

The background of the title page is a grayscale photograph of the Hallgrímskirkja church facade, showing its iconic stepped, spire-like structure.

Hallgrímskirkja Lighting Renovation

Lillie Kahkonen, Amber Smith, Thomas Uncein
THE4930 Facade Lighting



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Program Statement





Program Statement

Hallgrimskirkja, Reykjavik, Iceland

Purple - Amber Smith, Thomas Uncein, Lillie Kahkonen

Concept: **“An Ode to Iceland’s Natural Wonders”**

> In such a unique and active part of our natural world, it only seems fitting to write a visual love letter to the beauty that is Iceland. A land created by fire, god, and the seas, it’s violent and ferocious beginnings gave way to an island graced by the divine in the form of the Northern Lights. At the forefront of our design is a want to not just illuminate but to highlight the unique architectural style of Hallgrimskirkja. The nods to both the spiritual and natural world are of utmost importance to the design of this project, and a focus will be placed on the beauty of the untouched natural elements. This also includes embracing the shapes and colors of some of Iceland’s most striking landmarks.

History: Hallgrimskirkja translates to Halgrimur’s Church, and was named after 17th century religious poet Hallgrimur Petursson. It’s a Lutheran church that was designed by Guðjón Samúelsson, who took inspiration from Iceland’s many mountains, glaciers, and basalt lava formations. The building of Hallgrimskirkja began just after World War II, but wasn’t finished until 1986. When it was first completed, its design divided the city since many people were put off by the inappropriate shape of the main tower. Today, it’s well loved and appreciated by people. It also houses an incredible 15m tall pipe organ that consists of 5,000 pipes, many of which have been sponsored by Icelanders all over the island.

Materials: The tower is 244’ tall, and it’s made entirely out of concrete in a Gothic/ brutalist inspired design



- Timing:** Iceland lies incredibly close to the Arctic Circle and gets little to no darkness during the summer months. However, on the flipside, it receives only 4-5 hours of daylight during the winter months.
- Method:** Architecturally, Hallgrimskirkja stands out against the Reykjavik skyline and can even be viewed from the water's edge. We will artistically embrace the prominence of this feature so that it continues to stand out. In addition, we'll illuminate the courtyard surrounding the church in such a way the colors of the church seep on to the ground so it feels like a continuation of the church. We'll also be incorporating projections that coincide with important dates within the Lutheran calendar.
- Feasibility:** Our intention is to find a way to create this design in a way that best fits the environment.

Research and Development



Hallgrímskirkja Research and Development

Purple- Amber Smith, Lillie Kahkonen, Thomas Uncein

2.1 Owner and Design Team Preferences and Impressions

1. Space Function, use

a. Tourist Attraction¹

- i. In 2018 about 300,000 tourists visited the tower of Hallgrímskirkja
- ii. In 2019 church staff expected about 1,000 visitors a day

b. Lutheran Church

i. Religious Services²

1. Mass is offered every Sunday
2. Baptisms
3. Weddings

a. Including gay marriages: an older Bishop of Iceland Agnes M. Sigurðardóttir said “the church is primarily a channel of the love of Christ and celebrates life in all its diversity.”³

4. Funerals

ii. Cultural Events

1. New Years Eve fireworks celebrations⁴

¹ Hafstað, Vala. “Hallgrímskirkja Church Tower Reopens.” *Mbl.is*, 28 May 2019, icelandmonitor.mbl.is/news/nature_and_travel/2019/05/28/hallgrimskirkja_church_tower_reopens/.

² Guðlaugsson, Gísli. “Ceremonies.” *Hallgrímskirkja*, 14 June 2016, en.hallgrimskirkja.is/ceremonies/.

³ Costa, Natacha. “Hallgrímskirkja - a Church Inspired by Icelandic Nature.” *Itinari*, 13 Sept. 2020, www.itinari.com/hallgrimskirkja-a-church-inspired-by-icelandic-nature-ath5.

⁴ “Information about Hallgrímskirkja.” *Guide to Iceland*, guidetoiceland.is/travel-iceland/drive/hallgrimskirkja.

2. Building Materials, Architectural Style



a. Architectural Style

i. Icelandic Architecture⁵

1. Reflection of the Icelandic landscape.

ii. Modernist/Brutalist Architecture⁶

1. Since the inspiration is derived from the natural environment, some question whether this should be an example of brutalist architecture or not. But the Icelandic landscape can be very brutal with its volcanoes and rough seas.

⁵ Helgason, Magnús Sveinn, et al. "Seven Interesting Facts about One of Reykjavík's Best Known Landmarks, Hallgrímskirkja Church." *Icelandmag*, 14 Jan. 2018, icelandmag.is/article/seven-interesting-facts-about-one-reykjaviks-best-known-landmarks-hallgrimskirkja-church.

⁶ Helgason, Magnús Sveinn, et al. "Seven Interesting Facts about One of Reykjavík's Best Known Landmarks, Hallgrímskirkja Church." *Icelandmag*, 14 Jan. 2018, icelandmag.is/article/seven-interesting-facts-about-one-reykjaviks-best-known-landmarks-hallgrimskirkja-church.

- b. Building Materials⁷
 - i. The surface is a rough cast of white granite
 - 1. The granite makes a connection between modernist and Icelandic architecture since the granite is a natural material and Icelandic Architecture considers its natural landscape.
- 3. Important Features such as Art Locations and Signage
 - a. Cross at the top of the tower
 - b. Clock
 - c. Leifur Eiríksson statue in the courtyard
- 4. Comfort Level and Satisfaction of Occupants, Workers, and Users
- 5. Need for Flexibility of Space Function and Uses
 - a. Functions
 - i. Tourism
 - 1. Tourists are able to ride an elevator to the top of the tower, which has an amazing view of Reykjavík, for a fee.
 - 2. Tourists can also walk around the courtyard in front of the church to take pictures and view the statue of Leifur Eiríksson.
 - ii. Religious Services
 - 1. The interior of the church doesn't change for tourists, they're allowed to attend religious services.
- 6. Exterior Features (image, security, landscape)
 - a. Image



⁷ Lee, YS. "A Complete Guide to Hallgrímskirkja Church." *Extreme Iceland*, 11 Apr. 2019, www.extremeiceland.is/en/attractions/hallgrimskirkja-reykjavik-iceland.

- i. The Brutalist/Icelandic architectural style of the Hallgrímskirkja sticks out compared to the buildings around it.
- ii. The stepped wings of the church is one of its most attention grabbing features
- iii. The stark white colour of the Hallgrímskirkja is fairly different from the multi-coloured buildings surrounding the church.

> The common architectural style of Iceland is a protective, very box-shaped home that is mostly made of concrete. The people of the island have incorporated bright colors into their structures as the natural landscape often lacks much color for a large part of the year. Below is an example of buildings near Hallgrímskirkja in Reykjavík.⁸



⁸ Cott, Allix "How to Spend a Day in Reykjavík" *Architectural Digest*
<https://www.architecturaldigest.com/story/how-to-spend-a-day-in-reykjavik>

b. Landscape

- i. The Hallgrímskirkja is 245ft (74.6m) tall visually standing out against the Reykjavík skyline.⁹



2.2 Visual and Perceptual Needs

1. Age of Occupants (tourists)

- a. Considered one of the top tourist attractions in Reykjavík, the church is visited by people from all over the world of all ages.

2. Tasks to be Performed (their importance and duration)

3. Time of Occupancy during the day and year

a. Church

- i. Open Monday to Saturday from 11am- 4pm and on Sunday from 10am- 4pm.¹⁰

b. Tower

- i. Open Monday to Saturday from 11am- 3:45pm.¹¹

c. Courtyard

- i. The courtyard is accessible any time of the day or night as it is a public space.

4. Psychological Needs for Light

a. Iceland's daylight hours

- i. "The Midnight Sun", Summer

⁹ Basu, Rumela. "Iceland's Tallest Church Was Inspired by Volcanoes." *A Guide to Hallgrímskirkja, Iceland*, 28 June 2019, www.nationalgeographic.com/travel/destinations/europe/iceland/reykjavik/hallgrimskirkja-tallest-church-in-iceland/.

¹⁰ Guðlaugsson, Gísli. "Opening Hours and the Tower." *Hallgrímskirkja*, 13 June 2016, en.hallgrimskirkja.is/information/opening-hours-and-the-tower/.

¹¹ Guðlaugsson, Gísli. "Opening Hours and the Tower." *Hallgrímskirkja*, 13 June 2016, en.hallgrimskirkja.is/information/opening-hours-and-the-tower/.

1. From May to July, the sun is visible 24 hours of the day
 - a. The sun sets below the horizon just before midnight, but the sky never gets 100% dark.
- ii. Winter
 1. The shortest days of the year, December- January, see about 4-5 hours of absolute daylight.
 - a. These hours refer only to when you can see the sun, it is not completely dark for 19-20 hours.
- iii. Fall and Spring
 1. These seasons are much more normal, the sun rises from about 6:00am-8:00am and sets around 6:00pm-8:00pm.
5. The shape of the Task (particularly in industrial areas)

2.4 Architectural Opportunities and Constraints

1. Architectural Features, Interior and Exterior

a. Exterior Features

- i. Large, sloping columns on front facade, reminiscent of basalt columns (black sand beach, Reynisfjara)
- ii. Tower, reaching 73m (245ft), consisting of aforementioned “basalt columns”.

> The basalt columns are formed through the cooling of lava, in which the liquid rock forms hexagonal columns that appear to mesh together perfectly. They can be found in Iceland as well as the UK and Norway.



iii. Statue of Leifur Eiriksson, standing in courtyard in front of the main entrance/facade.

> Leif Erikson, Leiv Eiriksson or Leif Ericson (c. 970 – c. 1020) was a Norse explorer from Iceland. He is thought to have been the first known European to have set foot on continental North America (excluding Greenland), approximately half a millennium before Christopher Columbus in 1000 A.D.

iv. Geometric pattern surrounding statue, and leading to front entrance of the church.



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b. Interior Features

- i. Largely bare walls, with only texture of building materials (concrete, white granite) being the overwhelming majority of visible space. White granite plays a large role in Iceland as it meshes with the grey and white natural surroundings of the island.
- ii. Tall, clear-glass Gothic-inspired windows line the nave, beginning approx. 15ft off the ground, features smaller windows just below in row circling the entire structure.
- iii. Columns that emulate *fluted* columns.

¹²Photo by YS Lee, *A complete Guide to Hallgrímskirkja* April 11, 2019

<https://www.extremeiceland.is/en/attractions/hallgrimskirkja-reykjavik-iceland>; Leifur Eriksson statue, photograph by Lillie Kahkonen



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2. Historical Constraints

- a. Relatively “new” structure, despite a long build process.
- b. The site's significance is less historical as of faith.
- c. Site sits atop tall hill in central city, must be aware of visibility and how that will affect the Reykjavik skyline in long-term

3. Ceiling Heights, Type of Ceiling

- a. Ceiling Height:
 - i. Tower: ~242'
 - ii. Nave: ~65'
- b. Type of Ceiling:
 - i. Material:
 - a. Majority of structure uses concrete, coated in a white granite and plaster.
 - ii. Style:
 - a. Minimalistic interior gives appearance of vast height to ceilings

¹³ Agoda.com Gallery, *Architecture in Iceland: Cathedrals, Homes, & Day Trips from Reykjavik*. March 6, 2020

- b. **Nave** consists of three naves, German Gothic inspired. Intersections of vault crowns are far taller than keys of transverse arches.¹⁴
 - c. **Sanctuary** has ribbed vault ceiling, contrasting the cross vault of nave.
- 4. Plenum Depth
 - a. Walls and columns give appearance of being very thin, actual size is approx. 10.5"
- 5. Location and Size of Structural Members
- 6. Windows and Skylight Locations and Orientations
 - a. Windows
 - i. Windows run vertically, ~15ft from the ground reaching just before the lower reaches of ceiling (~60ft)
 - ii. Facing ENE and WSW. (Daylight concerns addressed in 2.4 section 4)
 - iii. Tower has small windows, running down the center of all 4 sides, as well as three small spear-shaped windows above clock.
 - iv. Small windows at peak of tower, among the texture approaching cross on top. All could be lit from interior.



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¹⁴ Ybl Miklos & Aurel Benard, *Hallgrímskirkja, Reykjavik. A Late Example of Expressionist Church Architecture*. 2018

¹⁵ Josh Ellis Photography <https://www.goteamjosh.com/blog/hallgrims>



7. Construction Schedule
8. Electrical Usage
 - a. Iceland relies on a 230V standard system in homes and business
 - b. Mainland EU uses 220V system.
9. Landscape Features
 - a. Location
 - i. The church is located atop a large hill, roughly 38m above sea level.
 - ii. City is surrounded by mountains on all sides except to the west, where there is sea.
 - b. Seasonal Considerations
 - i. Reykjavik is located along the coast near Arctic Circle. Lots of snow and grey weather for large part of the year.
 - ii. Most of the year is cloudy, overcast.

2.5 Photometric Considerations of Existing Installation

1. General Field of View: highlights, ambient levels
 - a. An exploration of nighttime photographs and figure ground contrast example, illustrates the brightness levels of the front facade of the church at night.



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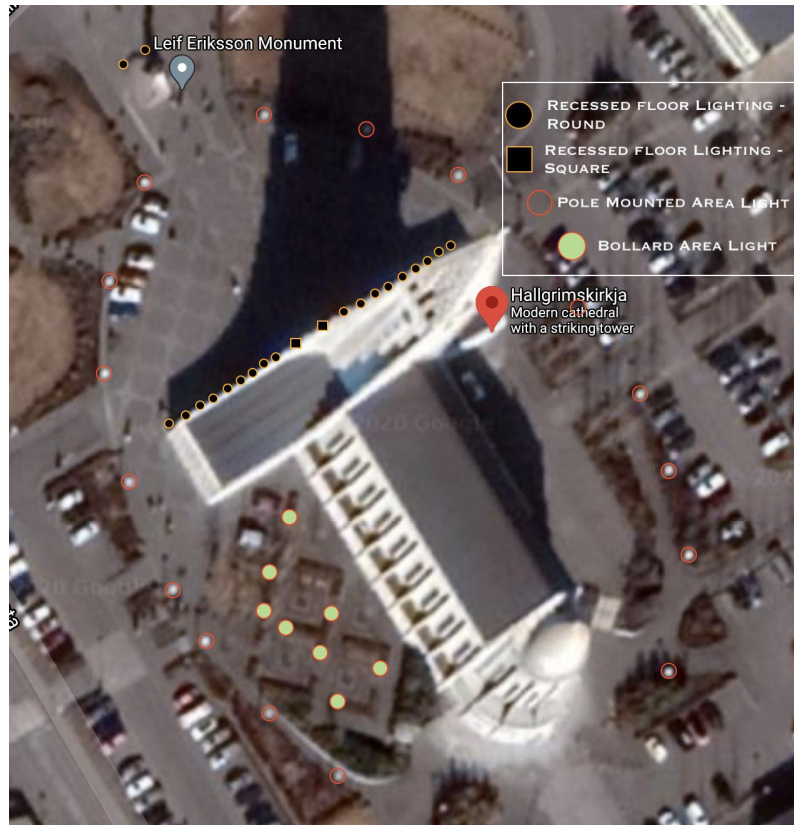


2. Distant Surrounds: circulation areas, transition areas
 - a. The church is surrounded by a combination of recessed floor lighting, pole mounted pedestrian area lighting, and Bollard area lighting. The pole mounted and bollard area lighting fixtures create a safe walking environment for all times of the year, and the recessed lighting provides

¹⁶ McKinnell, Anne. "Hallgrímskirkja at Night." *Anne McKinnell, Photographer, Writer, Nomad*, 24 Oct. 2016, annemckinnell.com/2016/10/24/hallgrimskirkja-at-night/.

¹⁷ Nagadhana, Narongsak. "Timelapse at Night at Hallgrímskirkja, (Church of Hallgrímur) Is a Lutheran (Church of Iceland) Parish Church in Reykjavik, Iceland. It Is the Largest Church in Iceland." *Shutterstock*, Shutterstock, www.shutterstock.com/ru/video/clip-5737052-timelapse-night-hallgrimskirkja-church-hallgrimur-lutheran-iceland.

illumination for the church's exterior to draw the eye in and help it stand out from the night sky. As shown in the picture below, the pole mounted lighting forms an oval around the entire exterior of the church and the bollard lighting provides light around the back half of the church and sanctuary. The recessed lighting, of which there are 2 types, resides in the tiles directly in front of the church and on the two short sides of the columns, as well as surround the Leif Erickson statue.



2.7 Energy Limitations

1. Energy Code Requirements (federal, state or province, local)
 - a. Our Design will be congruent with local laws and regulations regarding consumption and safety. Given Iceland's desire to focus on reducing energy consumption, we will place emphasis on using LED technology to create the design.



2.8 Maintenance Considerations

1. Type of Environment (clean dirty)
 - a. The entirety of this installation will be exterior and as a result, all fixtures must be capable of handling temperature fluctuations and cold weather, as well as any combination of rain, sleet, snow, and dirt. Weather varies from 17°F to 40°F in the winter and 50°F to 62°F in the summer. Although downpours don't occur everyday, misty rain is very common.¹⁸
2. Planned Maintenance Program
 - a. We will be using LED technology, which will drastically reduce maintenance. Approximately ⅔ of the fixtures will be accessible from the ground, with an additional ⅓ of the fixtures being attached to the church and pointing down

¹⁸ Leffman, David, and James Proctor. *Rough Guide to Iceland*. 5th ed., Rough Guides, Limited, 2013.



Design Statement

First and foremost, the natural light will play an important role in how we illuminate the Hallgrimskirkja. At some times of day, the church seems to glow as if acting as a beacon for God. Given the importance of this building as a church and national monument, this is something we want to enhance. In continuation of that we'll be exploring the beauty of Iceland's natural landscape by drawing color and texture inspiration from the northern lights, volcanoes, glaciers, waterfalls, and the black sand beaches and creating these colors across the full facade of the Hallgrimskirkja. We intend to utilize the basalt column-like facade to help break up light, with dynamic highlights and shadows. We also intend to extend parts of our design to include the Leif Ericsson statue, and the surrounding open space.

Our proposed lighting setup will provide flexibility to display simple lighting designs as well as multicolored dynamic northern light displays. We also intend to utilize projectors to give us the versatility to create specific lighting moments for community events and religious holidays throughout the calendar year. For special events, such as Whit Sunday and Monday, Christmas, and St. Þorlákur's Day, we'll be using a combination of lighting and projectors to create images congruent with the focus of the holiday, such as a dove for Whit Sunday.

Schematic Design





Hallgrimskirkja

Final Schematic Design

1. *Who occupies the space?*
 - a. The site still actively holds services throughout the week but the leadership of Hallgrimskirkja are open to visitors, so long as the services and church goers are respected.
2. *Where is the visual task located?*
 - a. The design involves all outer walls of the min building, with an artistic emphasis on the front facade.
 - b. Statue of Leifur Eriksson¹⁹ and its pedestal in front of the main entrance to the church.
3. *What is the proper quantity and quality of light needed for the task?*
 - a. The proximity of homes and businesses is an important factor to consider (between 100-220' away)
 - b. Brightness is to be considered carefully as well, the white granite facade will reflect relatively well.
 - c. Light should be focused and contained as much as possible as to not disturb nearby buildings.
4. *Will the space be pleasant for the users?*
 - a. The proposed designs will provide gentle, soothing tones and colors that honor dates significant to the people of Reykjavik as well as the Lutheran faith.
 - b. The goal of this project is to accentuate and highlight the natural beauty of Iceland.

¹⁹ Peter Prokosch 2013; *Lief Erkison statue in Front of [Hallgrimskirkja]* <https://www.grida.no/resources/4532>

5. *Will the lighting system be compatible with the architecture?*
 - a. Only small adjustments will be needed to achieve the design
 - b. Small fixtures are to be used throughout, such as the WW2-HW-Q13 from Jesco Lighting Group²⁰
6. *Will the lighting system work with available daylight?*
 - a. Due to the unique daylight conditions in the far north, the design must incorporate adjustments for certain times of year.
 - b. May 21-July 30 sees days without night, the “midnight sun”
 - c. From late November to Early February, only a few hours of daylight occur daily. Between 6-4 hours.
7. *What color light is appropriate?*
 - a. We have developed a palette based on naturally occurring colors in the natural world of Iceland.
8. *Will glare be a problem?*
 - a. Glare may become an issue with reflectiveness of the stone and fixtures themselves if they are glossy/shiny.
 - b. The unique angles of the sun in summer months must be considered.
9. *How will the system be controlled?*
 - a. Possibly Pharos²¹
10. *Is the system using energy and resources responsibly?*
 - a. As a team, the aim is to use only efficient fixtures, and avoid traditionally lamped fixtures.
 - b. LED is greatly preferred.
11. *Is the system flexible?*
 - a. In regards to software, the system will be very flexible.
 - b. Uploads of new designs will be made simple and efficient.

