

KYUSHU GEIBUN-KAN

KENGO KUMA & ASSOCIATES, 2013

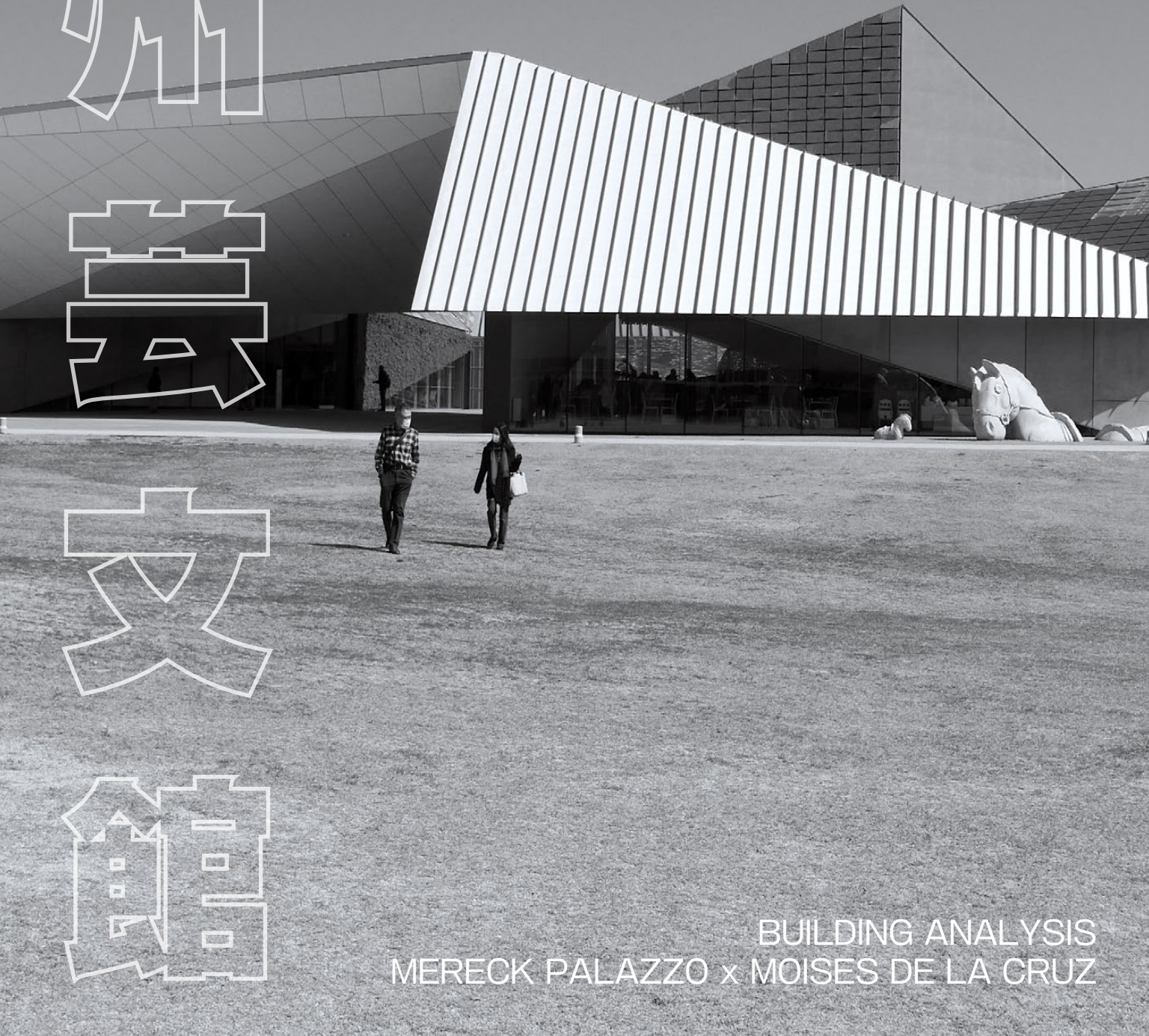
九

州

芸

文

館



BUILDING ANALYSIS
MERECK PALAZZO x MOISES DE LA CRUZ

KYUSHU GEIBUN-KAN

Chikugo, Fukuoka Prefecture, Japan

Kengo Kuma & Associates

Building analysis by Mereck Palazzo & Moises De La Cruz

ARCH 341, Fall 2019

Lab instructor: Margaret Kirk

TABLE OF CONTENTS

- 1 Project Summary
- 2 Place
- 3 Form and Assemblies
- 4 Perception and Performance
- 5 References

1 PROJECT SUMMARY

Metrics

Location: Chikugo, Fukuoka Prefecture, Japan
Year of completed construction: 2013
Total area: 44,745 sq ft

