2010

Daskalakis Athletic Center Philadelphia, PA

Britnei Godusky | Lighting/Electrical

Faculty Consultant: Dr. Houser

10/4/2010

Relevant computer files:
P:\bjg5004\Thesis

executive summary

The following report encompasses an in-depth study of the lighting design and performance in Drexel's Daskalakis Athletic Center (DAC) in Philadelphia, PA. With its structurally exposed concrete framing system and Southern-oriented façade glazing, the architecture's sharp lines and angles of aluminum paneling interact with the glazing to create a play on transparency and concealment. The lighting design presented here integrates well with the architecture, highlighting the building both inside and out.

Four spaces are presented in the following pages, with an additional space selected for a purely daylighting focus. Each space is broken down further into an examination of the existing space, important design criteria of both qualitative and quantitative light within the space, and an analysis of the current design. The importance of the façade to the overall building design is apparent in that each of the five spaces interact with the façade in some way, three along market street and two on the northern side.

The overall design of the Athletic Center successfully creates a bright, energetic space perfect for a workout. The consistency of the linear fixtures and cool color temperature of 4100K ensure easy visual transitions between the spaces. Although daylight is integrated into many spaces and attention was obviously paid to sustainability, there are more energy savings to be taken advantage of within the building.

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daskalakis athletic center

general building information

location | NW Corner of 33rd and Market Streets Philadelphia, PA

building occupant | Drexel University faculty and students

occupancy type | Gymnasium/Lounge Café

size | The entire athletic center is 250,000sf but the addition covered by this investigation is 84,000sf

total levels | Three levels above grade

dates of construction | June 2008-December 2009

actual cost | $41 million

project delivery method | Design-bid-build with a gross maximum price

primary project team

Drexel University	*owner*
Sasaki Associates	*architecture* *interiors* *landscaping*
EwingCole	*mechanical/electrical/plumbing* *structural* *fire protection*
Pennoni Associates	*civil* *site design* *geotechnical/environmental engineering*
Turner Construction	*contractor*

restaurant fit-out

LDL Studio Inc.	*architect*
FXBonnes Associates Inc.	*mechanical/electrical/plumbing* *fire protection*

existing conditions

large work space

fitness area

description

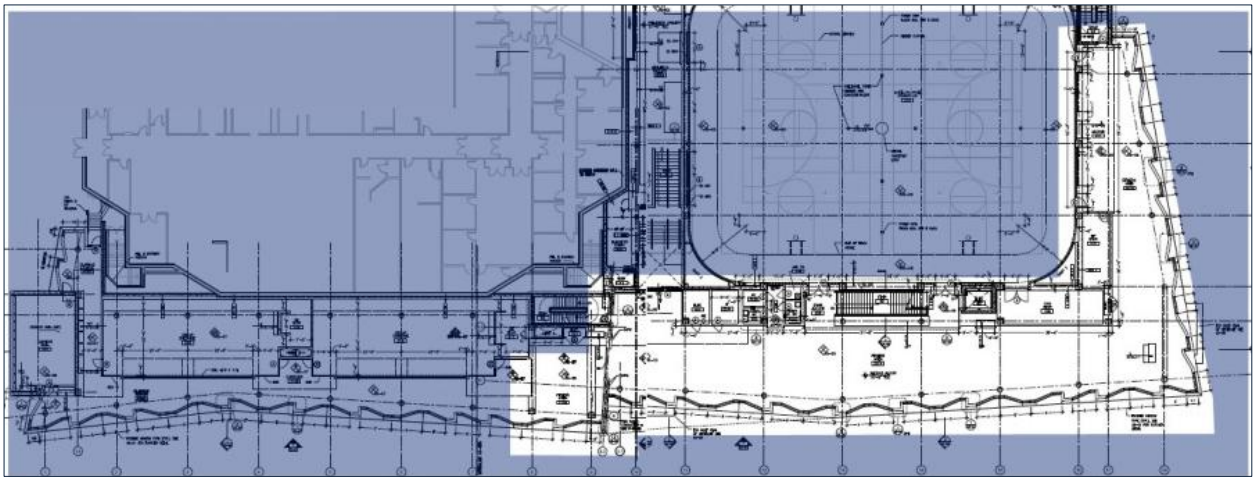

Figure 1- Orientation of fitness area on second floor plan

The fitness and weight lifting areas are located on the second and third floors of the DAC spanning the 140' southern façade. Sections for free weights and strength machines extend along the Eastern façade of the building. A primary focus of the facility, the floor-to-ceiling windows and 13' ceiling heights make the space an open, inviting, energizing place for cardio workouts and strength training.

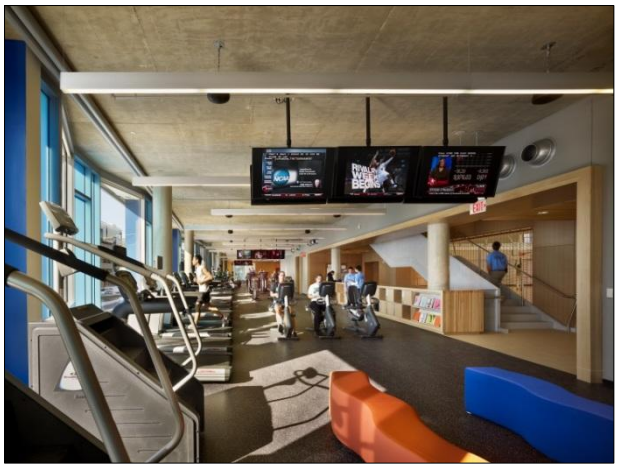

Image 1- Photograph of fitness area facing west

Image 2- Alternate view of fitness area facing west

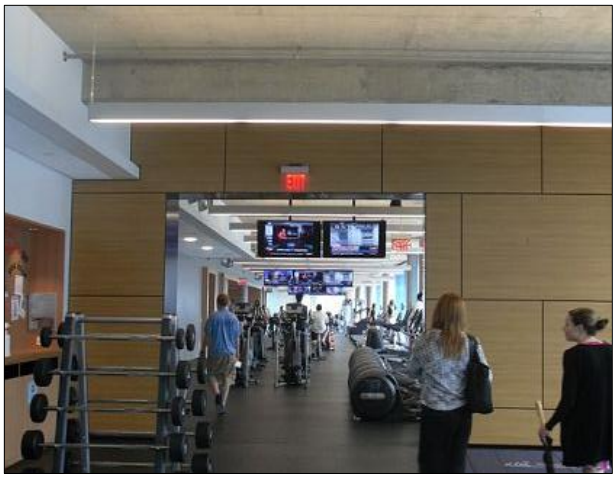

Image 3- Photograph of fitness are facing east

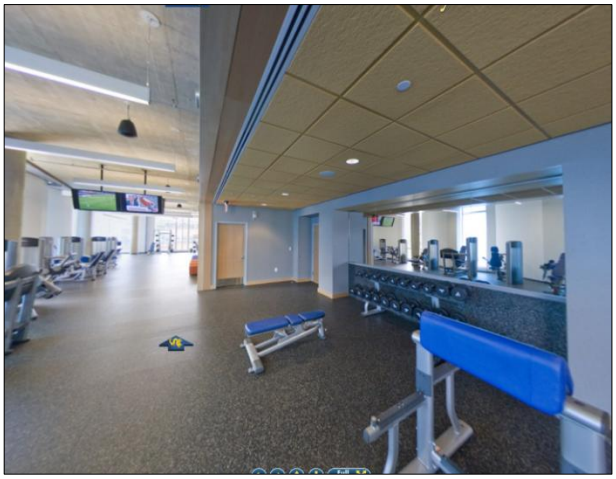

Image 4- Photograph of fitness alcove

materials and finishes

Clean, industrial materials and the exposed concrete ceiling give the space an open, spacious feel that creates and energetic environment that makes it easy to focus on a workout. The flooring and wall colorings are consistent throughout the main fitness area has open ceilings with an exposed concrete finish that is typical in the athletic center's circulation areas. In the alcove and the entrances, as well as on the dividing wall between the spaces a pale beech wood theme is followed in the finishes on the ceiling, walls, and built in shelving units.

fitness center

Surface	Material	Manufacturer	Color	Reflectance
north, east, and west walls	painted gypsum wall board	Sherwin Williams	Dovetail	0.6
south wall	painted gypsum wall board	Sherwin Williams	Ceiling Bright White	0.8
flooring	3/8" rubber tiles	Panorama		0.2
base	6" rubber base	Johnsonite	Moon Rock	0.2
ceiling	Exposed concrete			.60
framing and trim, railings, desk area	Wood veneer paneling	Prodema	Pale	0.45
glazing	insulated glazing	Viracon	VRE1-54	t = .46
panelite	panelite polycarbonate glazing	ClearShade IGU	blue	t = .32

Table 1- Fitness center materials

fitness alcove

Surface	Material	Manufacturer	Color	Reflectance
north, east, and west walls	painted gypsum wall board	Sherwin Williams	Dovetail	0.6
south wall	painted gypsum wall board	Sherwin Williams	Ceiling Bright White	0.9
flooring	3/8" rubber tiles	Panorama		0.2
base	6" rubber base	Johnsonite	Moon Rock	0.2
ceiling	Woodworks Vector Tile Ceiling	Armstrong	Natural Variations Beech	0.45

Table 2- Fitness alcove materials

tasks/activities

Cardio, strength training, and free weight workouts will take place in this space (see figure 6 below for a detailed equipment layout). It also functions as a path from the lower lobby level into the gymnasium, group exercise rooms, rock climbing wall, and various vertical circulation spaces throughout the facility.