²⁰ Jesco Lighting Group, WW2-HW-Q13; <https://www.jescolighting.com/portfolio/ww2-hw-q13/>

²¹ Pharos Lighting Group, <https://www.pharoscontrols.com/>

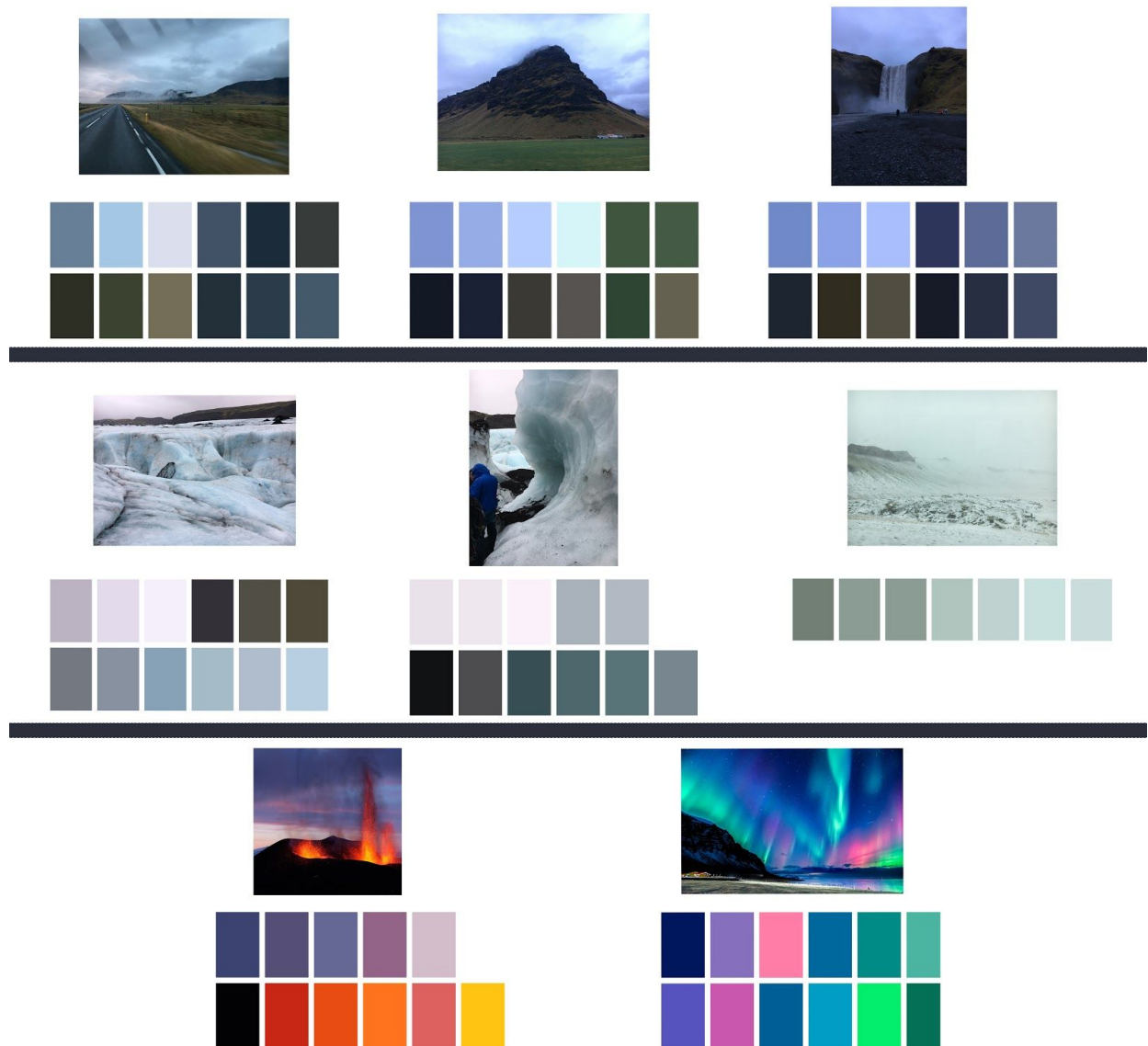


- c. Adjustment of fixtures will require a trained team to remove and replace cables and/or fixtures.

12. What are the applicable handicap, electrical, and energy codes?

- a. Plans do not affect handicap accessibility to structure.

Our design draws inspiration from natural formations across the entire country. We studied the gamut of colors across Iceland's landscape and created our color palettes (*depicted below*) from photographs taken at some of Iceland's most iconic natural formations: the Skogafoss Waterfall, Sólheimajökull Glacier, and Reynisfjara Black Sand Beach to Volcanos and Northern Lights.



(Color palettes inspired by landmarks)

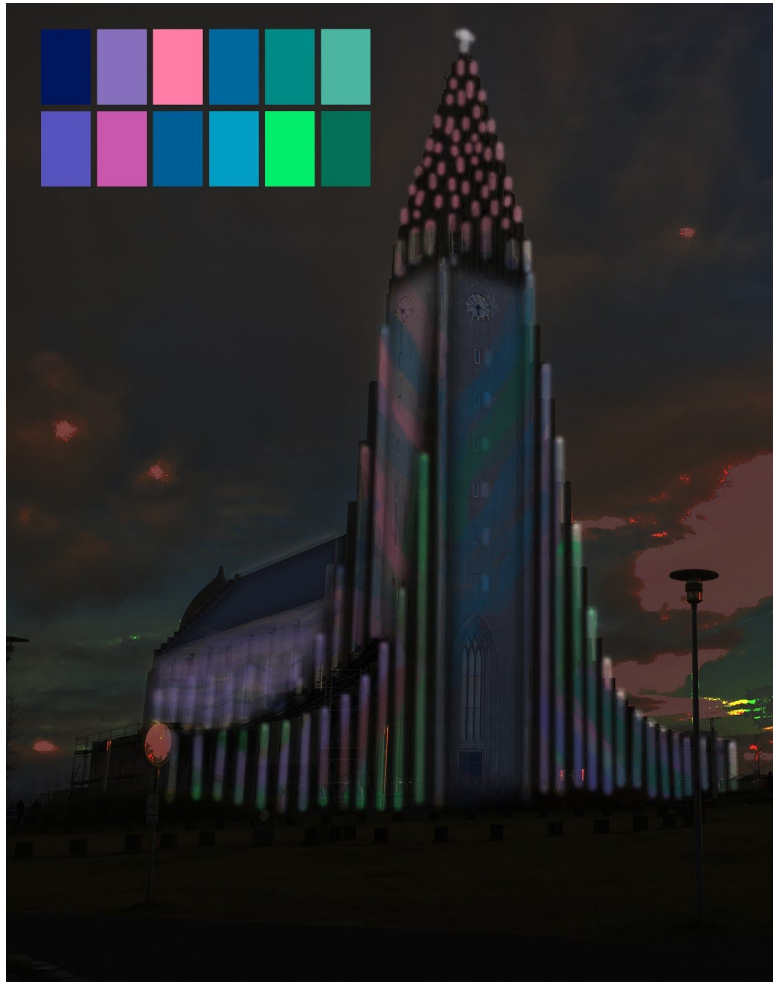
There are three main lands this design will live in are ice, mountains, and volcano and northern lights. The lands of ice and mountains live in very analogous color schemes. Both of them have variations of color but don't stray very far from their sides of the color wheel. These two color lands will greatly complement the beautiful granite color of the church facade. They will bring gentle color variety and interest to the building without being distracting or detracting from Hallgrimskirkja's grandeur. The two lands will be the general look of the building and the design will allow for switching between multiple looks that live in these two worlds.

The third land is that of volcanos and northern lights. This land will involve an explosion of color and movement. The lands of ice and mountains will involve subtle shifts in movement, but this land will be incredibly dynamic. We'll showcase the violence of the lava erupting and awe inspiring beauty of the northern lights dancing through the sky. Below are a few images of

possible displays:



*(rendering of potential
Waterfall display)*

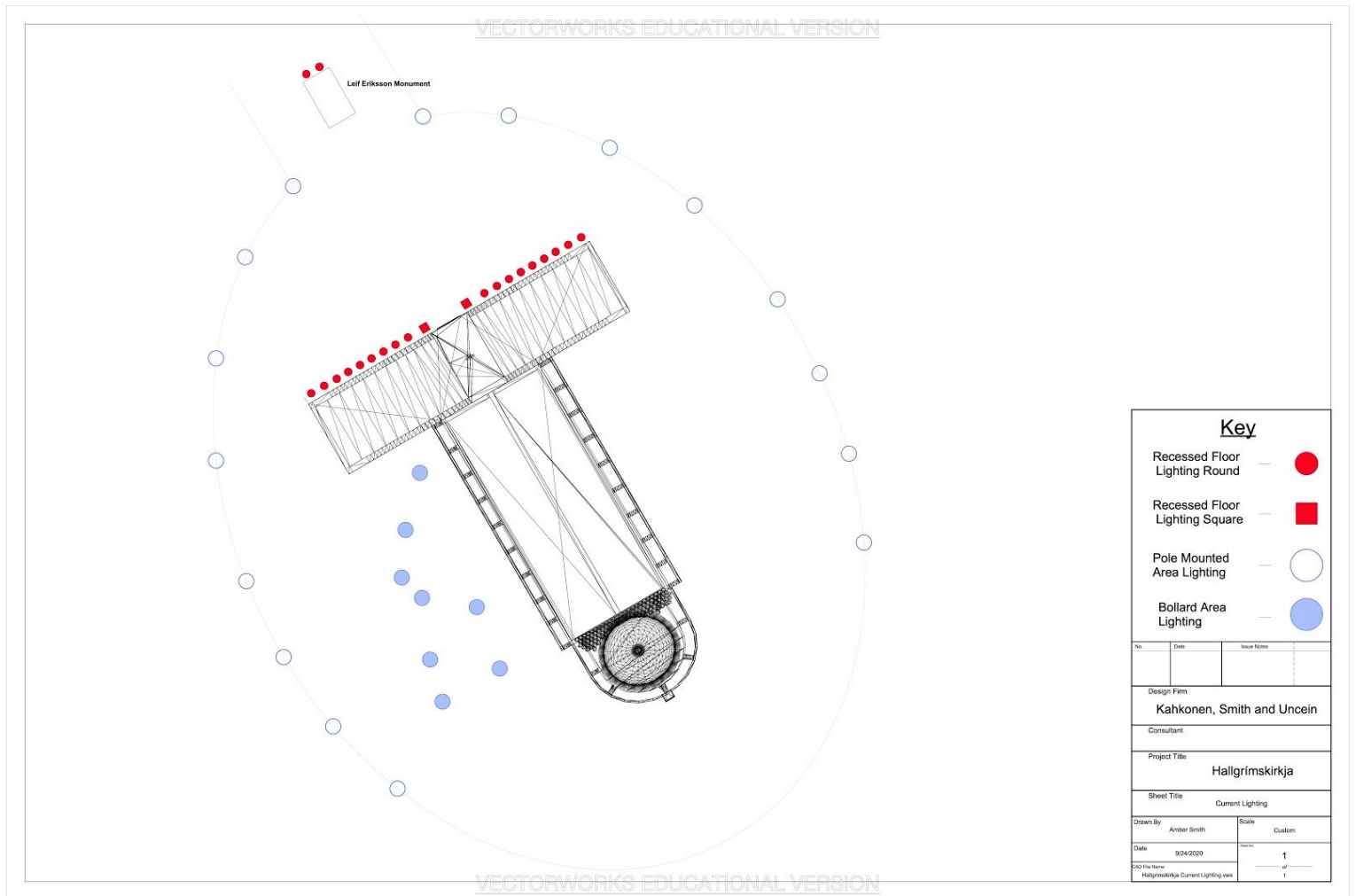


*(rendering of potential
northern lights display)*

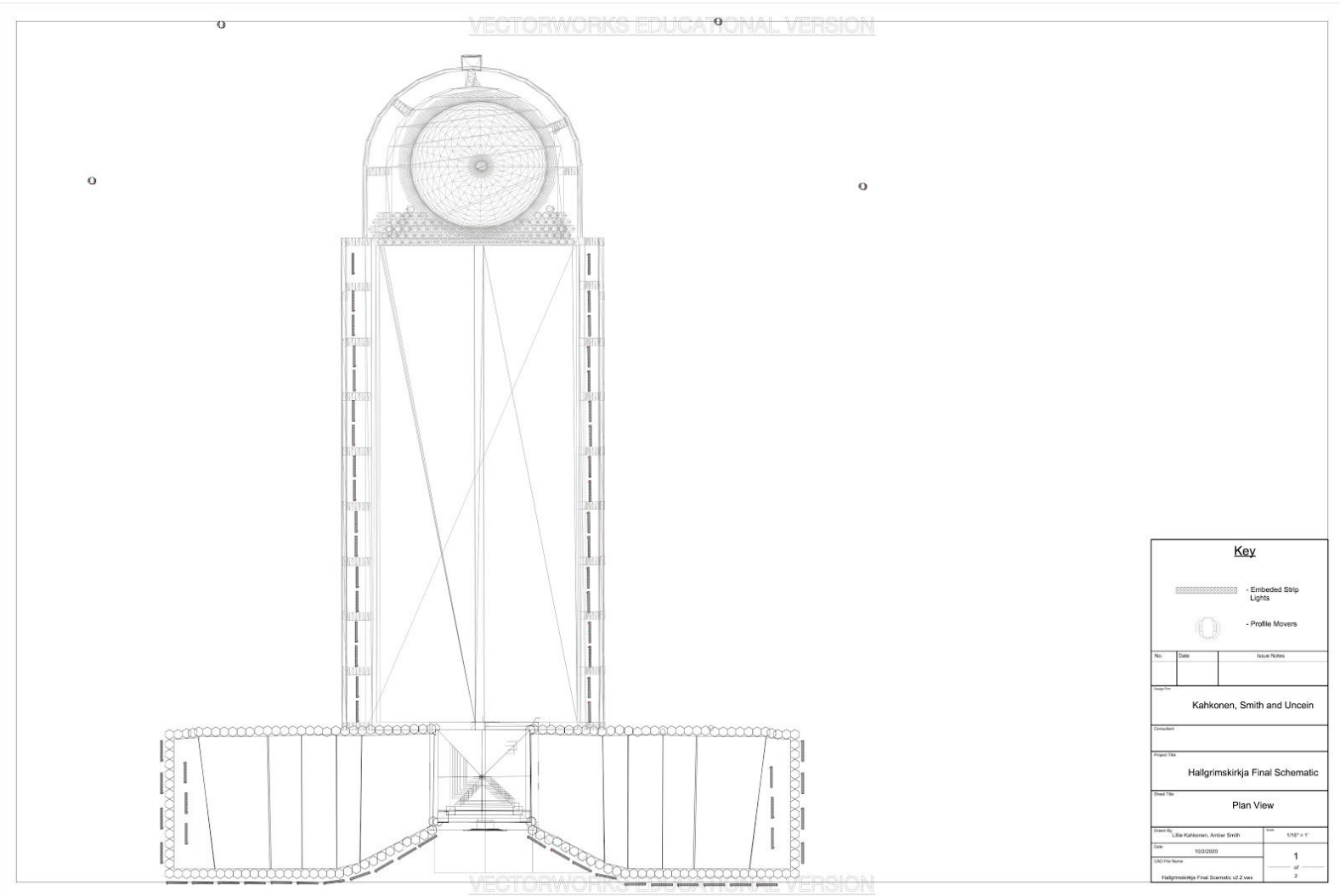


*(rendering of
potential Volcano
display)*

Here is a drawing of the current lighting at the Hallgrimskirkja, Reykjavik

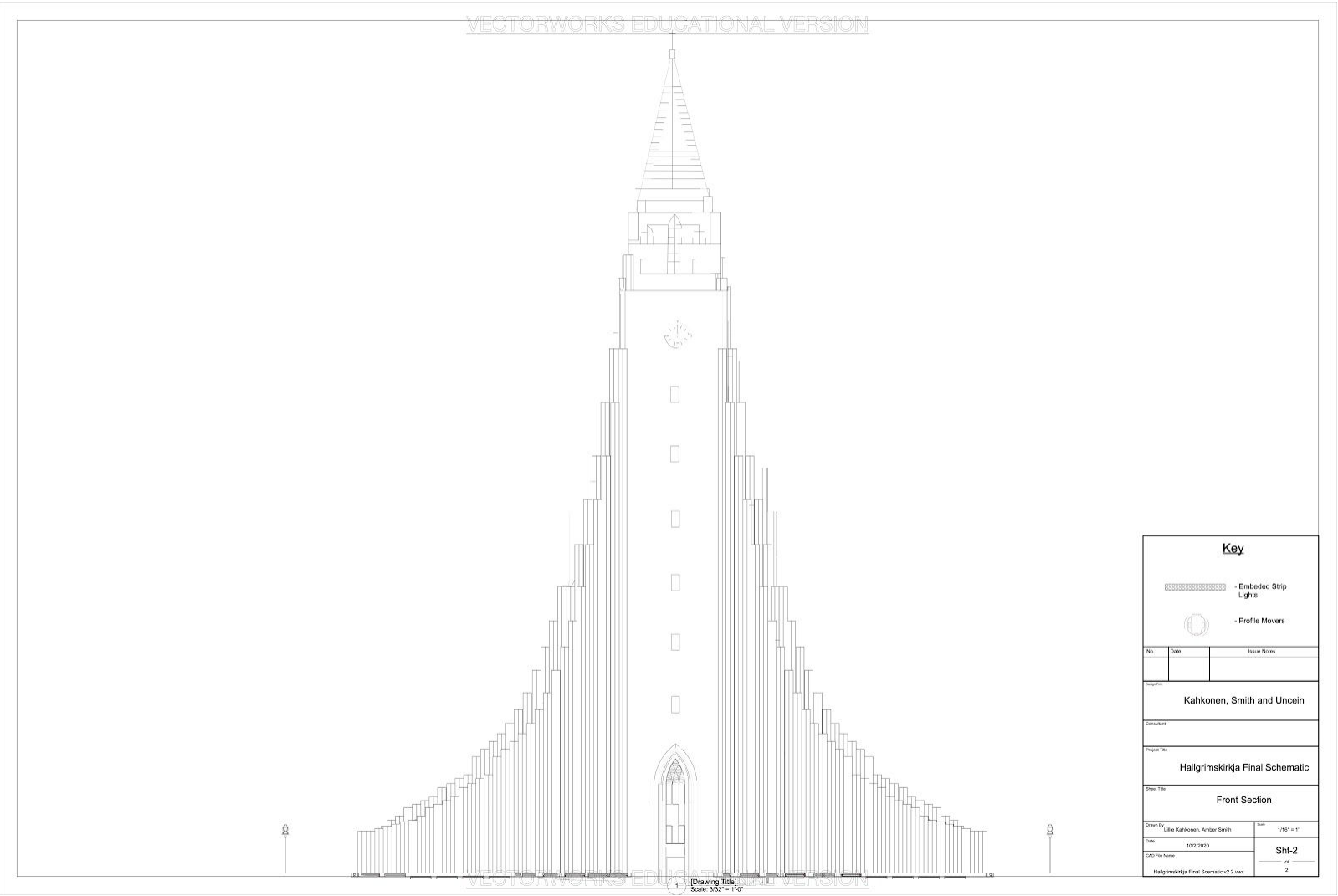


Below is a plan view of the current lighting positions and fixtures we are exploring.





