Appendix E: FAPC Shadow and Supplementary Lighting Study

FAPC SHADOW & SUPPLEMENTAL LIGHTING STUDY

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The following outlines our detailed analysis of the existing conditions and potentials for providing supplemental lighting as mitigation to the shadowing predicted in the DEIS.

We toured the Church on Monday August 3rd, meeting at 2:00 pm. The tour was conducted by Eric Daniels who appeared most knowledgeable about the history and architecture of the Church (**1**). It was a bright clear sunny summer's day.

Historically there had been skylights in the center of the sanctuary ceiling which had been illuminated with gaslights mounted above and to the side of the skylights. These gaslights utilized a reflector system to direct light onto the stain glass skylights. These skylights have long since been closed off with infill solid plaster panels accommodating down lights for artificial illumination of the space (**2a**).

When standing in the sanctuary it was quite clear that the space, although symmetric from an architectural standpoint, was quite asymmetric from a visual standpoint as it related to the stained glass windows that form the North and South Elevations (**2**). The twelve windows on the North Elevation were quite muted, especially the one closest to Fifth Avenue (**3**). The reason for this is the proximity of the adjacent buildings, which are only a few feet away and block all direct daylight and greatly limit even ambient light contribution. The window nearest Fifth Avenue is further impacted by ductwork that was recently placed there to provide air conditioning to the sanctuary (**4**). On the South Elevation the windows were significantly brighter as a result of direct sunlight along with ambient light contributed by reflected light from adjacent buildings (**5**). It is important to note that although brighter this elevation was still somewhat uneven due to shadows and highlights cast on some of the lower windows closer to Fifth, coupled with some architectural anomalies created by heating radiators that share the lower areas of the glazing cavity in the central upper windows.

See attached shadow study Figures 6-15, 6-16, 6-17 from the DEIS which illustrate which windows of the South Facade are affected and when they are affected.

This brings us to the specifics of the glazing cavity. The sanctuary is essentially a building within a building where an air space has been created between the inner decorative colored stained glass and an outer clear leaded art glass, with inserts of smaller colored borders (**6**) (**7**). In effect it is a form of double glazing that functions as a sound and insulation barrier. The resulting double glazing system most certainly represents an innovative solution for its time period and has great significance from both an engineering and aesthetic standpoint. It functions to allow the interior stained glass to be viewed from outside as well as inside. This system provides effective sound and temperature insulation that is still very effective in 2009 as we had to talk in hushed tones so as not to intrude on parishioners oblivious to the bustle of the city outside.

This begs the question could this cavity be used to augment the natural day lighting of the stained glass? In order to understand any such option one needs to understand the givens. There are six tall windows and six smaller windows. The cavity behind the six smaller windows is only accessible through one hinged partial casement per pair, the cavity behind the center four upper windows is accessible from above only and with great difficulty due to the curved form of the main sanctuary ceiling. The cavity behind these four center upper windows is not contiguous and quite shallow front to back and also shares space with heating radiators that rise above the sill to a height of around three feet. The sanctuary wall is curved in the four corners and the windows on the extreme ends are located on these curves resulting in a deeper cavity as the outer façade is truly straight.

Given modern lighting technology one could theoretically install lighting fixtures at the bottom of the cavity shelf of the upper windows (**8**), however, due to the height of these taller windows there would be a tendency for the light to diminish some toward the top and to augment it with fixtures from the top or side would not be practical as one would be able to see the source, especially through the clear outer glass. See attached specifications for prototypical lighting fixtures (**10**) (**11**) (**12**).

One must also realize that the outer glass would not assist in any way to the distribution of light towards the stained glass as it is clear and would merely allow the light to pass straight though it. One most certainly would

not do anything to effect or change the outer art glass. To effectively light the stained glass with some degree of uniformity one would ideally need to create a light box where the outer layer would be frosted or etched so as to catch the artificial light and return it to the stained glass. Given the shallow nature of the cavity it would be impossible to introduce an inner layer without compromising the relationships between the inner and outer historic glazing systems.

During the time we were exploring the sanctuary the effect of daylight and shadow cast by existing buildings created a mottled random effect as direct sunlight or reflected light danced across the South Façade; in fact there was no point at which it appeared even or constant so to speak. There would rarely, if ever, be a circumstance when predicted shadows or highlights would have distinct cut off lines demarking between light and no light since the volume of light outside is comprised of direct light from the suns rays, ambient light from the sky as a whole and reflected light from surrounding surfaces as a combination of both.

If one were to install a supplemental lighting system to mitigate the projected shadowing one would need a most sophisticated control system with multiple photo cell sensors and timed programmed sequencing to try and coordinate the effected windows in an attempt to balance them with the non impacted windows. We would not want to provide supplemental lighting across the entire façade during these shadow moments as this would create a purely artificial effect with complete disregard to nature.

Could other solutions be employed? Lighting the stained glass from outside the building seems out of the question since there are no significant ledges to locate grazing fixtures (**9**) and lighting from across the street is fraught with complexity and seems at odds with current thinking related to energy efficiency, light pollution, and any notion of being green.

So what conclusions can we take from these findings;

The lower windows cannot be internally lit without significant impact to the architectural envelope and therefore represent a substantial portion of the façade that cannot effectively be lit. The only way to access these window cavities for installation or maintenance would be to remove sections of the stained glass each and every time.

The upper windows could be lit, however it would involve removal of the radiators and sections of the stained glass since the space is very tight behind the four mid sections with access from above virtually impossible. The only way to access these window cavities for installation or maintenance would be to remove sections of the stained glass each and every time. Even if long life LED, latest technology sources were used access for maintenance would be most difficult. LED sources, although providing extended life cycles, can still experience unexpected failures, therefore access needs to be assumed and provided for (**10**) (**11**) (**12**). These fixtures are state of the art with regard to efficiency, however as shown in the sketch although the uniformity is good it is less than ideal. Achieving uniformity on the windows from top to bottom would be extremely difficult. We must also assume that one cannot change the outer layer of art glass (making it frosted or etched) as one would now be changing a significant historic component and preventing viewing of the stained glass from the outside.