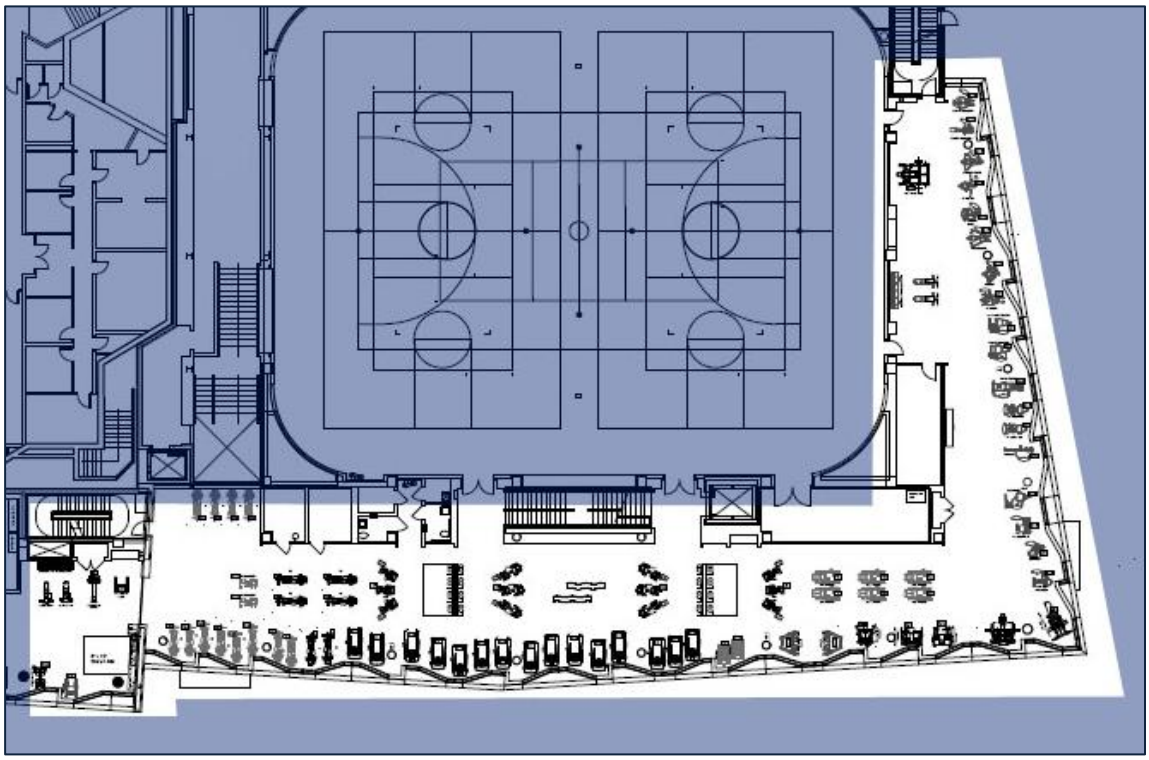

Figure 2- Exercise equipment plan

existing lighting conditions

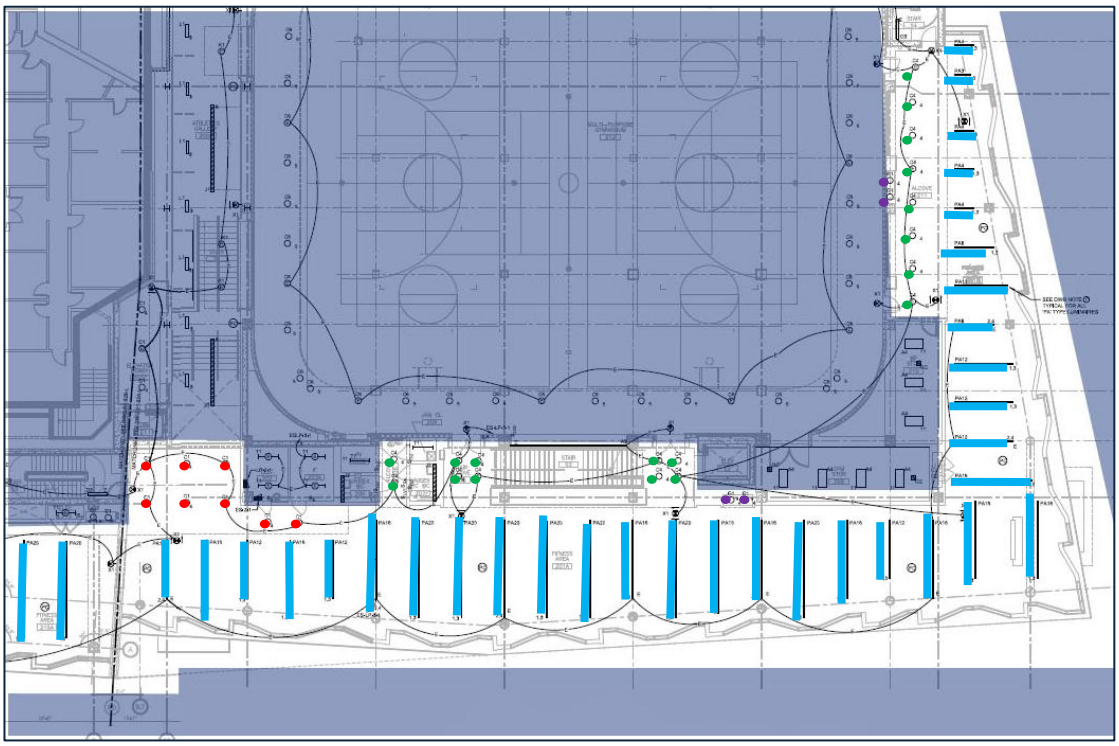

Figure 3- Fitness area lighting plan

Luminaire Schedule								
Type	Description	Manufacturer	Catalog Number	Lamp			V	Ballast
				No	Watts	Type		
C1	10" diameter dual lamp compact fluorescent downlight	Wila	123-26-277-*-HCL10	1	32	PLT-32	277	electronic
C4	6" compact fluorescent downlight with clear alzak cone and self-flanged reflector.	Gotham	AF-1/32TRT-6AR-277	1	32	PLT-32	277	electronic
G1	4" MR-16 adjustable low voltage accent light with specular low iridescent finish	Gotham	DLV-ADJ-MR16-4AC-T30-277	1	50	MR-16 WFL	277	electronic
PA2-32	2-3/8" wide direct/indirect linear T5 fluorescent pendant luminaire with asymmetric distribution.	Selux	M6DI-2T5-SD-C-*-*-277	2/SEC	28	F28T5	277	electronic

Table 3- Fitness area luminaire schedule

The following light loss factors were calculated using the new method in the 2010 IESNA handbook. The Room Surface Dirt Depreciation (RSDD) was neglected and the Luminaire Dirt Depreciation (LDD) was calculated using the updated calculation outlined in the book. A lamp maintenance schedule of twelve months was assumed.

Light Loss Factors				
Lamp Type	**LLD**	**LDD**	**BF**	**Total**
C1	.86	.92	1.0	.79
C4	.86	.92	1.0	.79
G1	.55	.92	1.0	.51
PA	.93	.92	1.0	.86

Table 4- Fitness area light loss factors

Power Density					
Luminaire	**Quantity**	**Watts/fixture**	**Watts/sf**	**Total Power Density**	**Compliant?**
C1	8	32	-	7740 Watts/ 4,620sf **1.7W/sf**	**No.**
C4	18	32	-		
G1	6	50	-		
PA	472 sf	-	14		

Table 5- Fitness area power density

Lighting layout and equipment

Fixtures

The majority of the fitness center's task lighting is provided by a direct/indirect linear lighting system of alternating lengths in order to interact with the façade. The lighting is primarily 4100K, and exceeds the desired footcandle level of 20fc for weight lifting. Architectural wall features are highlighted by recessed compact fluorescent downlights, and the space is lit primarily with daylight for a majority of the time during the day.

Controls

The fitness center integrates daylighting control into the space with the use of photocells and an on/off switching system. After daylit hours, a preprogrammed time clock takes over the switching controls.

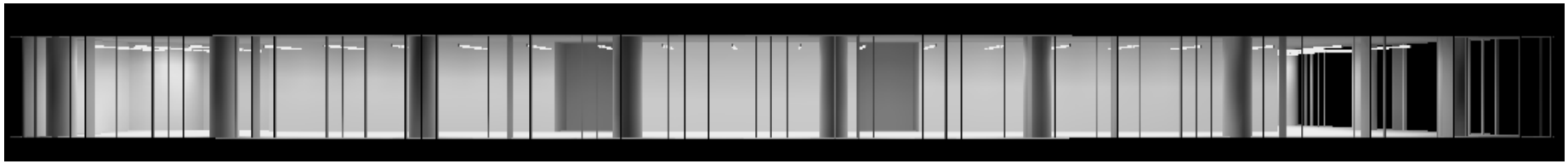

Image 5- Rendered south elevation of fitness center

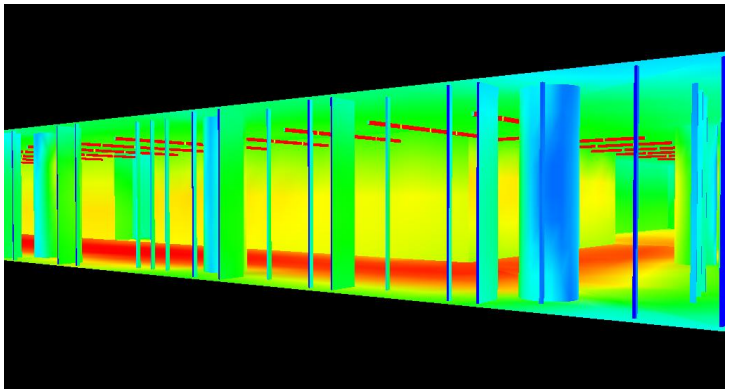

Image 6- Rendered psuedocolor of fitness area

Statistic	Fitness Center	Fitness Alcove
Avg Illuminance	37.04fc	22.90fc
Max/Min	4.32	3.78
Coeff. Variation	0.22	0.31

Table 6- Fitness area calculations

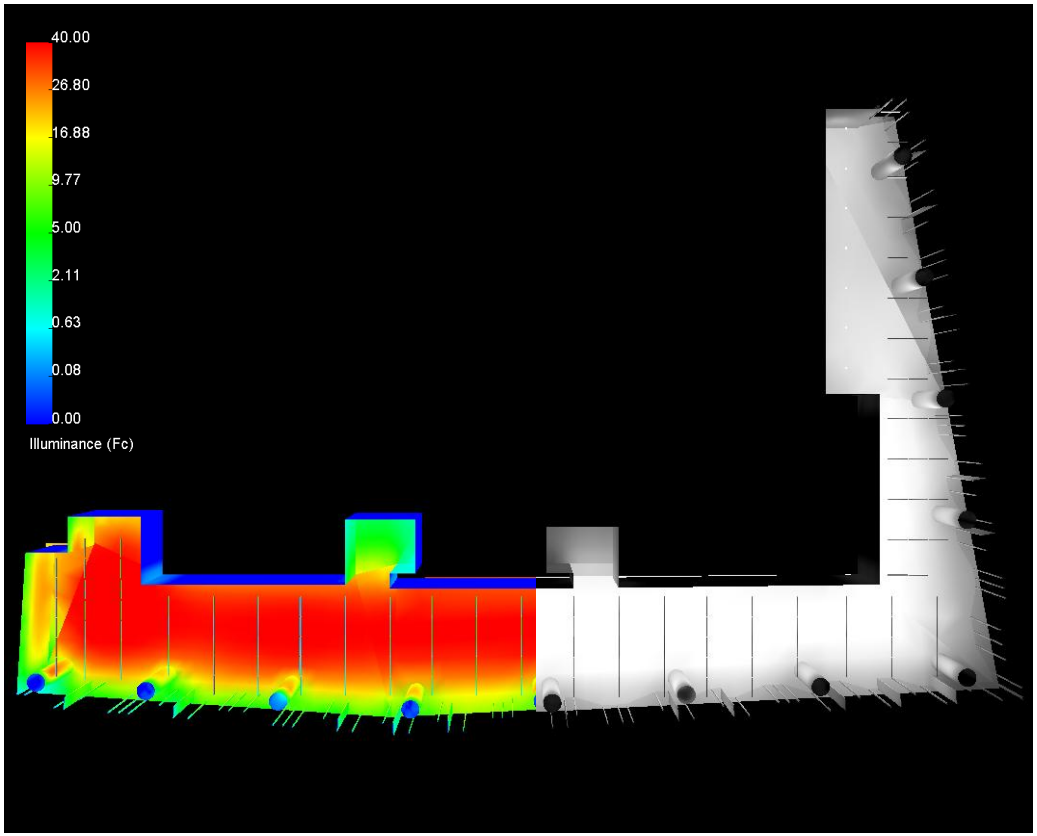

Image 7- Rendered and psuedocolor plan of fitness area

design criteria and considerations — large workspace fitness area

Quantity of Light

desired illuminance levels

weight training:
horizontal – 20fc
vertical – 2fc

ASHRAE/IESNA 90.1: Gymnasium/exercise center *playing area* – ***0.9W/sf***

Quality of Light

Psychological Impressions

The fitness area should feel spacious, and help to energize and uplift the occupants during their workouts. A bright, uniform lighting layout can help to create this impression. Peripheral emphasis and clean, uncluttered walls will add to an open space that encourages focus. To reinforce visual clarity, high illuminance levels on the ceiling and on the workplane are important. A bright open space also reinforces safety and cleanliness, which are also important within a workout facility.

Design Considerations

Very Important Criteria

Appearance of Space and Luminaires- The fitness area is entirely visible to Market Street and so is an integral factor in determining the building's initial impression to the public. In addition to the luminaires being completely exposed due to the exposed concrete ceiling, the façade lighting takes place almost entirely from within, making the appearance of both the space and the luminaires crucial in contributing to the sharp lines and strong angles of the glazing and aluminum paneled exterior. Luminaires should be consistent with the architectural concepts, with no soft forms or round edges.

The space should have an overall appearance of cleanliness and order, and help to encourage activity and efficiency.

Color Appearance (and Color Contrast) - The color appearance throughout all of the workout spaces should be consistent to facilitate effortless visual transitions between activities. The fundamental black, white, and grey color scheme would be better accentuated with a cooler color temperature of 4100K. A color rendering index of at least 80 should be specified in order to render a pleasant appearance of skin tones and objects with the space to create a more inviting and pleasant place to work out.

Daylighting Integration and Control- A view of the outdoors has positive psychological effects on occupants, and can help to energize those working out during the day. Daylighting used as an overall ambient lighting for the workout space will increase overall energy levels and provide a more energetic and dynamic lighting system.

Flicker/Strobe- Flicker can cause headaches and is distracting to occupants. This should be especially avoided in a fitness area when occupants can be working out on a weight bench or mat and will have variable points of view.

Luminances of Room Surfaces- To reinforce the feelings of spaciousness and energy, brightness levels can be elevated by directly illuminating the ceiling and walls.

Modeling of Faces or Objects- People are continually interacting with both each other and the objects in the fitness area. Objects should be rendered accurately to ensure the safe and proper usage of equipment. Facial recognition as well as visibility of muscles and muscle function is necessary for spotting and correct performance of various exercises.

Important Criteria

Direct and Reflected Glare- Glare is a particular issue in this space because the occupants will have a variable line of site throughout their workouts. This not only causes distractions but also can hinder safety as being blinded can inhibit the ability to use equipment correctly. Glare can be avoided by limiting the use of luminaires that aim directly down, instead using perimeter or indirect lighting.