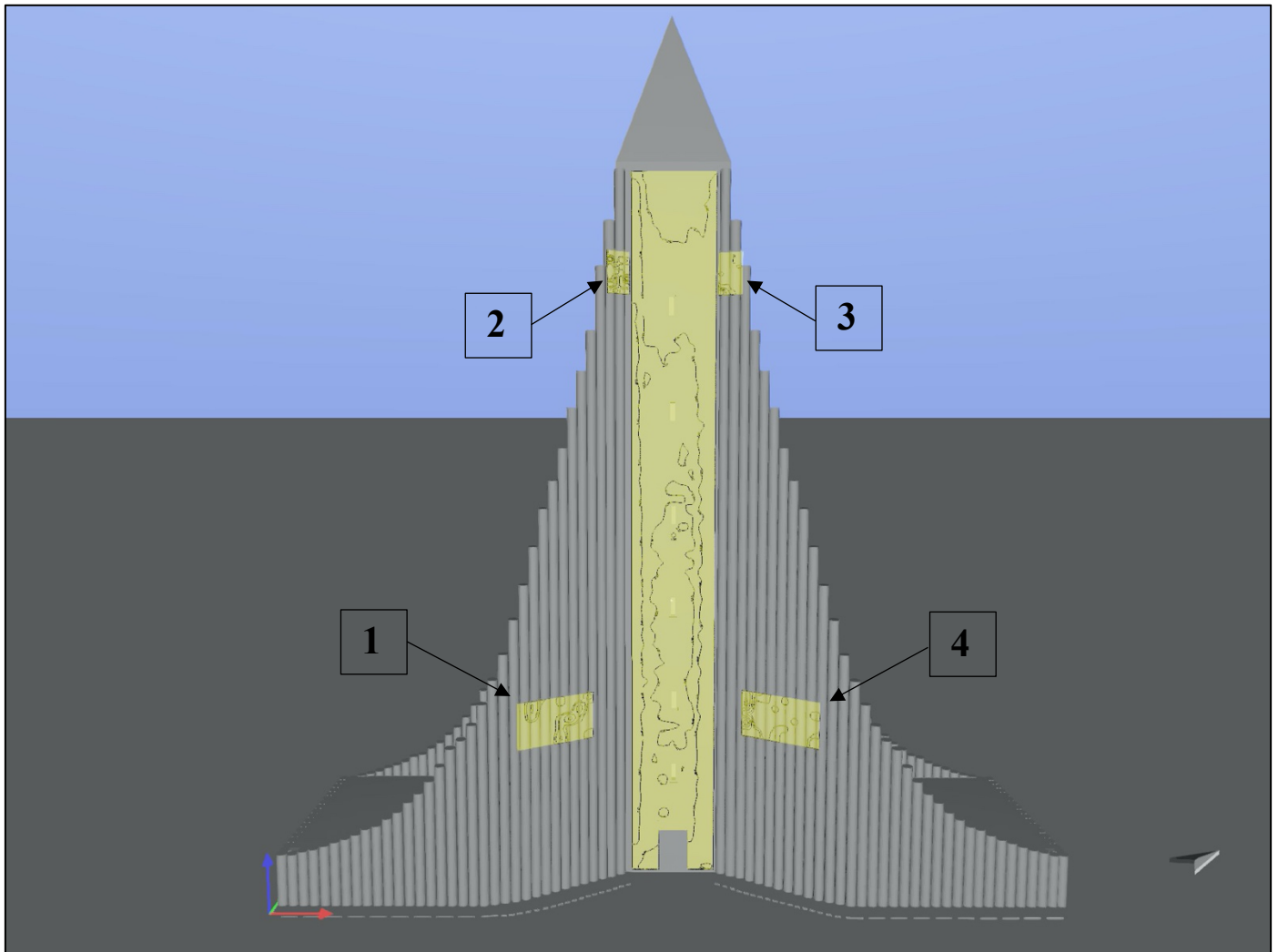
Below is a Front section:



Design Development



Hallgrímskirkja Front Façade Lighting Calculation Surface Key



1. Medium Pillars L
2. High Pillars L
3. High Pillars R
4. Medium Pillars R

Site 1

Luminaire list Φ_{total}

779650 lm

 P_{total}

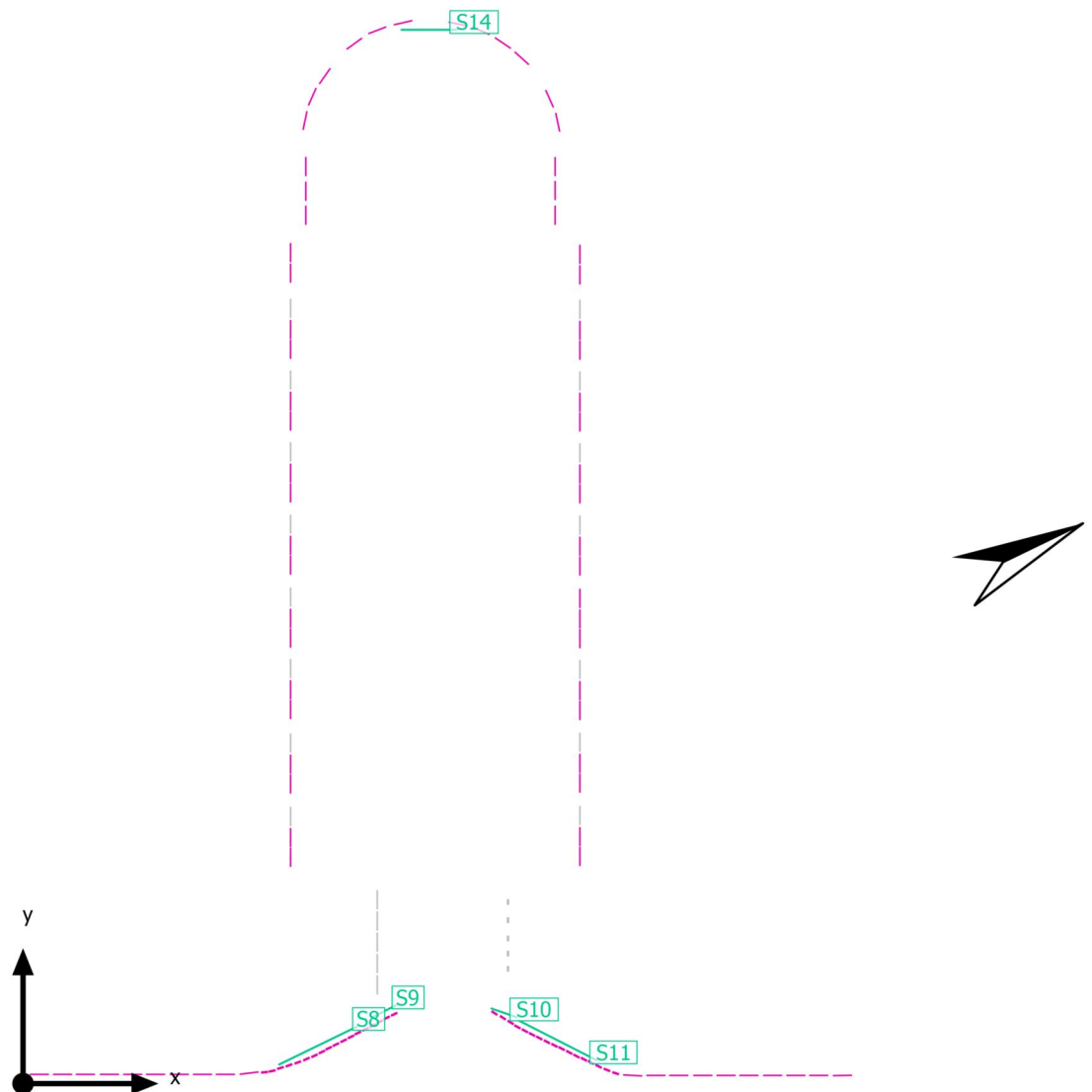
18768.5 W

Luminous efficacy

41.5 lm/W

pcs.	Manufacturer	Article No.	Article name	P	Φ	Luminous efficacy
5	Philips Color Kinetics	ColorBlast RGB Powercore gen4	Flood Fixture with 36 LEDs, Red/Green/Blue, 60deg Diffuser Lens. Serial #8800F70B. Date Code 1535 SCG 0001.	49.9 W	1461 lm	29.3 lm/W
35	SGM		I-5 RGBW_All on_raw_LM-79	439.0 W	16538 lm	37.7 lm/W
95	Traxon Technologies Limited		AL Linear AC 1200 RGBW 60X10 CE -RGB	33.2 W	2037 lm	61.5 lm/W

Site 1 (1. Base)

Calculation objects

Site 1 (1. Base)

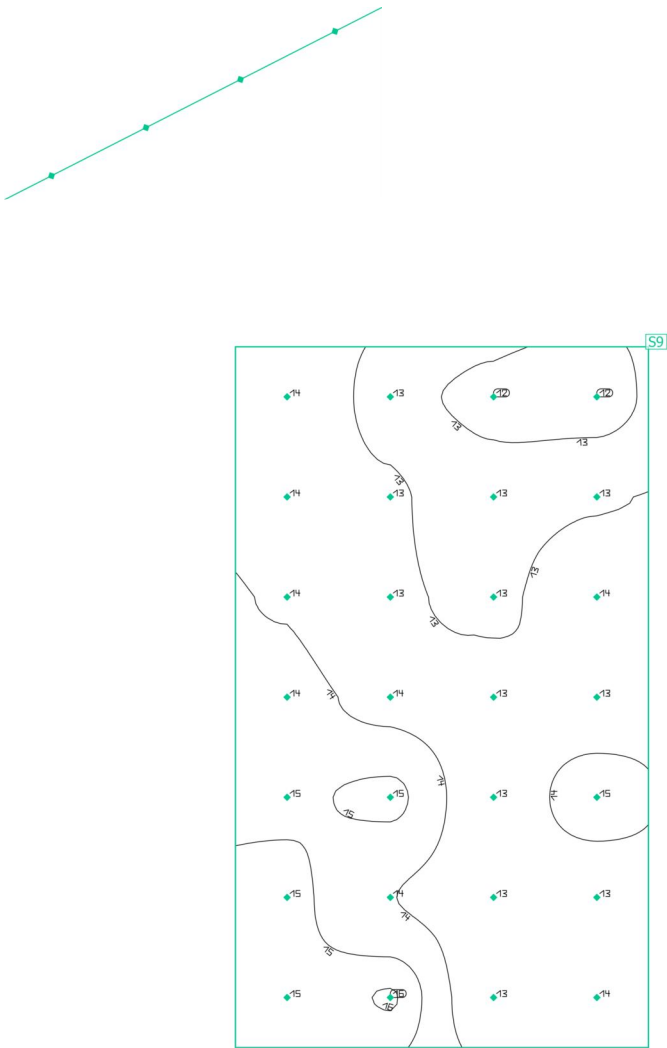
Calculation objects

Calculation surfaces

Properties	$\bar{E}$	E_{min}	E_{max}	$\bar{E}/E_{min}$	E_{max}/E_{min}	Index
Medium Pillars L Perpendicular illuminance Height: 41.339 ft	151 lx	72.8 lx	223 lx	2.07	3.06	S8
Medium Pillars L Vertical illuminance Rotation: 0.0°, Height: 41.339 ft	265 lx	194 lx	337 lx	1.37	1.74	S8
High Pillars L Perpendicular illuminance Height: 144.356 ft	9.64 lx	8.99 lx	10.7 lx	1.07	1.19	S9
High Pillars L Vertical illuminance Rotation: 0.0°, Height: 144.356 ft	13.7 lx	12.4 lx	15.5 lx	1.10	1.25	S9
High Pillars R Perpendicular illuminance Height: 144.028 ft	10.6 lx	9.57 lx	12.3 lx	1.11	1.29	S10
High Pillars R Vertical illuminance Rotation: 0.0°, Height: 144.028 ft	25.9 lx	17.0 lx	29.2 lx	1.52	1.72	S10
Medium Pillars R Perpendicular illuminance Height: 41.339 ft	130 lx	75.2 lx	191 lx	1.73	2.54	S11
Medium Pillars R Vertical illuminance Rotation: 0.0°, Height: 41.339 ft	224 lx	141 lx	302 lx	1.59	2.14	S11
Apse Perpendicular illuminance Height: 61.813 ft	0.99 lx	0.002 lx	3.65 lx	-	-	S14
Apse Vertical illuminance Rotation: 0.0°, Height: 61.813 ft	1.55 lx	0.00 lx	4.72 lx	-	-	S14

Utilisation profile: DIALux preset, Default (Drive Aisles/Parking Areas)

Site 1 (1. Base)
High Pillars L

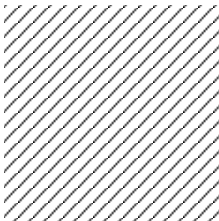


Properties	$\bar{E}$	E_{min}	E_{max}	$\bar{E}/E_{min}$	E_{max}/E_{min}	Index
High Pillars L Vertical illuminance Rotation: 0.0°, Height: 144.356 ft	13.7 lx	12.4 lx	15.5 lx	1.10	1.25	S9

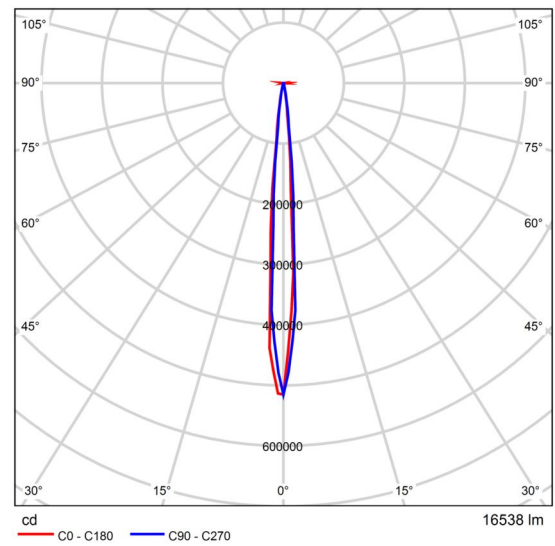
Utilisation profile: DIALux preset, Default (Drive Aisles/Parking Areas)

Product data sheet

SGM I-5 RGBW_All on_raw_LM-79



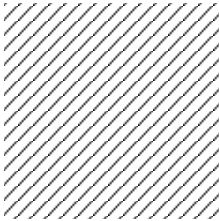
Article No.	
P	439.0 W
$\Phi_{\text{Luminaire}}$	16538 lm
Luminous efficacy	37.7 lm/W
CCT	3000 K
CRI	100



Polar LDC

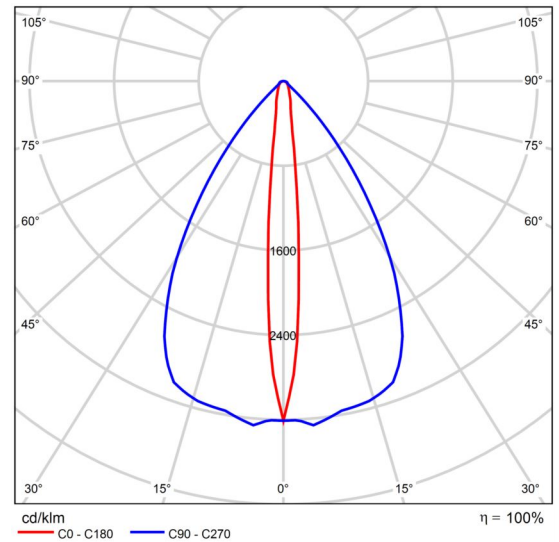
Product data sheet

Traxon Technologies Limited AL Linear AC 1200 RGBW 60X10 CE -RGB



Article No.

P	33.2 W
Φ_{Lamp}	2040 lm
$\Phi_{\text{Luminaire}}$	2037 lm
η	99.85 %
Luminous efficacy	61.5 lm/W
CCT	3000 K
CRI	100



Polar LDC

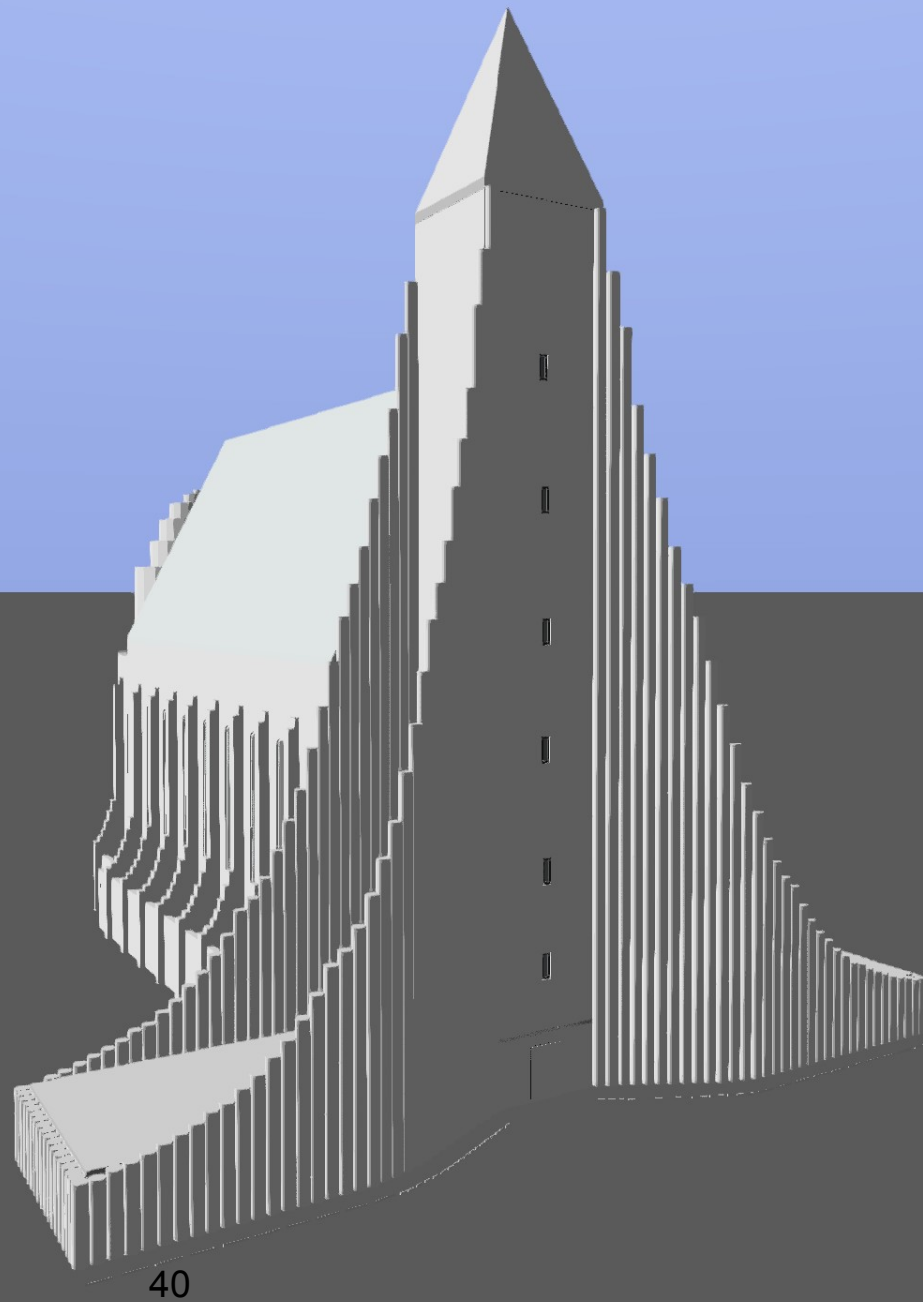
Glare evaluation according to UGR												
p Ceiling		70	70	50	50	30	70	70	50	50	30	
p Walls		50	30	50	30	30	50	30	50	30	30	
p Floor		20	20	20	20	20	20	20	20	20	20	
Room size X Y		Viewing direction at right angles to lamp axis					Viewing direction parallel to lamp axis					
2H	2H	14.2	15.1	14.5	15.4	15.6	19.4	20.3	19.6	20.5	20.7	
	3H	15.2	16.1	15.5	16.3	16.6	20.0	20.9	20.3	21.1	21.4	
	4H	15.3	16.1	15.6	16.3	16.6	20.5	21.3	20.8	21.6	21.9	
	6H	15.2	16.0	15.6	16.2	16.5	21.0	21.8	21.4	22.0	22.3	
	8H	15.2	15.9	15.5	16.2	16.5	21.2	22.0	21.6	22.2	22.6	
4H	12H	15.1	15.8	15.5	16.1	16.4	21.4	22.1	21.8	22.4	22.7	
	2H	15.0	15.7	15.3	16.0	16.3	19.4	20.2	19.7	20.4	20.7	
	3H	16.1	16.8	16.5	17.1	17.4	20.2	20.9	20.6	21.2	21.5	
	4H	16.2	16.8	16.6	17.2	17.5	20.9	21.5	21.3	21.8	22.2	
	6H	16.1	16.7	16.6	17.0	17.4	21.6	22.1	22.0	22.5	22.8	
8H	12H	16.1	16.6	16.5	17.0	17.4	21.9	22.4	22.3	22.7	23.1	
	2H	16.1	16.5	16.5	16.9	17.3	22.1	22.6	22.6	23.0	23.4	
	4H	16.5	17.0	16.9	17.4	17.8	20.9	21.4	21.3	21.8	22.2	
	6H	16.5	16.8	16.9	17.3	17.7	21.6	22.0	22.1	22.4	22.9	
	8H	16.4	16.7	16.9	17.2	17.7	22.0	22.3	22.5	22.8	23.2	
12H	12H	16.4	16.7	16.9	17.1	17.6	22.3	22.6	22.8	23.0	23.5	
	4H	16.6	17.0	17.0	17.4	17.8	20.8	21.3	21.3	21.7	22.1	
	6H	16.5	16.8	17.0	17.3	17.7	21.6	21.9	22.1	22.4	22.8	
8H	16.4	16.7	16.9	17.2	17.7	21.9	22.2	22.4	22.7	23.2		
Variation of the observer position for the luminaire distances S												
S = 1.0H							+2.2 / -1.0					
S = 1.5H							+4.2 / -1.2					
S = 2.0H							+5.9 / -1.5					
Standard table		BK03					BK03					
Correction Summand		-1.2					3.8					
Corrected glare indices referring to 2040lm Total luminous flux												