Team

Client: Chikugo municipality
Architect: Kengo Kuma

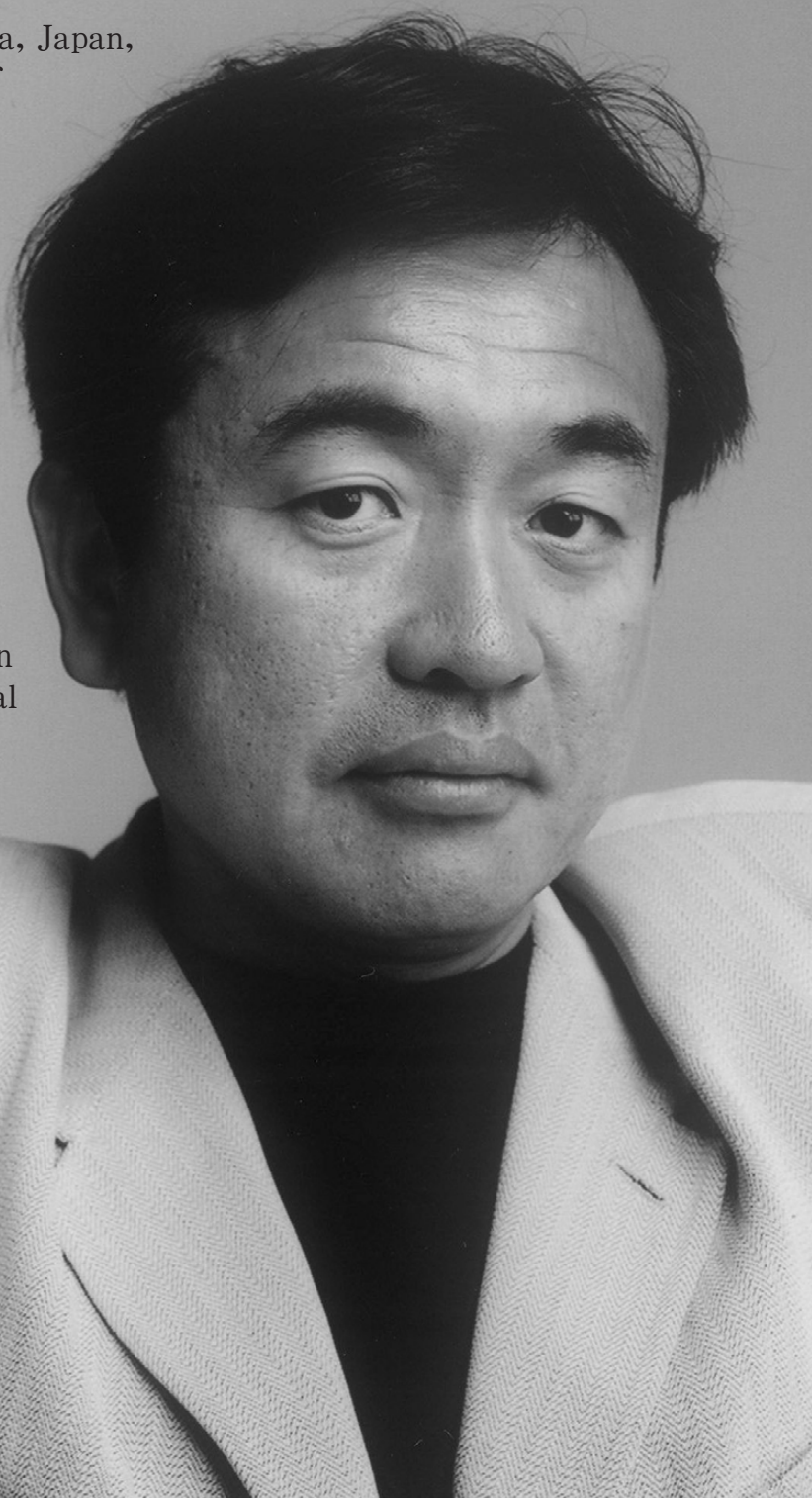


Exterior photos: Erieta Attali [1.1, 1.2]

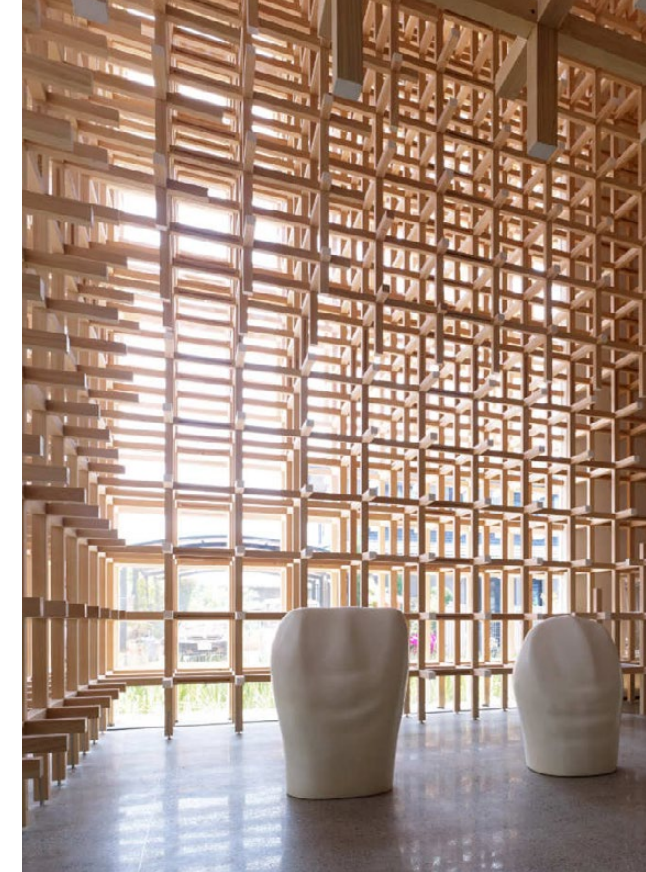
ARCHITECT PROFILE

Kengo Kuma was born 1954 in Yokohoma, Japan, a significant port city to the southeast of the Tokyo metropolitan area. He studied architecture at the University of Tokyo, and thereafter served as a visiting researcher for Columbia University from 1985 to 1986. In 1987, he founded his “Spatial Design Studio”, which eventually evolved into his current practice in 1990 - Kengo Kuma & Associates.