It is important to note that the net effect of such a potential lighting system would be more successful as a nighttime augmentation with an effect that would be eminently more suitable to the North façade. However, although this could help five of the upper windows on the south façade, it could do nothing to resolve the issue with the sixth window closest to Fifth Avenue (**4**). We would not recommend this option as it would only further emphasize a compromised path resulting from a decision favoring air conditioning over natural illumination. The church, in installing central air conditioning for the sanctuary, elected to locate and fill this sixth window cavity with ducts precluding any future lighting solution for this cavity.

To attain a daytime lighting solution closely mimicking the intensity of direct sunlight would be extremely difficult to achieve even utilizing very powerful state of the art technology, consuming large quantities of electricity, producing significant heat within the cavity, along with all of the associated access and substantial maintenance costs. It would seem that although perhaps technically possible the true benefits to the space for a

somewhat limited time frame would be far eclipsed by the impact and impracticality of such a necessarily complex and highly sophisticated solution.

In conclusion, we recommend that no supplemental lighting be considered since imposing such a solution could potentially harm the whole.

Quentin Thomas Associates Company Profile

Light is perhaps the most ethereal element of design yet it has a remarkable power to transform space and enhance the environment.

To create an environment of architectural distinction, which at the same time is financially viable, requires an uncommon blend of skills.

With the growth of the lighting industry and its rapidly changing technology, the role of the lighting consultant is now more important then ever. He must not only have the technical expertise but must possess an affinity and sensitivity for light as an architectural material.

For the past twenty years, we have been using these skills to create successful lighting solutions.

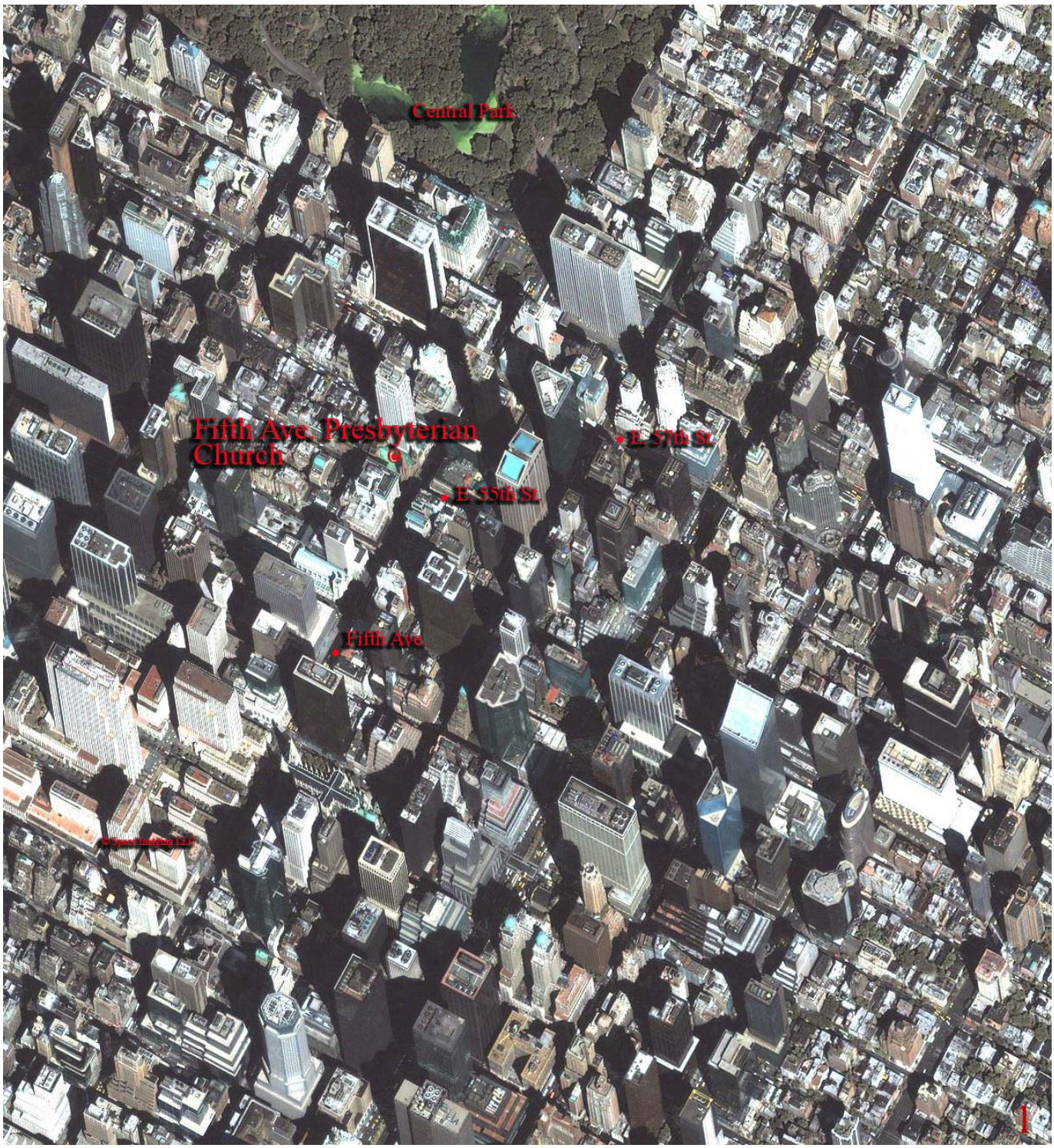
As an international architectural lighting design firm, Quentin Thomas Associates offers full services from schematic through construction implementation; supported by model and mock-up facilities, as well as computer based animation, analysis of daylight and artificial illumination along with cost estimating and energy projections.