Light Distribution on Surfaces- Distribution of light on the ceiling and walls should be uniform in order to provide both a more energetic and spacious feeling but also to provide a more luminous glow to the exterior at night. The exposed columns are an interesting architectural feature that could be highlighted to provide visual interest.

Light Distribution on Task Plane (Uniformity) - The task plane within the fitness space is variable and can be located on the floor, the treadmill, or at changing heights throughout strengthening routines. This makes the overall uniformity of the light levels throughout the space important for the effective performance of physical fitness tasks.

Source/Task/Eye Geometry- Placement of luminaires needs to be considered in order to enable proper rendering of machinery as well as electronic displays on cardio equipment and to avoid direct light from the source into the range of vision.

lighting evaluation and critique — large workspace

fitness area

The fitness area lighting in the Daskalakis athletic center is bright and uniform with an emphasis on lighting the ceiling. This lends to the energetic feeling that the occupant feels when entering the space. The majority of the task lighting is provided by a direct-indirect linear fixture, which improves the modeling of faces and objects within the space.

The designer successfully used linear fixture of different lengths to react with the changing angles of the façade, and to enhance the appearance of the space from the exterior. Compact fluorescent downlights are used to highlight the coves where reading or writing could take place.

A peripheral focus on the northern wall and western walls could be incorporated to draw attention away from other individuals within the space and help to emphasize the high, clean lines of structure even more. Effective daylighting control is exercised in this space, but the full range of daylight hours could be even better harvested by incorporating dimmers into the space to reduce energy even when daylight is not enough light to reach ideal illuminance levels.

The current lighting system actually provides more than IESNA's recommended levels to the workplane, but in this dynamic area higher light levels are actually preferred during exercise and active physical tasks.

existing conditions

special purpose space

restaurant

description

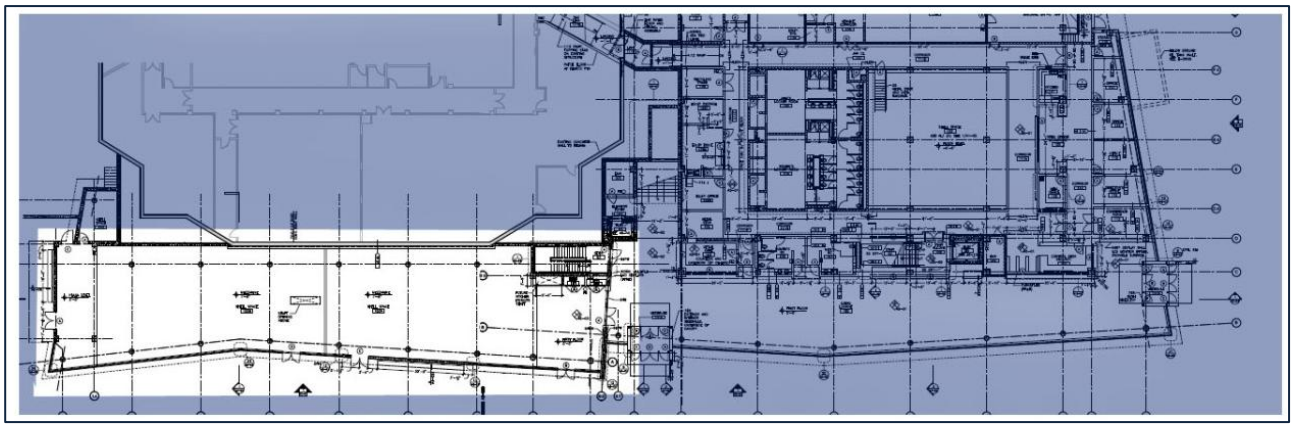

Figure 4- Orientation of restaurant on first floor plan

Image 8- Exterior photograph of western entrance

Centrally located in the heart of Drexel's campus, the Daskalakis Athletic Center dedicated the western half of their southern Market Street façade to a restaurant and sports bar. Windows extending to the ceiling provide a street view to almost every table in the restaurant, with flat screen TVs located throughout facing all directions. A full bar spans the north wall of the main restaurant space, creating a concealed space for an intimate dinner experience shielded from the commotion of the sports bar.

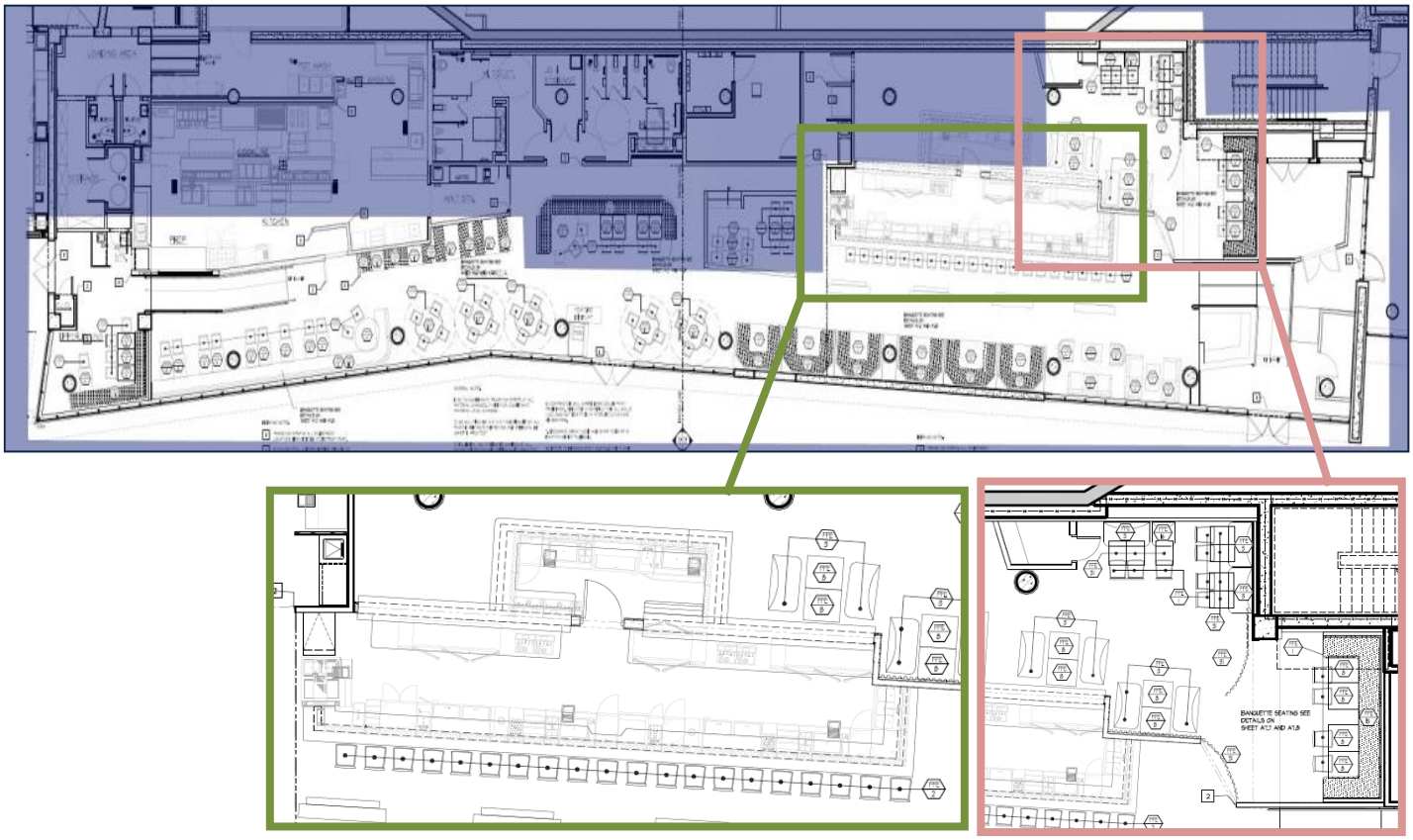

Figure 5- Detailed plan of restaurant highlighting the bar in green and the private lounge in pink.

Lighting layout and equipment

Fixtures

The restaurant lighting is almost entirely composed of metal halide and halogen track heads for the color rendering of food and people in the space. Custom fixtures adorn the bar, and are shown here in the private lounge behind the bar in figure 14 to the right. Task downlighting is provided at all service stations in addition to at both hostess stations at either entrance to the restaurant.

Image 9- Photograph of private lounge

Controls

The lighting is broken into multiple zones and is separately switched. Most luminaires have dimming capabilities to transition the space from lunch or a sporting event to more intimate dining.