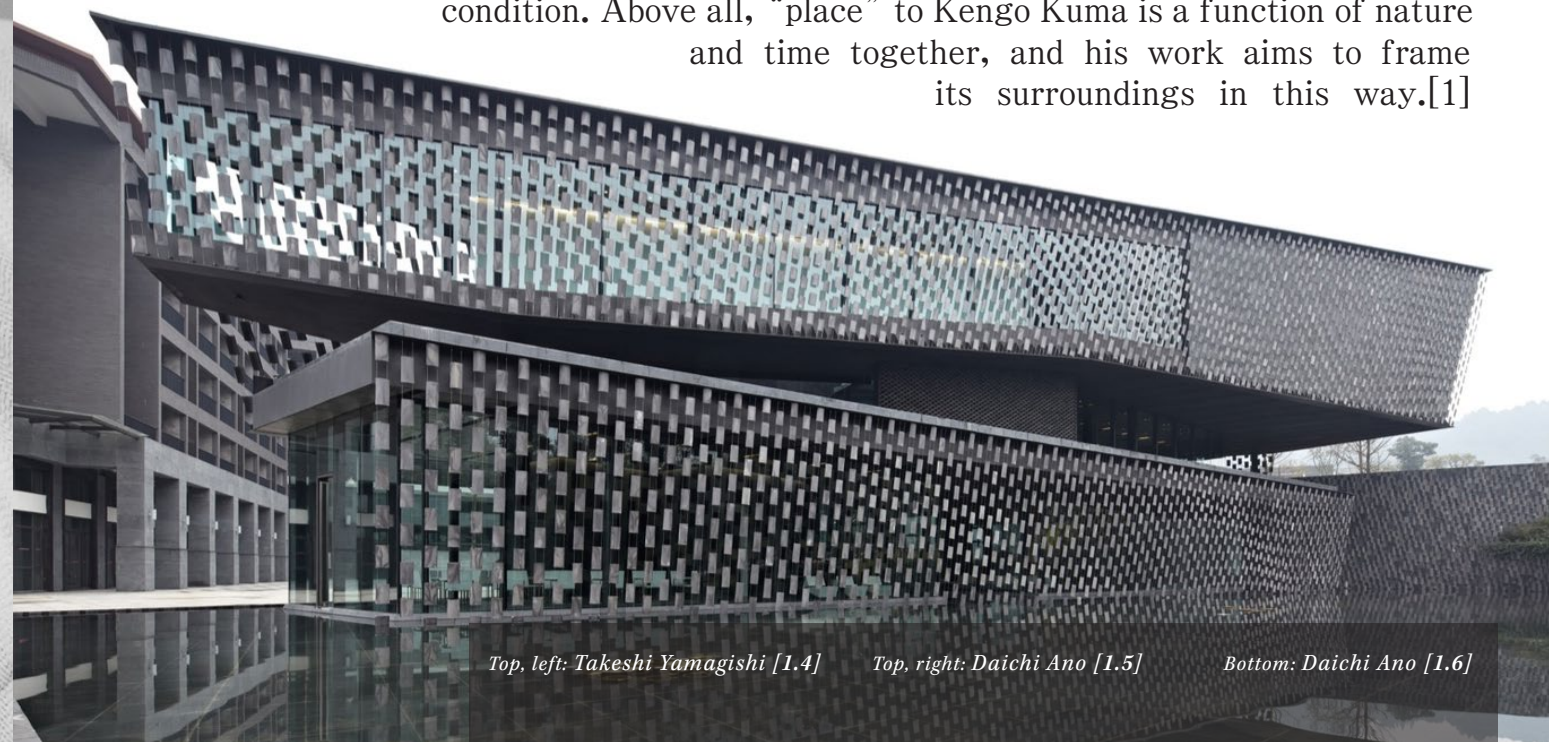
He now continues to practice, as well as lecture extensively and publish architectural discourse from scholarly articles to full books. His work focuses on the preservation of Japanese architectural tradition and the use of contemporary technology to make materiality more engaging. [1]



Portrait: Courtesy of Walter K. [1.3]



Kuma’s work frequently emphasizes the use of modern technology to bring a mystical sense of lightness to otherwise structural materials, such as timber and stone. The incorporation of this methodology in both construction and facade design is tied to his belief that material is not a guidance of architectural form, but an act of conforming to its context. A sense of “connection” is also prevalent in his work, whether it be his endeavor to bridge rooms in unique ways or create a more sublime interior-to-exterior condition. Above all, “place” to Kengo Kuma is a function of nature and time together, and his work aims to frame its surroundings in this way.[1]



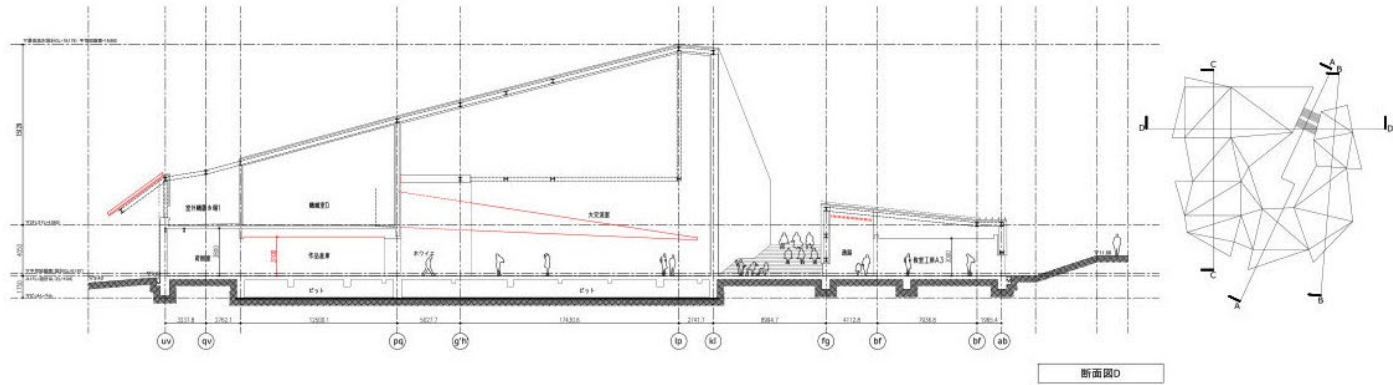
Top, left: Takeshi Yamagishi [1.4]

Top, right: Daichi Ano [1.5]

Bottom: Daichi Ano [1.6]

PROJECT BACKGROUND & DESIGN

The Kyushu Geibun-Kan addresses the region's desire for both a cultural museum and facilities for the public to use for mixed uses. The municipality of Chikugo provided the existing site of a wide park for the project, which overlooks the Yabe River. Kengo Kuma's response to the prompt yielded a building which reflects the surrounding scattered neighborhoods via its sloping roof geometries and varied materiality, functioning like a miniature village unto itself. Just as the Chikugo Park was intended to become a green nexus to the community, the museum wraps around a central courtyard to provide an array of various discreet programs. Despite prominently featuring oversized roof masses and overhangs, the building is fenestrated by numerous shopfront windows which pull light inside and bridge the built and natural environment around. [4]



The building's construction was completed in 2013, but Kuma was not finished with the project even then. Following successful opening of the Kyushu Geibun-Kan, he designed an annex for the project which sits adjacent to its southern face - an all-wood pavilion to be used for pottery and other art projects among the great outdoors. [7]



Building section: Kengo Kuma Architects [1.7]

Landscape, right: Erieta Attali [1.8]