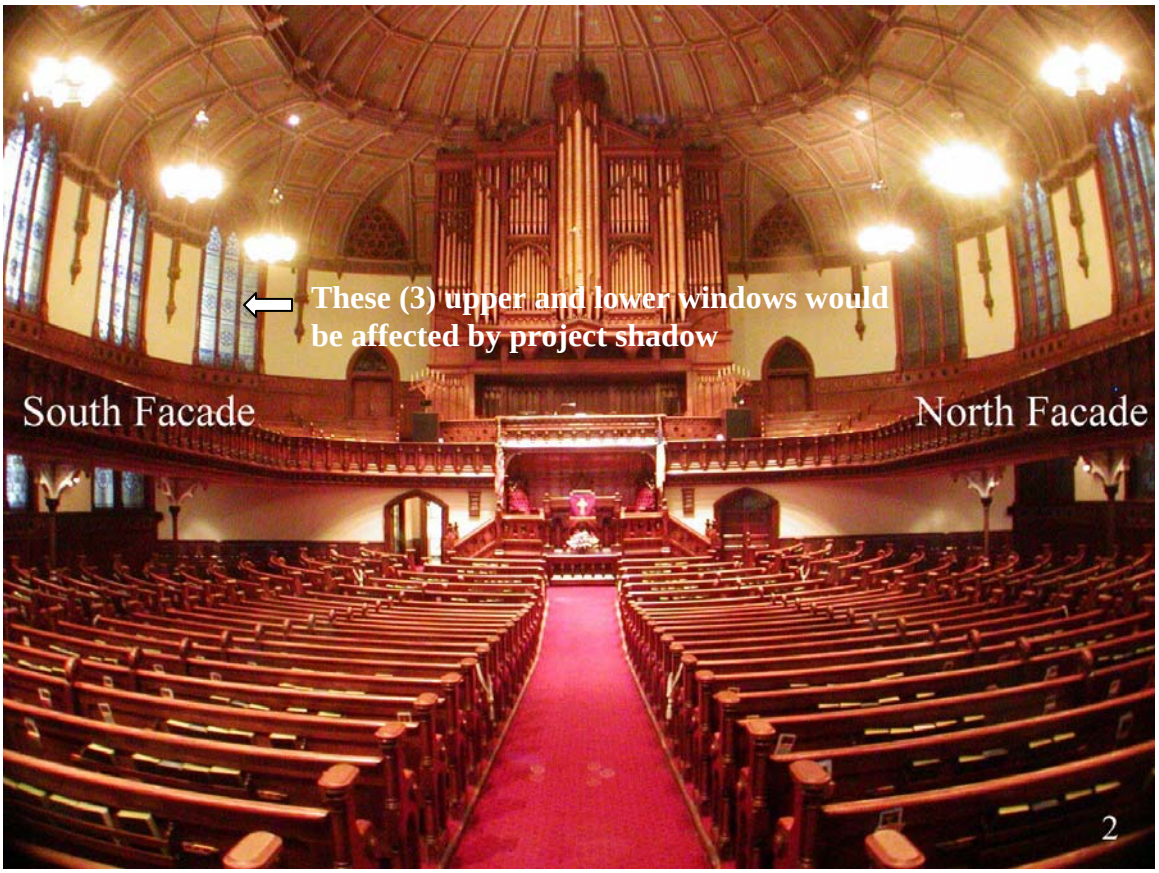
Mr. Thomas has worked extensively in Britain, Europe and the United States designing over 500 projects. Having trained in architectural, theater, film and television design, he brings a multi-disciplinary background to architectural lighting.

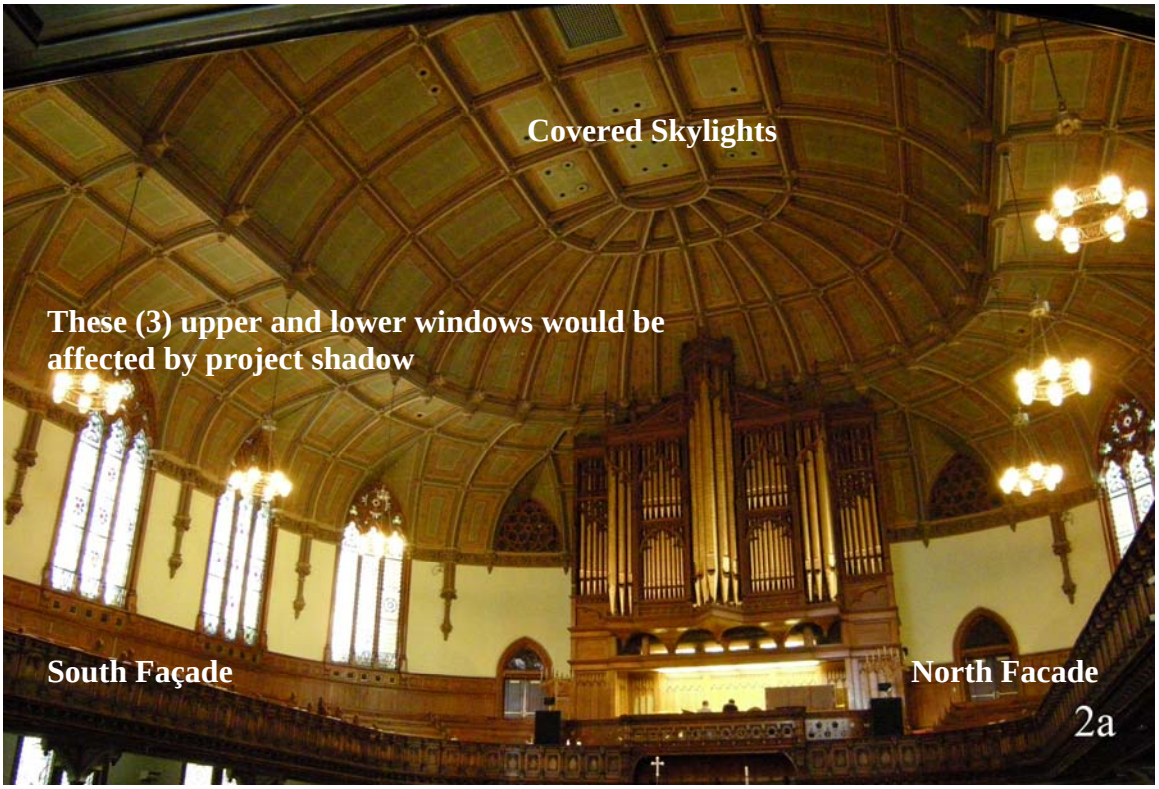
Quentin Thomas Associates has received numerous national and international awards. Most recently, the I.E.S.N.A. International Illumination Design Award for Outstanding Achievement in Lighting Design, the Boston Society of Architects Award for Design Excellence, the AIA Honor Award for Design Excellence, the I.E.S.N.A. Award of Merit for the Hawaii Theatre and the New York Landmarks Commission Award for Historic Preservation. His designs have been published in numerous professional publications including Architectural Record, Interior Design, Architecture Aujourd'hui, Casa Voque, Architecture Cree, Modo, Baumeister, Architecture and Urbanism, Designer's Journal and Interiors.