UGR diagram (SHR: 0.25)

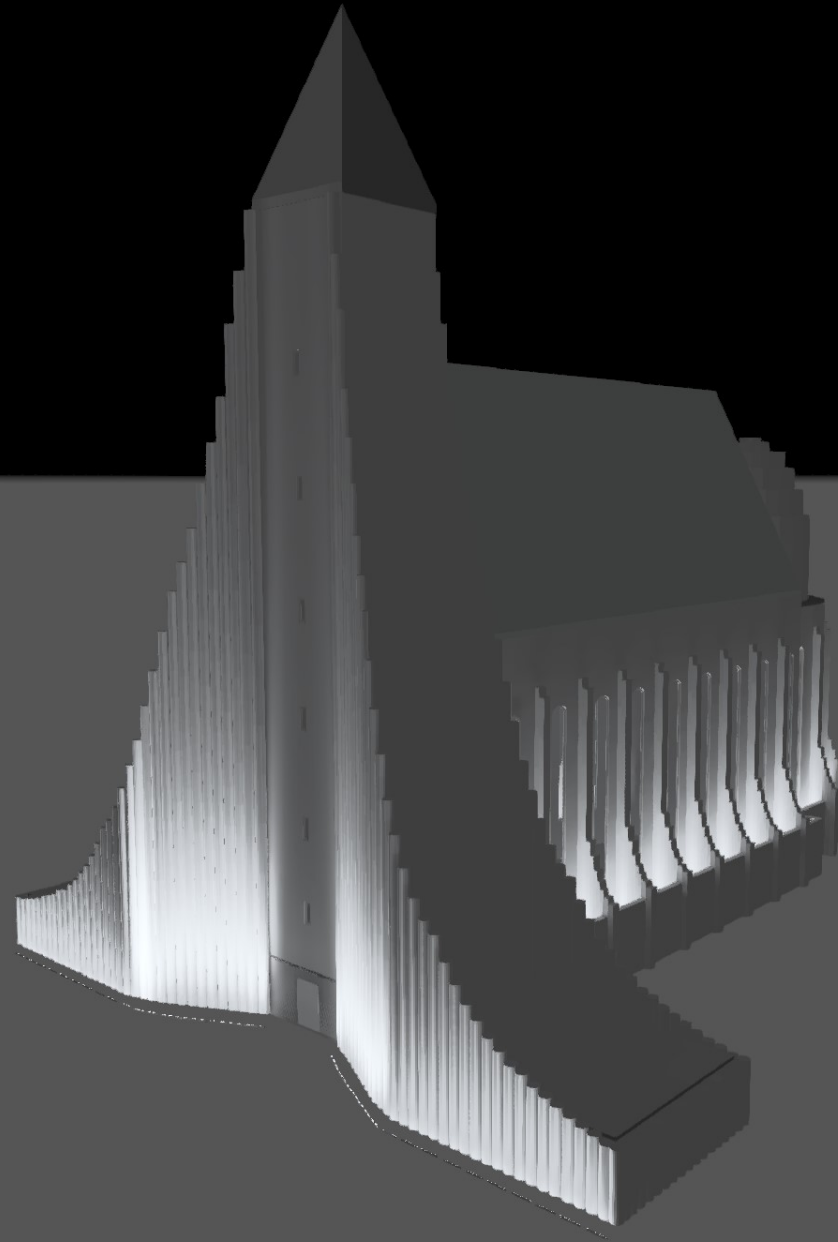
Medium Quality Renderings



Daylight



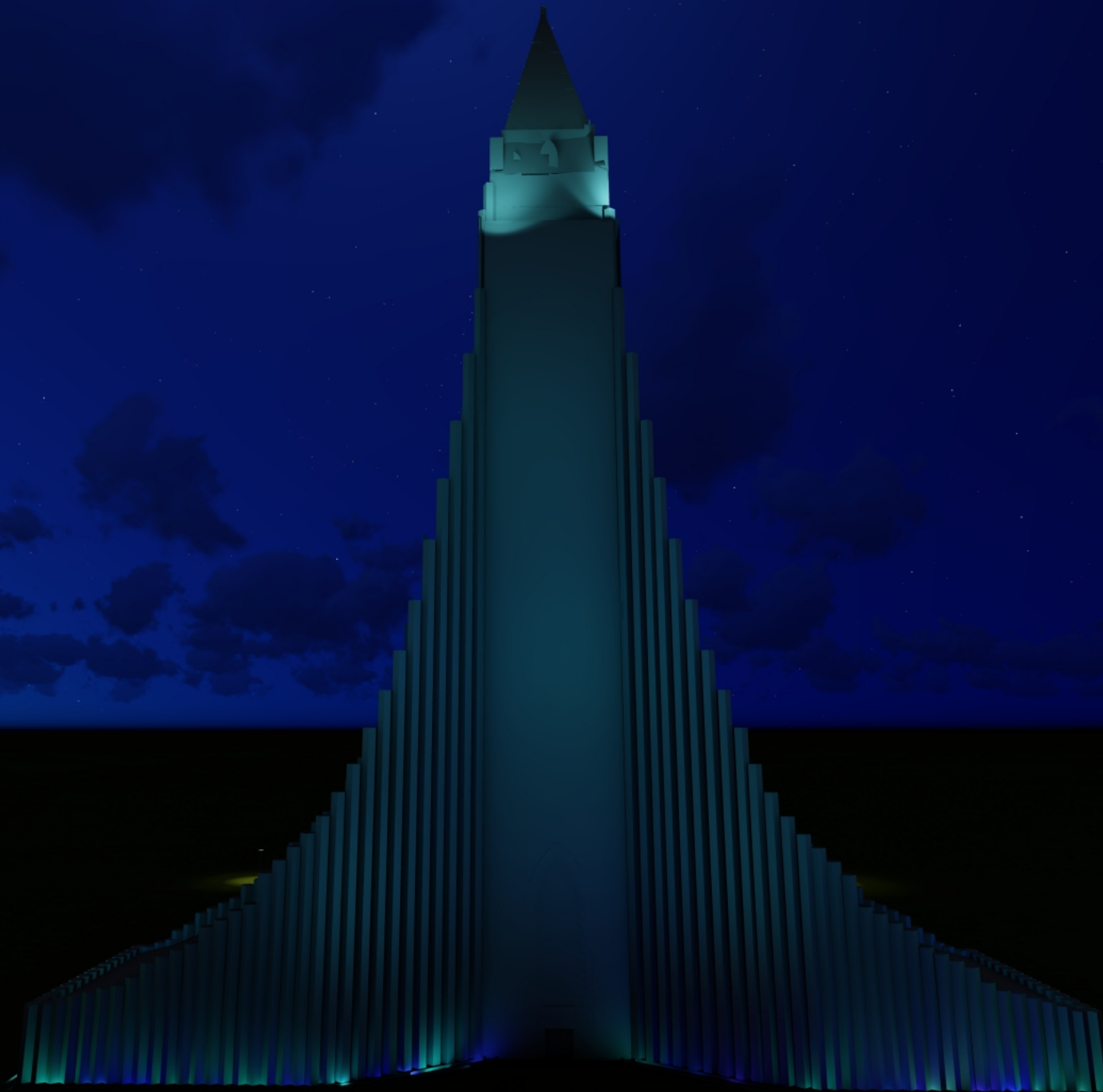
Real Fixtures



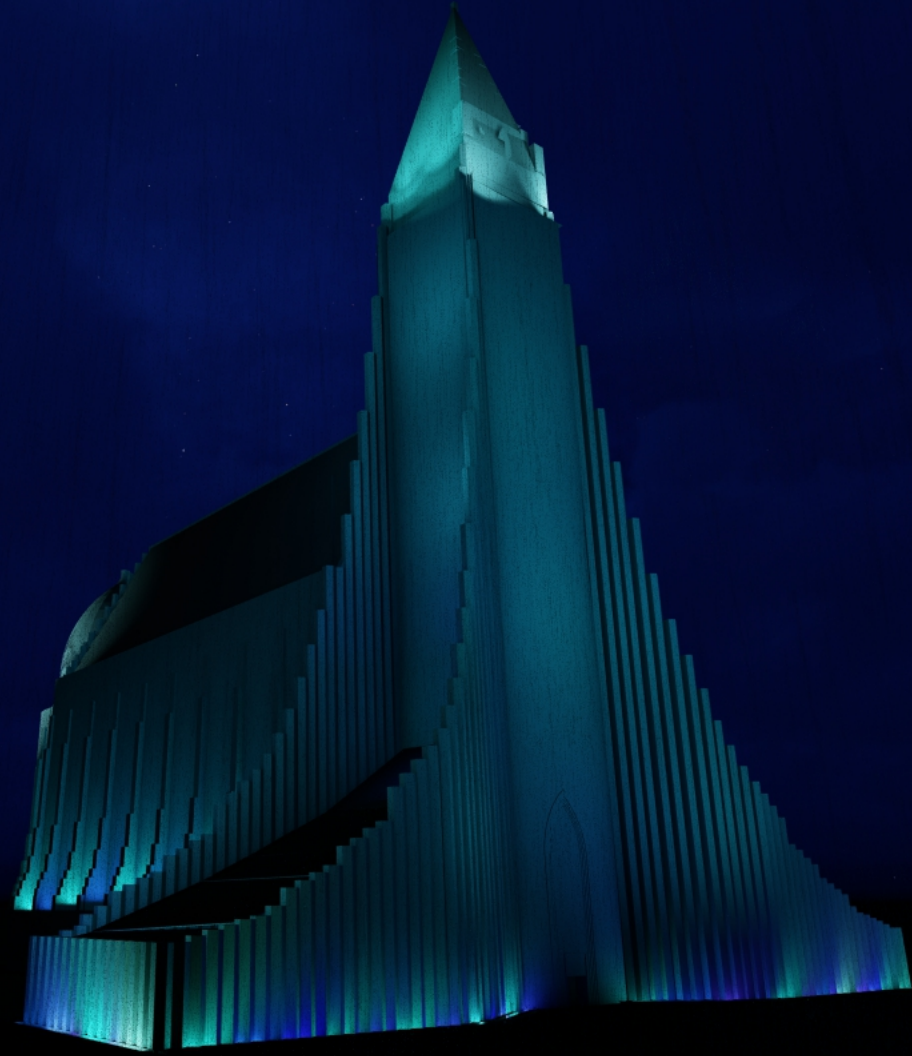
Waterfall



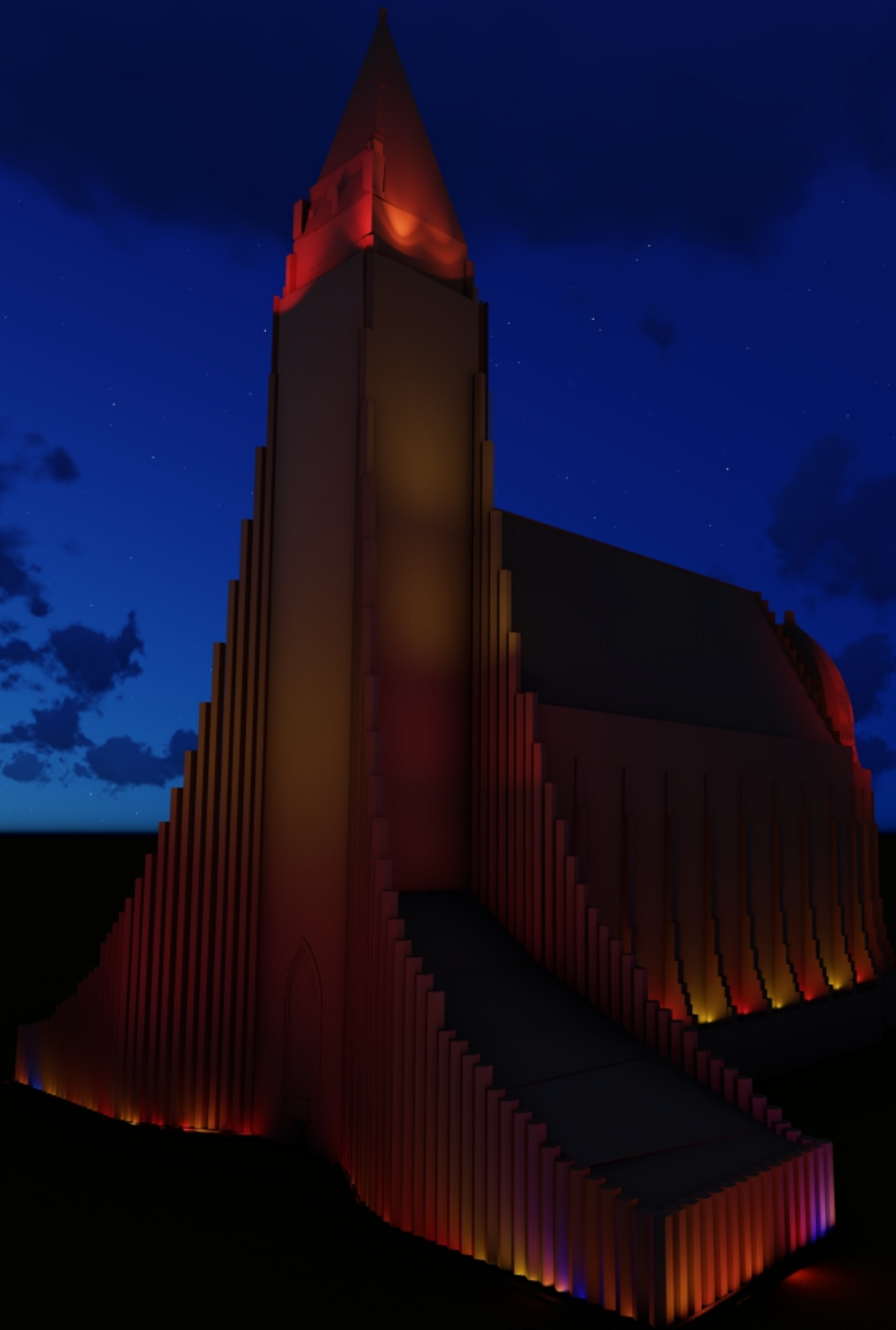
Glacier

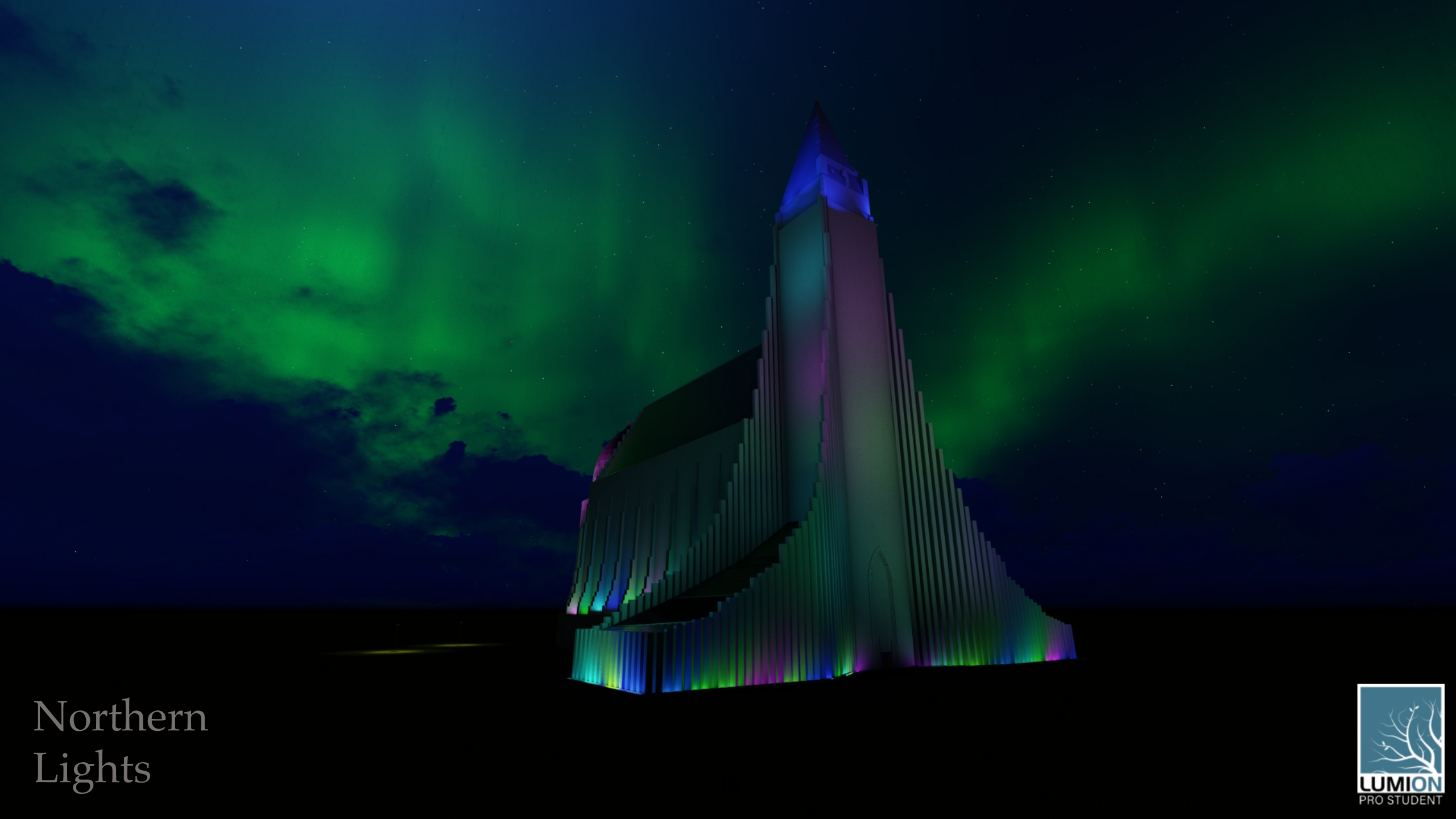


Glacier

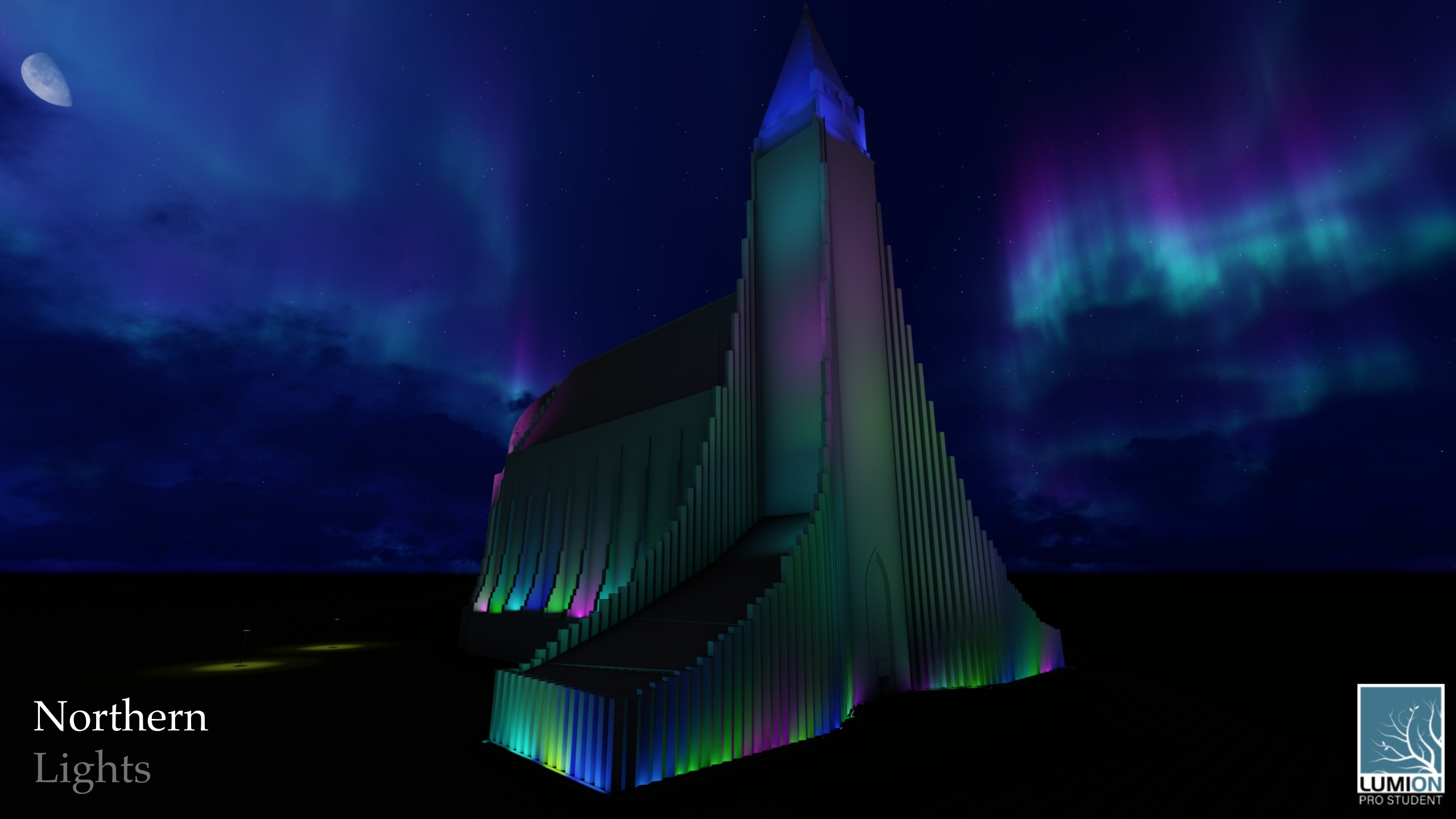


Volcano





Northern Lights



Northern Lights

Control System



Control System- Pharos

We will be using Pharos LPX as our lighting controller. We will most likely be using the “Astronomical Timeline” feature in Pharos which responds to the local sunrise and sunset based on location. Below are specifications for this controller:



Specifications

Certifications

CE compliant, ETL/cETL listed

Power

100-240VAC / 50-60HZ / 0.4-0.2A

40W typical (50W maximum)

IEC connector with switch

UK, EU and US cable supplied

Data Storage

Internal 16GB SSD (supplied)

Temperature

0°C to 50°C (32°F to 122°F)

Physical

19" Rack unit, 1U, 13.5" deep

Weight

3.1 kg (6.8 lbs)

Shipping

57 x 45 x 18 cm (22" x 18" x 7")

5.0 kg (11 lbs)

Recovery

Hardware watchdog and recessed reset button

Warranty

5 years

Interfaces

Ethernet

Neutrik etherCon (RJ45 compatible) for 10/100/1000Base-TX Ethernet; Static IP or DHCP

eDMX

Dedicated Ethernet port for eDMX; Neutrik etherCon (RJ45 compatible) for 10/100/1000Base-TX Ethernet; Static IP or DHCP

Serial

RS232 via DB9 connector

USB

Two USB 2.0 Type A ports

Audio Out

Stereo analog & digital audio ports with RCA connectors

DVI-D Input

Video input up to 1080p60 (with DVI-D IN option)

Supported Fixtures

LEDs

LEDs in any colour configuration (RGB, RGBW, 8-bit, 16-bit, tuneable white)

Automated

Moving heads, yokes or scanners

Generic

Downlights, spotlights, uplights, etc. via controllable dimmers, relays or ballasts

Fountain Jets

Fountain jets for fountain animation or other animatronics

Fixture Library

Pharos offers a cloud library with over 13,000 fixture profiles, for easy download of your luminaires

Output

sACN

ANSI E1.31 (with per fixture priority)

Art-Net

Art-Net, Art-Net 2, Art-Net 3, Art-Net 4 (configurable broadcast override)

KiNET

KiNET V1 (DMX out) and V2 (Port out); PDS/Data Enabler discovery

Pathport

Pathway Connectivity protocol

DVI-I

DVI-I output for video-mapped fixtures

DMX512

Via any eDMX node

DALI

Via [RIO-D](#) (supplied separately)

Scalable

Synchronises with up to 40 Pharos Controllers over network

Simultaneous

Multiple protocols can be in operation simultaneously. Limited by patched channels, not universes used

Triggering & Integration

Startup

Commences programmed playback automatically on receiving power

Clock

Battery-backed real-time clock for calendar and time-based triggers

Astronomical

Sunrise/Sunset/Twilight and Lunar phases

Ethernet

UDP, TCP, Multicast; send/receive any Ethernet message

RS232 Serial

Configurable port; send/receive free syntax in ASCII, HEX or decimal

eDMX

sACN or Art-Net

Inputs

Contact closure, active low, active high or 0-24V analog level via [RIOs](#)

MIDI

MIDI Notes, SysEx or Timecode via [RIO A](#)

Timecode

Linear Timecode via [RIO A](#) (SMPTE, Film, EBU, NTSC)

Audio Level

Stereo 30-band spectrum analysis via [RIO A](#)

RS485 Serial

Via [RIO](#); configurable port; send/receive free syntax in ASCII, HEX or decimal

DALI

Trigger on any message, via [RIO D](#)

Web Interface

Built-in or custom designed

Wall Stations

Integrate with [BPS](#) or [TPC](#)

Conditions

Full conditional logic support

Scripting

Lua scripting for total flexibility

Scalable

Supports [Pharos Remote Devices](#)

Project

Layout

Mapping

Patch

Scene

Timeline

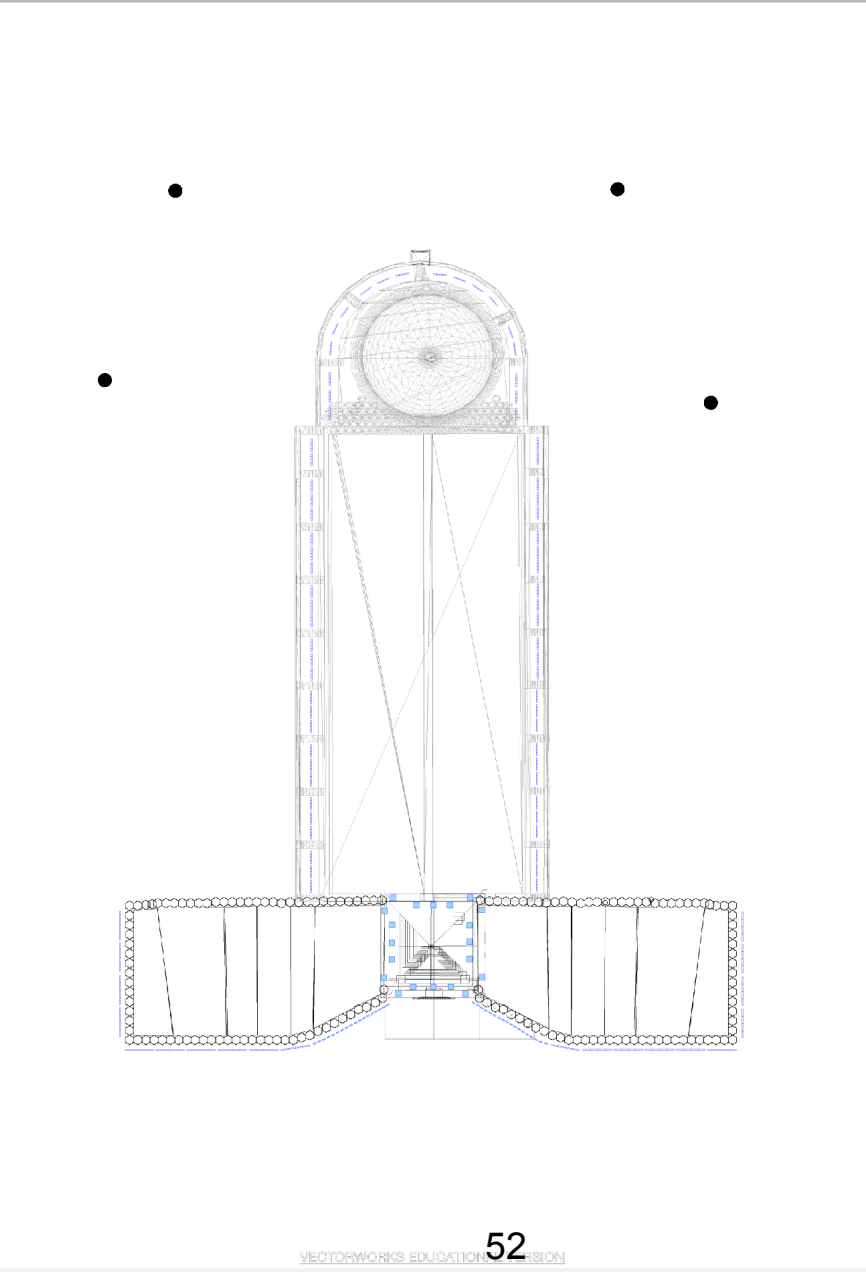
Trigger

Simulate

Network

Layout 2

- All Fixtures
- All Nano Liner Allegro A...
- All G Spot Turbo Standard
- All LED - RGB 8 bit
- 2: Front
- 3: Side Wings
- 4: Tower Outside
- 5: Tower Windows
- 6: Basilica
- 7: Apse
- 8: Movers



Scenes

- New
- Delete
- New Folder

Scene

Search in Scene

1: All at White

2: All at Blue

3: Varying

Number

Group

Fade

Skew

Direction

Repeat

Buddy

Clear Editor

- Colour
- Position
- Beam
- Control

Budgets and Logistics



PHASES OF WORK

The installation of a renovated and revamped facade lighting scheme for the Hallgrimskirkja in Reykjavik, Iceland will be an exciting albeit lengthy process. The installation will involve the installment of new fixtures that have breathtaking new color and textural capabilities and the addition of new infrastructure to manage power and control of said fixtures. This process will utilize craftspeople from many different fields, including electricians and construction workers to manage the installation. This project's many phases are divided into 6 categories (A. Site Setup, B. Fixture Installation, C. Cable Installation and Test, D. System Setup, E. System program and test, and F. Final Reveal) that will start with the setup of the site and the delivery of the products through troubleshooting and ultimately ending with the unveiling of the final product. These phases, listed below, include a description of the phase, an estimate of the amount of time needed in weeks, and the number of people required.

No.	Description	Weeks	People
A1	Setup onsite offices	2	5
A2	Setup staging facility	1	5
A3	Scaffold set up for exterior lights*	3	5
B1	Fixture and other product Delivery**	12	5
B2	Digging and reinforcing of the trough***	3	5
B3	Installation of fixtures on basilica and apse	3	4
B4	Installation of fixtures on along the roof	1	4
B5	Installation of fixtures in the trough	3	4
C1	Installation of cables to basilica and apse fixtures [⊕]	4	4
C2	Power Test and Troubleshooting	1	2
C3	Installation of cables to roof fixtures ^{⊕†}	4	4
C4	Power Test and Troubleshooting [†]	1	2
C5	Installation of cables to trough fixtures ^{⊕†}	4	4
C6	Power Test and Troubleshooting [†]	1	2
C7	Placement and Installation of fixtures on light posts	1	4
C8	Installation of cables to light post fixtures [⊕]	2	4
C9	Power Test and Troubleshooting [†]	1	2
C10	Placement and Installation of interior tower fixtures ^{⊕†}	2	4
C11	Installation of cables to interior tower fixtures [⊕]	2	4
C12	Power Test and Troubleshooting	1	2



HALLGRIMSKIRJA LIGHTING RENOVATION PROJECT

D1	Installation of Control panel for fixtures	2	2
D2	Power and control test of entire system	2	2
E1	Focus for Basilica, Apse, and Roof Lights [△]	1	3
E2	Focus for Trough Lights and Interior Tower Lights	1	3
E3	Programing time for entire setup [□]	1	2
E4	Test run of programed system and troubleshooting	1	
---	unforeseen closures due to church events and weather	4	
F	Unveiling Ceremony		



HOURS AND TIME SPENT

This project will begin on March 20th, the first day of spring and is projected to take about a year to install from truck arrival onsite to the final unveiling. The Projected reveal will be either during the Winter Lights festival or the Easter Weekend celebrations. The bulk of the time spent of this project will be done during normal business hours, 9am-5pm (September thru May) and 8am-4pm (June, July, and August). Unless absolutely necessary due to deadlines, work will not be done in the evenings, on weekends, or during the 16 public holidays to prevent overtime pay. The exception to this will be work done during phases E1 thru F, which will take place at night, as darkness is needed for focus and programming the display. This phase does work out to be during the winter months, which will hopefully limit the overtime required.

This church is an active church with many events and services that we want to be respectful of. Days are generally expected to be 8-hour workdays, with a ½ hour for lunch on Monday and Tuesday, and an hour for lunch Wednesday thru Friday to accommodate the 12pm prayer service. Extra time has been budgeted to account for church closures due to funerals, weddings, and other unexpected church events as well as any extreme weather conditions that might prohibit working outdoors.



SYMBOLS SEEN IN PHASES OF WORK EXPLANATION

* Scaffold will be setup around entirety of Basilica and apse and along backside of the front column façade to allow for trough digging.

** Phase will be started before trucks arrive onsite, with delivery intended to arrive no later than 5 weeks into personnel on site

*** Phase will happening concurrently with the installation of the basilica, apse, and roof lights

⊕ Phase includes running, installing and securing power and control cables for phase fixtures.

[†] Cable installations, tests, and troubleshooting will be running concurrently of each other, with work stopping if necessary, to protect worker safety during test and troubleshooting [△] For this phase, 2 electricians and 1 programmer will be needed

[‡] For this phase, 1 electrician and 1 programmer will be needed

Flythrough



https://drive.google.com/file/d/16_nV_FUBI--FoN-hHMpHx_dkwrAllebL/view?usp=sharing

Drafting Package



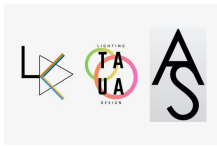


Table of Contents

1	Floor Plan
2	Basilica Plan
3	Column Plan
4	Tower Plan & Section
5	Section - Front
6	Section - Side
7	Details - Trough
8	Control Drawing
9	Isometric Views

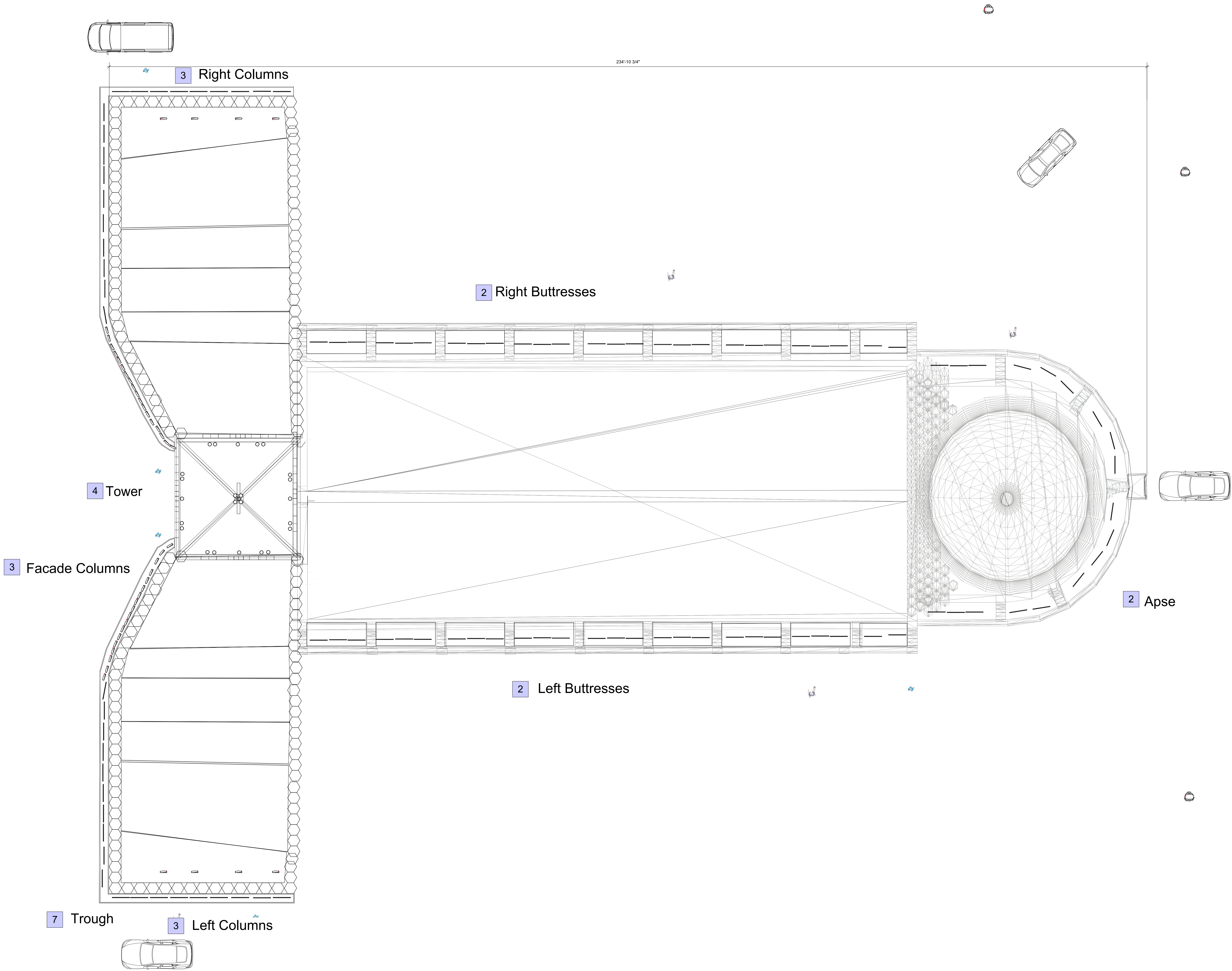


Table of Contents

- 1 Floor Plan
- 2 Basilica Plan
- 3 Column Plan
- 4 Tower Plan & Section
- 5 Section - Front
- 6 Section - Side
- 7 Details - Trough
- 8 Control Drawing
- 9 Isometric Views

Key

- ProPoint RGBW Wall Washer 40W
- Allegro Linear AC 1200
- SGM I-5
- SGM G-Spot Turbo POI

No.	Date	Issue Notes
D	12/10/20	Finalized Package
C	11/20/20	90% Finalized Package



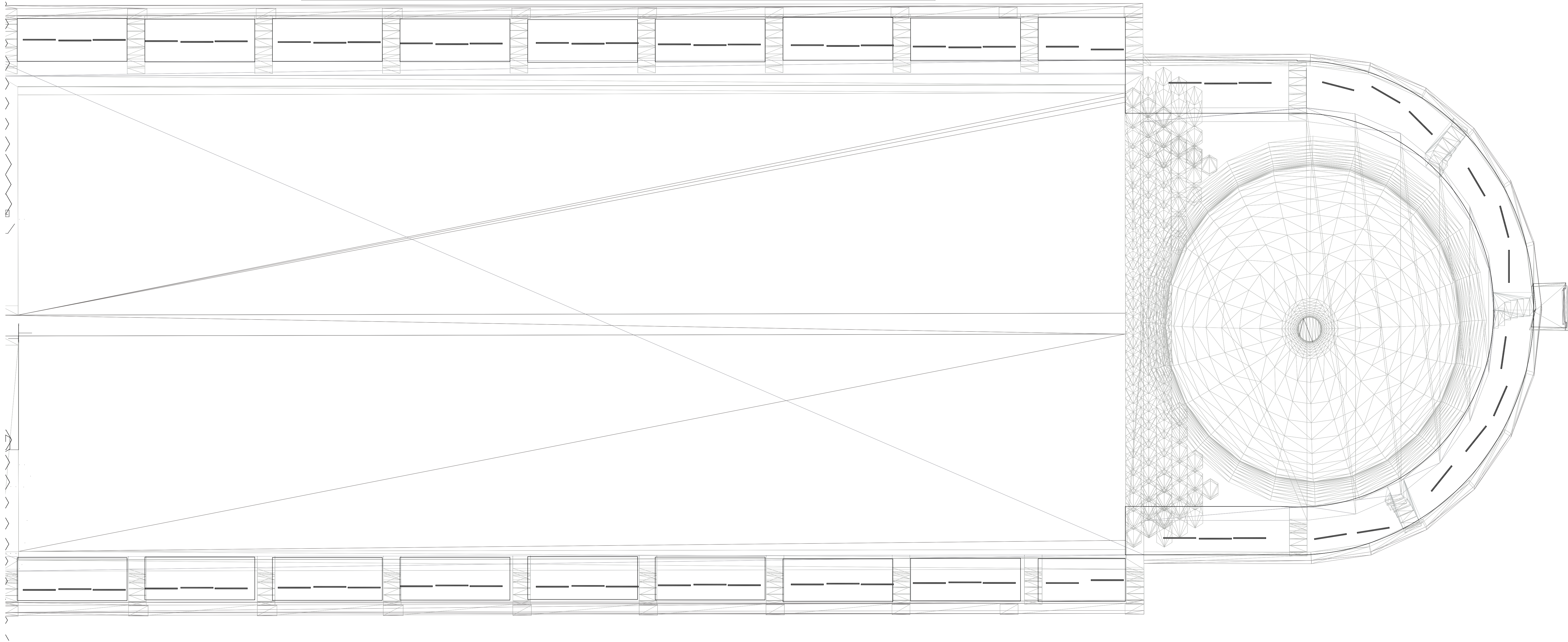
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Project Title: Hallgrímskirkja