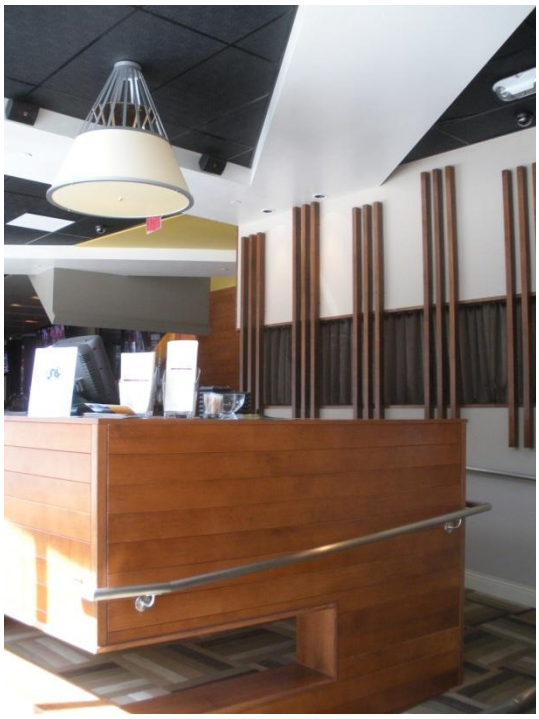

Image 10- Photograph of hostess stand at east entrance

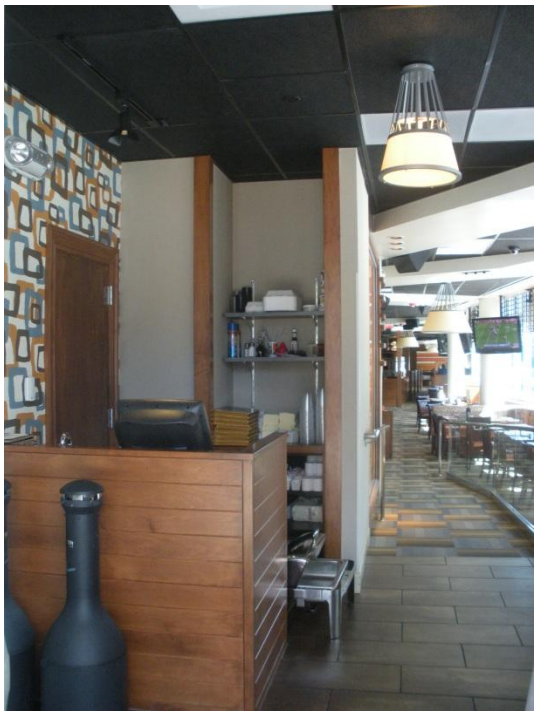

Image 11- Photograph of hostess stand at west entrance

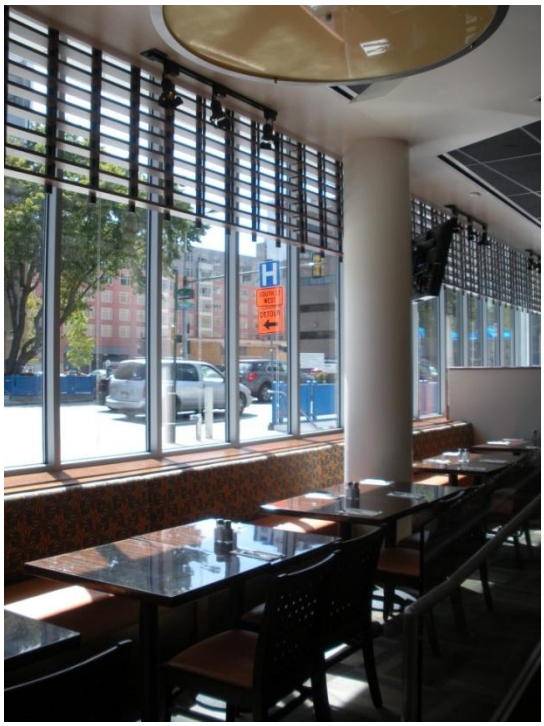

Image 12- Photograph of seating along south wall

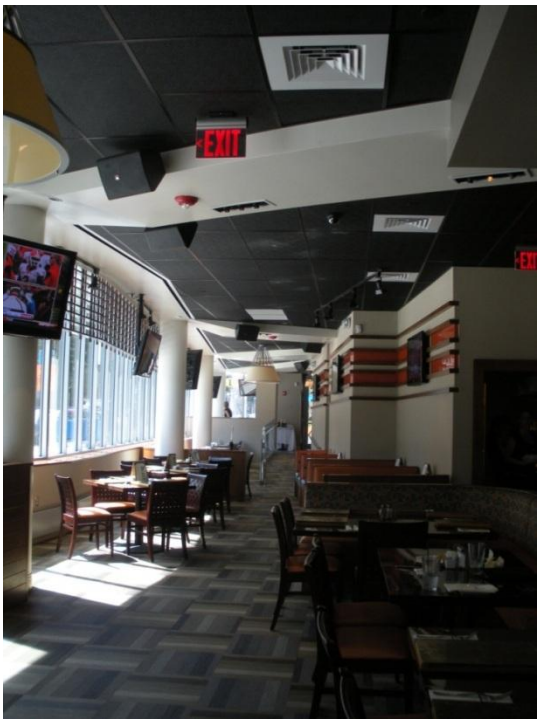

Image 13- Photograph of western half of restaurant

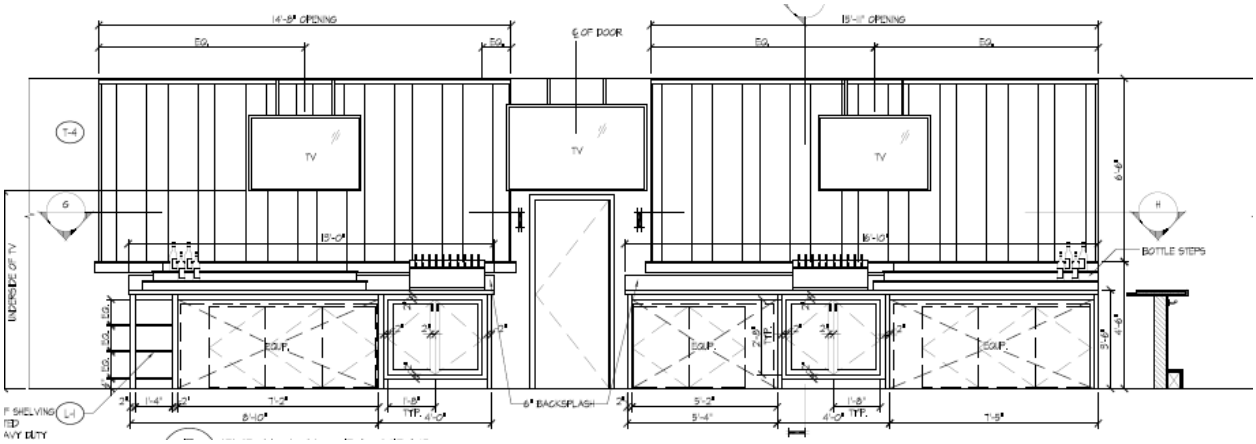

Figure 6- Bar elevation

Image 10- Photograph of bar facing east

Image 11- Photograph of bar facing west

materials and finishes:

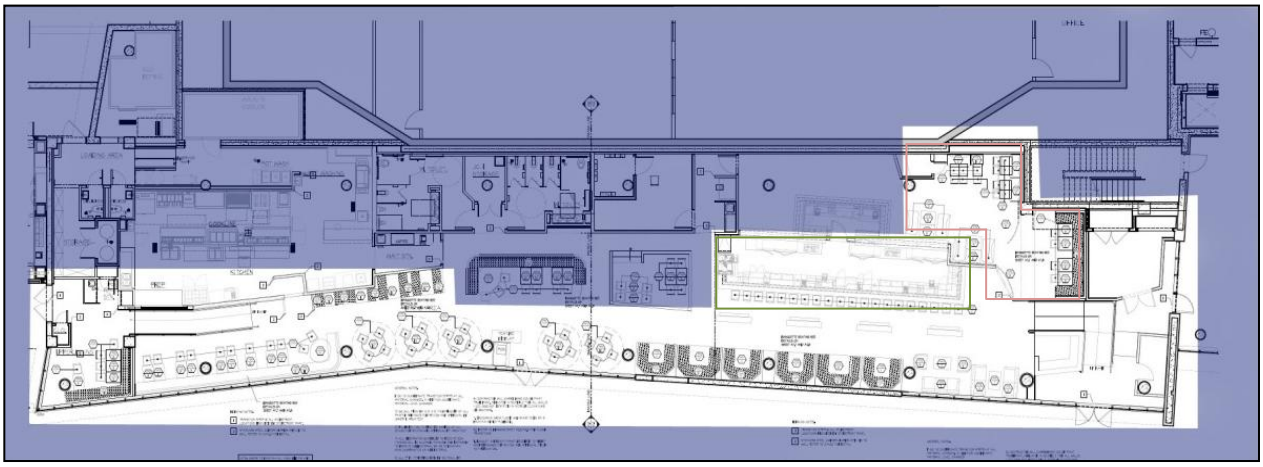

Figure 16- Photograph of hostess stand at west entrance

main restaurant

Surface	Material	Manufacturer	Color	Reflectance
walls	painted gypsum wall board	Benjamin Moore	Soft Chamois	0.8
wall stripes	back painted tempered glass	Benjamin Moore	Yellow rain coat	0.68
flooring	18" x 18"carpet tile	Spartan Surfaces	Cork	0.22
base	millwork contoured wall base	Johnsonite	Warm Beige	0.33
ceiling	2'x4' ATC ceiling tile	USG	Flat Black	0.05
ceiling soffits	gypsum wall board	Benjamin Moore	Soft Chamois	0.8
glazing	insulating laminated glass	Viracon	VRE 1-54	t = .46

Table 7- Materials in restauarant area

private lounge

Surface	Material	Manufacturer	Color	Reflectance
walls	painted gypsum wall board	Benjamin Moore	Ochre	0.2
walls	decorative paneling	Koroseal	Beyond	0.57
flooring	tile flooring	Stone Source	Beige	0.46
base	Millwork contoured wall base	Johnsonite	Warm Beige	0.33
ceiling	2'x4' ACT ceiling tile	USG	Flat Black	0.05
ceiling soffits	painted gypsum wall board	Benjamin Moore	Soft Chamois	0.9

Table 8- Materials in private lounge area

bar

Surface	Material	Manufacturer	Color	Reflectance
walls	painted gypsum wall board	Benjamin Moore	Taos Taupe	0.45
walls	painted gypsum wall board	Benjamin Moore	Ochre	0.2
flooring	1' x 2' tile flooring	Stone Source	Cortaud	0.53
base	Millwork contoured wall base	Johnsonite	Warm Beige	0.33
ceiling	2'x4' ACT ceiling tile	USG	Flat Black	0.05
ceiling soffits	painted gypsum wall board	Benjamin Moore	Soft Chamois	0.9

Table 9- Materials in bar area

tasks/activities

Both the guests and the wait/bar staff should be considered within this space. The principal tasks for the guests in the seating area include dining, socializing, and drinking, but can at times include reading, writing, and collaborative meetings given the location on a college campus. At either end of the restaurant are hostess stands. These areas should be inviting and draw people into the restaurant, while providing enough light for writing and computer tasks. A great deal of movement will take place throughout the space as servers run food and guests move between the bar and seating area.

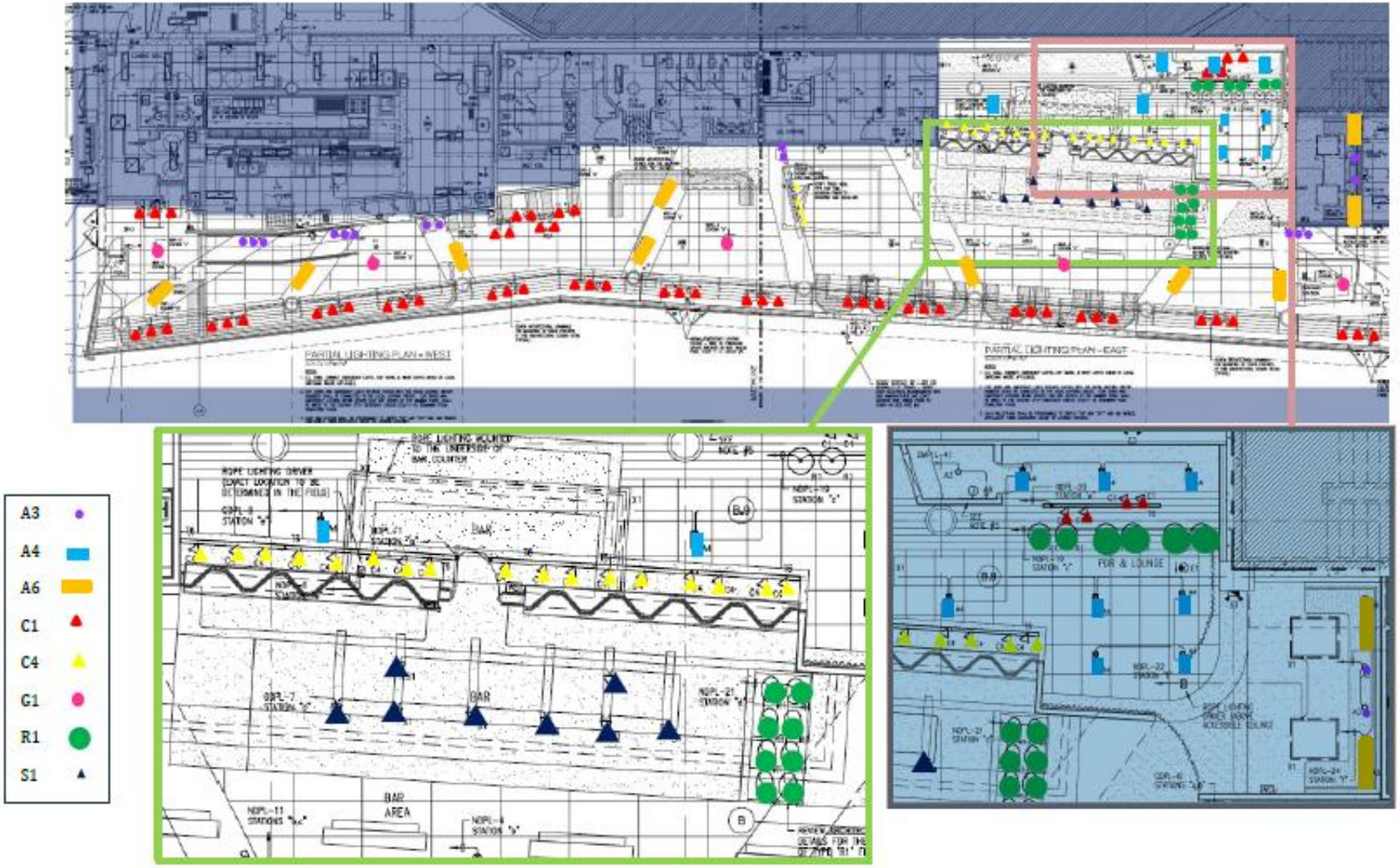

Figure 7- Color coded lighting plan

Luminaire Schedule								
Type	Description	Manufacturer	Catalog Number	Lamp			Voltage	Remarks
				No.	Watts	Type		
A1	5" recessed low voltage downlight with white adjustable aurora trim and integral transformer	Dasal Industries	2-020-F-E-120-WHITE 2-120-GX10-CMH-01-SH-S (TRIM)	1	50	MR-16 40>FL GU5	120	
A3	5" recessed low voltage downlight with white adjustable aurora trim and integral transformer	Dasal Industries	2-020-F-E-120-WHITE 2-160-01 (TRIM)	1	50	MR-16 20>FL GU5	120	dimmable
A4	4-lamp individually adjustable downlight fixture with integral transformer	Times Square	MR16R-4-120-BLACK	4	35	MR-16	120	dimmable
A6	Recessed low voltage downlight, 3 lamps per fixture, 2 fixtures per location with dimmable electronic transformer	Solavanti	Aixlight Pro Frameless Pro 3 W/AR Module Pro	6	75	MR-16 G53/ AR111	12	dimmable
C1	Adjustable low voltage dimmable black track head with integral transformer	Times Square	2016V-B-T1-XL3-BD3-DM	1	35	MR-16	12	integral transformer/ dimmable
C4	Adjustable line voltage white track head	Times Square	HW130 w/ SX12 Extension Rod	1	75 MAX	PAR 30	120	
G1	Custom decorative stadium dome pendant fixture	Illumination Lighting	-	5	60	A-19	120	dimmable
J	2' wall mounted linear fluorescent luminaire	Metalux	BC-217-UNV-EB81	2	17	T8	120	
R1	Custom decorative stadium dome pendant fixture	Alumn	-			A-19	120	
S1	Adjustable low voltage dimmable black track head with integral transformer and 6" mounting canopy	Times Square	2016V-CM4	1	50	MR-16	120	
T4	4'-0" long 120V, 2-circuit track	Times Square	-	-	-	-	-	dimming
T6	6'-0" long 120V, 2-circuit track	Times Square	-	-	-	-	-	dimming

Table 10- Restaurant luminaire schedule

The following light loss factors were calculated using the new method in the 2010 IESNA handbook. The Room Surface Dirt Depreciation (RSDD) was neglected and the Luminaire Dirt Depreciation (LDD) was calculated using the updated calculation outlined in the book. A lamp maintenance schedule of twelve months was assumed.

