into a design concept.

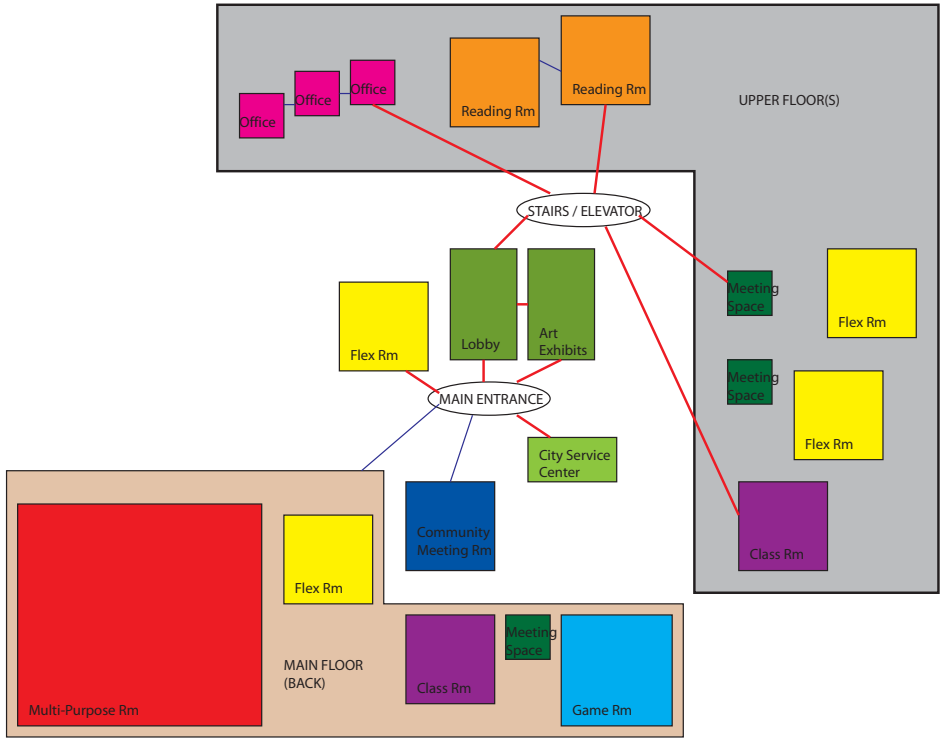


Figure 3.02: Early programming arrangement.

Table 3.01: Daylighting requirements for program elements.

	Square footage	Floor	Entry adjacent	Orientation	Daylight	Direct Sun	Views
Entry	--	1	--	S	Yes	Yes	Yes
Lobby/Art Exhibits	1500	1	--	S	Yes	Maybe	Yes
Community Bulletin Board	--	1	1	--	OK	Maybe	OK
City Service Center	100	1	1 – 2	--	OK	Maybe	OK
Senior Activity Space	400 – 600	1	1 – 2	--	Yes	Maybe	Yes
Senior Activity Space	400 – 600	1	2 – 3	--	Yes	Maybe	Yes
Multipurpose Rm	2700	1 or 2	4 or 8	--	Yes	Maybe	OK
Meeting Rm	100 – 200	1	1 – 2	--	OK	No	OK
Meeting Rm	100 – 200	2	6 – 7	--	OK	No	OK
Meeting Rm	100 – 200	2	6 – 7	--	OK	No	OK
Reading Rm	400 – 600	1	4	N, NE	Yes	Maybe	Yes
Reading Rm	400 – 600	2	8	S	Yes	Yes	Yes
Game Rm	400 – 500	1 or 2	4 or 8	--	OK	No	OK
Art Rm/Meeting Space	400 – 600	1	1 – 2	--	Yes	Maybe	Yes
Art Rm/Meeting Space	400 – 600	1	3 – 4	--	Yes	Maybe	Yes
Art Rm/Meeting Space	400 – 600	2	5 – 6	--	Yes	Maybe	Yes
Class Space	600	1	3 – 4	--	Yes	No	Yes
Class Space	600	2	6 – 8	--	Yes	No	Yes
Community Meeting Rm	500	1	1 – 2	--	OK	No	OK
Bathroom		1	3 – 4	--	OK	Maybe	No
Bathroom		2	5 – 6	--	OK	Maybe	No
Circulation		1 & 2	--	--	OK	Maybe	No
Storage		1 & 2	--	--	No	No	No
HVAC		1 or 2	--	--	No	No	No
			1: First floor, attached to Lobby				
			2: First floor, adjacent to Lobby				
			3: First floor, entry visible from Lobby				
			4: First floor, not visible from Lobby				
			5: Second floor, attached to stair/elevator lobby				
			6: Second floor, adjacent to stair/elevator lobby				
			7: Second floor, entry visible from stair/elevator lobby				
			8: Second floor, not visible from stair/elevator lobby				

Section 4: Concept

As an exercise to begin to develop a design concept, the site sketch (Figure 4.01) is an attempt to show perceptions of the site as experienced on multiple visits to the site. Some key elements shown in the sketch include Aurora Ave, pedestrian circulation, terracing of the site, and views.

Through the sound of traffic and the imposing presence of its barrier wall, Aurora Ave has great presence and impact on the small site. It creates a blank wall on the East side of the site, only affording views from the site as one reaches a higher elevation. Because of this, it also acts as a large sunshade, preventing most of the morning sun from hitting the site.

Another important element of the site concept is the pedestrian circulation. The empty lot of the existing site serves as a shortcut for many pedestrians, creating trails through the undergrowth (shown in light green in the sketch). The main trail parallels the Aurora ramp wall, with some minor trails leading to the different levels of the site.

These terraced levels are also important to the design concept. The section is broken up into three main levels. The lowest level is still very sloped, but the top two act as horizontal terraces, and are somewhat divided by the minor pedestrian trails.

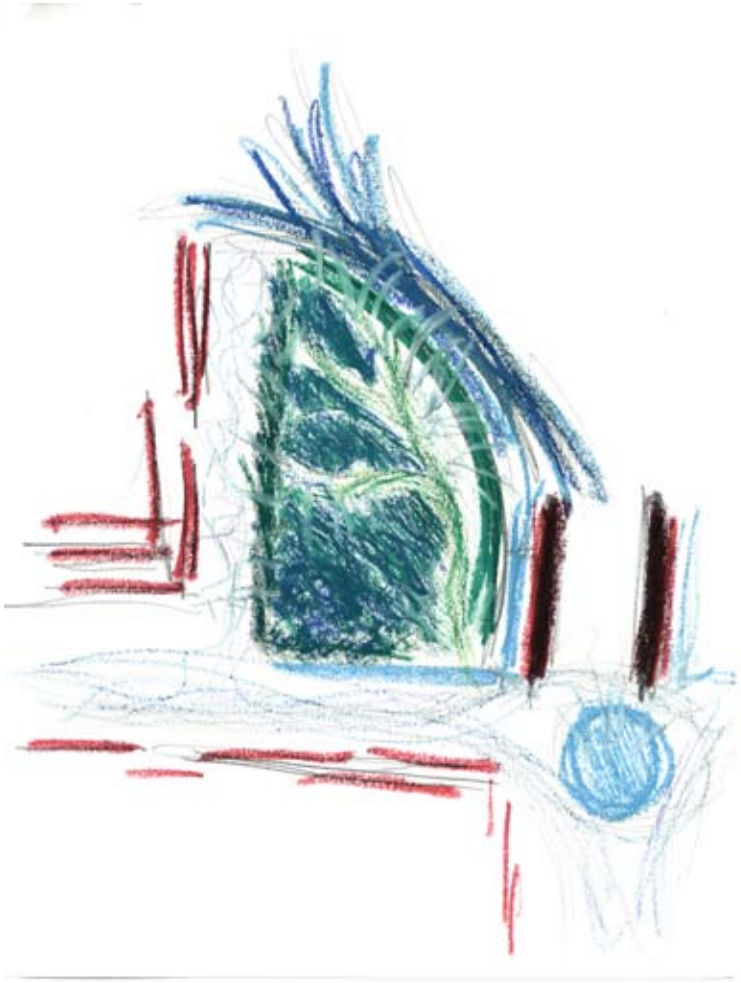


Figure 4.01: Site concept sketch.

The final aspect of the site concept concerns the views available from the different areas of the site. Brief views can be glimpsed of Aurora Ave, but the bulk of the views are to the South and West. The building concept should attempt to preserve most of these views, especially since this also allows a range of daylight angles throughout the day.

The site concept sketch was next developed into a conceptual digital model. This model is an attempt to further the site concept while also integrating some of the ideas about daylighting needs. As shown in Figure 4.02, the model delineates a mostly opaque circulation that parallels the Aurora Ave wall and the main pedestrian trail. The model is also terraced, taking advantage of the natural site terracing, which also allows for multiple levels of single story spaces that can be opened up to daylight. One other aspect of the model includes some smaller dark spaces that have no need of daylighting.

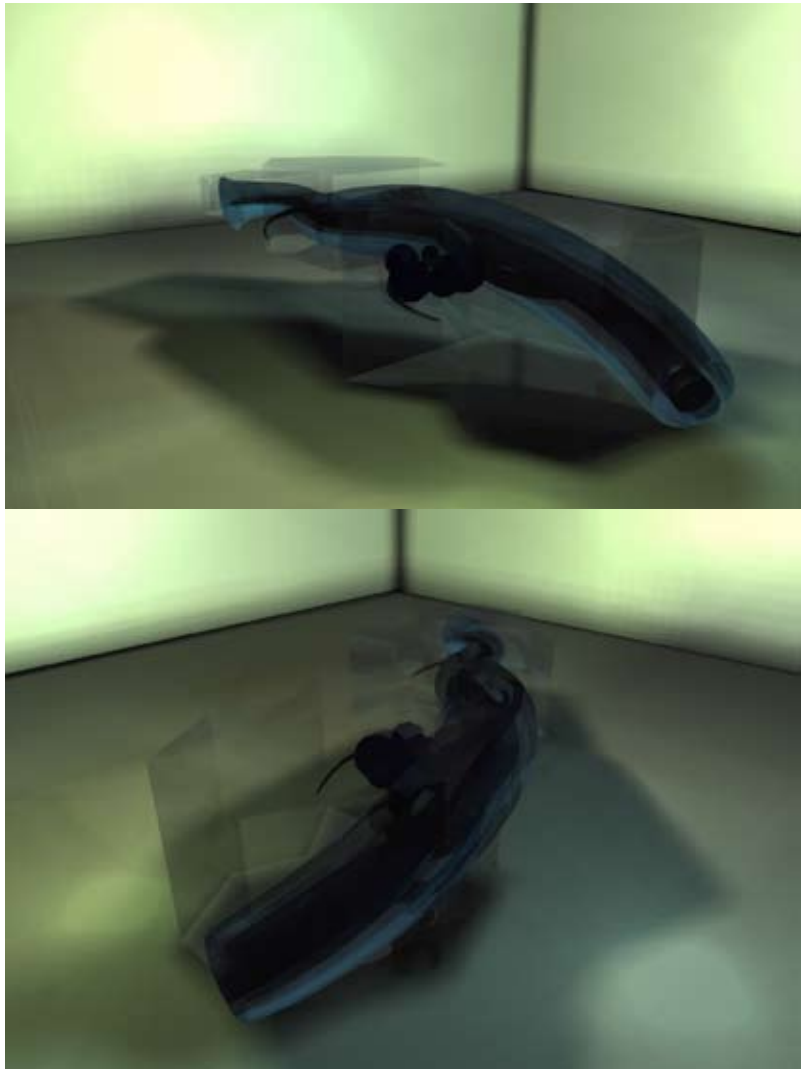


Figure 4.02: Conceptual digital model.

Section 5: Design Development

After developing many iterations of programming arrangements, it was determined that the programming and daylighting ideas needed to be integrated into the design concept (Figure 5.01). The conceptual site diagram provides strong ideas about circulation, views, and sectional arrangement, while the programming and daylighting needs provide spatial arrangement. By integrating these concepts, a stronger space and building arrangement could be developed. The resultant design includes the strongest conceptual elements and also allows for programming arrangement based on daylighting needs.

Another exercise that helped in the programming arrangement was a diagram of daylight hours on the site throughout the year (Figure 5.02). By determining when different areas of the site received sun throughout the year, the optimal placement

Figure 5.01: Integration of programming and concept.

of different design elements could be determined. As shown on the diagram, the site receives most of its daylight between 12pm and 4pm throughout the year, with some additional daylight between 9am and 12pm in the months of March through September. This means that most of the daylight comes from the South and West, so spaces with high daylight needs should be oriented in these directions.