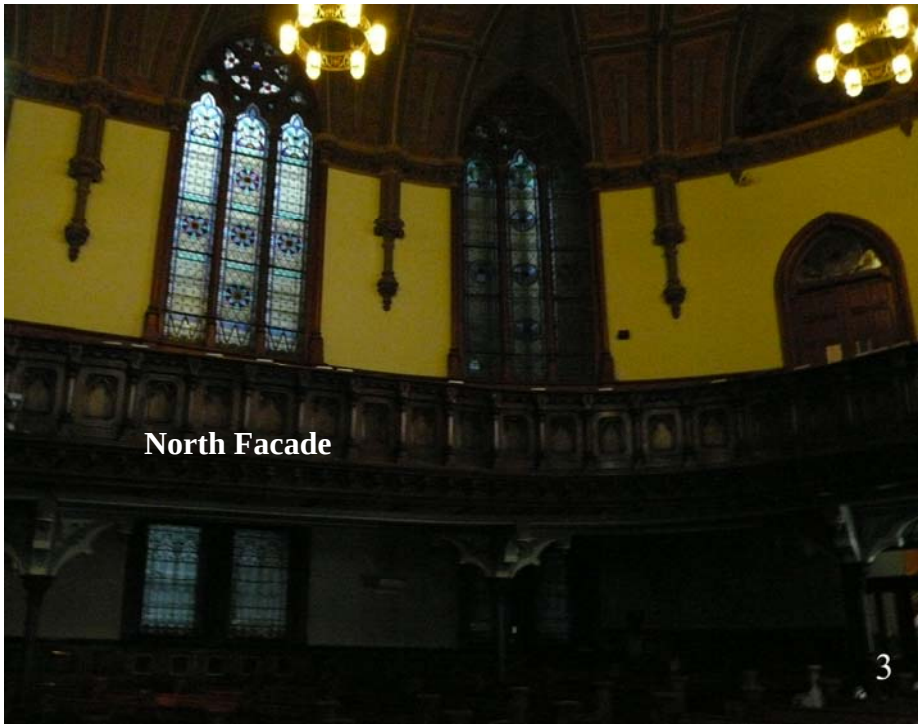
In the area of commitment to the environment, Quentin Thomas Associates is in the forefront, securing LEED Gold from the United States Green Building Council's Leadership in Energy and Environmental Design; for the Plaza at PPL Center in Allentown, Pennsylvania; Calper's Headquarters Complex in Sacramento, California, Shell Woodcreek Phase I in Houston, Texas, Sysco Office Campus in Houston, Texas and Kimball Showrooms in Jasper, Indiana, and LEED Silver status for Kimball Showrooms in Chicago and New York City.