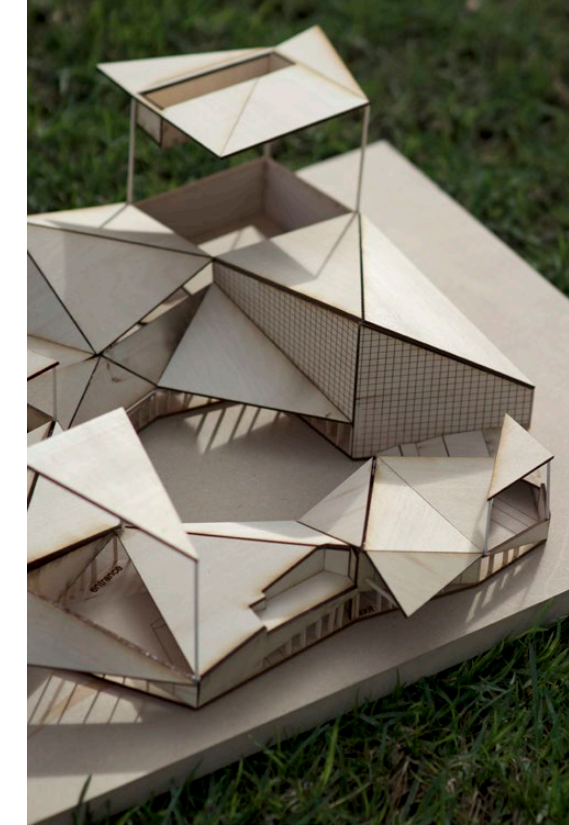
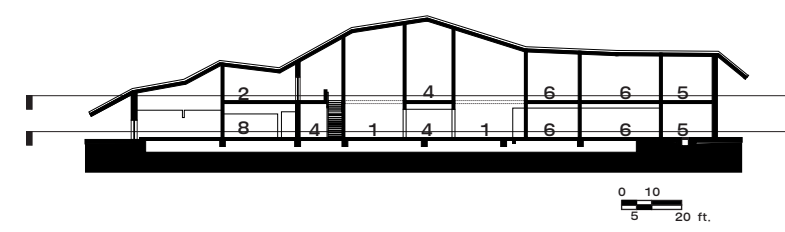
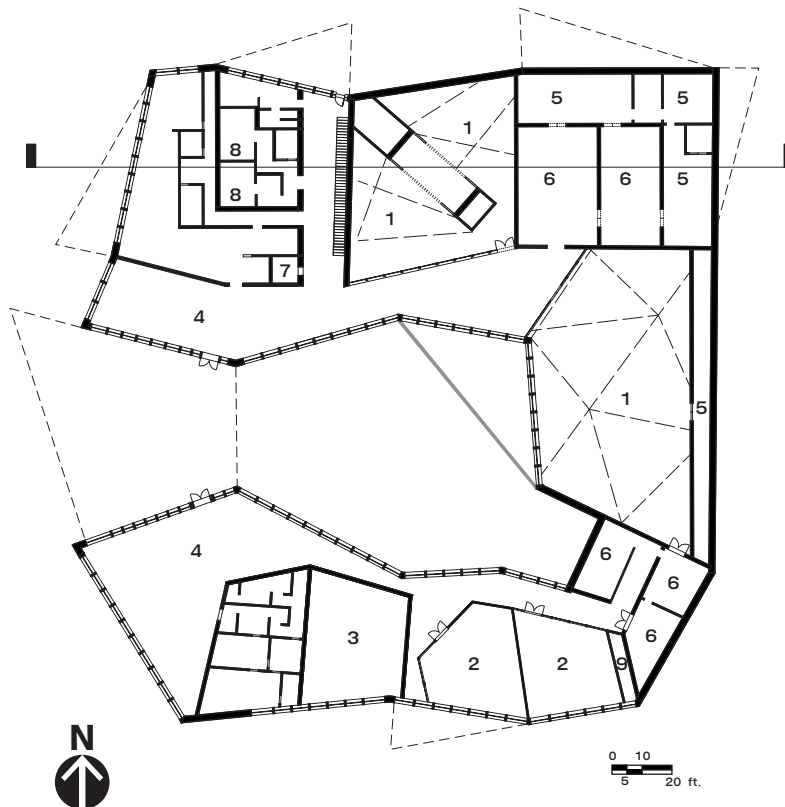
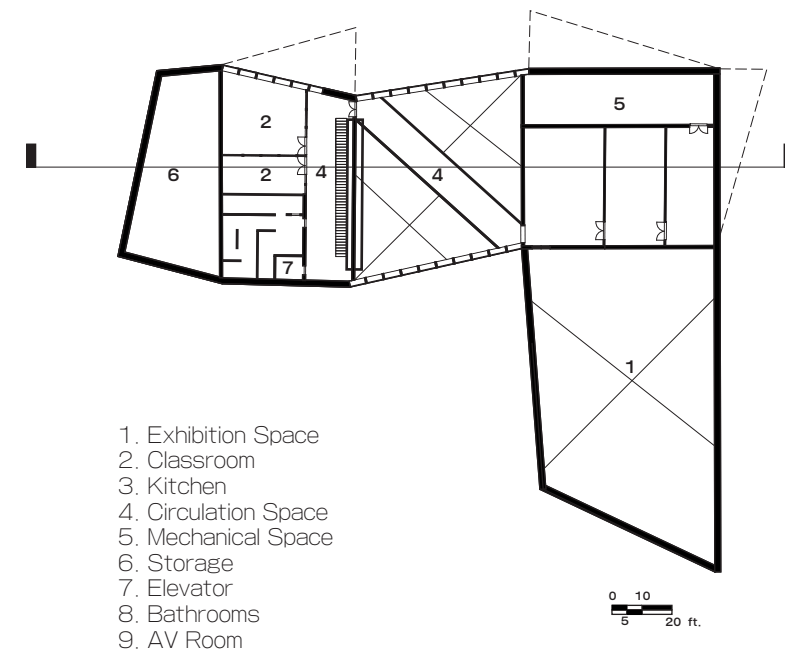
Courtyard, interior photos: David A. Ewen [1.9, 1.10]