The design concept that resulted from all of these considerations includes three types of spaces (Figures 5.03 and 5.04). The Circulation space (shown in green) consists of a ramp that runs up the Eastern edge of the site, in parallel to Aurora Ave and perceptually holding back the land to the East. Because of ADA requirements and space restrictions, the ramp includes a switchback about halfway up the site, subtly mirroring one of the minor pedestrian trails.The Retaining spaces (shown in dark red) are

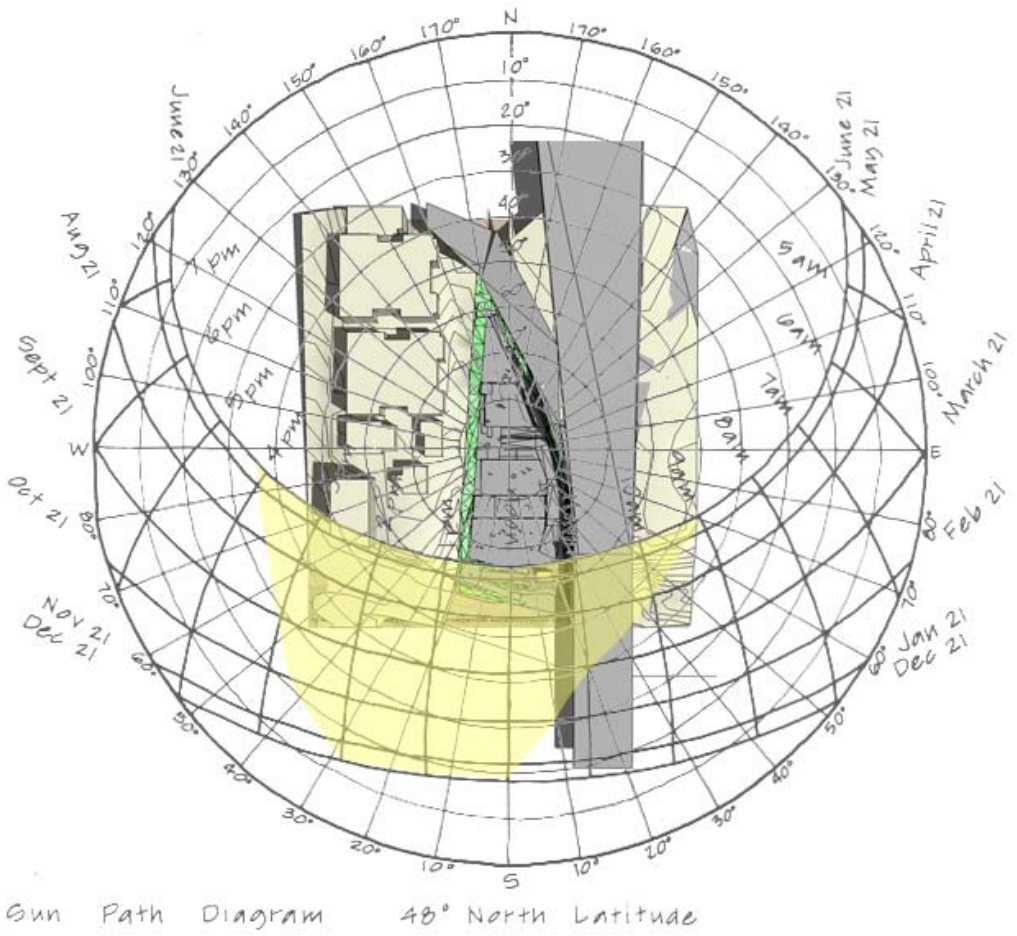


Figure 5.02: Daylight hours on site throughout year.

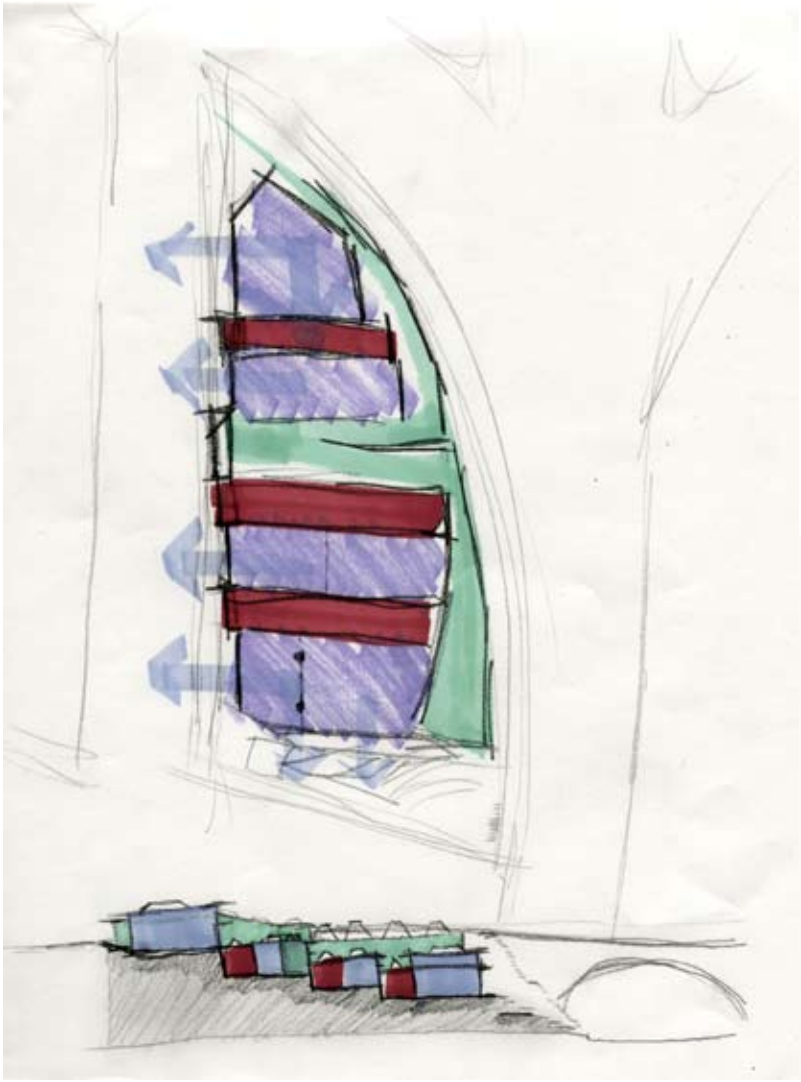


Figure 5.03: Three types of spaces: plan and section.

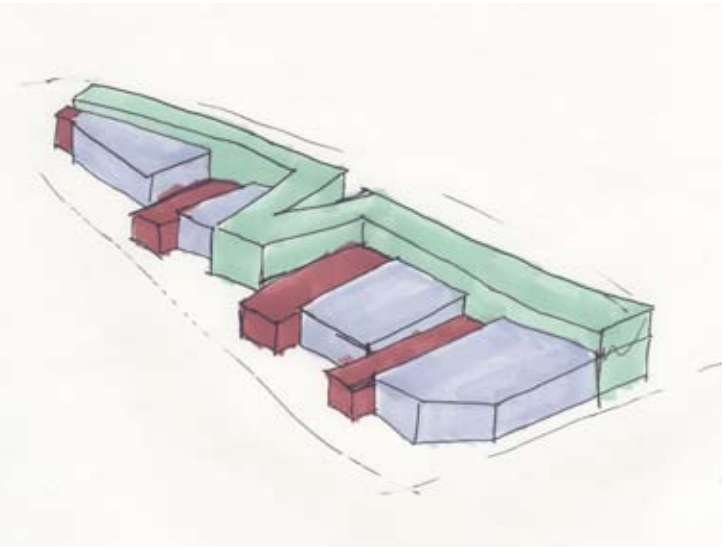


Figure 5.04: Three types of spaces: axonometric.

meant to be viewed as retaining walls, perceptually holding back the land at each terrace level. These spaces house the programmatic elements that need little daylighting and views. These programmatic elements include small meeting rooms, flex rooms, small reading rooms, storage areas, restrooms, and other similarly small, enclosed spaces. The Pavilion spaces (shown in blue) contain the programmatic elements that do not need the privacy of hard walls and that can allow direct sunlight to move through the space. This includes a front lobby / art gallery, a large meeting area, an informal classroom, a rear lobby, a game room, and a reading room. These spaces should be light and airy, perceptually sitting lightly on each terrace platform that has been created by the Retaining spaces. These perceptual ideas about each of the three spaces and how they interact with the site are shown in Figure 5.05.

After defining these three types of spaces, the lighting strategies for each needed to be determined. By defining which types of tasks would be common in each space and by defining a desired mood or atmosphere, the lighting strategies could be developed to meet these needs. Figure 5.06 shows these tasks, desired moods, and possible lighting strategies. Inspiration photos are also shown, defining some of the ideas behind the lighting strategy and mood.

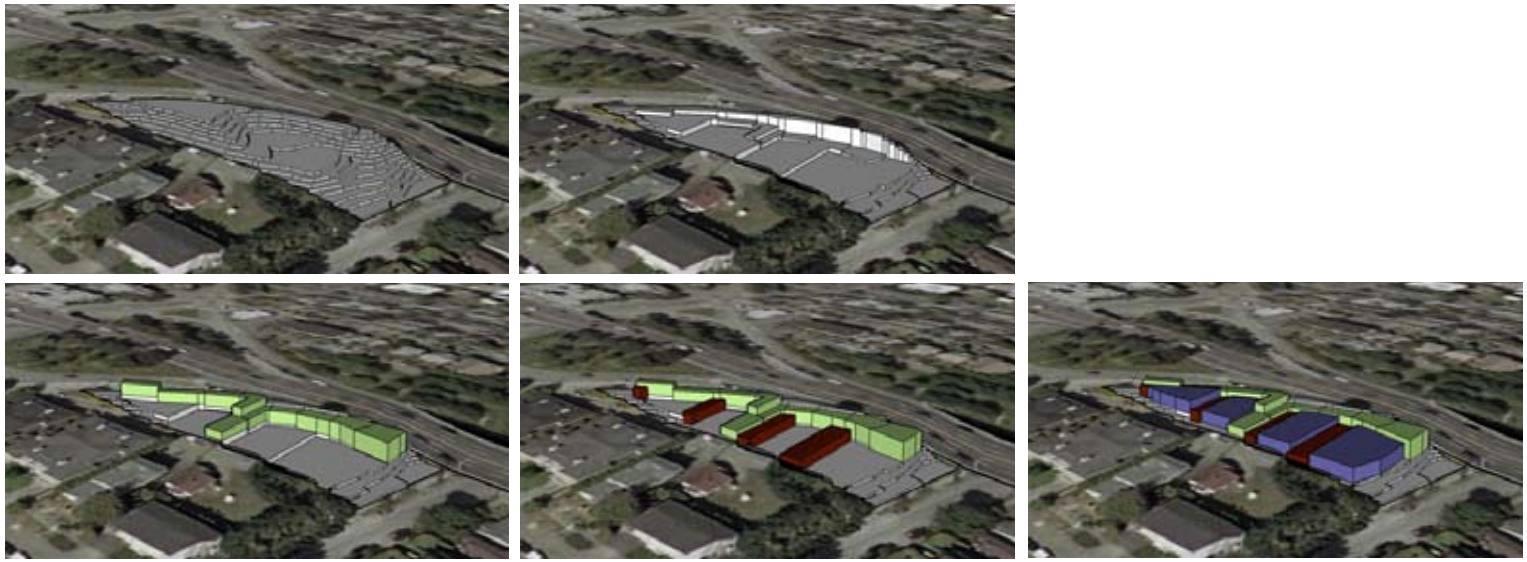


Figure 5.05: Three types of spaces: conceptual ideas.

Three Types of Spaces

	Tasks	Mood/Atmosphere	Lighting Strategies
•Circulation	·Movement through space ·Wayfinding ·Face recognition	·Rhythm ·Movement ·Destinations ·Intrigue	·Contrast ·Lines of light ·Patterns of light
•Retaining	·Privacy ·Quiet ·Reading/Studying ·Writing ·Speaking	·Intimate ·Comforting/Safe	·High reflectance values ·Ambient light ·Wall grazing/material emphasis
•Pavilion	·Variety of tasks ·Movement ·Viewing ·Playing ·Casual reading	·Dynamic ·Playful ·Changing over time ·Visually separated spaces	·Flexible ·High contrast

Figure 5.06: Lighting strategies and goals.

Section 6: Lighting Strategies

For the first step in developing a cohesive lighting design, conceptual ideas for the three different types of spaces were sketched out. Because this lighting design should integrate both daylighting and electric lighting, a lighting design was applied to each space for daytime as well as nighttime.

In order to create an atmosphere of movement and rhythm, as well as a sense of destination, two opposing lighting strategies were conceptualized for the Circulation spaces (Figures 6.01 and 6.02). These ramps would contain a few transparent windows and translucent skylights, at key points throughout the building, to draw visitors to the different levels of the community center using views and light contrast. Electrical lighting could serve as additional illumination during the day, and would then become the sole illumination at night. These lights would run along the handrails of the ramps, creating directional lines or paths of light. Additionally, lights recessed in the ceiling could provide sufficient illumination for facial recognition, also creating a pattern and sense of rhythm along the ramps.