Light Loss Factors				
Lamp Type	LLD	LDD	BF	Total
A1	.86	.92	1.0	.79
A3	.55	.92	1.0	.51
A4	.93	.92	1.0	.86
A6	.55	.92	1.0	.51
C1	.55	.92	1.0	.51
C4	.55	.92	1.0	.51
G1	.87	.92	-	.80
R1	.87	.92	-	.80
S1	.55	.92	1.0	.51
T4	-	-	-	-
T6	-	-	-	-
X1	.70	.92	1.0	.64

Table 11- Restaurant light loss factors

Power Density				
Luminaire	**Quantity**	**Watts/fixture**	**Total Power Density**	**Complaint?**
A3	15	50	11980W/ 4600sf = 2.6W/sf	**No.**
A4	9	140		
A6	10	450		
C1	57	35		
C4	21	75		
G1	5	300		
R1	14	-		
S1	8	50		

Table 12- Restaurant Power Density

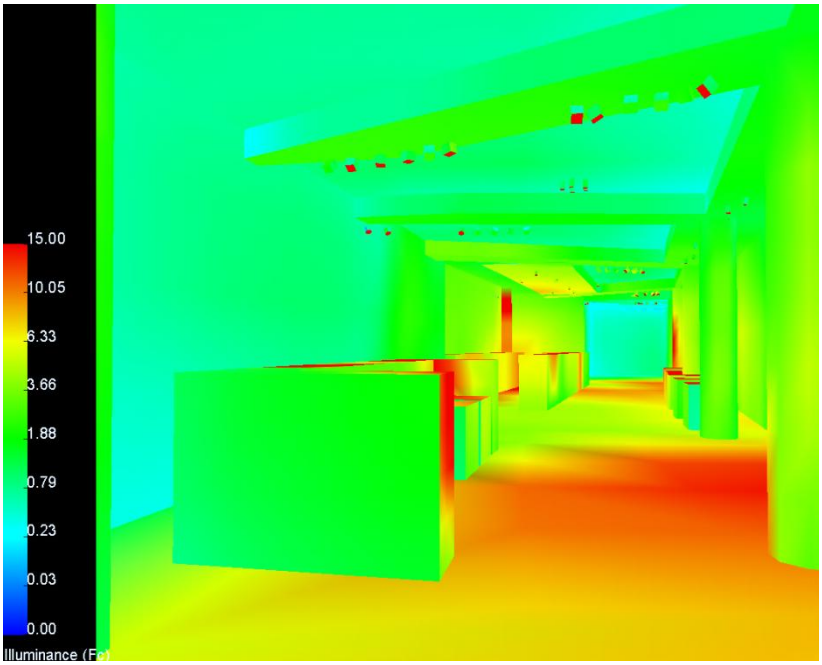

Image 11- Psuedocolor of restaurant/bar facing east

Image 12- Rendered image of restaurant/bar facing east

Image 13- Rendered image of bar

Statistic	Bar	Restaurant	Table
Avg Illuminance	21.47fc	15.72fc	18.96fc
Max/Min	3.78	94.7	2.56
Coeff. Variation	0.22	1	0.30

Table 13- Restaurant Calculations

design criteria and considerations — special purpose space

restaurant

IESNA Handbook 2000: Entertainment and food service spaces

Quantity of Light

desired illuminance levels

dining/bar:
horizontal – **10fc**
vertical – **3fc**

hostess/wait staff:
horizontal – **30fc**
vertical – **3fc**

ASHRAE/IESNA 90.1: Dining Area *for bar lounge/leisure area*- **1.4W/sf**

An increase in the interior lighting power allowance for spaces in which lighting is specified to be installed in addition to the general lighting for the purpose of decorative appearance, such as chandelier-type luminaires… provided that the additional lighting power shall not exceed **1.0W/sf of such spaces.*

Quality of Light

Psychological Impressions

The sports bar and restaurant is a multi-faceted space that can be an exciting, engaging place to watch a football game or can be a more relaxing, intimate place to take a break and enjoy dinner and drinks with friends. The lighting throughout the space needs to be adjustable in order to establish the desired atmosphere and impression for specific events. In either mode, a restaurant/lounge area should utilize a non-uniform lighting design with lower light levels immediately surrounding the guest with higher levels away from the guest, providing a sensation of watching without being watched. A highlight or focal point such as an interesting accent wall behind the bar is beneficial in creating this impression.

The private lounge should always create the impression of intimacy and exclusivity using high-end finishes and low lighting levels to enforce the mood created by having a private party behind the bar within a busy sports bar. The sports bar should create intimacy between sports fans, so the guests feel connected to those around them and also to help encourage new relationships between those drinking at the bar. The restaurant portion of the space should create the feeling of a private dinner while still being connected to the other surrounding tables.

Design Considerations

Very Important Criteria

Color Appearance (and Color Contrast)- The use of lighting with a high CRI is essential to the task of desirable and appetizing food and drinks, especially with the low lighting levels typical of a bar or late-night restaurant. The appearance and rendering of skin tones is particularly important in a social setting where dating and intermingling with the opposite sex occur. The restaurant should be a consistent color temperature as the rest of the project in order to present a uniform façade front during evening hours.

System Control and Flexibility- The bar and lounge are open for both lunch and dinner, as well as for sporting events and off-evenings. The lighting needs to have different scenes, as well as be highly reactive to the daylight that will influence the space through the glazing that makes up almost the entirety of the southern façade. An additional scene with high light levels needs to exist in order to facilitate the wait staff' in cleaning up at the end of the night.

Point(s) of Interest- There are several points of interest in the bar and restaurant. The color intensive accent walls along the northern side of the space as well as behind the bar should be accented, including the patterned decorative panels on the northern side of the private lounge area. The custom luminaires throughout the space are currently a focal point, and the televisions located throughout the bar need to be considered when placing light within the space. The columns and ceiling soffits are interesting architectural features that should be additionally highlighted.

Important Criteria

Appearance of Space and Luminaires- As one of the only venues located directly on Drexel's campus, the appearance of the bar is especially important given the total exposure to Market Street. Guests walking by should see the space and be drawn inside to watch the game or have a drink. The bold colors within should be effectively portrayed, and the luminaires should highlight the lines of the building.

Direct and Reflected Glare- Direct and reflected glare can make guests inadvertently anxious and uncomfortable. No one wants light reflected in their eyes when trying to interact with others. Glare can also be a significant issue by causing veiling reflections when attempting to read a menu in low light levels.

Sparkle/Desirable Reflected Highlights- Sparkle is desirable on glassware, silverware, and decorative objects worn by guests to draw attention such as jewelry.

lighting evaluation and critique special purpose space restaurant

The restaurant and sports bar at the DAC has the additional challenge of separating three spaces in one: the restaurant, the bar, and the private lounge successfully while still creating a sense of cohesion in the space. The variability of the lighting design gives the management and staff artistic license to change or enhance any public or private impression desired. The lighting incorporates and highlights the high contrast of the architectural soffit ceiling feature, is dynamic and easily adjustable for the wait staff's after hours needs. The non-uniform lighting levels provide an ideal mood and atmosphere with the space, making for a successful overall design.

The custom fixtures use standard incandescent A-19 lamps and could easily be substituted for something just as aesthetically pleasing but more energy efficient. In fact, when seated at the bar and in the private lounge, occupants experience a blast of light from the custom fixtures hidden in the woodwork. A more effective and less visually obtrusive lighting design can be employed at the bar. An interactive and color changing LED display on the back wall that responds to the teams playing that night could be a fun option.

existing conditions

circulation space

lobby/entrance

description

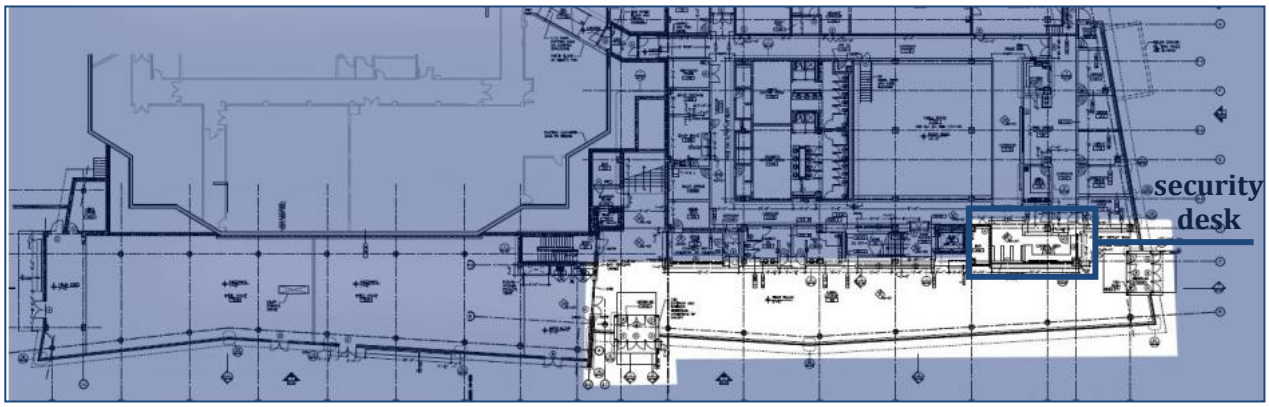

Figure 8- Orientation of lobby on first floor plan

The lobby and main circulation entrance is the daylight feature space of the Daskalakis Athletic Center. The exposed concrete and almost floor to ceiling glazing on the southern façade create an exposed, bright, spacious impression. To check into the athletic facility, visitors must use the key-card accessibility entry past the security desk on the eastern end. The entrance is also accessible from this space at the western side. This makes this corridor the most traveled space in the project. The lobby measures approximately 180' x 20' and has a ceiling height of 14'.