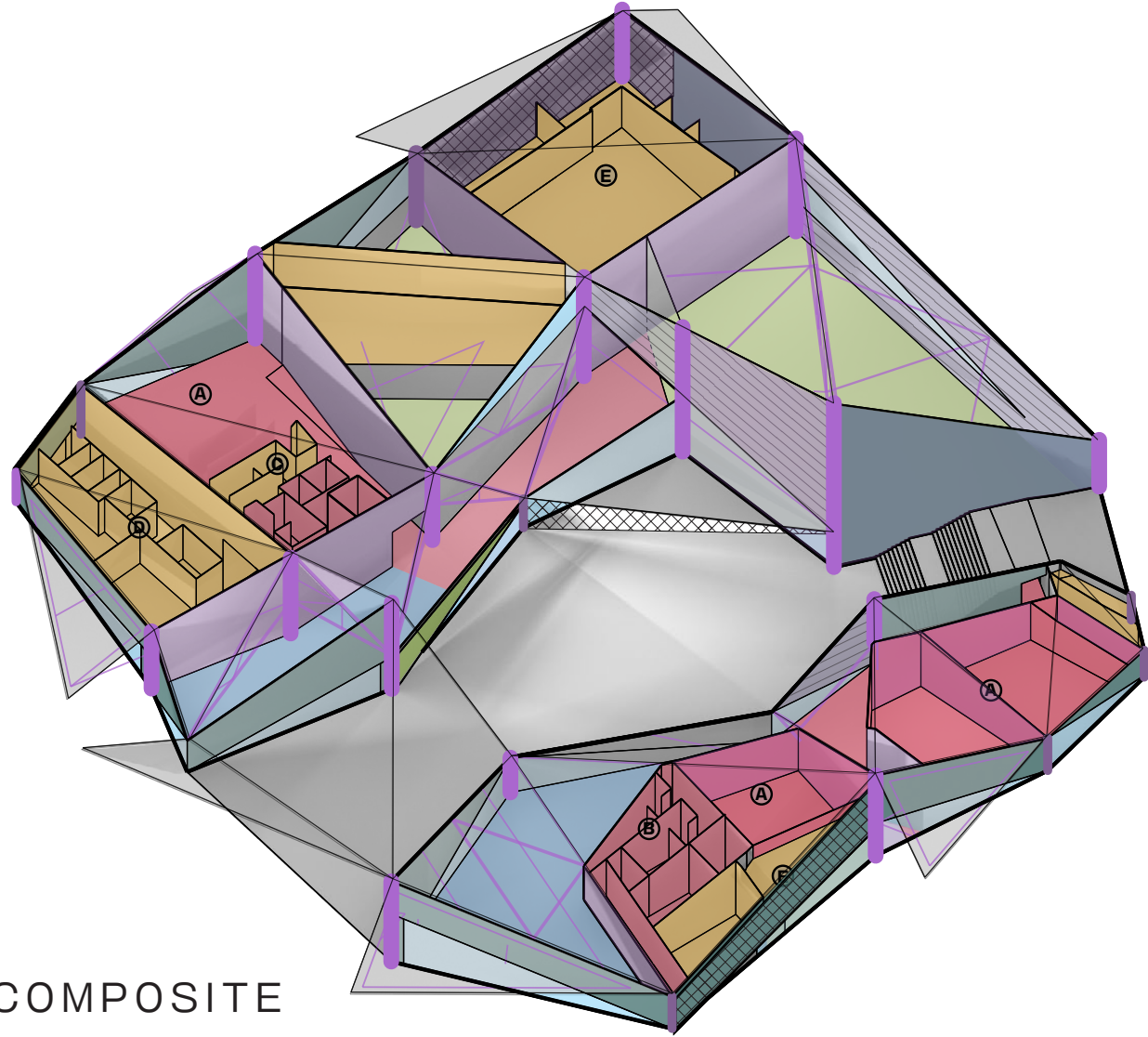


Massing model - 1/16" = 1'-0"

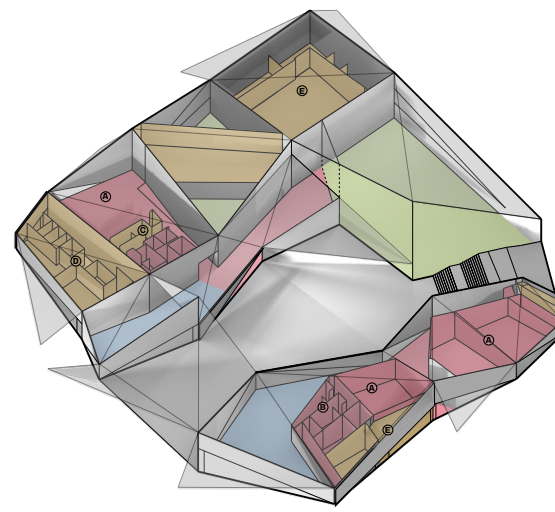
MASSING & CONFIGURATION

In plan, the building's two disparate wings become obvious. On the north is the primary museum, while on the south, below the central courtyard, is the studio wing with various multipurpose rooms for public use. In section, the building's surprising height is accentuated. The second floor features high vaulted ceilings which suggest the exterior geometry of the unique roof. Also worth noting are the plenum below the ground floor which presumably carries air for ventilation, and the huge quantity of glass panes throughout the first and second floors.