For the Retaining spaces, sufficient illumination for tasks becomes much more important. This is because most of the tasks occurring in those spaces (reading, writing, etc) require a higher, preferably evenly distrubuted, illumination level. There are two other goals in the lighting of the Retaining spaces: the need to provide some indication of time passing, and the desire to accentuate the concept that the Retaining spaces are perceptually holding back the land of the site. Because most of the Retaining spaces have no view windows, any visitors spending significant amounts of time in these rooms will have little indication that time is passing. While each space will be lit by a translucent skylight centered in the ceiling, therefore indicating passage of time as the light levels change, the light changes will be subtle. Any attempt to provide electric lighting that mirrors the daylight contribution will make the light changes even more

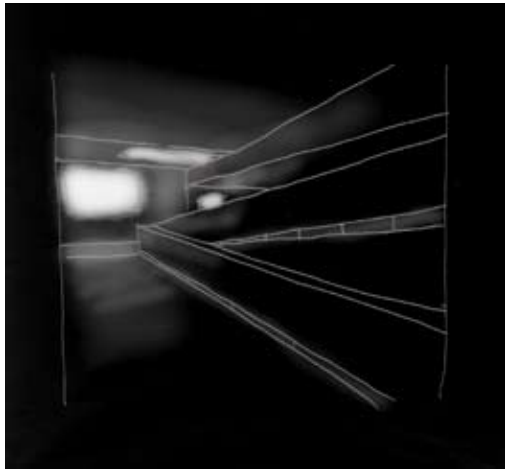


Figure 6.01: Circulation space: daytime conceptual.

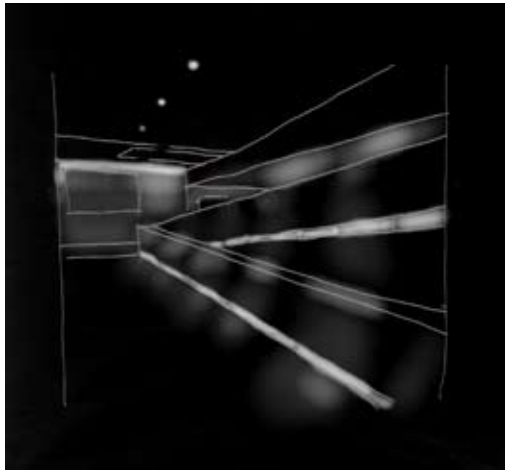


Figure 6.02: Circulation space: nighttime conceptual.

subtle, accomplishing the opposite of the desired result. Therefore, the lighting strategies for the Retaining spaces should create two completely different atmospheres for day and night (Figures 6.03 and 6.04). During the day, the translucent skylight could provide all necessary lighting for the space. By painting the walls white, the resultant high reflectance values in the small space should create a glowing, comforting mood in each Retaining room. For a different effect when the sun is no longer lighting the space, strips of lights recessed into the ceiling along the edge of the wall should create a grazing effect. As an attempt to accentuate the concept of the spaces as Retaining walls, they could be built of heavily textured masonry or concrete. This textured material would then be highlighted by the wall-grazing lights at night, creating a completely different atmosphere while still providing sufficient illumination for the necessary uses of the space.

The lighting design for the Pavilion spaces must be much more flexible. Also, the specific implementation of the electric lighting schemes will likely need to vary depending on what the programmatic use of each space will be. However, the Pavilion space lighting schemes should be similar to the other two types of spaces, in that they will differ between daytime and nighttime (Figures 6.05 and 6.06). During the day, South- and West-facing windows should fill the Pavilion spaces with light, whether overcast diffuse light or patterns of direct sun. An early design also included translucent skylights in these spaces, but it was determined that this would result in too bright of a space, in

Figure 6.03: Retaining space: daytime conceptual.

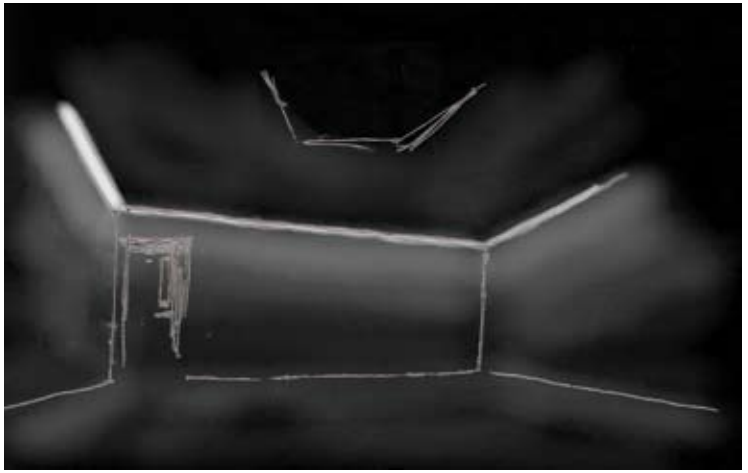


Figure 6.04: Retaining space: nighttime conceptual.

contrast to the other spaces in the community center. Also, the brightness provided by skylights would negatively offset the drama and contrast of patterns of direct sun moving through the space. At night, recessed electric strip lights above the North walls (adjacent to the Retaining spaces) highlight the Retaining walls, again reinforcing the concept that the walls are holding back the terrain and creating a platform for the Pavilion spaces to sit on. Flexible track spotlights provide a lighting scheme that can change throughout the year. This is especially useful for the lobby / art gallery space, as the displayed artwork will change periodically. It was originally thought that this type of moveable lighting could create a dramatic but also useful atmosphere for all the programmed Pavilion spaces. This was later refined into specific lighting schemes for the different spaces, to be more efficient and also to visually separate the areas that share a contiguous space but serve different programmatic needs. One example of this is the lobby / art gallery that is immediately adjacent to a community meeting space.

The next iteration of these lighting design concepts involves creating a realistic rendering of each type of space, attempting to show the perceptions and experiences that the lighting scheme should accomplish. This includes a variety of new design aspects that influence how the light is perceived: interior surface materials, furniture, exterior views, and other specifics such as light color temperature. These particular experiential images were created using a digital modeling program, which required assumptions

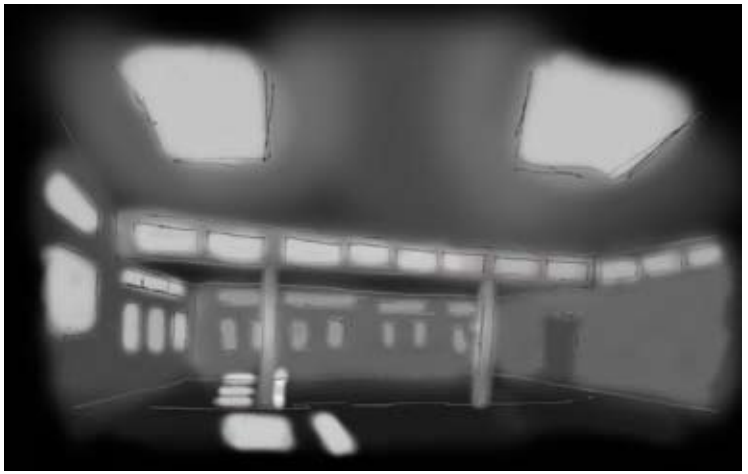


Figure 6.05: Pavilion space: daytime conceptual.

Figure 6.06: Pavilion space: nighttime conceptual.

about materials, lights, and the digital daylighting setup. Images of people, representing users of the space, were digitally inserted into the final rendered images, in order to create a sense of scale and intended use. Further digital manipulation was occasionally required when the rendering engine did not produce the desired experiential results.

For the Circulation spaces (Figures 6.07 and 6.08), a low-reflectance material was chosen to accentuate the contrast of the glowing lines of light. This material was also made specular (glossy, or polished) to create paths of light on the floor through reflection. The lighting schemes are very similar to the earlier conceptual designs. Sunlit windows create destinations to draw users through the space during the daytime, while patterns of lights on the ceiling create a rhythm and sense of movement in both day and night. By using glowing "lightboxes" rather than recessed downlights, the ceiling lights create a pattern in the space even when they are dim or off during the day. An additional handrail light creates yet another line of light to lead visitors up and down the ramps. Larger lightboxes were added at the destination points, near the windows or skylights, to again accentuate the ramp landings. While the lighting schemes are very similar between day and night, the electric lighting becomes more visually important at night, with circulation becoming more about rhythm and paths than about destinations. The dimness of the Circulation spaces is not only efficient, because great illumination is not required for wayfinding, but is also a good contrast to the Pavilion spaces, drawing users into the main areas of activity in the community center.

The experiential images for the Retaining spaces (Figures 6.09 and 6.10) attempt to show the relatively unchanged conceptual lighting

Figure 6.07: Circulation space: daytime experiential.

Figure 6.08: Circulation space: nighttime experiential.

ideas. A deep skylight well allows sunlight through the translucent glass during the day, creating a glow in the room. High reflectance white walls reflect a high amount of daylight, making the entire room seem brighter. Most of the sunlight illuminates the workplane, so any reading or writing should be sufficiently illuminated, and reflected light from the table adds to the general illumination of the room. Once sunlight is no longer contributing, fluorescent strip lights set in a recessed ceiling slot around the perimeter illuminate the room at night. A warm color temperature for the lamps accentuates the perception of transition from day to night. The placement of the fixtures near the wall creates a grazing effect, emphasizing the rough texture of the masonry or concrete walls, adding to the perception of these rooms as Retaining spaces. Reflected light from all four walls should create an even distribution of light. The amount of illumination should also be less than during the day, accomodating the adjustments of the human visual system at night.

For the Pavilion spaces, the transition from day to night is even more dramatic (Figures 6.11 and 6.12). An abundance of South- and West-facing windows allows a great deal of direct sunlight into the spaces during the day. Light and shadow should move across each space, creating dynamic effects throughout the day. Because the programs for the different Pavilion spaces allow users to choose how and where they use each space (as opposed to the Retaining rooms, where users might be stuck sitting around a table for hours), the daylighting can create very bright spaces contrasted with adjacent shaded areas. Visitors to the community center can choose which type of environment they would like to experience. This also creates a constantly changing interior landscape so that each daytime visit to the community center will be somewhat different than the last.

Figure 6.09: Retaining space: daytime experiential.

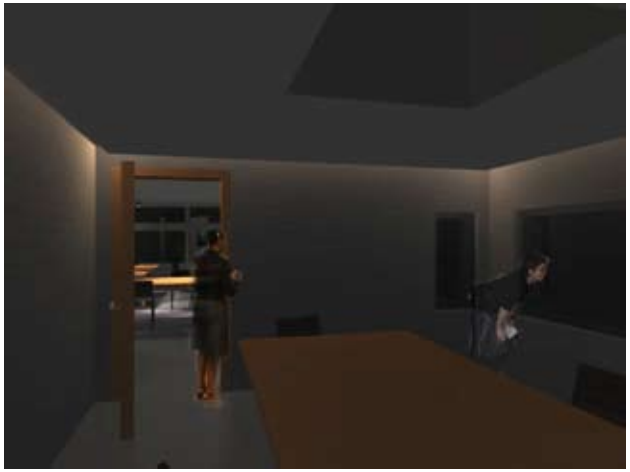


Figure 6.10: Retaining space: nighttime experiential.

Translucent slot skylights located near the North walls of each space create a visual emphasis on the adjoing Retaining space walls. At the times when the center is open at night, the Pavilion spaces can be dynamically lit with electric lighting. A flexible lighting scheme with moveable fixtures can spotlight different areas of each space. Parabolic reflectors for the fixtures direct the light to create contrast between the bright center of focus and the dimmer surrounding spaces. These lights can be adjusted for different tasks or, in the case of the art gallery, to spotlight works of art that may be changed throughout the year. Fluorescent or LED light strips located in or near the skylight slots graze the Retaining space walls, once again emphasizing the concept that those heavy masonry walls are holding back the terrain. This lighting also highlights the various Retaining room doors, making clear that these are public spaces even though they are somewhat hidden, being located at the rear of the Pavilion spaces.

Additional views of the various spaces and lighting schemes throughout the building are shown in Figure 6.13. These experiential images, while considered merely one step in an iterative design process, are used as a basis for analysis of the lighting concepts.

The next step in the design process is to analyze the decisions made so far and consider what changes should be made to create a quality lighting environment. Any changes should continue to keep in mind the desired conceptual ideas, but also provide sufficient luminance and illuminance values to create a well-lit space. The lighting should support the tasks necessary for each space, as well as generate an environment that is memorable and enjoyable for community center employees and visitors.

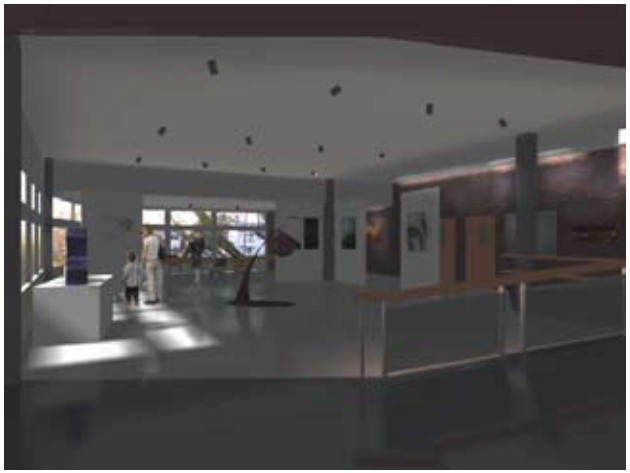


Figure 6.11: Pavilion space: daytime experiential.