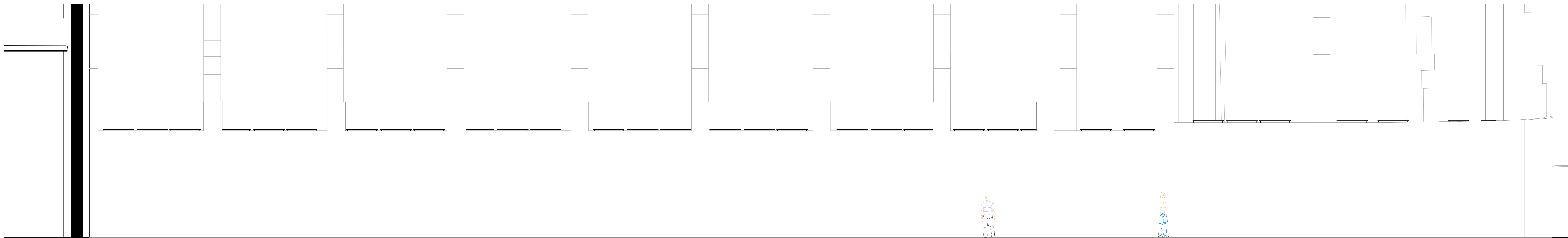
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Drawn By: Ullie Kahkonen, Thomas Uncein	Scale: 1/16" = 1'
Date: 12/15/20	1 of 9
CAD File Name: Hallgrímskirkja Final Drafting Package.vwx	

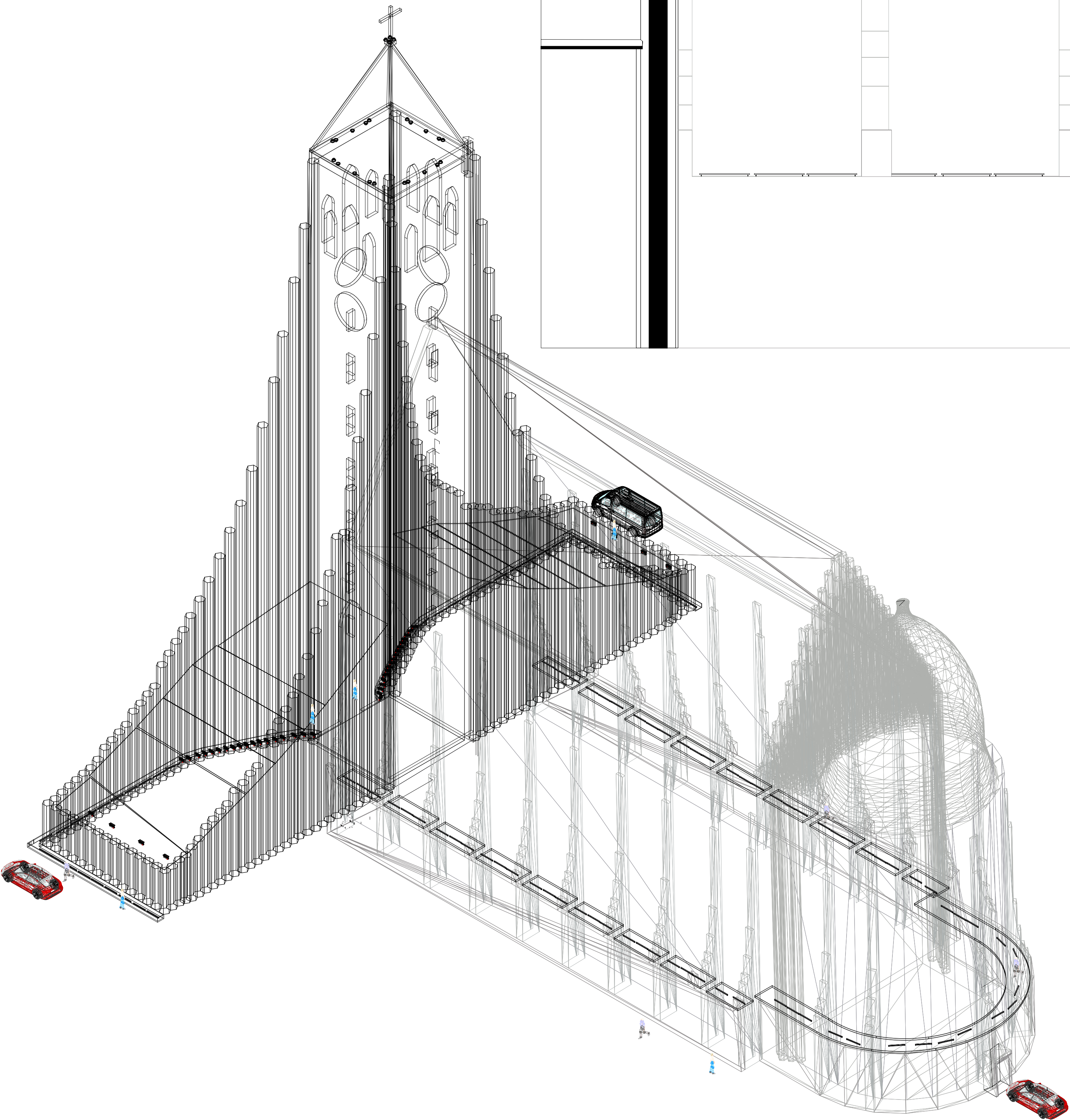
2 Basilica Plan
Scale: 3/16" = 1'-0"



1 Buttress Section
Scale: 3/16" = 1'-0"



3 Right Isometric
Scale: 1/16" = 1'-0"



Key

- ProPoint RGBW Wall Washer 40W
- Allegro Linear AC 1200
- SGM I-5
- SGM G-Spot Turbo POI

No.	Date	Issue Notes
E	11/5/20	



Design Firm
Kahkonen, Smith and Uncein

Project Title
Hallgrimskirkja

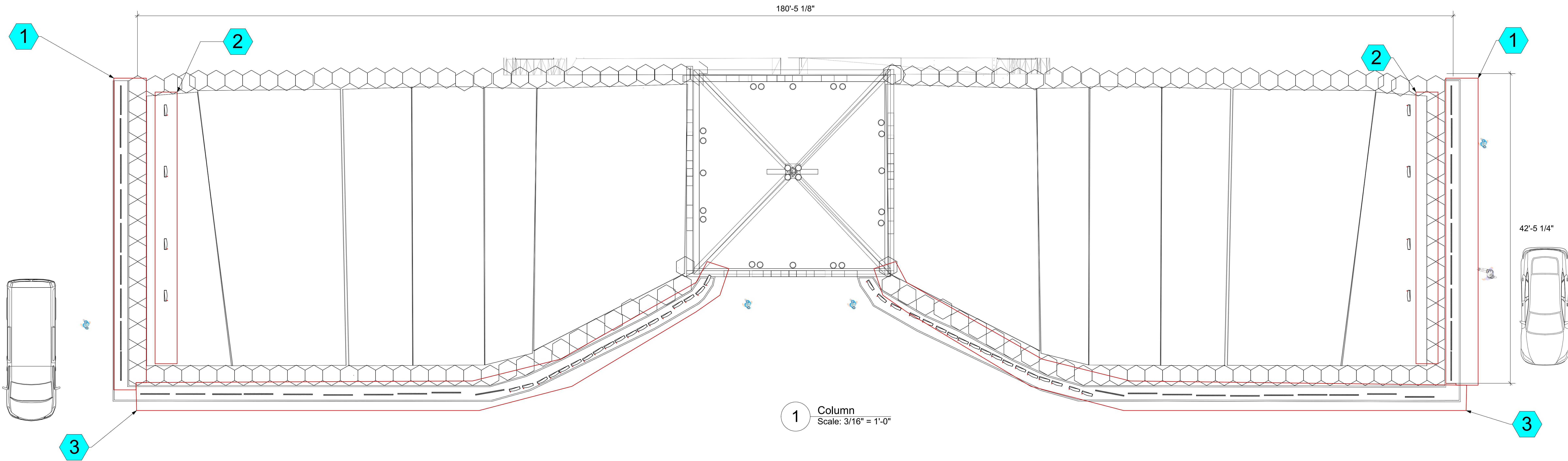
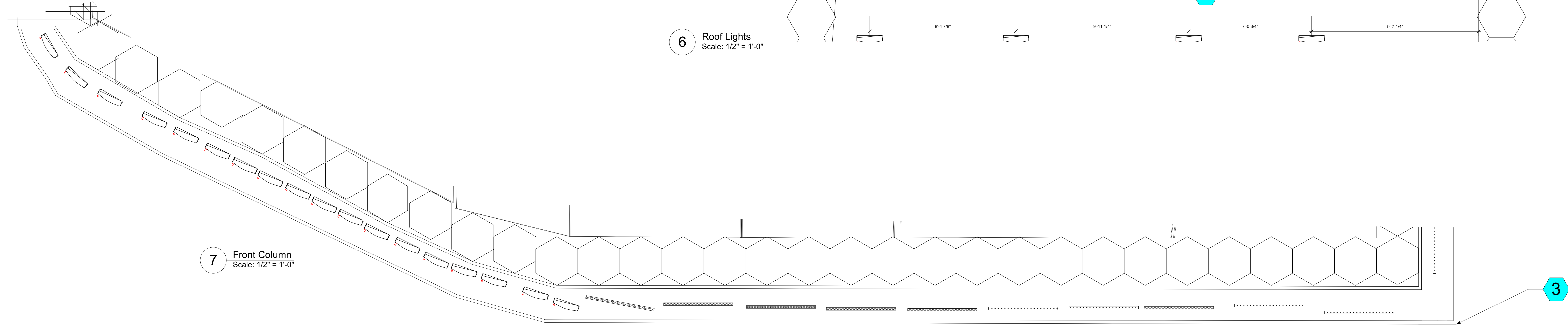
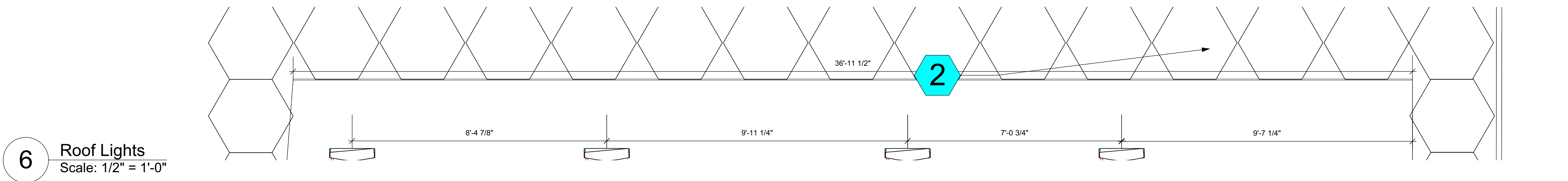
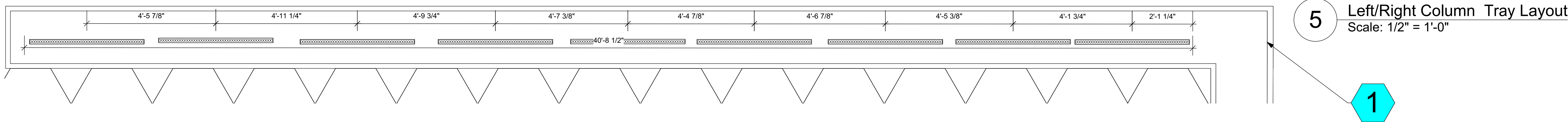
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Basilica Plan

Drawn By
Lillie Kahkonen, Thomas Uncein

Date
12/15/20

CAD File Name
Hallgrimskirkja Final Drafting Package.vwx

2
of
9



- Notes**
- 1 Side column Lights on the left (l) and Right (South East) of building are a mirror images. Spacing and measurements should be followed as such.
 - 2 Roof Lights on the left (l) and Right (South East) side columns of building are a mirror images. Spacing and measurements should be followed as such.
 - 3 Front Facade Lights on the Left (l) and Right sides of the tower are a mirror images. Spacing and measurements should be followed as such.

Key

- - ProPoint RGBW Wall Washer 40W
- - Allegro Linear AC 1200
- - SGM I-5
- - SGM G-Spot Turbo POI

No.	Date	Issue Notes



Design Firm: Kahkonen, Smith and Uncein

Project Title: Hallgrímskirkja

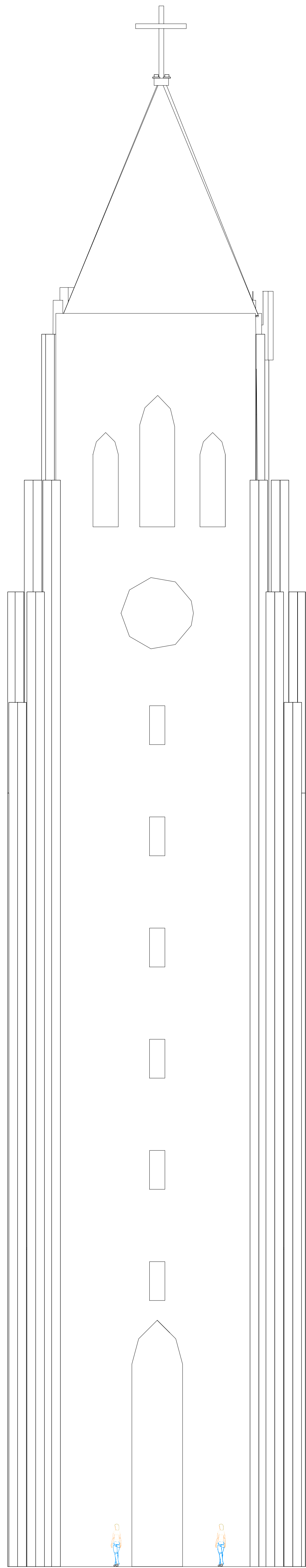
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Drawn By: Lillie Kahkonen, Thomas Uncein

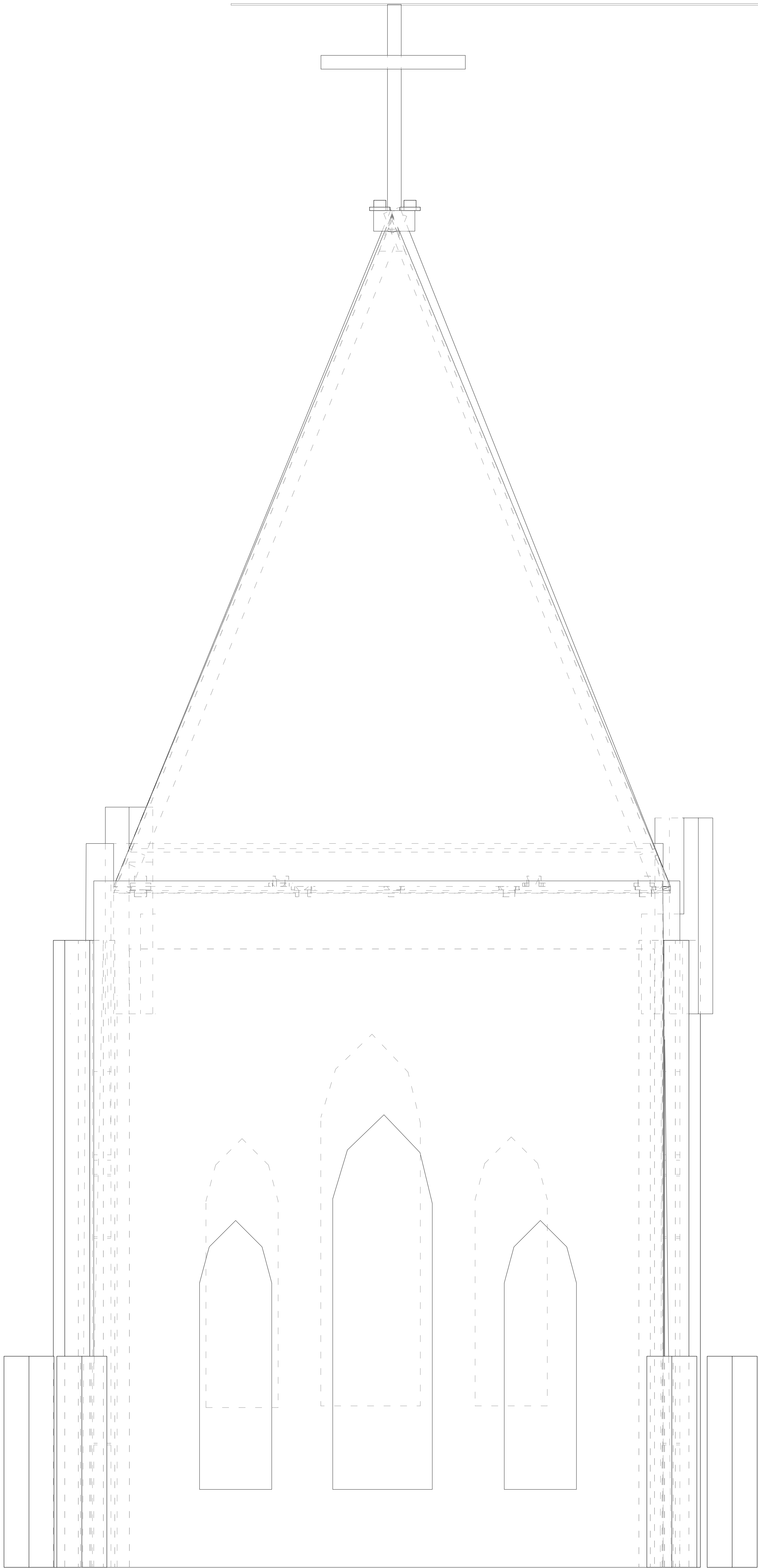
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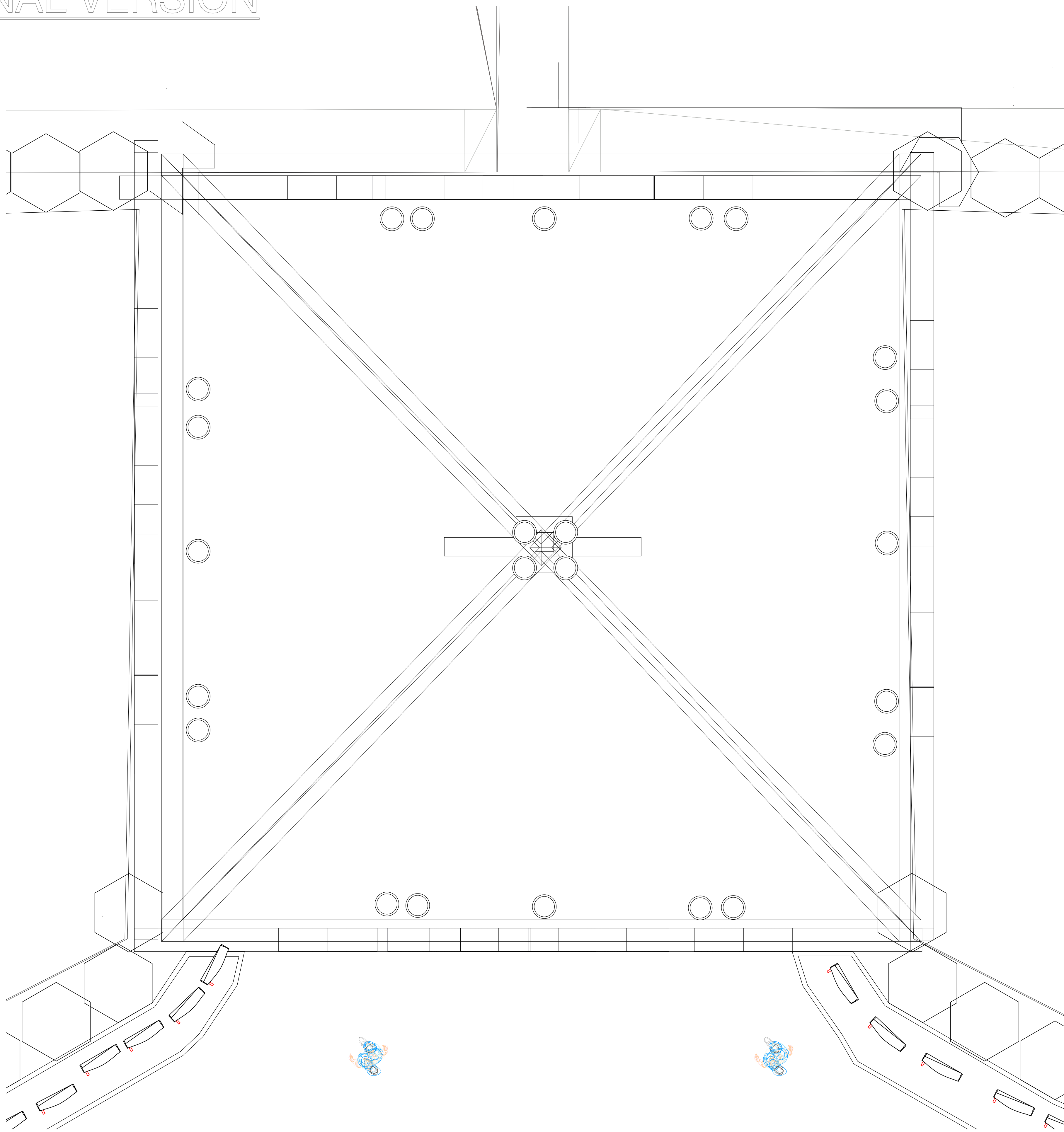
3 of 9