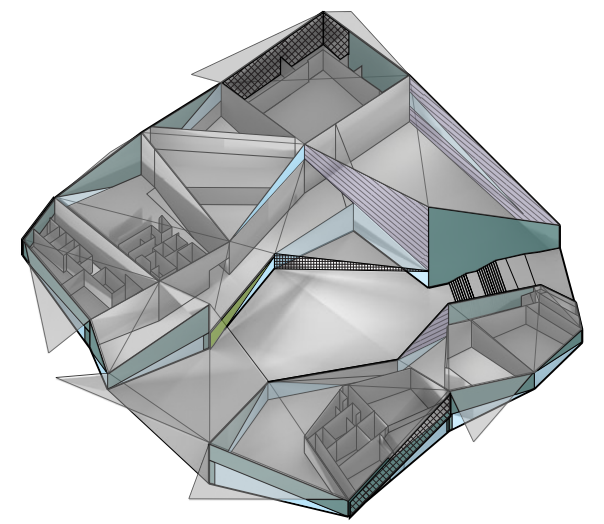




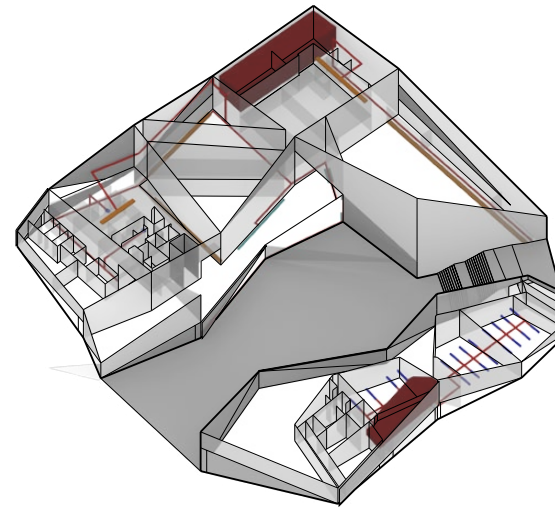
COMPOSITE



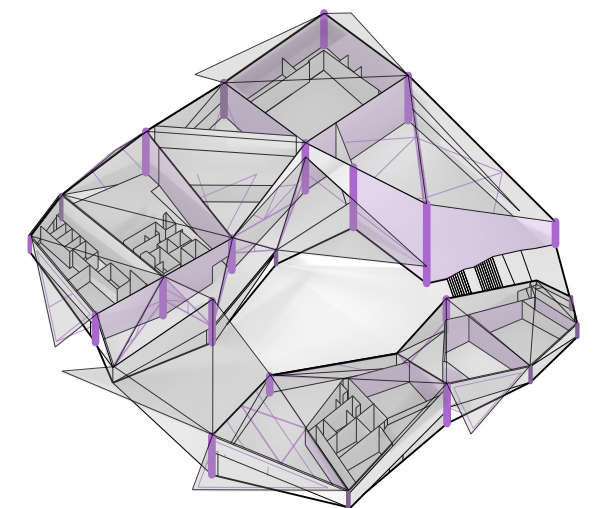
PROGRAM



ENVELOPE

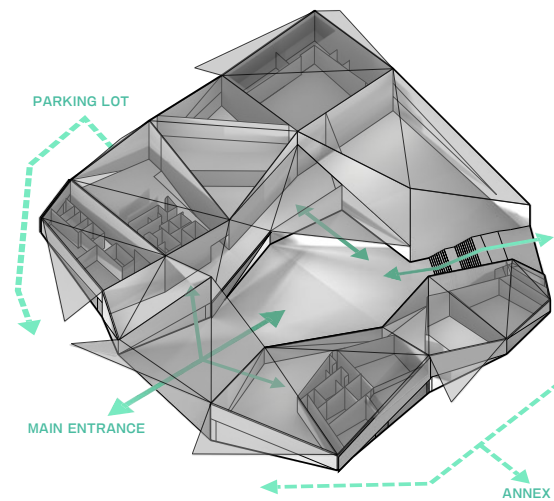


MECHANICAL

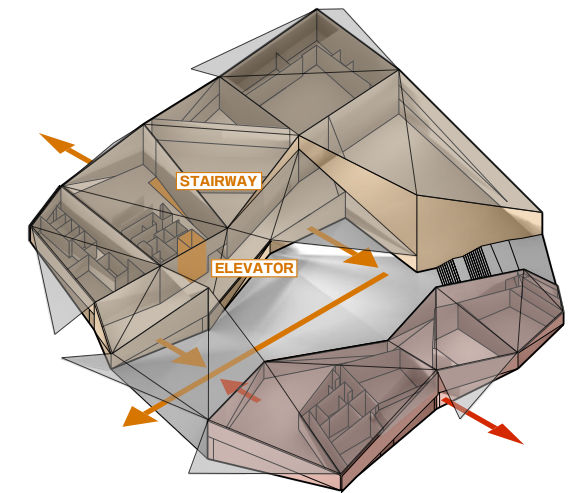


STRUCTURE

GRAPHIC SUMMARY



CIRCULATION



EGRESS

2 PLACE

The project sits amid expanses of grass and dirt in the Chikugo Park, where it forms a cultural hub for the surrounding neighborhood and overlooks a river whose water is crucial to the community. It is also worth noting that the park is directly coupled with a train station, connecting the project to the rest of Chikugo, the adjacent town of Miyama, and also the greater Japanese rapid transit network carried by the JR Line system.

The project is conveniently a stone's throw across the river from the local water treatment plant, which it is presumably connected to via the municipal sewer system. Energy for the building is assumed to be carried by the Kyushu Electric Power Company, Inc. Across 7 Japanese prefectures (essentially, counties), the company operates almost 200 power generation plants - the majority of which are hydroelectric. [11]

Augmenting the energy is a system of photovoltaic panels situated on several south-facing roof panels of the building. These take advantage of the region's sunny climate and allow for a more sustainable degree of interior climate control.

As per Kengo Kuma's observation, the area's neighborhoods are scattered about between patches of agricultural fields. The building's topology is seen as a direct answer to this condition, acting similarly as an additive series of man-made roofs rising out of a rural landscape, rather than a subtractive partitioning of green space. This is characteristic of Japan's countryside towns, which often act as islands of suburbanization cropping out of the natural topography.