Figure 6.12: Pavilion space: nighttime experiential.

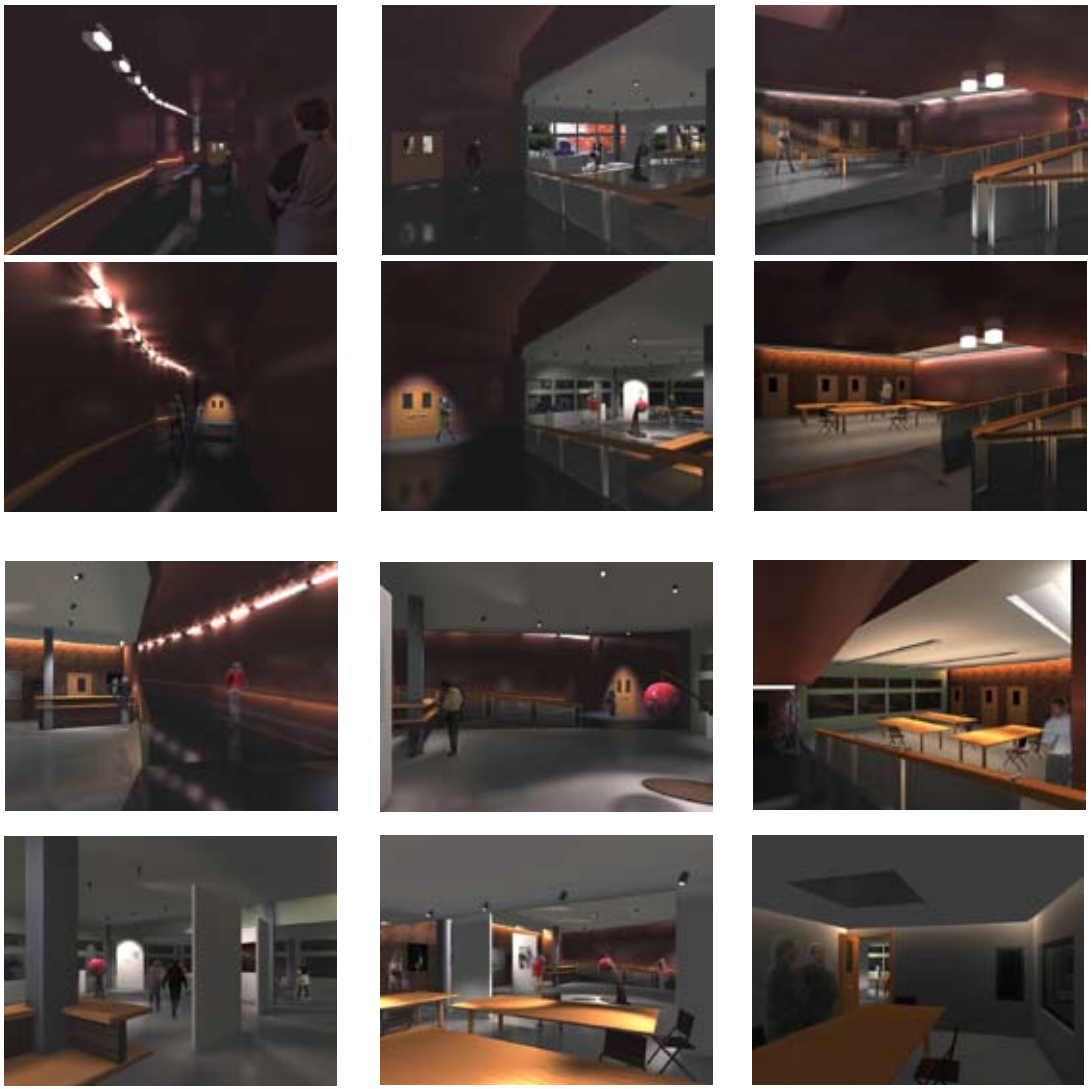


Figure 6.13: Additional experiential images.

Figure 6.14 shows the analysis patterns for the community center lighting designs, as applied based on the conceptual and experiential ideas. A variety of factors were considered, shown in the following analysis images. Daylight factor, the measure of what percentage of light from an overcast sky enters a building, gives a good idea of how well the envelope penetrations (windows and skylights) are working. However, daylight factor is not the only measure of good daylighting design. Contrast from direct sun patterns can cause glare problems, so the sun path throughout the year should also be

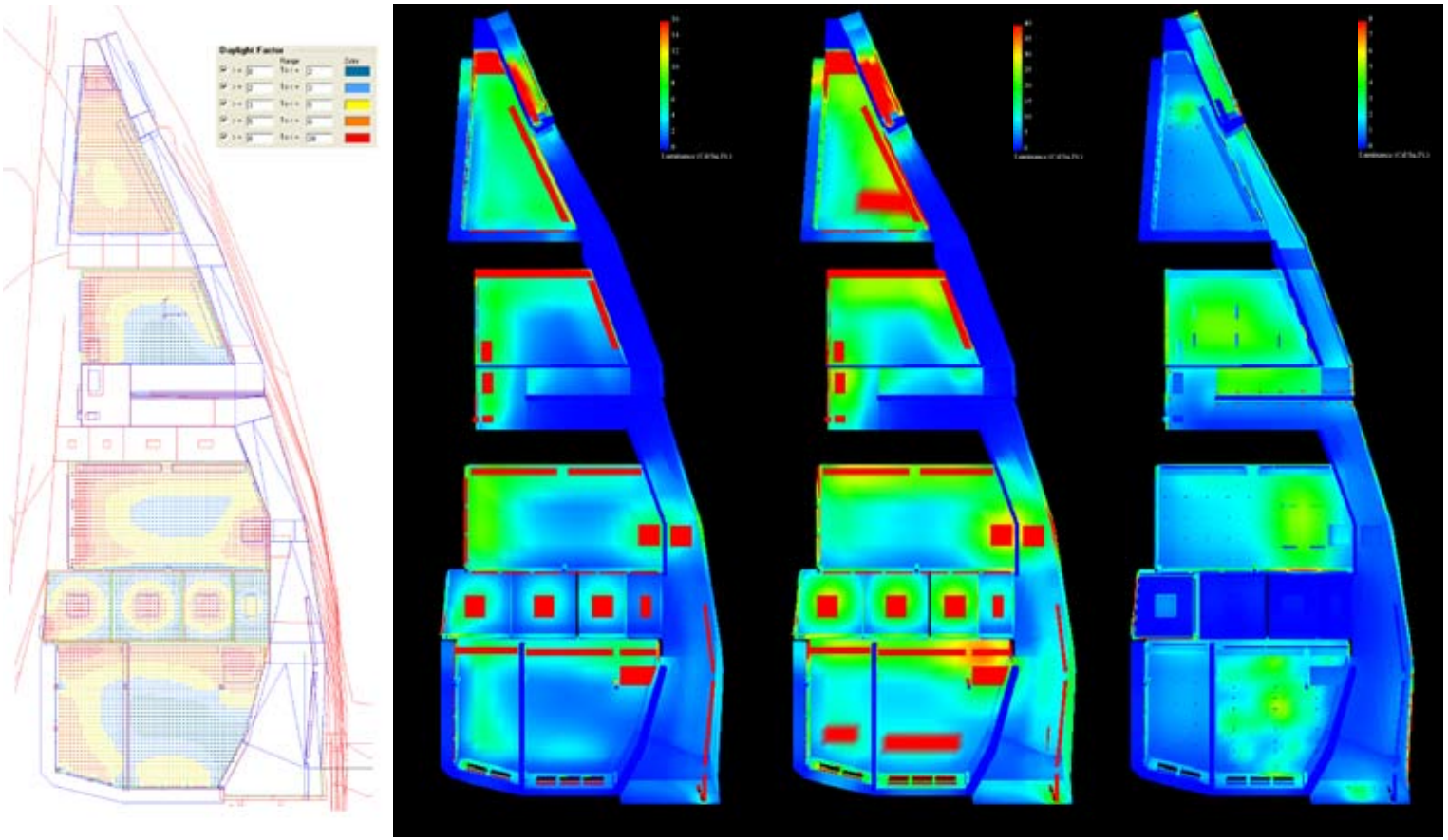


Figure 6.14: Lighting analysis: plans - overcast sky daylight factor, overcast sky luminance, Sept. 21 clear sky luminance, and electric lighting luminance.

considered. Finally, an analysis of the electric lighting schemes can show factors such as lighting levels, contrast, and distribution. It is important to consider the fact that, while absolute lighting levels may differ greatly between the different scenarios (overcast sky, clear sky, and electric lighting), contrast and distribution are the greatest influence on perception of the space. This is due to the fact that the human visual system adjusts and compensates for changing light levels over time. In addition to the horizontal illuminance, other factors should be considered, including vertical illuminance (for facial recognition) and vertical luminance (wall brightness). Because vertical walls are the most visible elements in any interior viewpoint, perception of brightness of a space is highly influenced by the luminance of the walls.

For the initial analysis, luminance values for each type of space were also generated, allowing for analysis of wall brightness and general light distribution. When combined with the analysis of the overall building plans, a comprehensive view of the lighting design can be achieved. The digital model that generated these analysis images used IES files for the electric lights, mimicking how these lights would illuminate a real space. The model

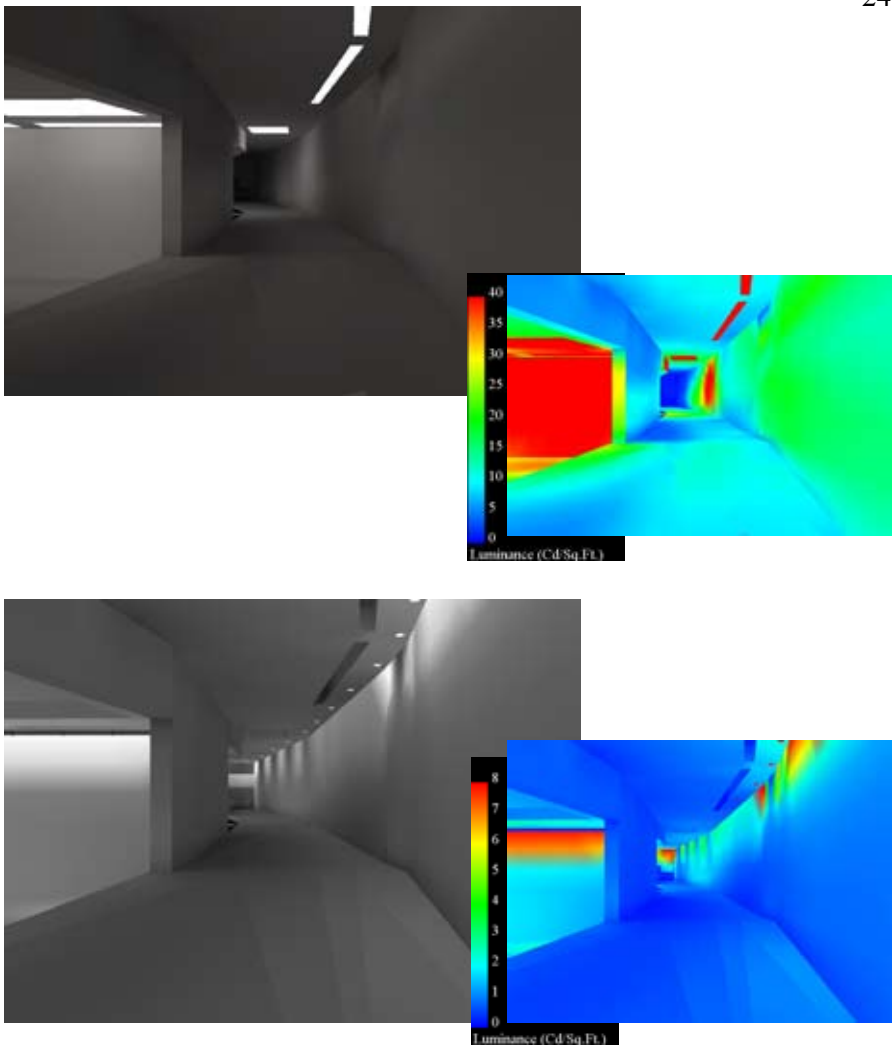


Figure 6.15: Luminance analysis: Circulation space - clear sky, electric lighting.

shows no furniture, few details, and uses basic reflectances with no textures, in order to make analysis less complicated. Eventually, a final analysis with all of these missing factors included would be helpful for final decisions.