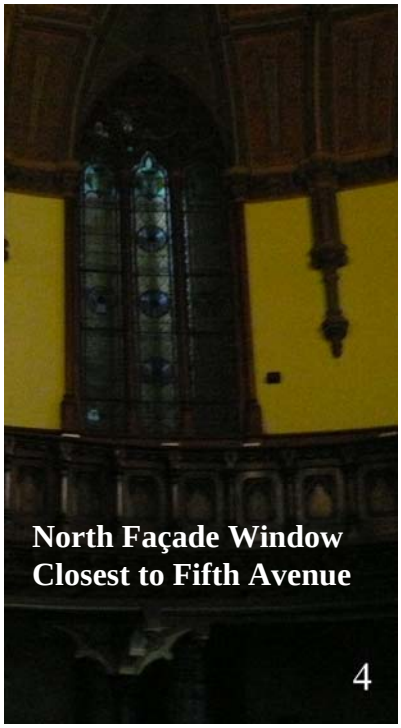
http://www.quentinthomasassociates.com

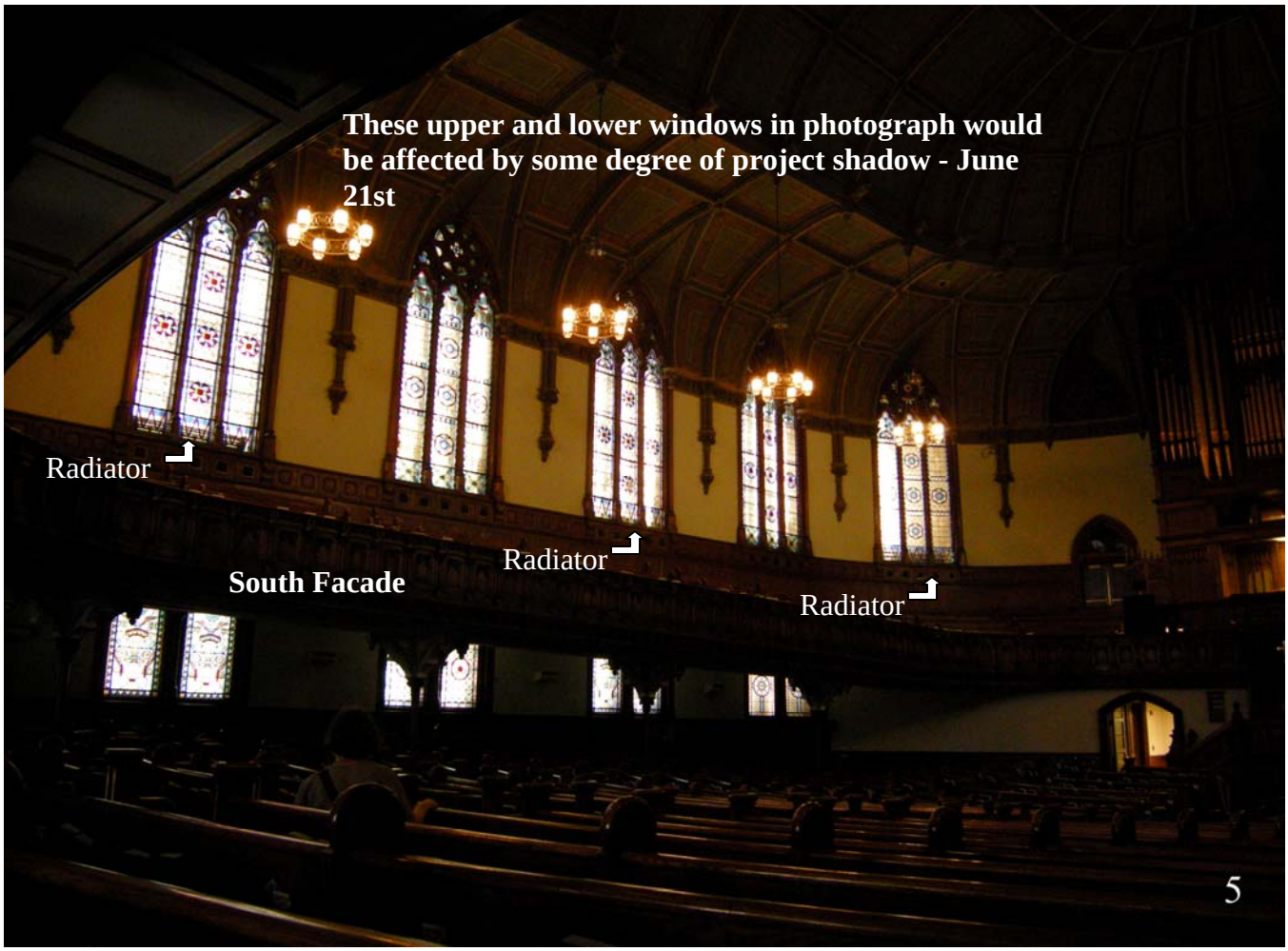

Central Park
Fifth Ave. Presbyterian Church
E. 57th St.
E. 55th St.
Fifth Ave.
1


These (3) upper and lower windows would be affected by project shadow
South Facade
North Facade
2


Covered Skylights
These (3) upper and lower windows would be affected by project shadow
South Façade
North Facade
2a