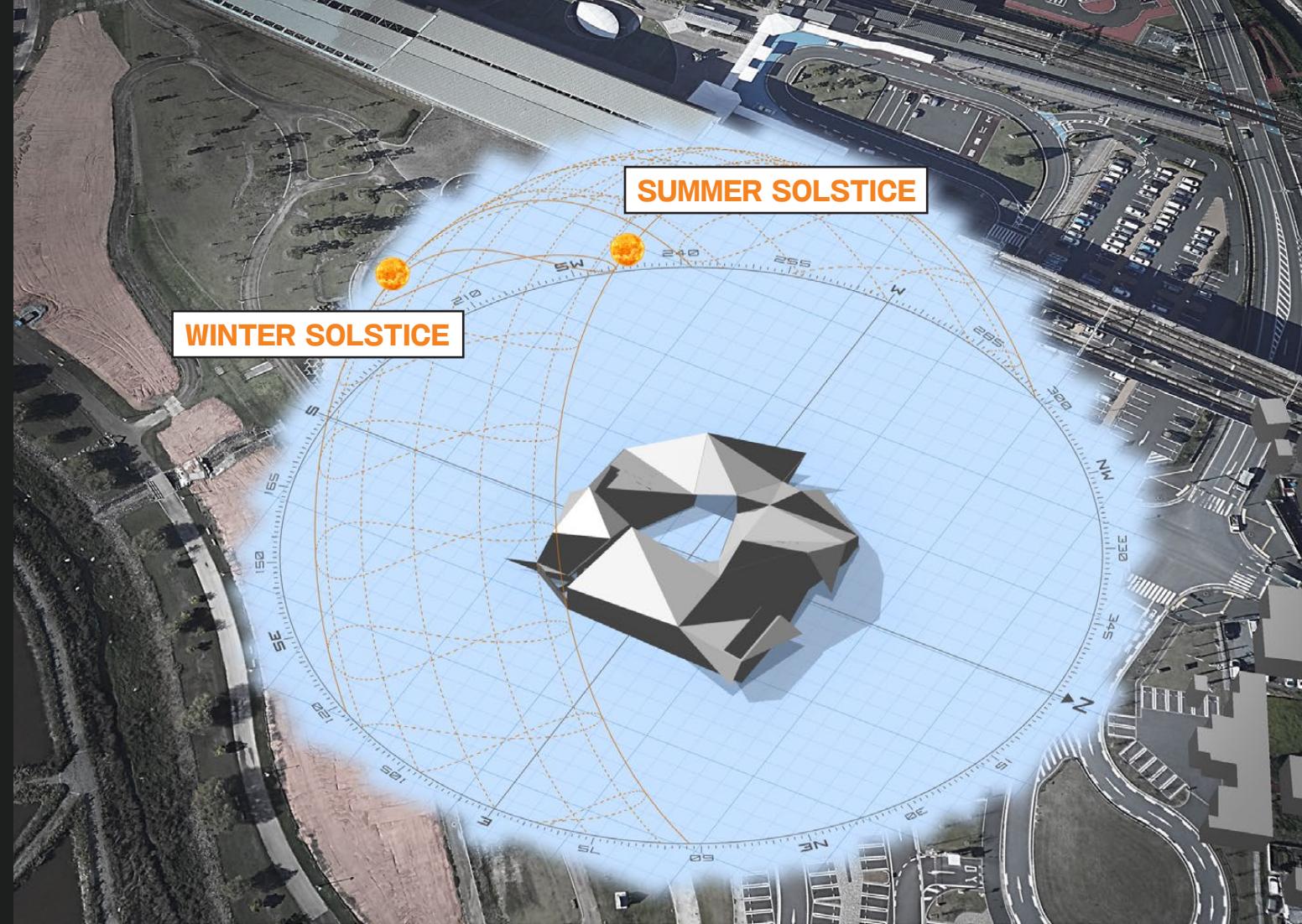
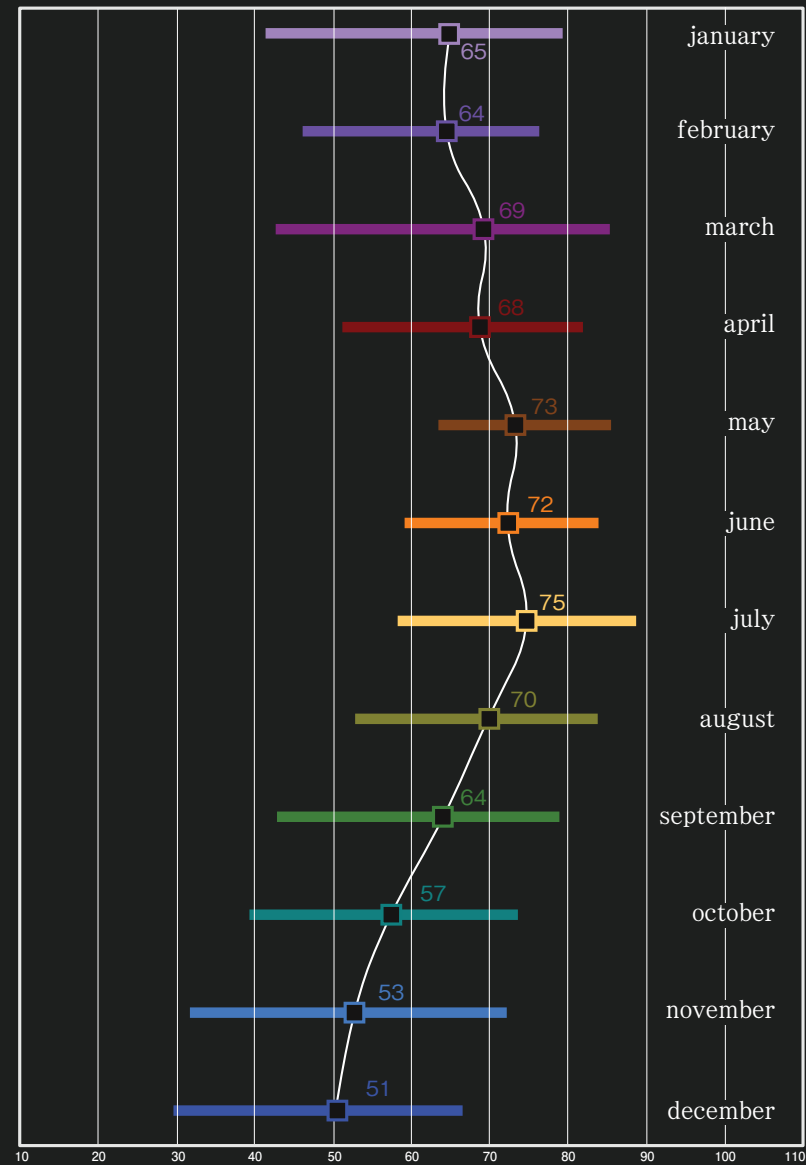
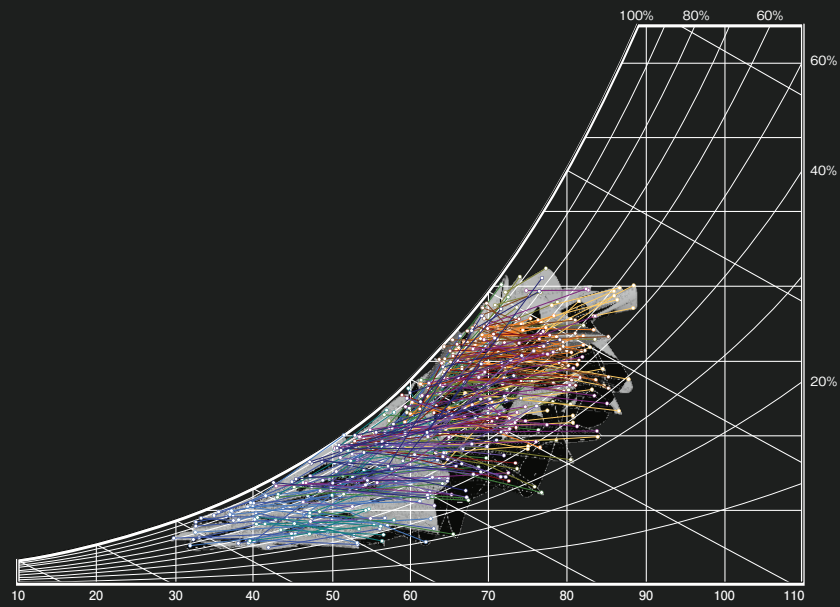


CLIMATE

Climate analysis was carried out using proxy data from Tosashimizu, Japan, a city located along nearly the same latitude as Chikugo, and of a similar coastal region on the Shikoku island.