As shown in Figure 6.15, the lighting for the Circulation space achieved the desired patterns of light, but did not afford adequate light levels at night. Calculation points on a vertical plane at face level also showed that less than 5 footcandles (fc) illuminate faces in the ramps, which is not quite sufficient for facial recognition. The next iteration of the lighting design would have been to improve this electric lighting layout to get the proper levels of light in the space. Because of limitations of the analysis program and digital model, the layout involving recessed ceiling downlights (from the earlier conceptual ideas) was used for the Circulation space. Since this was proven not to work for the space, the experiential idea of using the glowing lightboxes would have been the next design to be explored in an analysis. Another aspect that was considered in the analysis was lighting power density. In order for a building to be sustainable, the lighting must be sustainable, which means the lighting power density must be monitored once the lighting design reaches a point where that can be done. For the daylighting scheme, the analysis shows that the relevant goals were fulfilled: bright points of destination, well-lit vertical walls, and dim overall light levels in comparison to the adjacent spaces.

The digital model for the Retaining rooms was built for only a single space, as every Retaining room is very similar to the others: each is of a similar size and contains a skylight centered in the room with perimeter strip lights recessed into the ceiling (Figure 6.16). Analysis of this space showed that all of the desired goals were met with this lighting design. When sunlight is illuminating the room, whether overcast or clear sky, the translucent skylight glass disperses the light which is then reflected off the white walls, creating a diffuse glow throughout the entire space. This lighting should create a sense of comfort and intimacy, as is necessary for these smaller meeting spaces. The electric lighting, which was modeled as strips of fluorescent lights for the digital model, created the desired distribution by grazing down the walls, but was also too bright and used too much energy. Both of these problems could be solved by using fewer lamps, but this would then affect the distribution of the light down the walls; it would no longer be a smooth gradient and would likely result in scalloping effects. One possible solution to this would be to use strips of LEDs, therefore using less power, creating lower light levels, and allowing for more even distribution. This would become yet another iteration of the lighting design, followed by more analysis to assure that quality lighting is achieved.

As shown in the earlier plan views of the community center (Figure 6.14), the lighting schemes for the Pavilion spaces were changed so that a variety of lighting methods were used, visually separating each space. This change was made in the

design process between the experiential development and the analysis stage of the lighting design. In order to achieve some of the goals for the Pavilion spaces, such as visual separation of different programmatic elements and using contrast to create a visual hierarchy of focus, it was determined that a variety of different electric lighting strategies would be needed. While the daylighting strategies are essentially the same throughout each Pavilion space, visual separation could be achieved using ceiling height and amount of glazed wall area. These differences are then further emphasized when the electric lights are turned on. Figure 6.17 shows the lobby / art gallery space, adjacent to the community meeting space that can double as an activity space. Because these spaces have activities that change throughout the day or year, and the spaces also flow into one another with almost no architectural boundaries, the lighting had to be very flexible. This is shown in the analysis images to work fairly well at night, but there is still not much differentiation during the day with direct sun. However, because of the amount and orientation of the windows, the overcast lighting creates a subtle separation between each space, so it is questionable whether the daylighting scheme would need to be reworked. Given enough time, this design

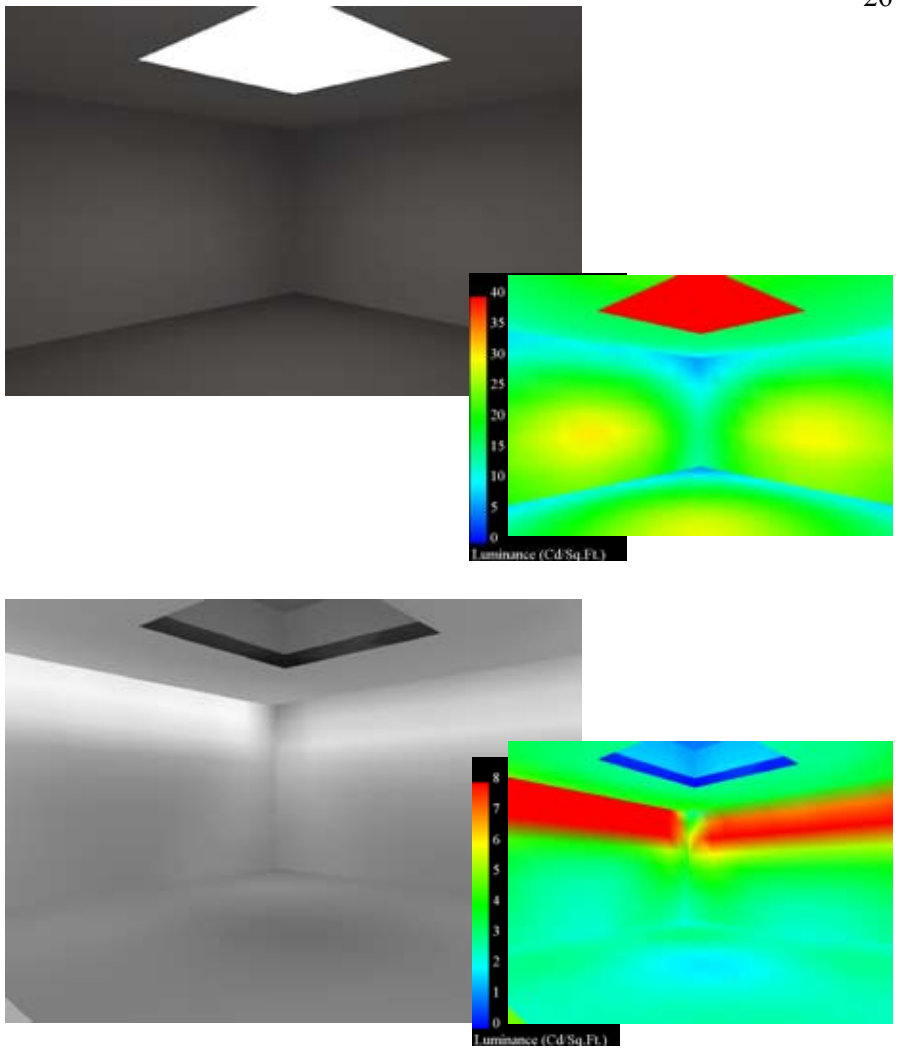
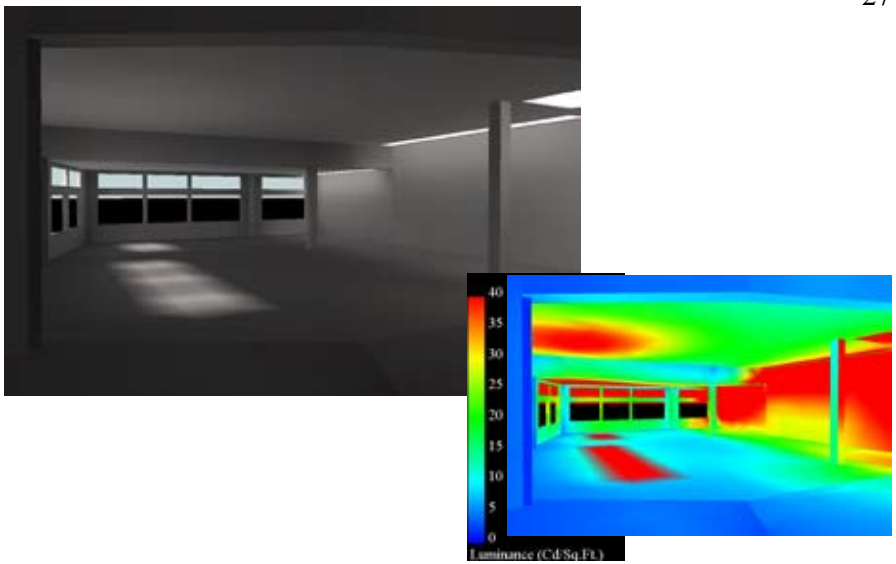


Figure 6.16: Luminance analysis: Retaining space - clear sky, electric lighting.

could be redone over many iterations, exploring a variety of solutions to the lighting issues.

Figure 6.18 shows additional analysis images of the three types of spaces. While some of the spaces are similar to each other or self-similar throughout time, it is still important to approach analysis very thoroughly. This means looking at a variety of spaces, at different times of the day and year, during different sky conditions, and from many view angles. The analysis shown here is merely the beginning of a more exhaustive design and analysis that would create a fully realized lighting design, fulfilling all the desired quantitative and qualitative goals. All of the data gathered from this lighting design could next be applied to design decisions in other areas of the architectural design, informing changes and being adjusted according to other decisions. This should hopefully create a fully integrated architectural design.



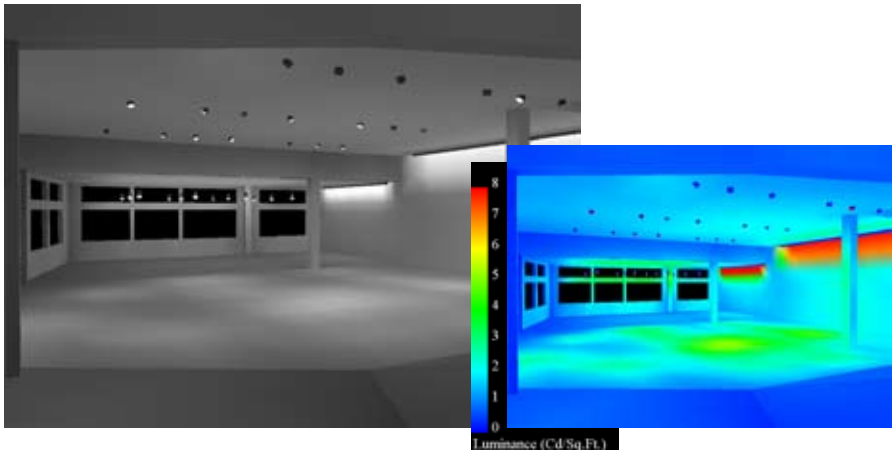


Figure 6.17: Luminance analysis: Pavilion space - clear sky, electric lighting.

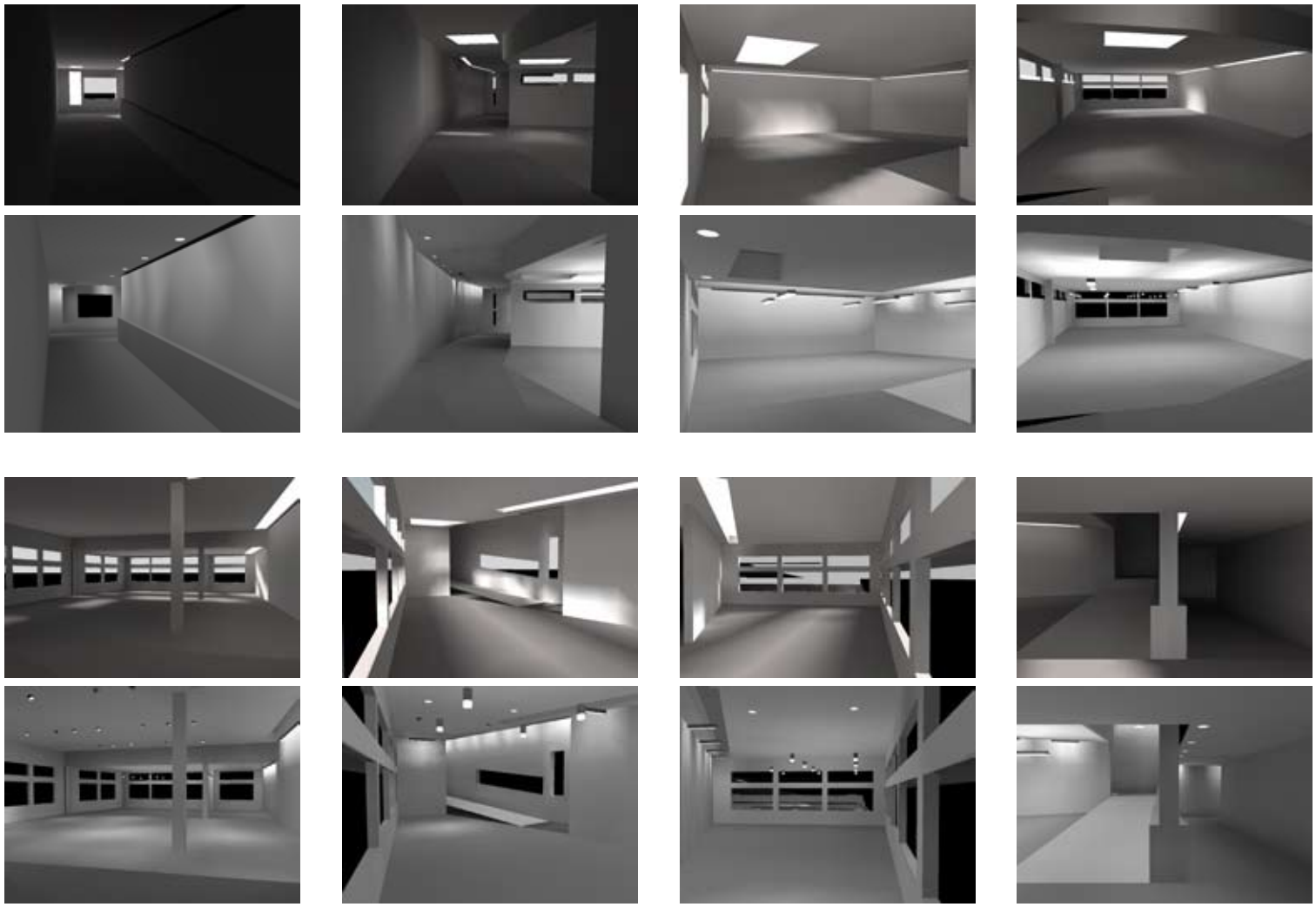


Figure 6.18: Luminance analysis: additional images.