Image 14- Photograph of main lobby entrance

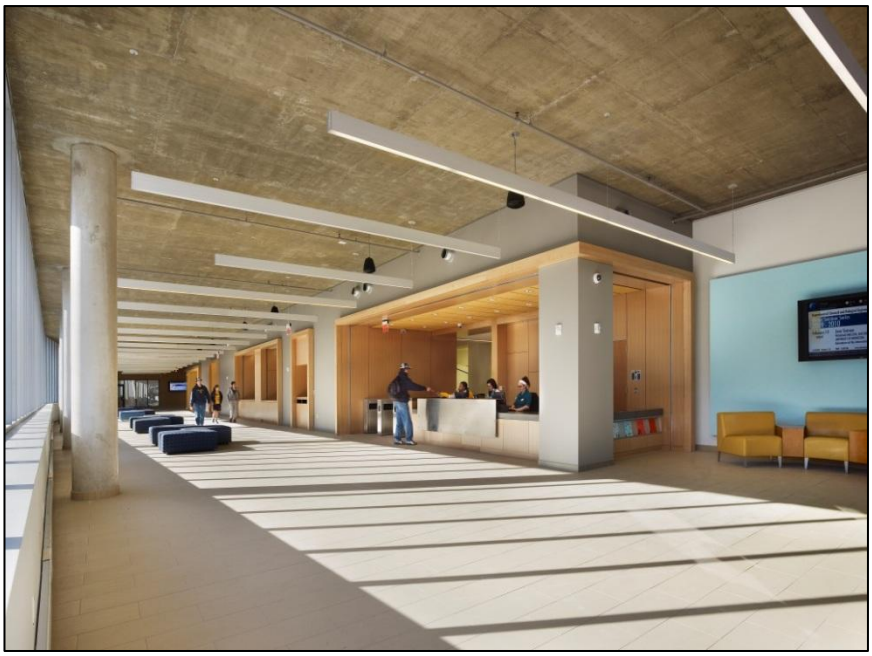

Image 15- Photograph of security desk

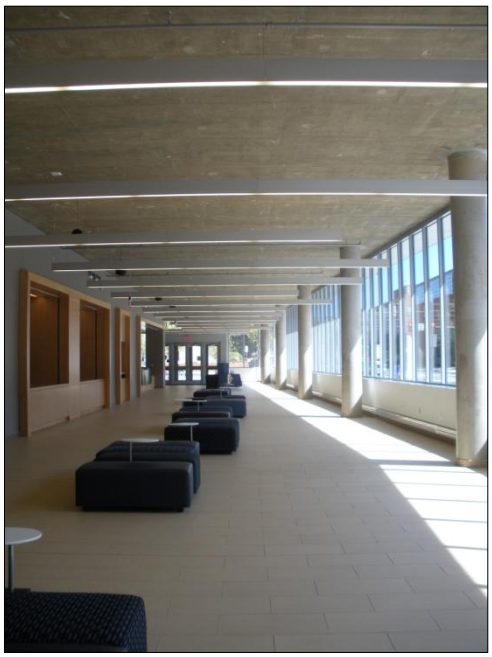

Image 15- Photograph of lobby facing east

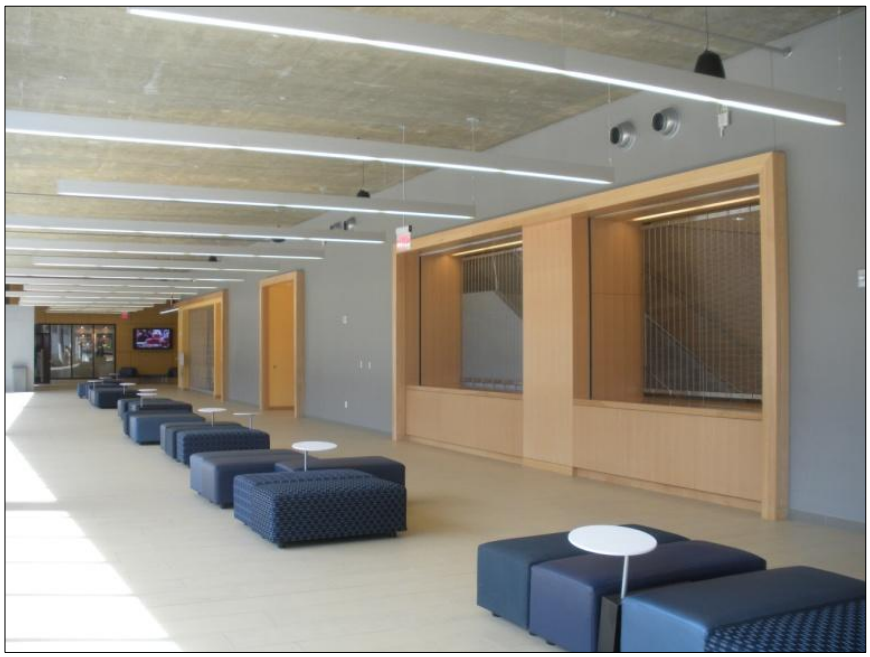

Image 16- Photograph of lobby facing west

materials and finishes

lobby

Surface	Material	Manufacturer	Color	Reflectance
north, east, and west walls	painted gypsum wall board	Sherwin Williams	Dovetail	0.6
south wall	painted gypsum wall board	Sherwin Williams	Ceiling Bright White	0.9
accent wall	painted gypsum wall board	Sherwin Williams	Blue bauble	0.69
flooring	1’ x 2’ Stone source tile	Logica	Grigio	0.46
base	1” x 1” tile	Dal	Suede Grey	0.32
ceiling	Exposed concrete			0.6
framing,	Wood veneer paneling	Prodema	Pale	0.45

Table 14- Lobby materials

security desk

Surface	Material	Manufacturer	Color	Reflectance
back wall	wood veneer paneling	Prodema	Pale	0.45
flooring	1' x 2' matte finish porcelain tile	Stone Source	Sand Beige	0.46
base	6" rubber base	Johnsonite	Moon Rock	0.33
ceiling	Suspended ceiling tiles	Armstrong	White	0.9

Table 15- Security desk materials

tasks/activities

The main purpose of the corridor is purely circulation, although it does double as a student study/lounge area because of its convenient operating hours and brightness during the daylight hours. Security staff perform administrative duties such as paperwork and camera monitoring, as well as provides services to the students. The northern wall of the lobby has screened windows providing interesting views into the racquetball courts and central staircase.

lighting layout and equipment

Fixtures

The lobby introduces the linear fixture that is prominent throughout the rest of the circulatory spaces in the facility. A majority of the lobby's lighting is provided by the direct/indirect linear lighting system that alternates lengths in order to interact with the façade. The lighting is primarily 4100K and is complimentary to the blue glazing when illuminating from within. The space is lit primarily with daylight for a majority of the time during the day.

Controls

The desk at the lobby houses the primary control lighting system for the athletic center, with emergency overrides for both electrical and mechanical equipment. The lobby integrates daylighting control into the space with the use of photocells and an on/off switching system. After daylit hours, a preprogrammed time clock takes over the switching controls.

Luminaire Schedule								
Type	Description	Manufacturer	Catalog Number	Lamp			V	Ballast
				No.	Watts	Type		
A8	4" recessed continuous flanged fluorescent luminaire with satine lens.	Selux	M1R1-1T5-SD-SH-*-WH-277-TB	1/ SEC	28	F28T5	277	electronic
C4	6" compact fluorescent downlight with clear alzak cone and self-flanged reflector.	Gotham	AF-1/32TRT-6AR-277	1	32	PLT-32	277	electronic
G1	4" MR-16 adjustable low voltage accent light with specular low iridescent finish	Gotham	DLV-ADJ-MR16-4AC-T30-277	1	50	MR-16 WFL	277	
PA2-32	2-3/8" wide direct/indirect linear T5 fluorescent pendant luminaire with asymmetric distribution.	Selux	M6DI-2T5-SD-C-*-*-277	2/ SEC	28	F28T5	277	electronic

Table 16- Lobby luminaire schedule

The following light loss factors were calculated using the new method in the 2010 IESNA handbook. The Room Surface Dirt Depreciation (RSDD) was neglected and the Luminaire Dirt Depreciation (LDD) was calculated using the updated calculation outlined in the book. A lamp maintenance schedule of twelve months was assumed.

Light Loss Factors				
Lamp Type	LLD	LDD	BF	Total
A8	.86	.92	1.0	.79
C4	.86	.92	1.0	.79
G1	.55	.92	1.0	.51
PA	.93	.92	1.0	.86

Table 17- Lobby light loss factors

design criteria and considerations — circulation space

lobby/entrance

Quantity of Light

desired illuminance levels

security desk:
horizontal – **50fc**

circulation space:
horizontal – **10fc**

ASHRAE/IESNA 90.1: *Lobby*- **1.3W/sf**

Quality of Light

Psychological Impressions

The lobby is the first space that a majority of the people will see, and should reflect the overall design goals of the building. People should have an impression of the public space upon entering the facility, followed by visual clarity and cleanliness. This can be achieved with bright uniformity. Because of the dynamic functions of the building and the precise lines of the space, the lobby should also be visually interesting, playing with punctuations of light.

Design Considerations- *circulation space*

The most important design consideration for lobby lighting is the emotional and aesthetic reaction to the space, as it is typically the initial and final impact of the building on an occupant.

Important

Appearance of Space and Luminaires- Important in every space on the southern side, this is most important in the lobby. In addition to establishing the athletic center's presence on Market Street and on the campus, the lobby is the primary space which presents the architectural concepts to observers. The space should be punctuated with sharp lines and angles of light to complement the sharp dimensions of the façade.

Daylight Integration and Control- The glazing composure of the southern façade makes daylighting a prominent focus of the DAC. The design will need to integrate and respond to the full

exposure of daylight to the space during the entirety of the day. Philadelphia is overcast for a good portion of the winter, so photo sensors should be incorporated into the system to ensure proper light levels throughout the space in any sky condition.

Direct and Reflected Glare- Transitioning through this space and into the building will be disrupted if occupants experience uncomfortable glare and reflections. The high exposed ceilings will draw eyes upwards and the façade glazing presents a potential for reflected glare. Luminaire position should be considered so that this is avoided. No light should be aimed directly at the glazing.

Light Distribution on Surfaces- The most important surfaces to the occupants are those that will guide them through the space: either through the space to the restaurant or through the security desk and into the fitness center. A uniform light pattern on the walls and ceiling and a non-uniform pattern on the floor will help to direct visitors as well as to reinforce the public aspect of the space.

Luminances of Room Surfaces- The high ceiling should be accentuated by illuminating the perimeter and high levels of brightness on the walls will help to keep the visual contrast between the walls and the daylight entering through the glazing comfortable.

Design Considerations- ***Security Desk***

Very Important

Direct and Reflected Glare- Both direct and reflected glare can limit the ability of workers to read and write, as well as reduce the contrast of computer screens. The monitoring of security cameras, as well as ID scans and other computer work will take place at the security desk. Luminaire placement should not be in line of sight of the eye or directly behind the seats so as not to reflect in the screens.

Modeling of Faces or Objects- Because a majority of the athletic center is controlled access, facial recognition is crucial to maintaining the integrity of the security ID check station. Visible threats need to also be readily identifiable so all aspects of an individual must be clearly rendered.

Important

Appearance of Space and Luminaires- The security desk should present an initially welcoming aesthetic impression followed by one of control and cleanliness. This can be achieved with high illuminance values and an overall uniformly high ambient light level behind the desk.

Light Distribution on Surfaces- The security desk is open on three sides with a dropped ceiling, making uniform distribution of the space difficult. The linear lines on the back wall could be uniformly accented to reinforce the impression of control and cleanliness while still adding visual interest.

Luminances of Room Surfaces- The luminance ratios between the task (in this case the computer or desk) should not exceed 10:1. This is an important consideration for this area because some of the employees directly face the windowed façade while behind their computer. This can cause unnecessary eye strain and lower productivity in the space.

Source/Eye/Task Geometry- The majority of the work at this desk takes place on computers, making luminaire placement an important aspect of design. Luminaires should be placed to the sides of rather than behind to limit reflections.

lighting evaluation and critique — circulation space

lobby/entrance

As the initial impression to anyone entering the sporting facility, the lobby orients both to the circulation within the space but also to the feel and aesthetics of the building itself. The modern feeling of the high, spacious, uncovered ceiling is punctuated by the lines of the lobby lighting, adding visual interest while still providing a bright, uniform light level. The clean, uncluttered appearance makes the lobby inviting while inspiring efficiency and energy for a workout.

The lobby successfully creates a uniform glow for the façade in the evening while still adding excitement with lines that complement the angular footprint of the building. The lobby takes advantage of the southern exposure by switching the luminaires, but additional energy savings are possibly by switching to a dimming system.

The positioning and lighting at the security desk can be re-evaluated because some of the employees end up facing the window. Having this as the backdrop to their computer screen causes unnecessary eye strain and is not recommended by the IESNA. The majority of the lighting being provided indirectly eliminates shadows enhances modeling of both faces and objects, adding to the overall feeling of security when entering this space.

existing conditions

outdoor space

courtyard

description

The exterior courtyard space is located on the northern side of the Athletic Center addition, and is bordered on the west by the existing athletic center. Measuring 123' x 117', the courtyard covers close to 15,000sf. A focal point of the space is the "Running Free" statue, sculpted for Drexel University in 1971 by famous Philadelphia sculptor Henry Mitchell that was relocated to the courtyard as part of the Daskalakis addition. Providing access to both the gymnasium and the Hall of Fame entrance to the facility, the space is an important circulation space and is the first impression portrayed to visitors approaching the DAC from the north side.