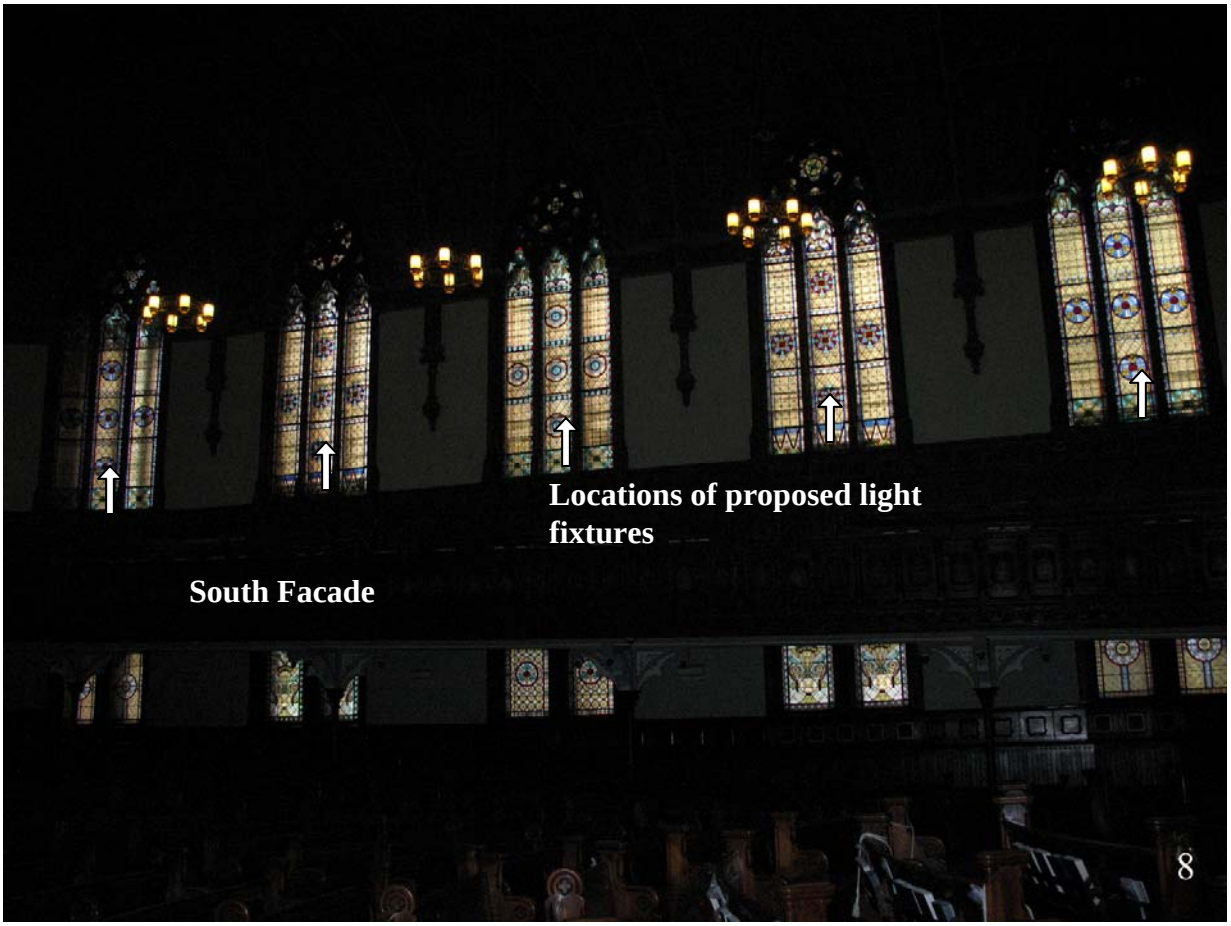

North Facade
3

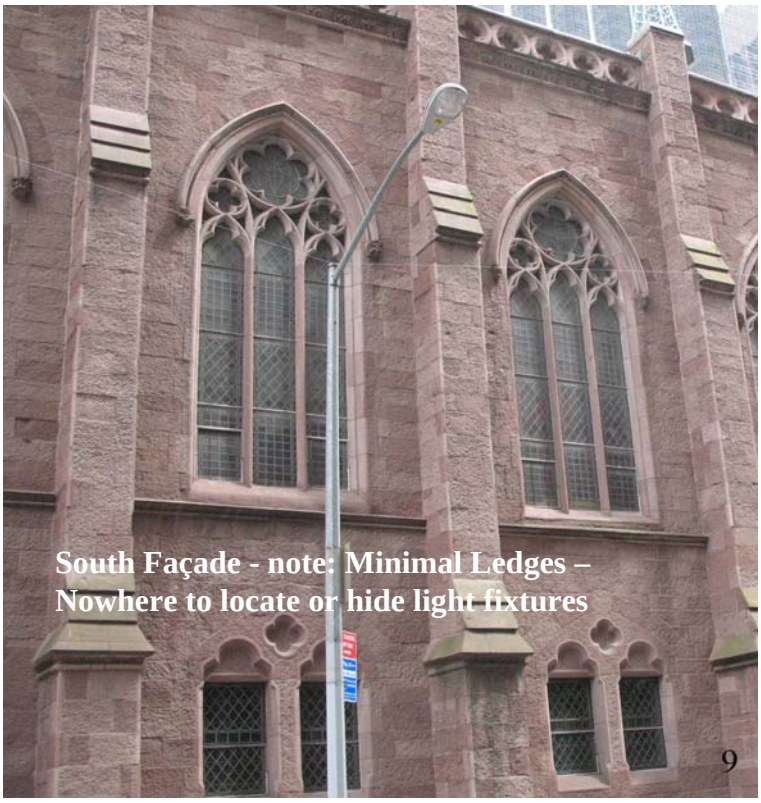

North Façade Window
Closest to Fifth Avenue
4


These upper and lower windows in photograph would be affected by some degree of project shadow - June 21st
Radiator
Radiator
Radiator
South Facade
5


Hinged partial casement
South Facade
6


Detail of Exterior Glazing
7


Locations of proposed light fixtures
South Facade
8


South Façade - note: Minimal Ledges – Nowhere to locate or hide light fixtures
9

Shadows - View Northeast
Proposed Project Comparison to Previously Approved Project
June 21 - 4:00 PM EDT
Figure 6-15

53 West 53rd Street

Historic Resource with Sun-Sensitive Feature

Incremental shadow on Sun-Sensitive Window

Shadows - View Northeast
Proposed Project Comparison to Previously Approved Project
June 21 - 4:30 PM EDT
Figure 6-16

53 West 53rd Street

Shadows - View Northeast
Proposed Project Comparison to Previously Approved Project
June 21 - 5:00 PM EDT
Figure 6-17

53 West 53rd Street

View larger image

Data Sheets & Specification Sheets:

User Guides & Installation Instructions:

ColorReach Powercore Installation Instructions
ColorReach Powercore Spread Lens Kit Installation Instructions

Wiring Diagrams:

View wiring diagrams

Dry / Damp / Wet Location, IP66

Cast aluminum

Beam Angle / Lens:

Clear tempered glass cover lens

UL, cUL, CE pending

ColorReach Powercore

ColorReach™ Powercore, our flagship, high-performance architectural floodlight, is the first LED fixture powerful enough to brilliantly and dynamically illuminate large-scale façades and structures. With significantly more lumen output than any other competitive fixture and unprecedented light projection of over 500 feet, this powerful fixture represents the next generation in exterior illumination.

- Incorporates Powercore® technology to directly accept line voltage for ease of installation
- With an output of over 5,000 lumens, offers legitimate LED-based illumination of large-scale structures and objects
- Optional spread lenses of 8°, 13°, 23°, 40°, 63°, and an asymmetric 5° x 17° support a multitude of applications
- Rugged, slim-profile mounting bracket allows simple positioning and fixture rotation through a full 360°

Item Numbers:

123-000013-00 ColorReach Powercore

Video:

ColorReach Powercore video

Related Products:

Data Enabler

Sample Installations:

The Royal Netherlands Military Academy at the Castle of Breda

Super Bowl XLIII

Gateshead Millennium Bridge

Date: _____ Type: _____

Firm Name: _____

Project: _____

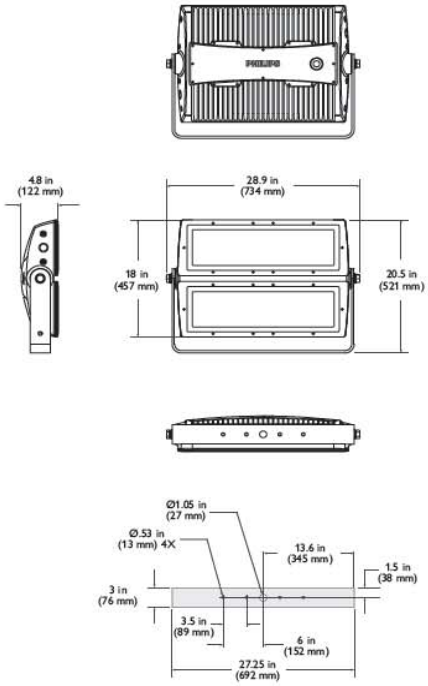
ColorReach Powercore

13° Spread Lens

Next-generation LED floodlight for signature façades and structures

ColorReach™ Powercore, our flagship, high-performance exterior architectural floodlight, is the first LED fixture powerful enough to brilliantly and dynamically illuminate large-scale architectural façades. ColorReach Powercore combines all the benefits of LED-based lighting and control in an elegant fixture specifically designed for large-scale installations, such as commercial skyscrapers, casinos, bridges, piers, public monuments, and themed attractions. With unprecedented light output and projection, this powerful fixture is the next generation in exterior illumination. Build-to-order configurations with custom channels of white or color LEDs are also available to support special applications.