Section 7: Conclusions

This project has been an exploration of a new method of architectural design. The idea that integration of lighting decisions into every aspect of the design process could create a fundamentally different design has been supported and explored throughout. Hopefully, by showing the creation of a different kind of building, one that has been designed from the inside out, the idea of integrating lighting and architectural design decisions might become more common. Rather than dividing design decisions into discrete and unrelated steps (Figure 1.02), a fully integrated design process can create a building that supports a quality user experience. This ideal may not be fully practical in current architectural design processes, but with time, education, and technological advancements in design and analysis, this goal might someday be achieved.

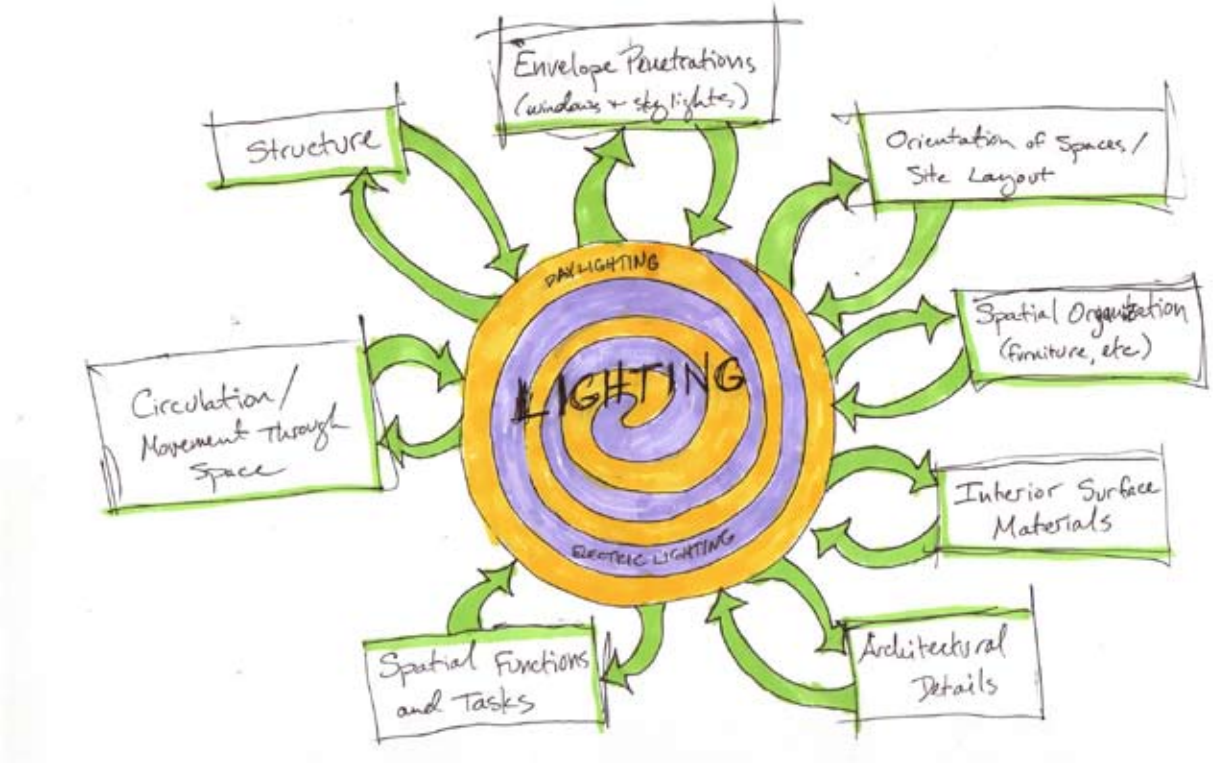


Figure 7.01: Proposed design decision diagram - the ideal integration of lighting and architectural design decisions.

Glossary

daylight factor : the measure of the amount of overcast daylight illuminating an interior space.

footcandle (fc) : a measure of illuminance. One footcandle is defined as the amount of light falling on a one-foot square spherical section positioned one foot away from a single lit standardized candle.

human visual system (HVS) : consisting of the eyes, neural pathways to the brain, and visual processing portions of the brain, the HVS receives and translates light waves into visual images and perceptions.

IES files : created and/or regulated by the Illuminating Engineering Society of North America (IESNA), IES files are digital files that contain information about illumination levels and distribution of electric light fixtures.

illuminance : the amount of light falling on a surface, commonly measured in footcandles.

LED : Light Emitting Diode, a recently popularized type of lamp with improved efficiency and smaller size over other sources such as incandescent and fluorescent.

lighting power density : a measure of the energy efficiency of a lighting scheme, shown in W/sq ft, calculated by dividing the square footage of the occupied space by the total wattage of the electrical lighting system.

luminance : the amount of light being reflected from a surface, commonly measured in lux or in candelas per meter squared (cd/m^2).

parabolic reflector : a reflector shape used in some light fixtures, redirecting light from the source so that it is reflected as a beam of parallel rays. Often used for spotlights and other fixtures that require a concentrated beam and limited spread of light.

sustainable : an adjective used to describe energy-saving methods of architecture and building, commonly defined as methods that avoid depletion of natural resources and/or minimize contribution of polluting materials to the atmosphere.

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Appendix A: Fremont Community Plan Excerpt

FREMONT PLAN

Part 1

FREMONT'S NEIGHBORHOOD PLAN

May, 1999

FUNC

Fremont Urban Neighborhood Coalition

3. Establish a means to communicate between developers and the neighborhood (early warning) regarding new development intentions and plans within the Urban Village (tie into permit process) :

   - Augment current design review process with an "early warning" process (Fremont Early Warning Noticing Process?);
   - Establish a Fremont Design Review Committee with representatives from various community groups;
   - Prepare a MOU between the City of Seattle and the Fremont community groups regarding roles and responsibilities for design review over development projects in Fremont;
   - Define relationship of process and organization to the existing City of Seattle Design Review Board(s) and design review process;
   - Create a Client Assisted Memorandum (DCLU) explaining the Fremont design review and permit process.

4. Extend design review to all commercial properties in the Urban Village, exempt single-family.

Study and creation of guidelines will require additional funding outside this plan. Fund through DON Matching Grant or other means.

Design guidelines should be Fremont-specific and would supersede the City's Design Guidelines for Commercial and Multifamily zones.

This action would be applicable to the Urban Village.

Ensure that all design review processes (existing and proposed) include a review for Crime Prevention Through Environmental Design (CPTED) and "defensible space" and other safety-related principles (B6) - All existing and proposed design review programs should address the issue of defensible space and other safety-related issues along with other urban design issues.

This action is applicable to the Fremont Planning Area.

Assure safe uses of Fremont parks and open spaces (B5) - Apply safety and security principles in park and open space design. Evaluate park plans for lighting and defensible space. Work with the Seattle Police Department to review park and open space design issues. Patrol parks and open spaces, especially where problems have occurred.

This action would be applicable to the entire Fremont neighborhood.

4.3 FREMONT COMMUNITY CENTER

Fremont has told FUNC that it wants it's own community center. The Fremont Community Center ("Center" of the Universe?) is envisioned as a place where an active community will communicate and recreate, meet, teach, and socialize. This Key Strategy generated tremendous interest as well as more than a few great ideas.

Objective

To create a neighborhood community center which will become the focus of an active and creative community.

Fremont Community Center Essential Recommended Actions

Fund a feasibility study for the development of a new Fremont Community Center (CI) - Fremont needs a community center in the Urban Village where the community and visitors can find:

- City Service Center;
- Community bulletin board - kiosk;
- Center for transit and housing information, and community info;
- Space for programming senior activities;
- Rooms for informal meetings, reading, and for games;
- Other neighborhood services;
- Art exhibits and arts-related activities and info;
- Class space;
- Community meeting room;
- Space for organizations to meet, store materials, and have office space;
- Other activities and amenities;
- Support services information.

The study would identify what services are most appropriate. Ideally, the facility would be 5,000 square feet to 20,000 square feet, depending on the uses selected.

An appropriate site/venue will be identified for the center. The site must provide access be a variety of transportation modes. Potential sites include:

- BF Day School - Fremont Avenue, some facilities are presently used by the Fremont Arts Council;
- Floating Structure - Kalakala at Ship Canal/Lake Union;
- N. 36th Street between Troll and Linden;
- Location adjacent to the Fremont Baptist Church;
- Use of Ross Playground Building; or
- Public/Private partnership with Boys and Gals Club.

Identification of finding will be the first step toward development.

The community has expressed a strong desire for a community arts center within the Urban Village, and many ideas for an appropriate location have been discussed, including the use of the refloated Kalakala as a floating facility.

This project will be located within the Urban Village.

4.4 FREMONT TROLL

The Fremont Troll and surrounding environs are recognized by the Fremont community as a potential parks and open space/arts amenity unique to the neighborhood and worthy of developing for the enjoyment of everyone in Fremont. This Key Strategy builds upon several important actions, which focus on the Troll, the area under Aurora Bridge, and nearby open space linkages, to create a special sense of place in Fremont.

Objective

To promote a unique arts/open space amenity in downtown Fremont that can capitalize on the Fremont Troll as a unifying theme.

Fremont Troll Essential Recommended Actions

Rename Aurora Avenue N. (under Aurora bridge) to "Troll Way N." (DI) - Rename this roadway segment from N. 34th Street to the Troll consistent with the Troll Sculpture.

This is an Urban Village project.

Develop Hill Climb (steps) between N. 35th Street and N. 36th Street to connect the Troll site with the property west of the Fremont Library (D2) - Make a formal connection between these two community amenities - acquire an easement to complete the Hill Climb and construct steps between the Troll and the property west of the Fremont Library; N. 35th Street to N. 36th Street near the Fremont Baptist Church. Project will include mid-block crosswalk across N. 35th Street.

This is an Urban Village open space project.

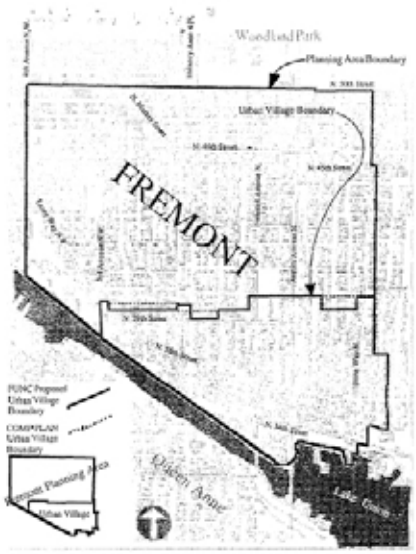
Support Fremont community discussions with Washington State Department of Transportation (WSDOT) about Troll Park Space (D3) - Work with WSDOT to use public right-of-way to the east and west of the Troll and Aurora Bridge for a public Park. Work with WSDOT to develop a maintenance plan for the Troll site and proposed park (Adopt-a-Park Program?). Park would include both sides of Aurora Avenue N. Integrate proven safety measures in the development of the Troll Park space.

This is a unique open space opportunity - an open space park with excellent views of the Aurora Bridge crossing the Ship Canal and downtown Seattle.

The Fremont neighborhood is now in the process of discussing the use of this site with WSDOT.

Family (SF) zones as well as other land use classifications. Actual land uses vary considerably and non-conforming uses are common.

Figure 2-1



FREMONT PLANNING AREA
& HUB URBAN VILLAGE

2.2 FREMONT HUB URBAN VILLAGE

The Fremont Hub Urban Village was designated by the City of Seattle Comprehensive Plan in 1994. The preliminary boundary of the Urban Center was located by the City of Seattle and included "downtown" Fremont as well as portions of north Queen Anne along the Ship Canal. According to the City of Seattle Designation Package, the Urban Village included 339 acres and 3,646 households. Employment within the preliminarily designated Urban Village totaled about 3,600 jobs. Residential and employment densities were calculated to be 10.1 households per acre and 20 jobs per acre, respectively.

The Fremont Urban Neighborhood Coalition (FUNC) has proposed an amended Urban Village boundary shown in Figure 2-1. This modified area includes no Urban Village south of the Ship Canal.