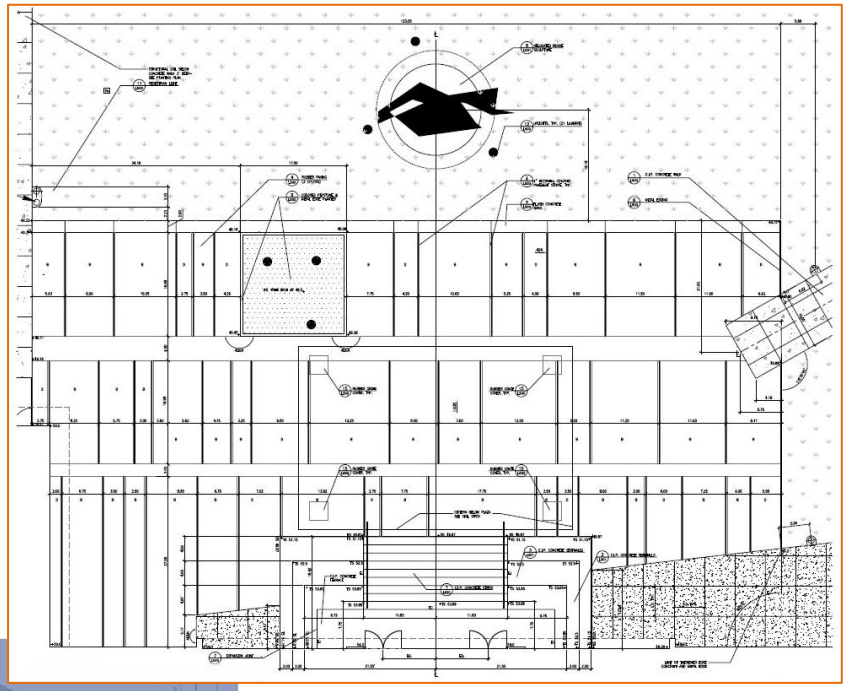

Figure 10- Enlarged courtyard plan

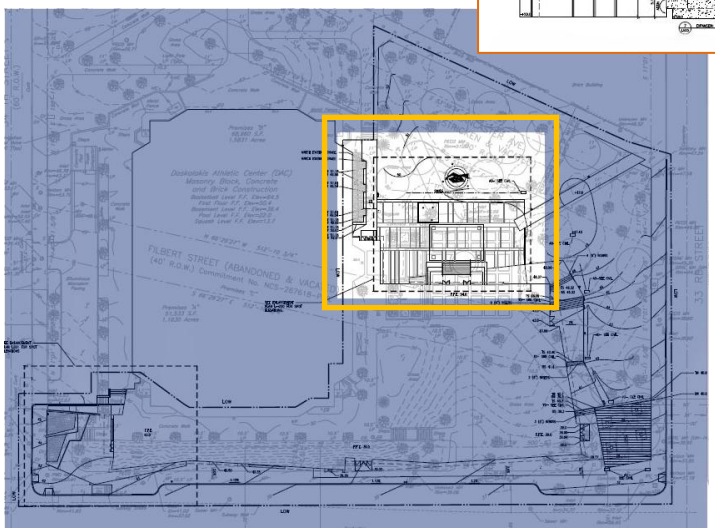

Figure 9- Orientation of courtyard to building site

Image 17- Photograph of courtyard facing southeast

Image 18- Photograph of courtyard featuring hall of fame entrance and "Running Free" statue

materials and finishes

Surface	Material	Manufacturer	Color	Reflectance
asphalt shingles	-	-	-	0.24
rubber pavement	3/8" rubber tiles	Panorama	Eggshell	0.57
rubber pavement	3/8" rubber tiles	Panorama	Light Blue	0.47
rubber pavement	3/8" rubber tiles	Panorama	Blue	0.32
rubber pavement	3/8" rubber tiles	Panorama	Orange	0.23
glazing	insulating laminated glass	Viracon	VRE 1-54	t = .46

Table 18- Exterior materials

tasks/activities

For a majority of the day, this space is simply a space in which students cut through on their way to class, and a visibly engaging courtyard for the secondary entrance to the workout facility, the vestibule shown above in figure 18 above. The springy rubber tiles allow yoga, martial arts, and other physical tasks typically performed on wrestling mats to take advantage of this open outdoor space for group activity.

lighting layout and equipment

Fixtures

The exterior currently has three fixtures each grazing the statue and the tree in the courtyard. Two specification grade compact fluorescent wall-packs are located on either side of the gymnasium door for safety and there are compact fluorescent downlights under the overhang into the Hall of Fame entrance.

Controls

The lighting for both the statue and the tree are on a photocell system and are only illuminated at night.

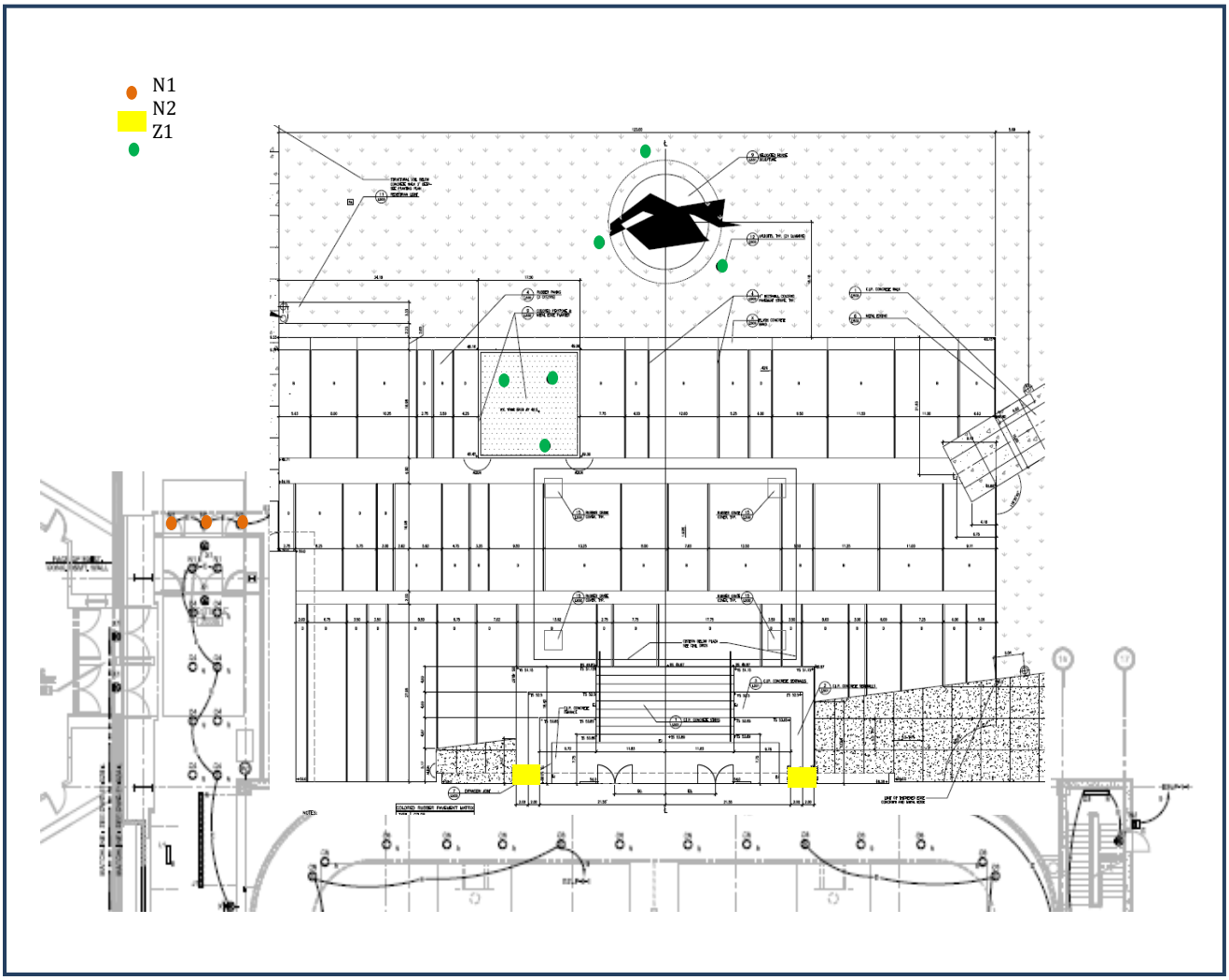

Figure 11- Exterior lighting plan

Luminaire Schedule							
Type	Description	Manufacturer	Catalog Number	Lamp			V
				No.	Watts	Type	
N1	9" compact fluorescent wet location listed downlight with cold start temperature ballast.	Design Plan	RHL-8-J8-4-*-0-C-C-P	1/ SEC	32	PLT-32	277
N2	Compact fluorescent exterior wall pack IP65 rated	Bega	2242P-277	2	26	F18DTT	277
Z1	direct buried ceramic metal halide asymmetrical landscape luminaire	Bega	8712MH-277	1	70	CMH ED-17	277

Table 19- Courtyard luminaire schedule

The following light loss factors were calculated using the new method in the 2010 IESNA handbook. The Room Surface Dirt Depreciation (RSDD) was neglected and the Luminaire Dirt Depreciation (LDD) was calculated using the updated calculation outlined in the book. A lamp maintenance schedule of twenty-four months was assumed.

Light Loss Factors				
Lamp Type	LLD	LDD	BF	Total
N1	.86	.65	1.0	.56
N2	.86	.75	1.0	.65
Z1	.73	.75	1.0	.55

Table 20- Courtyard light loss factors

design criteria and considerations — outdoor space

courtyard

Quantity of Light

desired illuminance levels- IESNA 2000 *Parks, Plazas, and Pedestrian Malls*

plaza:

horizontal – **5fc**
vertical – **3fc**

ASHRAE/IESNA 90.1: Building grounds- *Plaza areas* ***0.2W/sf***

Quality of Light

Psychological Impressions- The athletic center's courtyard and plaza should feel welcoming while balancing the feeling of a public space during the day and a more private, enjoyable shortcut across campus after dark. Keeping the central area dimmer and guiding the pedestrians through the space with light can transform this space from its current state as a scarcely lit, unnoticeable space to an inviting, engaging spot in which to walk.

Design Considerations – IESNA 2000 *Parks, Plazas, and Pedestrian Malls*

Very Important Criteria

Color Appearance (and Color Contrast) - In low light levels especially, color rendering plays an important role in the appearance of both individuals and objects throughout the space. To

complement the glow from within the gymnasium and also to play on the yellows and blues of the courtyard itself, a cooler temperature will interact in a more pleasing manner with the space.

Direct and Reflected Glare- Glare can be avoided by positioning fixtures outside the direct line of sight of a pedestrian. The expanse of glazing on the façade of the gymnasium as well as the glass vestibule to the hall of fame have the potential to cause reflected glare if uplighting luminaires are reflecting into the façade.

Light Pollution/Trespass- Specifying shielding or cutoff fixtures can minimize light pollution and trespass. Avoiding luminaires aiming up and away from the façade of the building will also help to eliminate the issue. Pathway lighting should follow the path, and general luminaires should only send illuminance to the space intended for lighting.

Modeling of Faces or Objects- Due to the levels of foot traffic on campus at night, the modeling of both faces and objects is important within this space to promote a general feeling of safety.

Peripheral Detection- The courtyard is open on two sides to the campus, but both the southeast and northwest entrances to the space are well lit by the entrances to the DAC. However, the location of Drexel on the outskirts of west Philly still make this an important design consideration.

Shadows- The courtyard is a small enough space that shadows should add to the guidance of pedestrians throughout the space. Shadow in the trees and on the statue will actually add a dramatic and aesthetically pleasing effect for those to view when passing through.

Important Criteria

Appearance of Space and Luminaires- The openness of the area makes both the space itself and the luminaires within it on display to the public. To avoid light trespass, luminaires should be placed so as not to be visible from someone not directly inside the boundaries of the space. Balancing the round statue base with the strong lines of the building could be difficult although the base could also be tied into the circularity of the elevated track. The statue could alternatively provide nice contrast to the stark lines of the building's exterior.

Light Distribution on Surfaces- Guided pathways both between entrances and through the space are important and pedestrians are encouraged to walk along them. To counteract the uniform glow from within, the lighting on either side of the façade and on any objects within the space should be dynamic and interesting.