2 Tower Section
Scale: 1/8" = 1'-0"



3 Tower Section - Closeup
Scale: 3/8" = 1'-0"



1 Tower Plan
Scale: 1/2" = 1'-0"

Key

- ProPoint RGBW Wall Washer 40W
- Allegro Linear AC 1200
- SGM I-5
- SGM G-Spot Turbo POI

No.	Date	Issue Notes



Design Firm
Kahkonen, Smith and Uncein

Project Title
Hallgrímskirkja

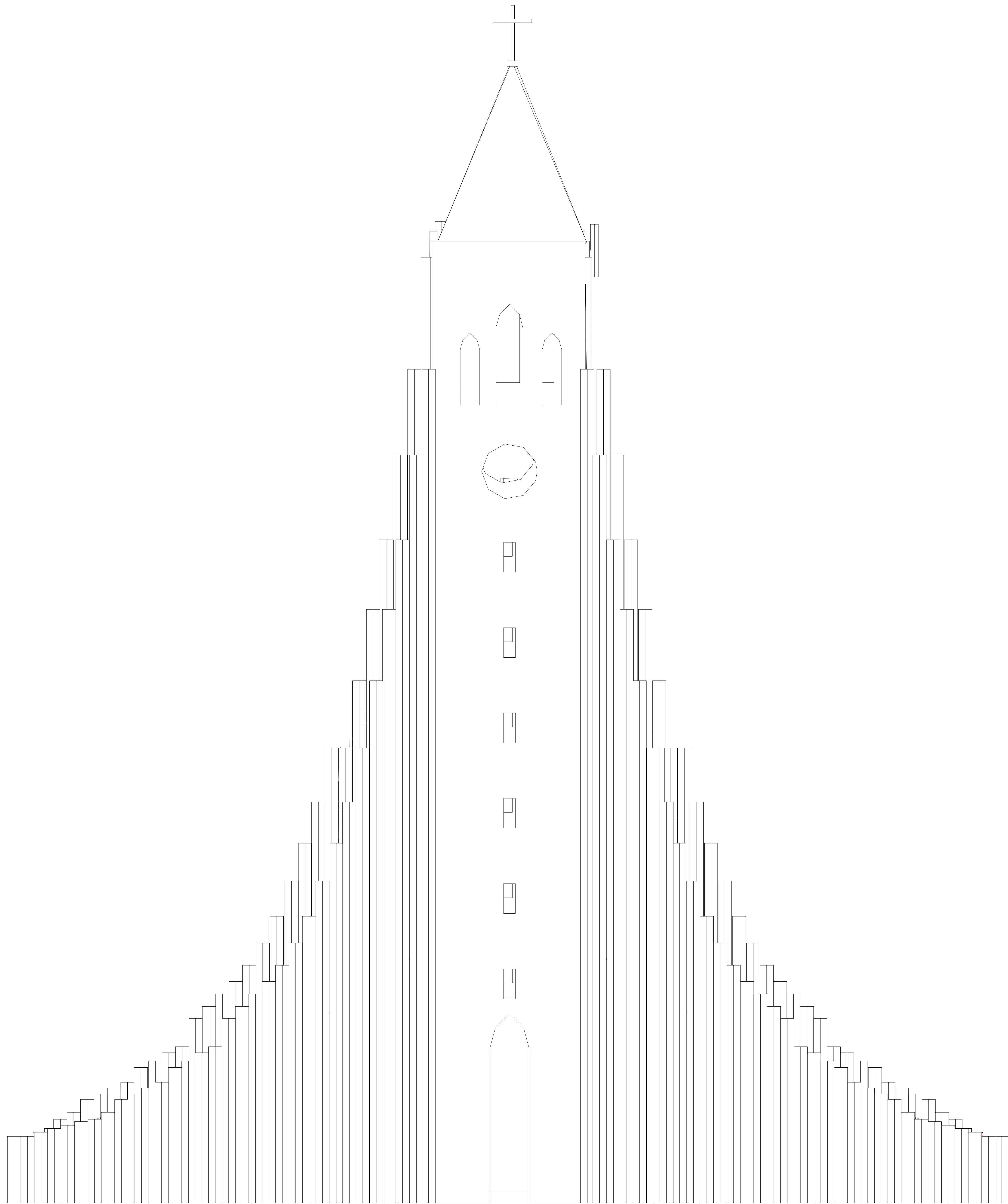
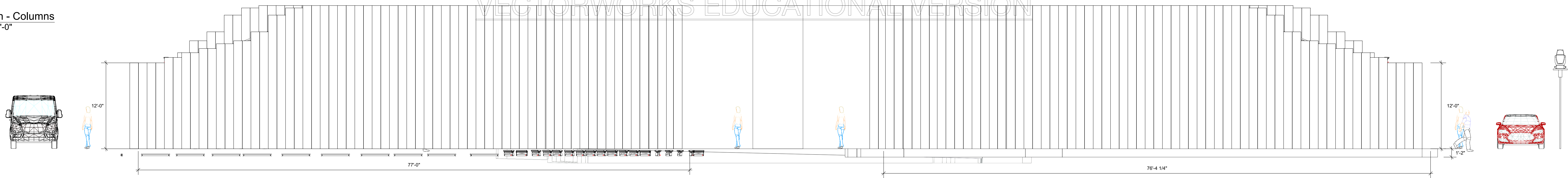
Sheet Title
Tower Plan & Section

Drawn By
Lillie Kahkonen, Thomas Uncein

Date
12/18/20

CAD File Name
Hallgrímskirkja Final Drafting Package.vwx

4
of
9



1 Front Section
Scale: 1/8" = 1'-0"

Key

- ProPoint RGBW Wall Washer 40W
- Allegro Linear AC 1200
- SGM I-5
- SGM G-Spot Turbo POI

No.	Date	Issue Notes

Design Firm: Kahkonen, Smith and Uncein

Project Title: Hallgrimskirkja

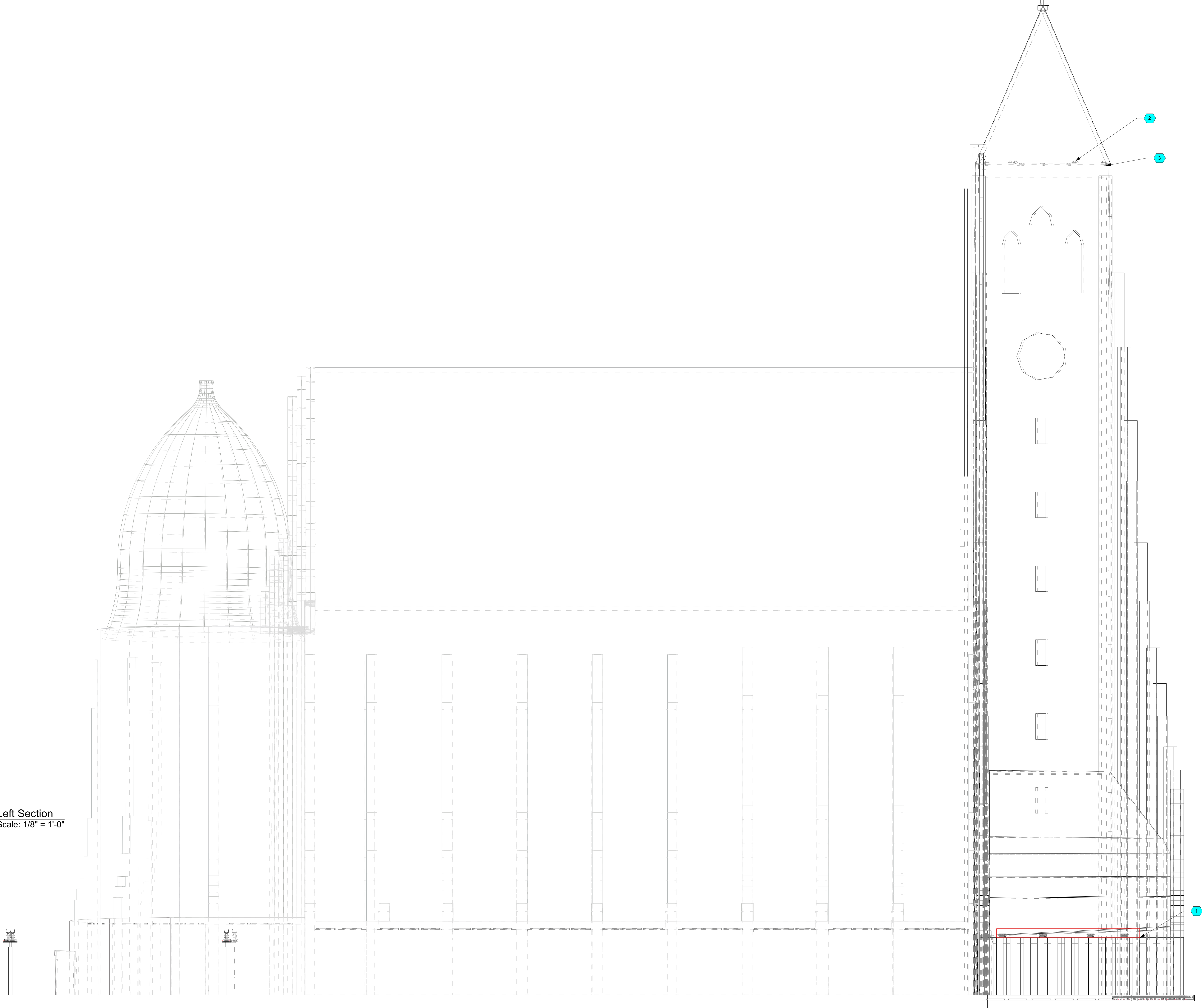
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Drawn By	Date	Scale	Notes
Ullie Kahkonen, Thomas Uncein	12/15/20	5	Assorted

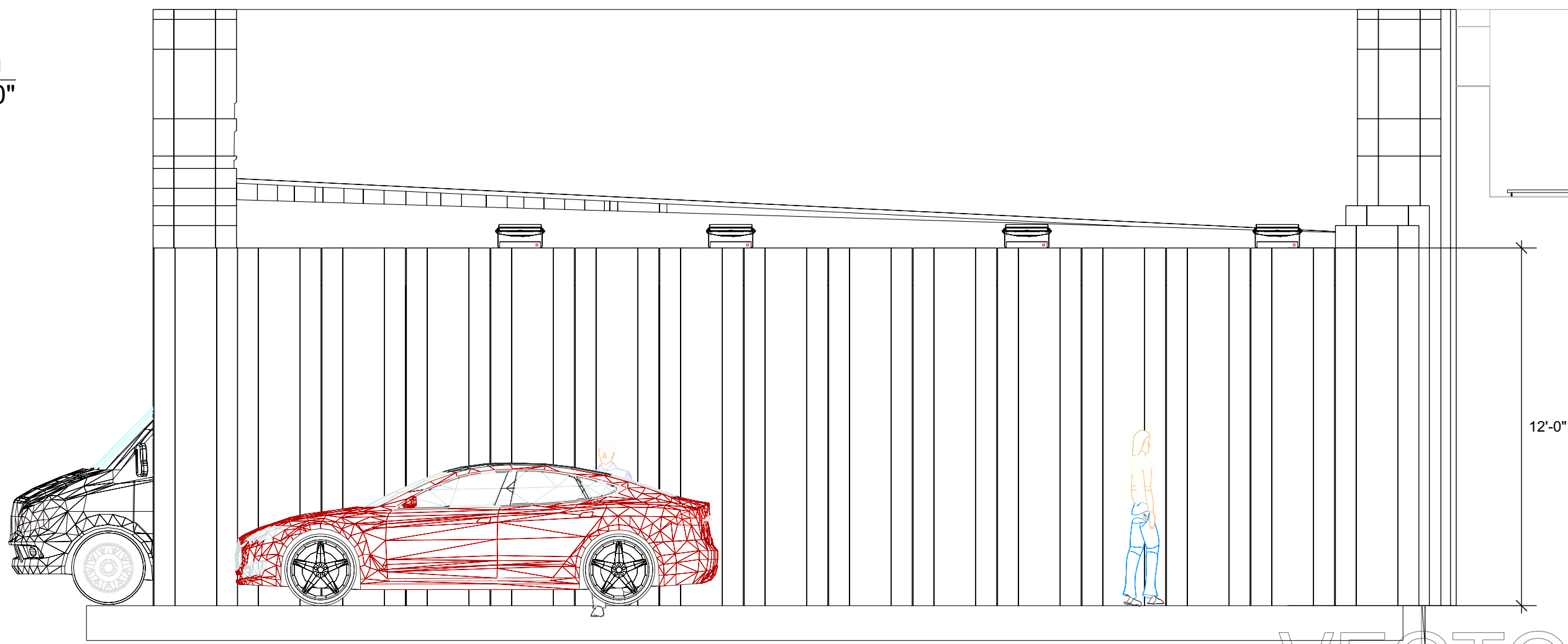
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5 of 9

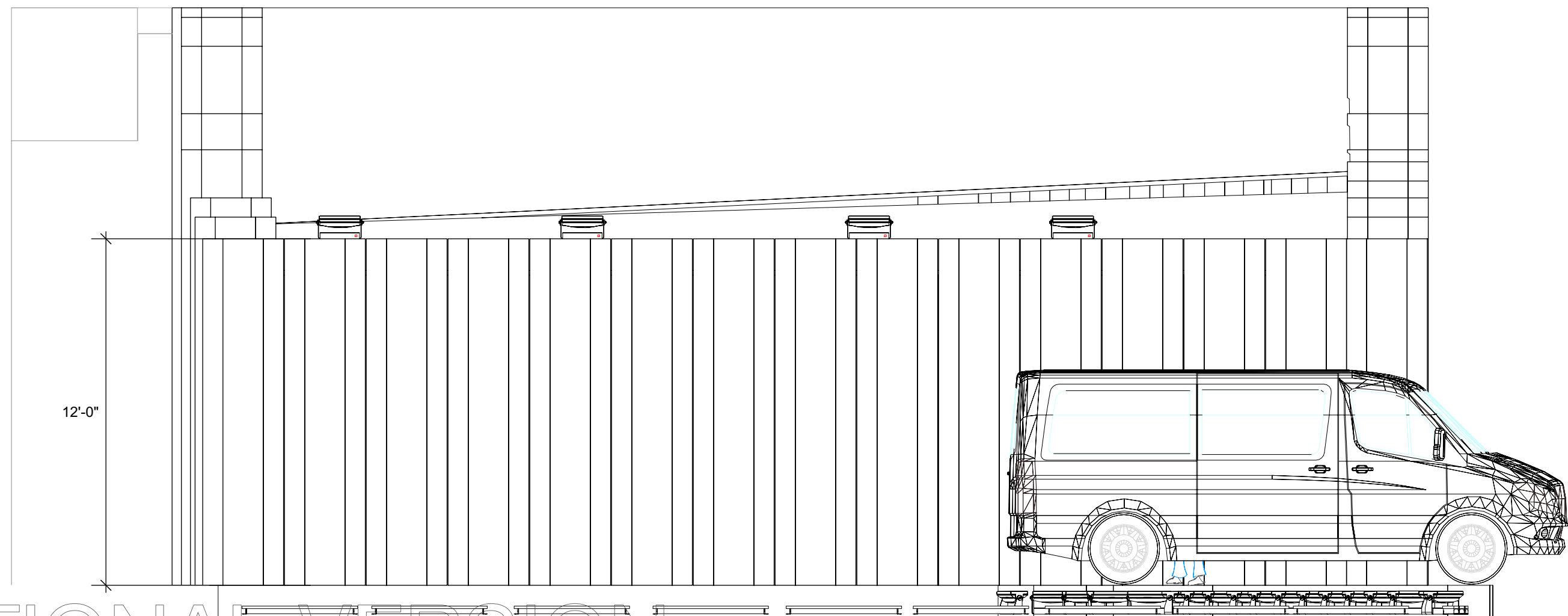
1 Left Section
Scale: 1/8" = 1'-0"



4 Right Section
Scale: 1/4" = 1'-0"



3 Left Section
Scale: 1/4" = 1'-0"



Notes

- 1-5 Lighting the Tower Facade
- Propoints lighting holes in roof
- Propoints Lighting Large Windows

Key

- ProPoint RGBW Wall Washer 40W
- Allegro Linear AC 1200
- SGM I-5
- SGM G-Spot Turbo POI

No.	Date	Issue Notes



Design Firm: Kahkonen, Smith and Uncein

Project Title: Hallgrímskirkja

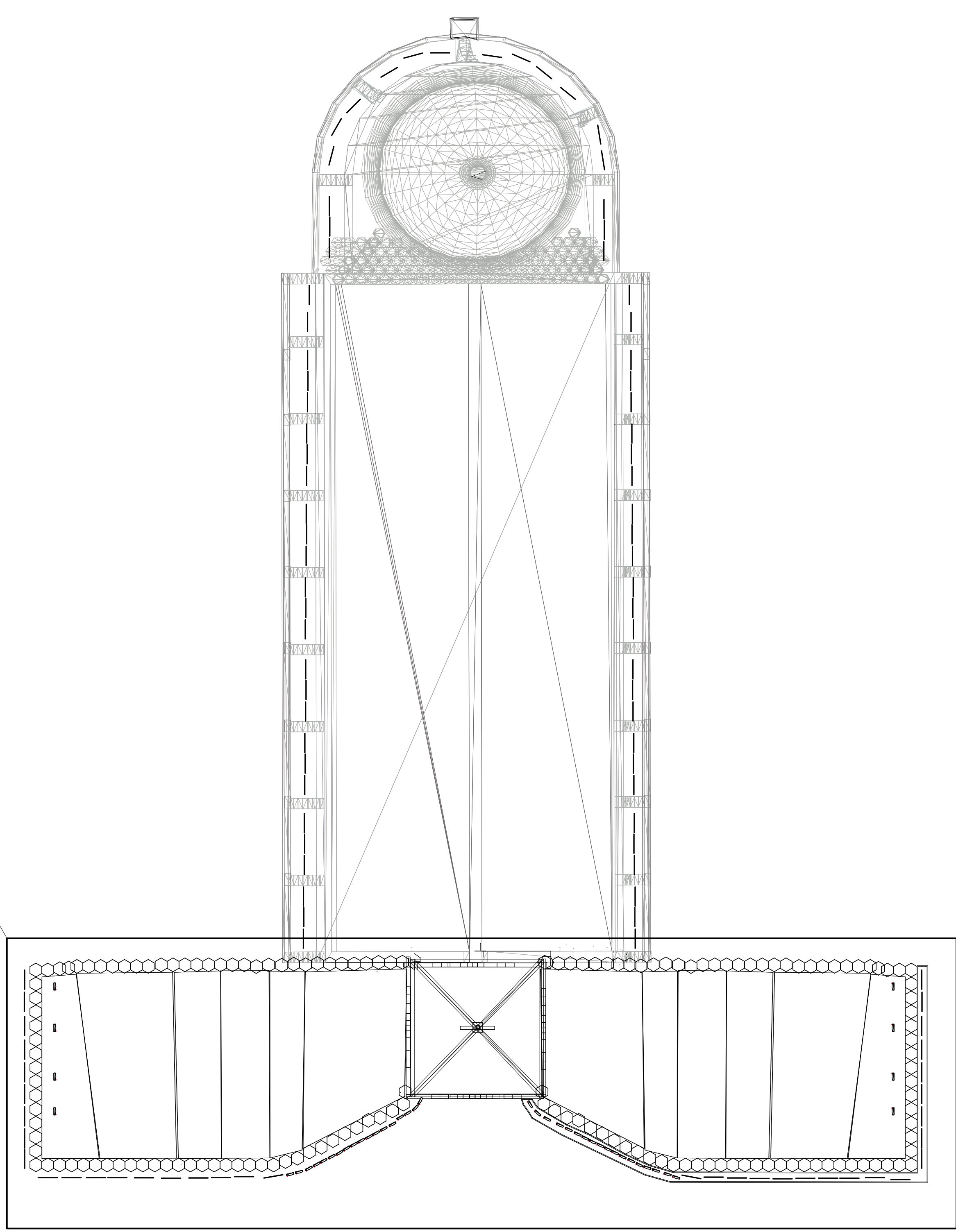
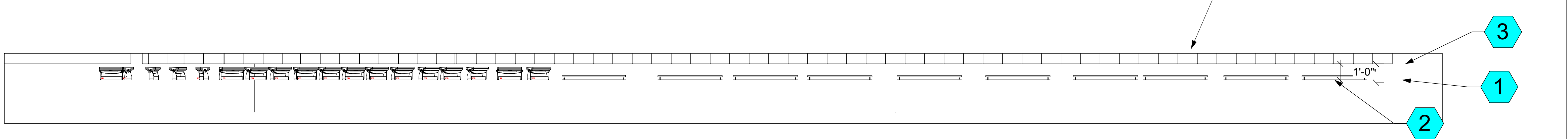
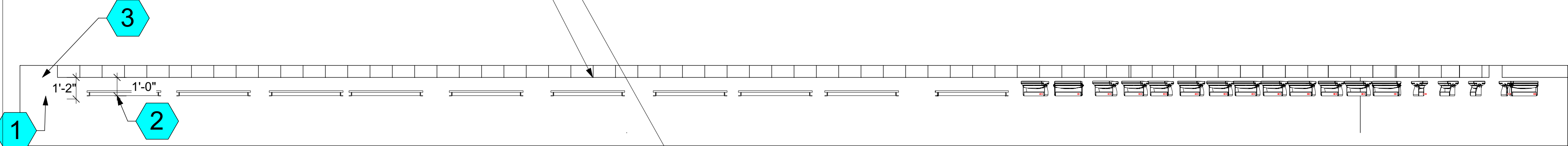
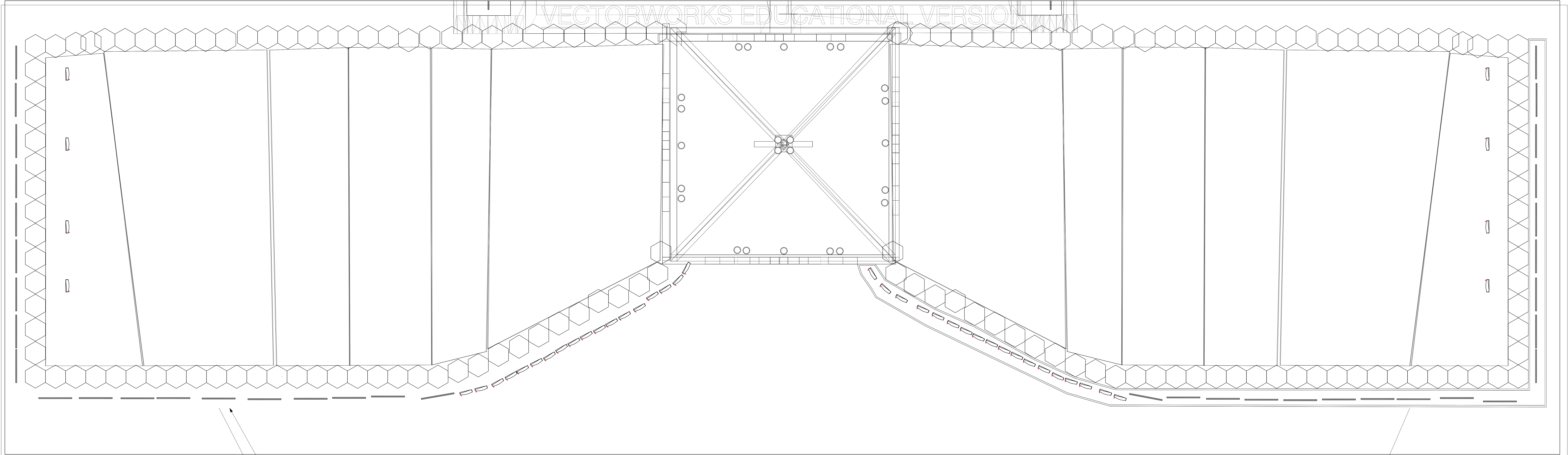
Sheet Title: Side Section