The Fremont Urban Village was designated as a "Hub" Urban Village which includes future growth in both residential units (households) and employment (jobs). This area will be expected to accommodate growth in both of these within its boundary within the next 20 years. The area preliminarily designated as Urban Village by the *Seattle Comprehensive Plan* was estimated to contain a zoned capacity for about 1,400 additional housing units, 5,800 additional jobs, and 2.2 million square feet of commercial space. Because of the new

Appendix B: Seattle Community Center Design Standards

SEATTLE PARKS AND RECREATION

Design Standards For: COMMUNITY CENTERS

Rev. July 10, 2003

I INTENT

A. To provide guidelines for producing Community Centers that truly become "THE HEART OF THE COMMUNITY"- A place for social, civil, and physical activities that enhance the human spirit.

B In the United States, the Northwest leads the nation in sustainable building design. The City of Seattle is one of the recognized leaders in promoting sustainable design, pursuing at least a "Silver" rating under the U. S. Green Building Council's "Leadership in Energy and Environmental Design" (LEED) rating system for all its new and renovated city buildings larger than 5,000 square feet. The Seattle Parks and Recreation Department (DPR) is committed to constructing sustainable buildings and landscapes, and has set a goal of achieving a minimum of "Silver" rating for its buildings, consistent with the Department's Initiative for Sustainable Design.

II GENERAL

A. Comply with all current applicable codes, including ADA Regulations and City of Seattle's Sustainable Building Policy. Community Center designs must comply with Washington State Regulations (DSHS) for childcare.

B. All projects involving design and construction (new construction or renovation) shall comply with Seattle Department of Parks and Recreation Initiative for Sustainable Design. Life cycle costs of alternative building materials and building systems shall be part of the design process of all of these projects. Key points to consider during the design process are.
   1. Provide as much natural, glare-free day lighting as possible, integrating it with the lighting system and HV controls.
   2. Provide exterior windows with operable sash for natural ventilation. Coordinate free air volume with mechanical design. Window hold-open devices shall be used to dissuade in/out egress via windows.

C. Coordinate with Seattle Arts Commission for incorporation of art in the building as a part of "1% for Art" planning.

D. Comply with DPR Design Guidelines, Specifications and Details and the most current City of Seattle Standard Specifications and Plans. Construction of all site elements and furnishings shall conform to established DPR Design Guidelines, Standard Specifications and Standard Details. Accessibility for maintenance staff, service vehicles and access to irrigation controls shall be factored into layout of site elements.

E. Associated Design Guidelines and Specifications needed to start the design process shall include but not be limited to the following list:

Standard Instructions to Designers	00000.01
Do's and Do Not's For Consultants	00000.02
Contract Document Checklist for Project Manual	00000.03
Survey & Mapping Standards	00000.04
Use of Recycled Content Products	00010.01
Operation & Maintenance Manual (incl. notes to consultants)	01730.01
ADA Access and Signage	02500.01
Roofing (new or re-roofing)	07000.01
Gutters (prefabricated aluminum)	07630.01
Hardware (preferred list)	08710.01
Flooring for Community Centers- future	09000.01
Basketball Court Layout (Indoor)	09900.54
Volleyball Court Layout (Indoor)	09900.55
Badminton/Pickleball Court Layout (Indoor)	09900.56
Gym Floor Striping (for New Community Centers)	09900.58
Wood Flooring (for Gyms & Multi-purpose Rooms)	09550.01
Carpeting	09680.01
Painting Work	09900.01
Restrooms (for Community Centers)	10000.01
Community Center Signs	10440.01
Building Systems & Equipment- future	11020.01
Athletic & Recreational Equipment (for Community Centers)- future	11480.01
Control Systems Information Outline (CSI)	13880.01
Energy Management Control System (EMCS)	13880.01
Plumbing Fixtures	15400.01
Boiler Valves & Miscellaneous Equipment	15550.01
Electrical Work	16000.01

F. Maximizing the use of recycled or reused materials is required. Durability, sustainability and maintainability are the over-riding considerations in determining the materials and construction methods for all site elements and areas.

G. Design chair rails with impact resistant wainscot into all spaces, except corridors (use impact resistant wainscot with hardwood or approved top trim at height of chair rails), game rooms, and gym (both rooms to have impact resistant wainscot to minimum 8 to 10 feet height) and kitchen. Coordinate mounting heights with the architecture- chalk boards, tack boards, doors and windows, etc.

H. Appropriate **acoustical attenuation** shall be provided in designs for all activity, game, gyms, and fitness rooms, as well as lobby, corridors and lounge areas.

I. Provide key box for Fire Department.

III. SITE ELEMENTS

A. Site Conditions:
   1. Before design begins, soil testing, borings, sub-surface and seismic conditions, etc., assessments shall be completed, along with topographic surveying of the site. Soil testing shall be required for all newly planted areas. The soil shall be appropriately amended before planting begins.

B. Siting of Buildings:
1. The design team, which includes (but is not limited to) the Architect, Landscape Architect, Civil Engineer, Project Artists, etc., shall work together, with DPR and the community, to determine how and where the building(s) will be located on the site. Criteria to be considered during the siting process shall include: site and building accessibility, parking requirements, availability of utilities, traffic, site circulation, views, noise, solar and wind exposure, environmental and energy savings, and relationships of the community center to other park amenities such as play areas, athletic facilities, existing plantings, etc. Every possible effort shall be made to preserve and protect existing trees that are determined to be of value by a Certified Arborist. Consideration should also be given to possible future expansion.

C. Parking:
1. The number of parking spaces shall comply with the Seattle Zoning Code or as established by DPR for Community Center Facilities.
2. A maximum of 35% spaces shall be striped for 8 feet wide stalls (compact vehicles) and remainder of the parking spaces shall be striped for 9 feet wide stalls.
3. Parking area shall have a minimum of 2% slope to drain, except at ADA spaces and main routes of travel (2% max. slope).
4. Parking space lines shall be painted white. Do NOT use traffic buttons.
5. Drop off/pick-up zones shall be provided near the main entrance and their design coordinated with fire zones and ADA.

D. Site - General:
1. Bicycle racks, litter receptacles and recycle bins, shall be located near the entrances.
2. Main pathways shall be 10 feet wide to accommodate maintenance vehicles. Maintain 2% or less cross-slope where possible for ADA access.
3. A paved special events plaza, when provided, shall be near the main entrance or multi-purpose room.
4. Provide signage for direction from street to main entrance.
5. Signage - see DPR Design Guideline #10440.01 for exterior signs.

E. Site Lighting:
1. The accessible path to the community center entry shall be lit in accordance with ADA requirements.
2. Lighting must balance safety and security with a welcoming appearance.
3. Full-cutoff or fully shielded luminaries should be used to minimize light trespass.
4. Special lighting in areas that could be lurking zones, such as back of community centers, shall be provided with motion sensors.
5. Incorporate energy-efficient measures in lighting, motion sensors etc.

F. Landscape Plantings:
The design team shall incorporate DPR and City of Seattle Best Management Practices guidelines into the design of all site elements. All newly planted areas shall be irrigated with automatic irrigation systems and shall drain adequately. Plants shall be durable and hardy. Plants shall not be used that have thorns or fruit, or which may be hazardous to the public. Native plants, drought-tolerant and low maintenance species shall be used as

much as possible. Large or deep shrub beds around community centers shall be discouraged because of security considerations. Traffic and circulation patterns shall be considered, especially near entries. Pedestrian routes between parking lots, play areas, etc., and the entries to the building, shall be open and paved. Shrub beds shall be protected near entries using curbs, walls or raised planters, whenever possible. Plant warranties, and maintenance during establishment of plantings shall be required to be for at least one year (three years is preferred). Tree wells or trees planted adjacent to paving shall have substantial room for root growth (no less than 50 S.F./tree and larger for larger species). The soil in the tree planting areas shall be prepared for deep growth. Paving adjacent to trees shall be protected with root barriers.

G. Grading/Drainage Systems:
Site drainage shall be accommodated as much as possible. Detention, retention, and treatment of site runoff is required per City of Seattle Stormwater, Grading and Drainage Control Codes, see Ordinance #119965, November 2000. Proper placement and elevations of the building(s) shall assure positive site drainage conditions. Set the floor elevations high enough above the surrounding site areas to assure that all areas drain away from the building terminate in appropriate drainage structures, protecting landscaped areas. The project Civil Engineer and Landscape Architect shall work together to design the grading and drainage. These must work in unison to provide positive drainage conditions. Lawn areas shall be graded no steeper that 4:1. Lawn areas shall be graded to at least 3% slopes to assure positive drainage. Planted areas (shrub beds) shall be graded to no steeper that 2:1 (3:1 preferred) and shall be graded to assure positive drainage. Walls or rockeries shall be provided in areas steeper that 2:1. Paved areas shall be graded at 2% minimum for asphalt paving and 1% minimum for concrete paving, to assure positive drainage and allow for potential settling. Grades of paved areas must also meet ADA requirements (2% maximum cross slope), where paved areas are meant to be accessible routes of travel.

IV. BUILDING ELEMENTS

A. Exterior

1. Materials:
   a. Must be graffiti resistant or offer ease of removal
   b. Must be highly resistant to impacts
   c. Materials must be durable, offering a minimum of 40-year life span
   d. If masonry, must be sealed with appropriate sealer (approved by masonry manufacturer). DPR to review and approve.

2. Painting: All paints must comply with the current EPA and DPR Guidelines and Standards. See Design Guideline #09900.01 for Painting Work.

3. Roofing. See DPR Roofing Design Guideline #07000.01 (for new and reroofing) for steep and low sloped roofing.

4. Plumbing: No liquid carrying piping shall be allowed in the outside walls for freeze prevention purposes.

5. Plumbing: Provide flush, lockable freeze proof hose bibs (verify number and locations).

6. Electrical:
   a. Provide a minimum of 3 to 4 lockable, switchable outlets. Provide outlet(s) in the direction of the field for field access. Locations of the outlets shall be determined during design process.
   b. Provide a 50 amp lockable exterior outlet for future espresso cart at "Community Plaza".
   c. Provide special lockable exterior outlet for an emergency generator with hard surface access from the main street for trucks. Provide a phased power panel with emergency service requirements and a "pig-tail" connection.
   d. Lighting must enhance "welcoming feeling" and be balanced with security and pathway lighting for ADA.
   e. Provide building address on building for fire department.

B. Interior Spaces:

Introduce as much natural glare-free daylight as possible considering the entire center and not simply individual rooms; integrate daylighting with artificial lighting and HVAC control systems. Provide ability to darken windows in designated rooms.

1. Entry/Vestibule:
   a. The entry must have 2 sets of doors with removable center mullions - each leaf to be ADA compliant for opening pressure.
   b. Explore the possibility of ADA automatic doors - if 8.5 lb. or less pull for doors cannot be provided.
   c. Provide walk-off mats with walk-off grates outside - total lineal distance to be 15 - 18 feet or more to catch rocks and sand (outside) and dry the shoes (inside). This is especially important to protect wood and carpet flooring inside.

2. Lobby:
   a. Provide hard surface flooring, such as stained concrete, quarry tile or other materials such as linoleum, rubber tile, etc. Maintenance, appearance and sound attenuation are key considerations. Carpet is not acceptable.
   b. Visitors must easily see reception counter from lobby doors.
   c. Provide space for recycle containers (paper, glass and aluminum).
   d. Make provision for a pay phone location (power and telephone cable).

3. Lounge:
   a. Use easily cleanable resilient surface flooring.
   b. Provide space for display of trophies, artwork, etc.

4. Reception Area:
   a. The location must be easily visible from the lobby.
   b. Staff must be able to visually observe gym, activity room(s), game room(s), restrooms and multi-purpose room entrances as well as main entrance, corridors, pay phone, lounge, and exits.
   c. Place security monitors, parabolic mirrors etc. in this area as required.

   d. Adjust reception countertop for children, ADA, and standard heights.
   e. Provide service space for two computer stations at counter. One shall be either accessible.
   f. Cash handling, including registers shall be considered.

5. Corridors:
   a. Walls and floor material must be durable, slip-resistant and highly impact resistant. Carpet is not acceptable in corridors.
   b. Pop and candy vending machines should be located in alcoves, if possible.
   c. Flooring under and around the vending machines must be an easily cleanable surface.
   d. Sound attenuation is very important.

6. Activity Rooms:
   a. These must be multi-functional adaptable rooms, used for a variety of activities throughout the day such as hangout space for different age groups.
   b. Each room shall accommodate 20 to 30 people.
   c. Lockable cabinets with a stainless steel sink shall be provided.
   d. Lockable storage closet for chairs, tables, etc. shall be provided.
   e. Design for sound attenuation.
   f. Cabinetry shall be lockable with locks keyed alike.
   g. Provide resilient flooring, such as, linoleum, vinyl composition tile or rubber tile floor.

7. Computer Training Room:
   a. The size shall accommodate up to 20 workstations.
   b. Provide four (4) power outlets (one fourplex) and one network outlet for each computer station.
   c. Provide two (2) power outlets and one (1) network outlet for each printer.
   d. Provide lockable secure storage (for servers, disks, books etc.).
   e. HVAC management is very important to control the environment and equipment-generated heat. See Design Guideline #13800.11.
   f. Flooring shall be carpet for noise and static electricity control.
   g. Provide indirect lighting for control of glare.
   h. Multiple phones lines (to be determined during prelim. design).
   i. Fiber optic cable (to be determined during preliminary. design).
   j. Provide sound attenuation.