- Integrates Powercore® technology — Powercore technology rapidly, efficiently, and accurately controls power output to ColorReach Powercore fixtures directly from line voltage. Philips Data Enabler merges line voltage and control data and delivers them to fixtures over a single standard cable, dramatically simplifying installation and lowering total system cost.
- Unparalleled light output — With an output of over 5,000 lumens, light projection of over 500 feet, and a 5° native beam angle, ColorReach Powercore is the first fixture to offer legitimate LED-based illumination of large-scale structures and objects.
- Versatile optics — Exchangeable spread lenses of 8°, 13°, 23°, 40°, 63°, and an asymmetric 5° x 17° support a variety of photometric distributions for a multitude of applications, including spotlighting, wall grazing, and asymmetric wall washing. Bezel and gasket ship with spread lenses for easy user installation.
- Saturated, cost-effective color — High-performance LEDs offer rich, saturated color at significantly less cost for installation, operation, and maintenance than traditional light sources.
- Simple fixture positioning — Rugged, slim-profile mounting bracket allows simple positioning and fixture rotation through a full 360°. Side locking bolts reliably secure fixture with a standard wrench.
- Universal power input range — ColorReach Powercore accepts a universal power input range of 100 to 240 VAC, allowing the installation of multiple units in a continuous run.
- Industry-leading controls — ColorReach Powercore works seamlessly with the complete Philips line of controllers, including iPlayer 3 and Light System Manager, as well as third-party DMX controllers.



For detailed product information, please refer to the ColorReach Powercore Product Guide at www.colorkinetics.com/ls/rgb/colorreach/

PHILIPS

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Specifications

Due to continuous improvements and innovations, specifications may change without notice

Item	Specification	Details
Output	Beam Angle	13°
	Lumens†	5,200+
	Color Range	16.7 million additive RGB colors; continuously variable intensity
	Mixing Distance	50 ft (15.2 m) to uniform light
	Lumen Maintenance‡	90,000 hours L_{50} @ 25° C 68,000 hours L_{50} @ 50° C
Electrical	Input Voltage	100 – 240 VAC, auto-switching, 50 / 60 Hz via Data Enabler
	Power Consumption	290 W maximum at full output, steady state
Control	Interface	Data Enabler (DMX or Ethernet)
	Control System	Philips full range of controllers, including Light System Manager, and iPlayer 3, or third-party DMX controllers
Physical	Dimensions *(Height x Width x Depth)*	20.5 x 28.9 x 4.8 in (521 x 734 x 122 mm)
	Effective Projected Area (EPA)	0.42 m²
	Weight	75 lb (34 kg)
	Housing	Die-cast aluminium, powder-coated finish
	Lens	Tempered glass
	Fixture Connections	Integral male / female waterproof connector, 6 ft (1.8 m) leader cable
	Operating Temperature	-40° – 122° F (-40° – 50° C) Operating -4° – 122° F (-20° – 50° C) Startup
	Humidity	0 – 95%, non-condensing
	Fixture Run Lengths*	5 @ 110 VAC 6 @ 120 VAC 11 @ 220 VAC 12 @ 240 VAC *Configuration: 20 A circuit, standard 6 ft (1.8 m) Leader Cables, 5 ft (1.5 m) jumper cables*
Certification and Safety	Certification	UL / cUL, FCC Class A, CE, PSE
	LED Class	Class 2 LED product
	Environment	Dry / Damp / Wet Location, IP66

† Lumen measurement complies with IES LM-79-08

‡ See ColorReach Powercore Product Guide for specific applications

* These figures, provided as a guideline, are accurate for this configuration only. Changing the configuration can affect the fixture run lengths.

Fixtures and Accessories

Item	Type	Item Number	Philips 12NC
ColorReach Powercore *includes 6 ft (1.8 m) Leader Cable*	UL/cUL and CE/PSE	123-000013-00	910503700451
Replacement Leader Cable	UL/cUL, 6 ft (1.8 m)	108-000043-02	910503700453
Replacement Leader Cable	CE/PSE, 6 ft (1.8 m)	108-000043-03	910503700454
ColorReach Powercore Spread Lens with bezel	13°	120-000068-00	910503700506
	23°	120-000068-01	910503700507
	40°	120-000068-02	910503700508
	63°	120-000068-03	910503700509
	5° x 17°	120-000068-04	910503700510
	8°	120-000068-05	910503700511
Data Enabler	DMX	106-000003-04	910403326801
	Ethernet	106-000003-05	910503700064
Light System Manager		103-000015-00	910503700221
iPlayer 3	N. A. Power Cord	103-000019-00	910403327101
	Europe Power Cord	103-000019-01	910503700392
ColorDial		103-000014-00	910403326901
Synchronizer		103-000001-00	—
Multi Synchronizer		103-000002-00	—

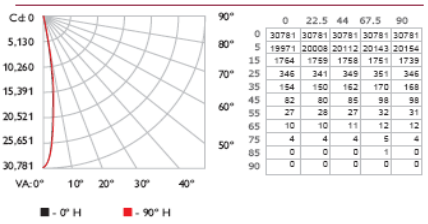
Use Item Number when ordering in North America

Philips Color Kinetics
3 Burlington Woods Drive
Burlington, Massachusetts 01803 USA
Tel 888.385.5742
Tel 617.423.9999
Fax 617.423.9998
www.colorkinetics.com

Photometrics

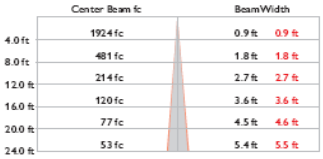
13° spread lens

Polar Candela Distribution



	0	22.5	44	67.5	90
0	30781	30781	30781	30781	30781
5	19971	20008	20112	20143	20154
15	1764	1759	1758	1751	1739
25	346	341	349	351	346
35	154	150	162	170	168
45	82	80	85	98	98
55	27	28	27	32	31
65	10	10	11	12	12
75	4	4	4	5	4
85	0	0	0	1	0
90	0	0	0	0	0