Points of Interest- The gymnasium with its glow from within is automatically highlighted as a main focal point of the space. Interesting patterns could be brought out of the rubber tile at night by grazing the ground's surface. As a historical piece of artwork in Philadelphia, "Running Free" should be the main attraction opposite the gymnasium. In addition to guiding pedestrians around the building, a clear path into the Hall of Fame entrance should be set by the lighting.

lighting evaluation and critique

outdoor space

courtyard

Currently, there is minimal exterior lighting for the athletic center. This seems particularly bare in contrast to the exciting Market Street façade. Lighting could be added to highlight the lines and angles in the rubber tracking that have the potential to complement or interact with the angles on the southern façade of the building. Safety should also be considered. Adding lighting to this area would make this a more desirable place to relax in the evening after a tough workout.

existing conditions daylighting focus space

gymnasium

description

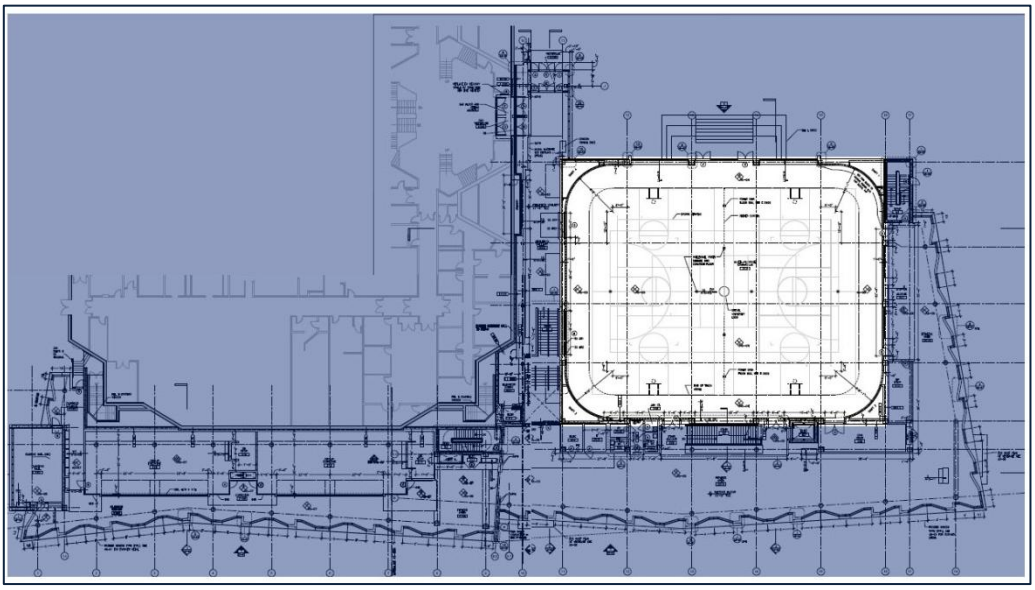

Figure 12- Orientation of gymnasium on second floor plan

The bi-level gymnasium is located on the second and third floors of the Northern face of the Athletic Center addition and can be entered from the fitness area or for special events from the courtyard. The space serves as the practice facility for the Drexel Dragons basketball team and has an elevated running track around the perimeter of the second level. A divider is enclosed within the dropped ceiling to section off the gymnasium for classes and different sports teams practice times. The northern wall is composed almost entirely of glass providing natural light to the space. The gymnasium measures 103 x 130' and spans a total of 13,420sf.

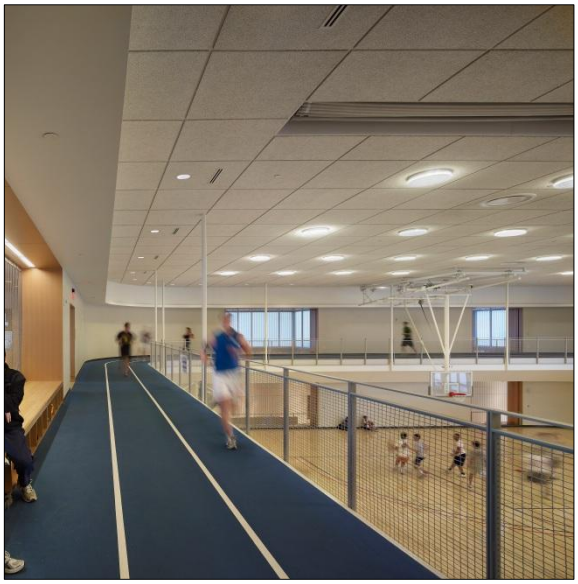

Image 19- Photograph of gymnasium from track level

Image 20- Photograph of gymnasium from first level

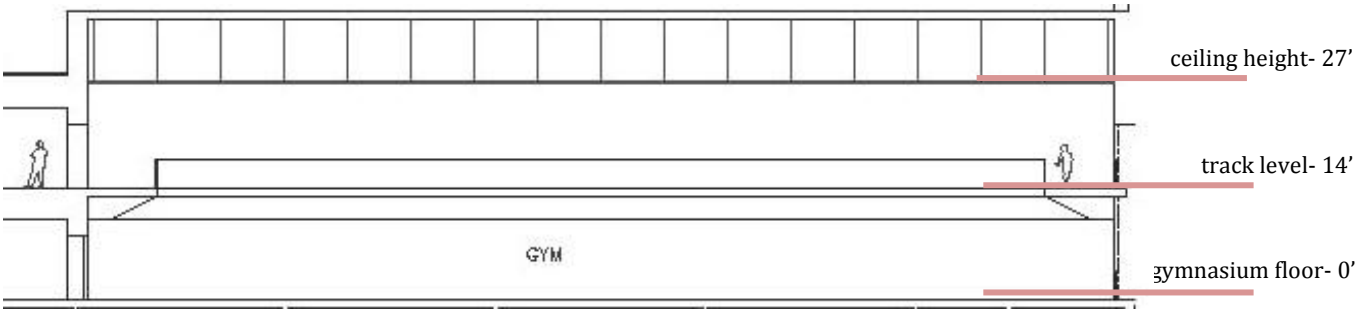

Figure 12- Gymnasium section

materials and finishes

gymnasium

Surface	Material	Manufacturer	Color	Reflectance
walls	high performance painted gypsum wall board	Sherwin Williams	Useful Gray	0.6
flooring	Bio Channel wood flooring system	Robbins Sports Surfaces	Northern Hard Maple	0.31
base	4" vented rubber base	Johnsonite	Thunder	0.33
ceiling	4' x 4' perforated co-polymer panels	Sound Concepts	Pewter	0.81
glazing	insulating laminated glass	Viracon	VRE 1-54	t = .46

Table 20- Gymnasium materials

Surface	Material	Manufacturer	Color	Reflectance
track walls	painted gypsum wall board	Sherwin Williams	Useful Gray	0.6
flooring	12mm rubber track surface	Mondo	Light Blue	0.25
base	4" rubber base	Johnsonite	Thunder	0.33
ceiling soffit	painted gypsum wall board	Sherwin Williams	Ceiling Bright White	0.9
glazing	insulating laminated glass	Viracon	VRE 1-54	t = .46

Table 21- Track level materials

tasks/activities

A wide variety of dynamic movement takes place within the space. The multi-purpose gymnasium can be set up for basketball or for volleyball, as well as a multitude of other sporting events. The elevated track is used both for recreational and university sponsored running, sprinting, and walking. The space is also used by intramural teams. There are no bleachers incorporated in this facility, so spectators do not need to be considered.

lighting layout and equipment

Fixtures

The current lighting system utilizes a compact fluorescent sports lighting fixture with switching for different desired light levels in the space. Sporty compact fluorescent downlights provide lighting both to the track and to the area underneath.

Controls

The lighting is separately switched with zones for the downlights as well as for the main gymnasium lighting. Photosensors are used in the main space for daylight harvesting.

existing daylighting conditions

The Northern façade is ideal for daylighting a gymnasium because it provides mostly diffuse light from the sky with minimal direct sunlight, which causes glare and discomfort to athletes performing within the space. The elevated track actually functions as a sort of light shelf and shade, both reflecting more light from the ground and limiting any direct light that could cause unwanted shadows on the gymnasium floor.

Luminaire Schedule								
Type	Description	Manufacturer	Catalog Number	Lamp			V	Ballast
				No.	Watts	Type		
C2	8" compact fluorescent downlight with clear alzak cone and self-flanged reflector	Gotham	AF-2/32TRT-8AR-277	2	32	PLT-32	277	electronic
C4	6" compact fluorescent downlight with clear alzak cone and self-flanged reflector.	Gotham	AF-1/32TRT-6AR-277	1	32	PLT-32	277	electronic
C6	10" compact fluorescent downlight with recessed housing and impact resistant polycarbonate lens.	Gotham	AF-232TRT-10AR-PCL-277	2	32	PLT-32	277	electronic
PB1	Compact fluorescent high bay sports lighting pendant fixture with drop lens and wire guard.	Sportlite	LX800-T42-35K-21PRL-21DLCP-277-4SL-3PEN-21XWG-21AL	8	32	PLT-32	277	electronic

Table 22- Gymnasium luminaire schedule

The following light loss factors were calculated using the new method in the 2010 IESNA handbook. The Room Surface Dirt Depreciation (RSDD) was neglected and the Luminaire Dirt Depreciation (LDD) was calculated using the updated calculation outlined in the book. A lamp maintenance schedule of eighteen months was assumed.

Light Loss Factors				
Lamp Type	LLD	LDD	BF	Total
C2	.86	.90	1.0	.56
C4	.86	.90	1.0	.65
C6	.86	.75	1.0	.55
PB1	.86	.90	1.0	.78

Table 23- Gymnasium light loss factors

design criteria and considerations — daylighting focus space

gymnasium

Quantity of Light

desired illuminance levels

gymnasium- basketball class III, training facility:
horizontal – **50fc**

gymnasium- volleyball class III, training facility:
horizontal – **50fc**

track class III, training facility:
horizontal – **30fc**

ASHRAE/IESNA 90.1 Sports area, indoor court area – **2.3W/sf**

Quality of Light

Psychological Impressions- This multi-purpose space should always feel public and open, giving an impression of visual clarity both for the players and anyone who is watching from the track or from one of the fitness centers. A bright, uniform lighting layout is appropriate, with the possibility of some perimeter lighting to accentuate ceiling height and push out the walls. Light finishes should be used to make the space appear brighter and provide a comfortable environment where players can feel energized and focused at practice.

Design Considerations

Very Important

Direct and Reflected Glare- The placement of luminaires is key in the gymnasium because multi-directional sporting events take place here. Both volleyball and basketball involve the critical viewing of a fast moving object, and direct glare from a luminaire can be both distracting and in some cases can severely inhibit the performance of an athlete. When luminaire placement cannot be completely controlled, such as in a gymnasium, lensing can help to alleviate the issues of both direct glare and the glare reflected in the glazing.

Light Distribution on Task Plane (Uniformity) - Poor uniformity can distort visual perception of both the location and the speed of objects and individuals involved in the game. All of the sports listed above in design criteria require a max/min of no more than 3:1 and a coefficient of variance (CV) of less than 0.25.

Important

Color Appearance and Color Contrast- Color contrast in an athletic facility gymnasium is important to facilitate the player's ability to discern between the object in play and the background, as well as between teams in some cases.

Daylighting Integration and Control- A gymnasium is the perfect place in which to integrate and control the amounts of daylighting within a space. Daylighting can be tricky in a space where shadows and uniformity are desired, so a northern facing façade is preferred in order to avoid strong shadows and bright spots in the early and late parts of the day. Dimming of the luminaires using photocells to monitor the light levels within the space is the most successful way to utilize daylight to control both light levels and energy costs within a space.

Luminaire Noise- Sports lighting can also have noise disturbance cause both by the lamp and by the ballast. Consider this when selecting luminaires for the space.

Modeling of Faces or Objects- Illuminance within such a dynamic space must be multi-directional in order to properly and effectively render the objects and players moving at fast speeds throughout the space.

lighting evaluation and critique — daylighting focus space

gymnasium

The analysis of this space for my report will solely focus on daylight. The potential for daylighting improvements by way of clerestories and/or skylights will be evaluated. Special attention will be payed to avoiding direct and reflected glare that can be caused by skylights in a space where this issue can be detrimental to player's performance.

The current lighting system provides a bright, uniform lighting level to both the treack and the gymnasium. High reflectance values in the space interact to generate a high-energy environment. Glare is minimized by using lensed fixtures to provide a less concentrated glow when looking straight into the luminaire.

general lighting critique daskalakis athletic center

The lighting throughout the Daskalakis Athletic Center successfully creates a bright, energetic space that interacts and responds directly to the architecture and aesthetic intent of the façade and the building within. Direct and reflected glare is avoided and an attractive rendering of people and objects in the space is achieved by the use of mostly indirect lighting to illuminate the task plane. Just as the glazing on the southern and eastern building façades demands attention in each space in the facility, the continuity of both color temperature and the linear response to the façade creates cohesion when transitioning from space to space.

Southern glazing along the lobby and exercise areas combined with a northern glazing façade for the gymnasium give this building huge daylight harvesting potential. While the design does utilize photocells for on/off switching to the south and three-way switching in the gymnasium, the potential to dim the fixtures for additional energy savings is available.

Initial intent for an LED exterior lighting system on the northern exterior façade to compliment the market street façade was value engineered out of the project. This does leave room for improvement of the courtyard which has the potential to be equally as engaging and interestingly lit as the front façade.