8. Game Rooms:
   a. Walls in game rooms shall be made of highly impact resistant products such as Medium Density Fiberboard (MDF) or 3/8" MDO.
   b. Room shall be large enough to accommodate game machines, and/or pool table, and/or ping pong tables. Verify program.
   c. Provide lockable storage closet.
   d. Make game room nearby but separate from "teen room".
   e. Design for sound attenuation.
   f. Flooring to be linoleum or VCT.

9. Kid's Room:

a. Flooring to be part carpet for comfort when seated on floor and part hard-surfaced around the sink area. Or a hard easily cleaned surface and a throw rug for seating on floor.
b. Counters will be 24" high (kid-height) with sink and controls easily used by small children. Provide open storage cubbies below (verify number).
c. Provide lockable storage closet for additional supplies.
d. Provide a single restroom with a sink, accessible from kid's room only.

10. Fitness Room:
a. Size room for: 2 bikes, 2 treadmills, 2 elliptical, 1 multi-station gym and 4 stations. Develop a machine use layout diagram.
b. Provide a lockable storage closet for free weights and other equipment.
c. Design for sound attenuation.
d. Special cushion flooring for safety as needed where free weights are used.
e. Meet or exceed number of air changes as required per current State Energy Code (chapter #2).
f. Provide convenience outlets for fans.
g. Provide outlets high on the wall for TV mounted on ceiling hung brackets.

11. Teen Room:
a. Provide hangout space for teens.
b. Late Night Programs will operate in this room.
c. Lockable storage space is required for teen program equipment.
d. For Teen Center Programs, provide spaces for study, tutoring, counseling area, offices, etc.

12. Offices:
a. Provide two (2) private offices and one (1) general office with 3 to 4 workstations. The general office will have the whole-building pager system base.
b. Staff must have visual access to corridors from general office.
c. General office to have a dual "drop-and-secure" wall safe. Drop opening to be @ 40" above floor level.
d. The general office shall be next to the reception space.
e. Offices shall be grouped.

13. Kitchen:
a. Design of kitchen layout to meet all ADA, and Seattle & King County Health Department requirements.
b. Verify size and use with design program. There are two EQUIPMENT types of kitchens- one is a full service with deep fry cooking and a Class A range hood and the other is a warming only without fry cooking and a Class B hood. There are two USE types of kitchens- one is for teaching up to ten students at a time and the other is not for teaching.
c. Provide electric range (for safety) and a convection oven, with hoods that vent to outdoors.
d. Range Hood - Type. Class A for deep fry cooking or Class B for others. Exhaust hood fan shall have a timer.

e. Provide heavy duty, latches, hinges, and Best locking systems on cabinets (ADA compliant). Locks shall be keyed alike. See Design Guideline #08710.01.
f. Provide 2 full size commercial refrigerator/freezer units (with upper freezers) or that are divided into 4 sections - 3 refrigerator and 1 freezer sections. All compartments shall be lockable with padlocks or built-in locks.
g. Provide a commercial microwave oven.
h. Provide a commercial dishwasher with adjacent drying, loading and garbage disposal.
i. Cabinets and counter tops are to be heavy duty with durable wearing surfaces and heavy-duty hardware (hinges locks and latches).
j. Flooring shall be quarry tile with cove base or homogeneous flooring with cove-formed base.
k. Counter top roll-up door for pass-through access to multi-purpose room.
l. Provide a floor drain.
m. Provide grease trap.
n. Counter top next to the stove shall be heat resistant.
o. Island sink shall be provided only if non-island location proves impractical.
p. Provide stainless steel sinks- one three compartment sink, one hand washing sink, one pre-rinse sink, and one prep sink with indirect drain.

14. Multi-Purpose Room:
a. Approximate size 2700 square feet.
b. To be dividable by a ceiling-hung acoustical operable wall (52 to 55 STC Rated) into two spaces - one small and one large - approximately 1/3 and 2/3.
c. Flooring to be gym-type floating floor of wood, #2 or better maple. See DPR Design Guideline #09550.01. Coordinate with Architect for use of walk-off mats and purchase of maintenance equipment (2-speed buffer, paver squeeze for protection of wood floor.
d. Provide a counter cabinet with sink and electrical outlets in each space.
e. Design acoustics of room for large gatherings, music, dance etc.
f. Lighting to be controlled with dimming or multi-task/staged fixtures.
g. Where rooms are dividable, provide separate HVAC zones.
h. Two large closets for tables, chairs, etc in each side or one accessible from both sides.
i. Zone control HV (year around ventilation is necessary for preserving wood floor). Also, consider humidistat control for wood floor.
j. Provide wiring for internal PA and music system.
k. Provide wall mirrors next to Barres for dance per program.

15. Gymnasium:
a. See DPR Standard Detail # 09900.58 for dimensions.
b. See DPR Standard Details # 09900.54, .55, .56, and .58 for court layouts.
c. Provides two portable bleachers that are storable in the gym storage room adjacent to gym.
d. Sports lighting:
1. To have a good color balance and even distribution of 30 FTC (foot-candles) at use level - +/- 3' to 6', combined with light

colored walls. With darker color walls, levels of FTC must be increased. Overall perceived brightness must be the same.

2. To have a control systems to coordinate with daylighting to maintain foot candle level. Provide continuous dimming of fixtures if fluorescent.

e. For multi-purposes such as dances and large gatherings, provide a separate dimmable lighting system if sport lighting is not dimmable.
f. Game Standards shall be as manufactured by ' Senoh'. Verify number of standards with Senoh.
g. Provide thickened slab in areas for game standard sleeves. Verify depth of thickened slab with game standard manufacturer.
h. Provide divider curtain, 2 electrical score boards, and a scorer's table location with computer, phone, power, and scoreboard control outlets
i. Provide electrical outlets and internal PA and Music systems. Electronic equipment to be securely stored in the gym storage room.
j. Gym storage to have a pair of access doors and space for the storage of portable bleachers, multiple game stanchions (standards) and nets, and other equipment. Provide hard surface walls such as painted plywood wainscot to protect walls from damage. Floor can be concrete.
k. Provide a floating maple sports floor system. See Gym Sports flooring Standard #09550.01

16. Restrooms, Family Changing and Showers:
a. Number of restroom fixtures shall be per code.
b. Two separate family changing rooms to have a shower stall, lavatory and water closet - one to be fully ADA accessible. Provide interior locks, changing bench, and towel hooks for each room.
c. Showers shall have at minimum, floor pans with integral walls that extend 6'-8" up to minimize water damage.

17. Custodial Office and Storage:
a. Office to be separate but adjacent from the storage area.
b. Office to have space for regular size desk, chair, filing cabinet, etc.
c. Provide space for wood floor cleaning and buffing equipment and cleaning materials, as well as vinyl floor and carpet cleaning equipment and materials.
d. Storage is for normal day-to-day paper products and cleaners. Storage to be sized for reasonable amounts, i.e. two weeks to one-month supply.
e. Air supply and exhaust shall be designed to eliminate storage odors from the office.

18 Custodial:
a. Floor sink shall be have 4' high stainless steel backsplash or tile finish over backerboard.
b. Provide a floor drain.
c. Can be included in the Custodial storage room.

19 Storage Rooms:
a. Provide built-in heavy-duty shelving.

20. Mechanical and Electrical Rooms:

a. Do NOT place a boiler or hot water tank over "occupied" spaces.
b. Noise of mechanical and electrical systems must be controlled by means of good structural design, vibration dampeners or/and acoustical insulation.
c. Provide emergency 50K exterior lockable outlet, generator panel and panel with emergency service circuits.
d. Adequate lighting must be provided and located for maintenance personnel's use to inspect and service equipment.
e. Pumps shall be mounted on equipment pads on floors.

21. Display Cases for Art:
a. When programmed, provide suitable exhibition space for display of artworks generated through community classes and/or from the City's portable collection. Coordinate planning with Seattle Arts Commission.
b. Coordinate designs of art display spaces or installation with "1% for Art" the planning objectives for each project.
c. Two wall-mounted cases will be provided that are at least 48"H x 60"Wx 9"D.
d. Cases will be mounted with their horizontal center point 60" from the floor.
e. Cases may be either flush-mounted or wall-mounted depending on the particulars of the space they will be placed in.
f. Back surface of case is suitable for mounting picture hangers for 2-D artwork.
g. Cases will be lit. If there is a case design that includes an internal lighting option, the case must also provide adequate venting to maintain a low internal temperature. If the lighting will be provided by an external track system, it must be positioned to fully light the interior of the case when people are standing in front. The lighting must also be positioned to minimize any shadows cast by the top of the case into the interior space if the front of the case is not mounted flush to the wall.
h. Case doors will be lockable. Whether the glass doors are hinge-mounted or sliders, any vertical line created by the doors should be as minimal as possible.

C. Interior Finishes/Materials:
1. Exit doors opening into fire-rated corridors from Activity Rooms, Multi-Purpose rooms, Gyms shall have electric magnetic hold-open devices.
2. Use of blinds - for long-term life, use type within the insulated glass units (integral type), especially on solar (south, southwest & west) side windows.
3. Provide for tack/bulletin boards throughout the center at a consistent height integrated into the architecture.
4. Corridor floors to be of durable material slip resistant and impact resistant. Do not use carpet in corridors.
5. Walls in game rooms and corridors to be highly resistant to impact blows.
6. Provide a minimum of 42" high wainscot of high impact resistant material in all corridors.
7. Provide similar 42" wainscot and a chair rail in the following rooms: offices, activity rooms, kid's rooms, computer rooms and multi-purpose rooms.
8. Provide high impact resistant wainscot up to top of window height in game rooms, teen rooms, and in vending machine alcoves.

D. Computer Service Requirements:
1. Communications & Infrastructure Design Standards and Specifications:
Refer to the most current version of the above manual published by City of Seattle's Department of Information Technology Network Services.

2. Reception Counter
a. When CPU is located inside the cabinet and behind a lockable cabinet door, means of ventilation shall be provided. Provide a minimum of 3 to 4" of clear space between backside of the CPU and the cabinet back.
b. If the CPU is located on the top of the counter, secure CPU and monitor with a steel cable.
c. Provide 2-1/2" diameter knockouts or holes (one per computer station) in the countertop for cables.
d. At the countertop, provide a minimum of one "fourplex" telephone outlet for communication connections (computer, fax, phone and credit cards).
e. If there is no "plugmold" for power available at the countertop, provide a minimum of four (4) "fourplex" power outlets for a total of 16 power connections.
f. Provide a minimum of four (4) power outlets (one fourplex) and one (1) network outlet per computer station.
g. Provide a minimum of two (2) power outlets and one (1) network outlet per printer.
h. If a sliding out type keyboard is provided, make sure it is an ergonomically designed heavy-duty type, such as one made by "Details", a "Steelcase" company.
i. Provide a deep enough countertop to accommodate a 17" monitor.

3. Communications/Telephone Closet:
a. Provide enough space for communications (LAN) equipment
b. Where there is a Computer Lab, provide security to prevent access to City equipment while allowing access to computer lab equipment.

4. Computer Labs:
a. Provide four (4) power outlets (one fourplex) and one network outlet for each computer station.
b. Provide two (2) power outlets and one (1) network outlet for each printer.

E. Interior Signage:
1. See DPR Design Guideline #10440.01 for interior signage.

F. Furnishings:
1. Seating furniture in the lounge must be comfortable and very durable.
2. When fabric is used, it must be stain resistant.

G. Special Equipment:
1. Elevator, if provided, shall have 2000 lb. minimum capacity and shall be ADA compliant.

H. Mechanical and Electrical:

1. Use a coordinated energy efficient heating and ventilating system in conjunction with Sound Building Insulation and Day-Lighting strategies.
2. Acoustical noise of mechanical and electrical systems must be controlled and minimized.
3. Security, fire alarm and sprinklering, and video camera monitoring systems must be integrated into the architecture.
4. Use a Day Lighting strategy tied into the lighting system controls for energy conservation.
5. Provide complete building mechanical systems integrated by means of Energy Management Control System; see DPR Design Guideline #13880.01.
6. See DPR Design Guideline #15550.01 for boiler valves and miscellaneous equipment. Do not use butterfly or ball valves.
7. See DPR Design Guideline #16000.01, "Electrical Work", for electrical system requirements.
8. Provide separate hot water circulation system and tempered water circulation systems. Must have separate pumps for each system.
9. Community center shall be provided with fire sprinklers as required per NFPA and SBC Standards.

H. Communications, and Security:
1. Provide security system motion detectors in each room.
2. All rooms (except restrooms) shall be wired for monitoring TV cable, PA/music, networking (computers), phones, data, power, etc.
3. PA system controls shall be located in the main office and shall have an optional all-rooms or individual room announcement capability.
4. Add conduit for home runs from each room to main distribution frame location.

END OF SECTION