Illuminance at Distance



175 ft (53.3 m)
1 fc maximum distance

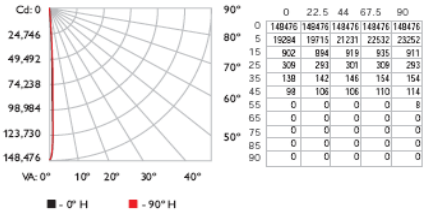
Vert. Spread: 12.9°
Horiz. Spread: 13.0°

LED	Lumens	Watts	Efficacy
RGB	2423	146	16.59

For lux multiply fc by 10.7

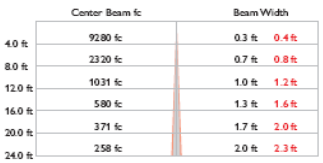
No lens, half unit

Polar Candela Distribution



	0	22.5	44	67.5	90
0	148476	148476	148476	148476	148476
5	19084	19715	21231	22532	23252
15	902	894	919	935	911
25	308	293	301	309	293
35	138	142	146	154	154
45	98	106	106	110	114
55	0	0	0	0	8
65	0	0	0	0	0
75	0	0	0	0	0
85	0	0	0	0	0
90	0	0	0	0	0

Illuminance at Distance



385 ft (117.3 m)
1 fc maximum distance

Vert. Spread: 4.8°
Horiz. Spread: 5.6°

LED	Lumens	Watts	Efficacy
RGB	2622	146	17.96

ColorReach Powercore fixtures are part of a complete line-voltage system which includes fixtures and:

- One or more Data Enablers.
- Any Philips controller, including Light System Manager and iPlayer 3, or a third-party DMX controller.
- One 6 ft (1.8 m) leader cable to connect each fixture to a junction box or Data Enabler.

For detailed product information, please refer to the ColorReach Powercore Product Guide at www.colorkinetics.com/ls/rgb/colorreach/

DAS-000022-03 R03 06-09

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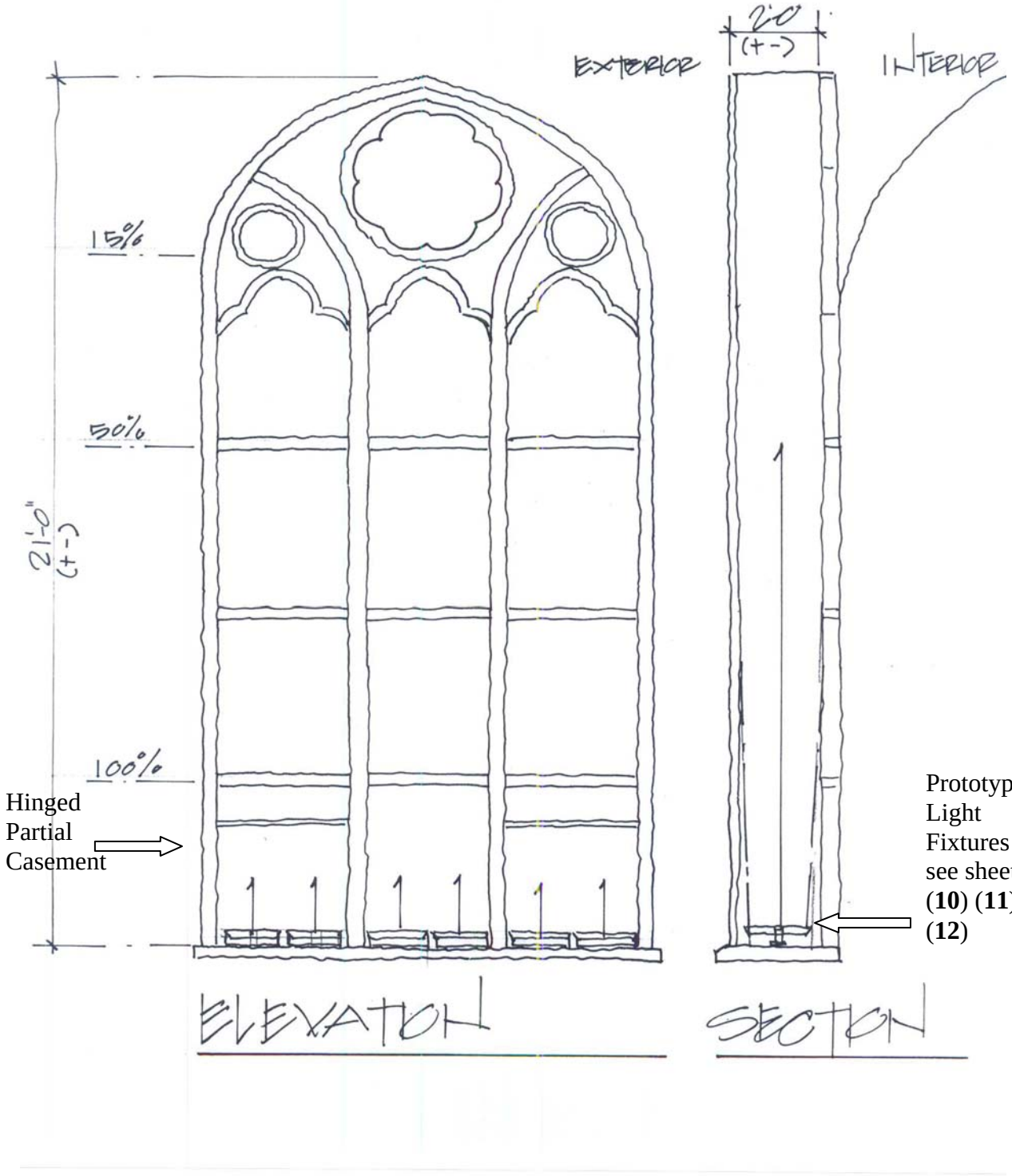
Note: Percentages are center beam candlepower as a percentage of 100 %. As noted in the report, the candlepower of lighting within the cavity would diminish considerably toward the top of the window.



Note: Hinged partial casement needs to be removed each and every time for installation and maintenance