Drawn By: Ullie Kahkonen, Thomas Uncein

Date: 12/15/20

CAD File Name: Hallgrímskirkja Final Drafting Package.vwx

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Notes
1. Depth of Trough including base
2. Depth of Trough interior
3. Trough measurement from the base of the church

Key

- ProPoint RGBW Wall Washer 40W
- Allegro Linear AC 1200
- SGM I-5
- SGM G-Spot Turbo POI

No.	Date	Issue Notes

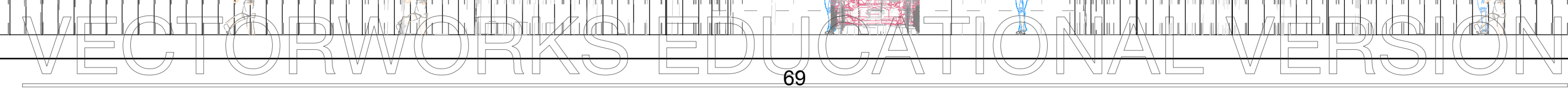


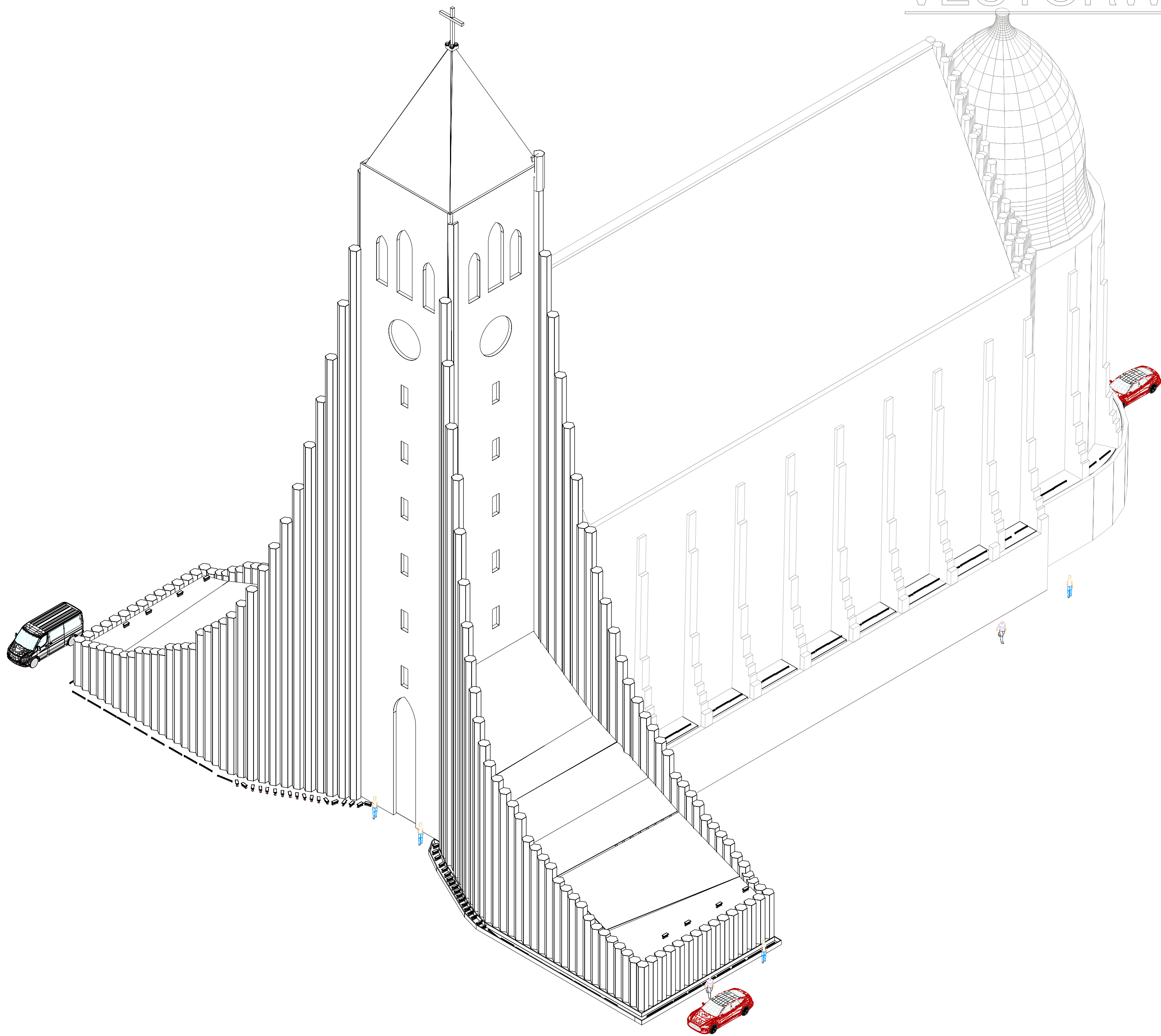
Design Firm
Kahkonen, Smith and Uncein

Project Title
Hallgrímskirkja

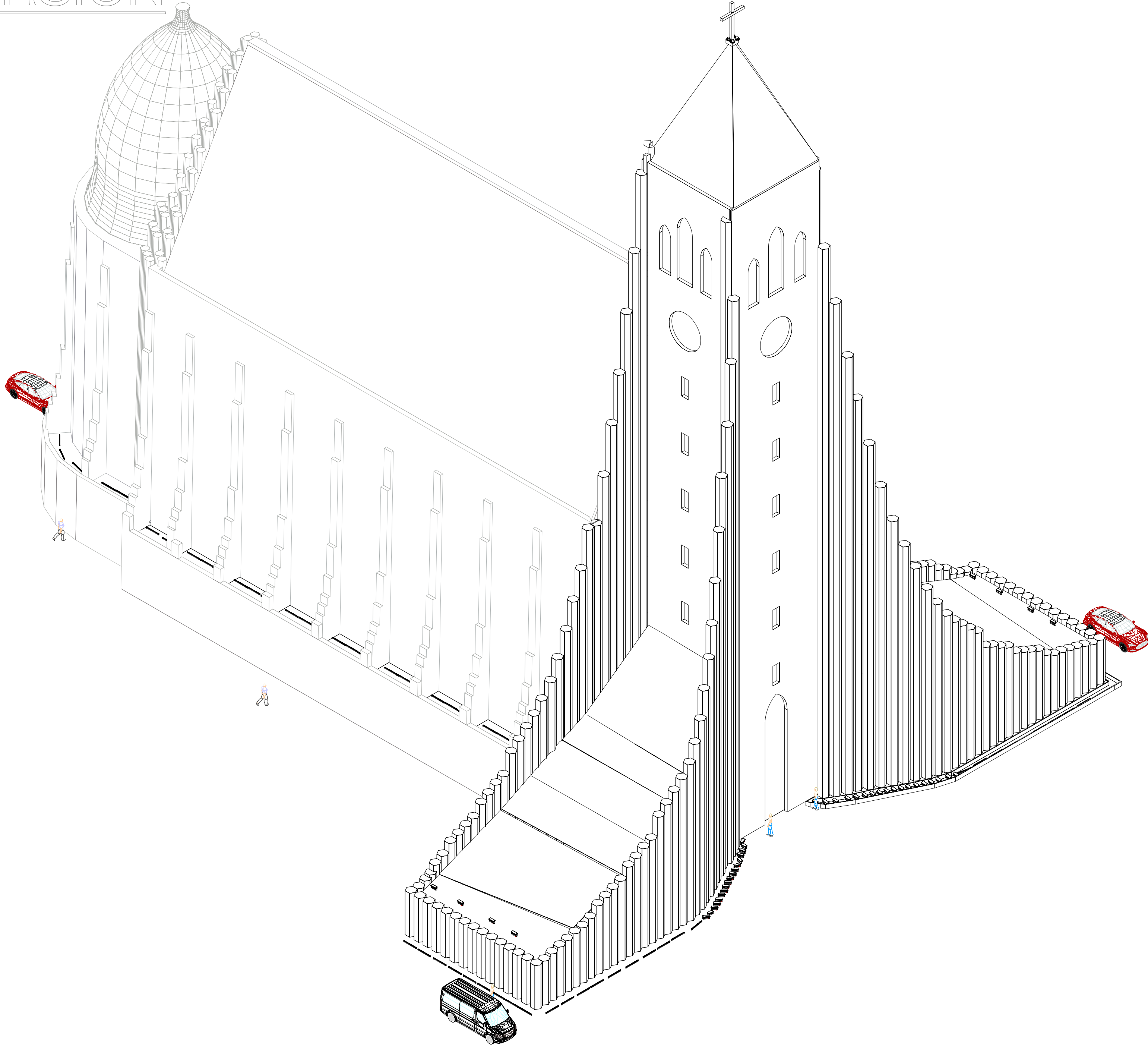
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Detail Section of Trough

Drawn By Lillie Kahkonen, Thomas Uncein	Size Assorted
Date 12/15/20	7 of 9
CAD File Name Hallgrímskirkja Final Drafting Package.vwx	

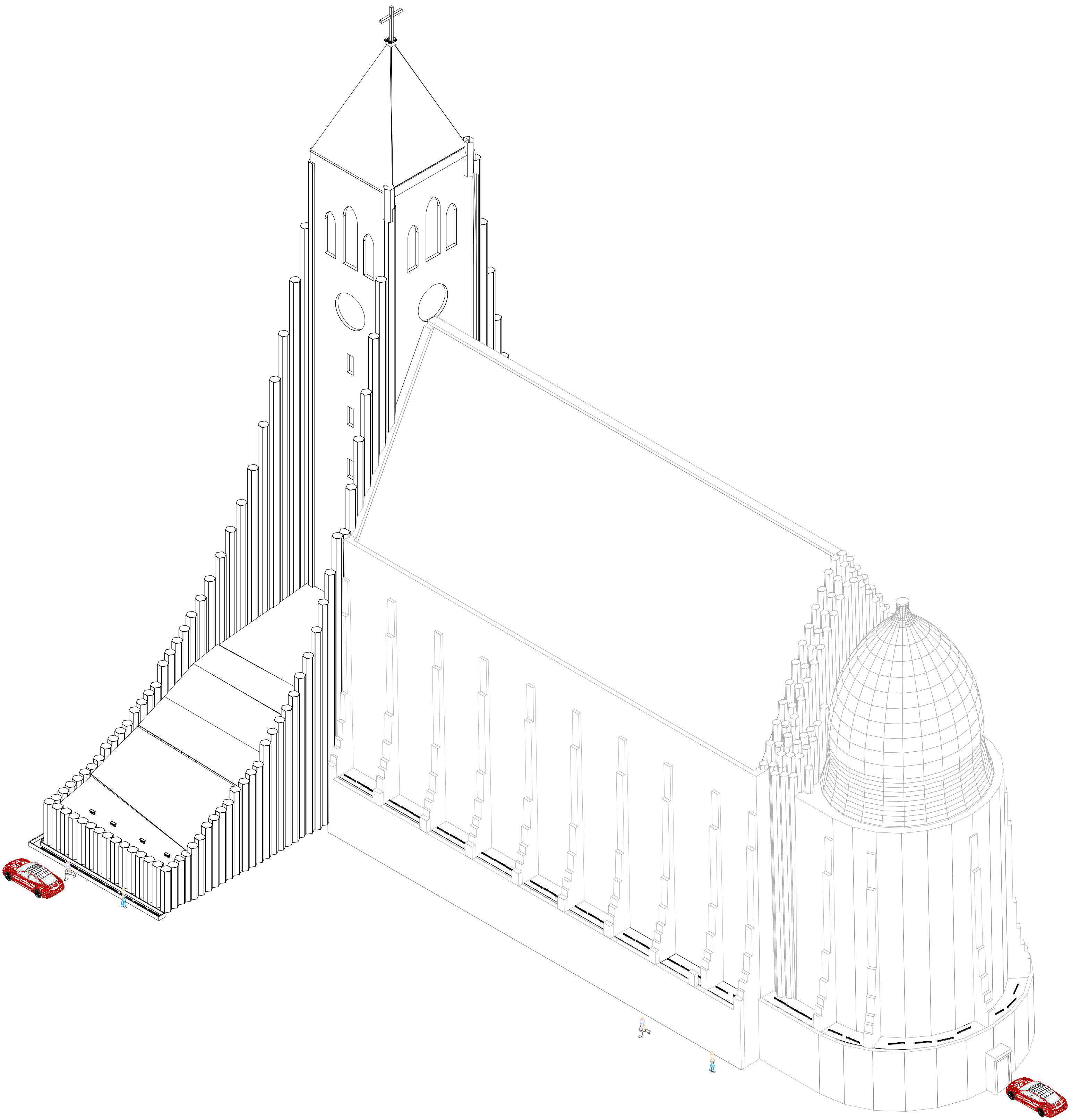




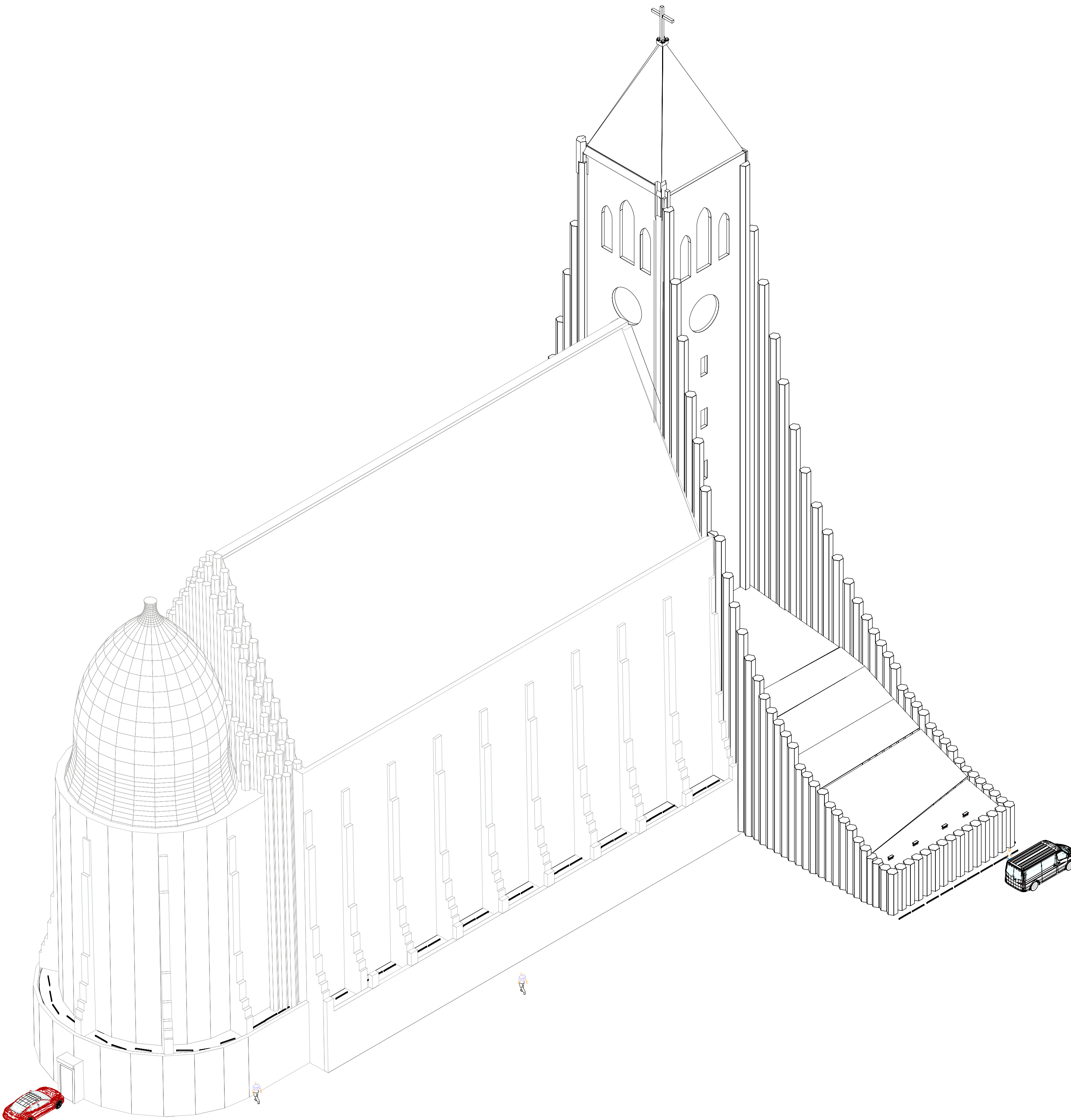
1 Right Isometric
Scale: 1/16" = 1'-0"



2 Left Isometric
Scale: 1/16" = 1'-0"



3 Right Rear Isometric
Scale: 1/16" = 1'-0"



4 Left Rear Isometric
Scale: 1/16" = 1'-0"

Key

- ProPoint RGBW Wall Washer 40W
- Allegro Linear AC 1200
- SGM I-5
- SGM G-Spot Turbo POI

No.	Date	Issue Notes



Design Firm
Kahkonen, Smith and Uncein

Project Title
Hallgrímskirkja

Sheet Title
Isometric Views

Drawn By
Lilja Kahkonen, Thomas Uncein

Date
12/15/20

CAD File Name
Hallgrímskirkja Final Drafting Package.vwx

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