Japan's largely subtropical climate creates the ideal conditions for a building whose passive strategies prioritize shading and ventilation. As evidenced by the monthly temperature graph, the region's hottest months have the smallest diurnal swings; the colder months, on the other hand, fluctuate between anywhere from 30 to 65 degrees. Therefore, it is clear that the architects were grappling with a polar climatic issue that shifts between chillingly cold and painfully hot throughout the year.

The psychrometric chart was developed by digitally lofting a surface through each month's collated daily min/max curves, and area centroids were calculated to determine the mean temperatures for each.



DAYLIGHT

With a latitude of $33^{\circ}12'$, Chikugo's daylight profile is similar to that of San Luis Obispo. The area's summer sun shines down from nearly directly above, giving extra power to the building's overhanging roofs as they protect the structure and many nooks on the exterior of the building as well. During the winter, many of the building's windows become portals which let ample light into the building's southern wing, and specifically its multipurpose rooms. This creates a warmer interior condition where it is most necessary - the working areas where patrons are designing crafts, practicing cooking, and taking public classes. Meanwhile on the northern side, the museum's fewer windows (several of which are overshadowed by the roof throughout the year) allow only diffuse light into the auxiliary spaces, while rooms specifically for curated displays are lit completely by artificial light or indirect light from across the floor plate. Kuma demonstrates a very intentional use of the building's natural sunlight in selecting orientation, floor geometry, and envelope composition.

3 FORM & ASSEMBLIES

PROGRAM

The project is designed with a deliberate separation of public exhibition & work space from private administrative functions, circulation for which is driven through two separate **lobbies** on each “wing” of the building.

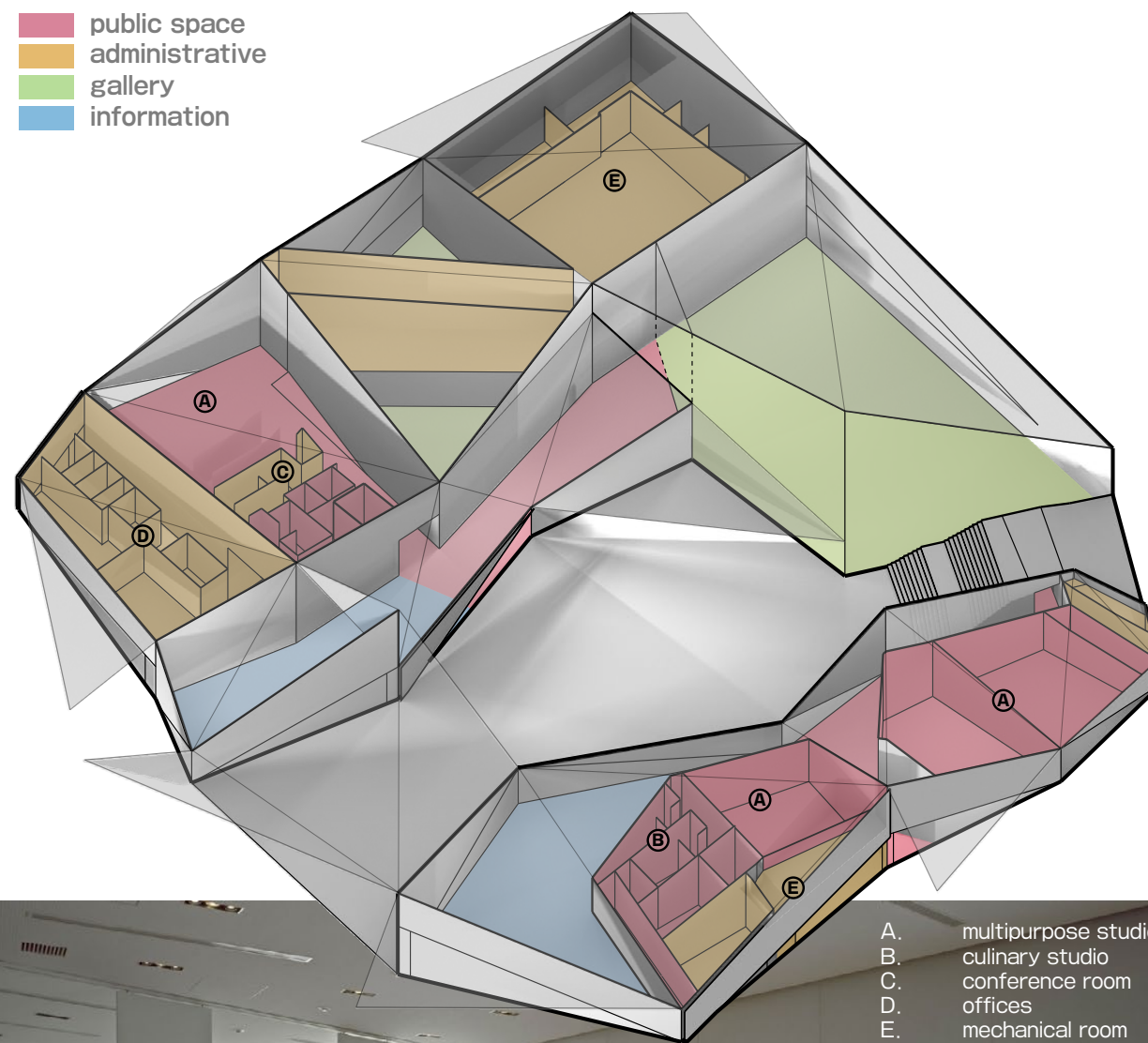
Gallery display spaces are allocated to the larger primary wing, whose high lofted ceilings provide a sense of awe as guests enjoy the various cultural exhibits.

Studios, open to the public, are predominantly featured through the secondary wing and the second floor of the primary. Among these spaces are recreational classrooms as well as pseudo kitchens for cooking classes and the like.

Administrative spaces such as offices, storage, & mechanical rooms are pushed to the edges of the building, or isolated under the main courtyard’s staircase.

Interior Photographs: Hiroyuki Kawano [3.1, 3.2]

- public space
- administrative
- gallery
- information



- A. multipurpose studio
- B. culinary studio
- C. conference room
- D. offices
- E. mechanical room



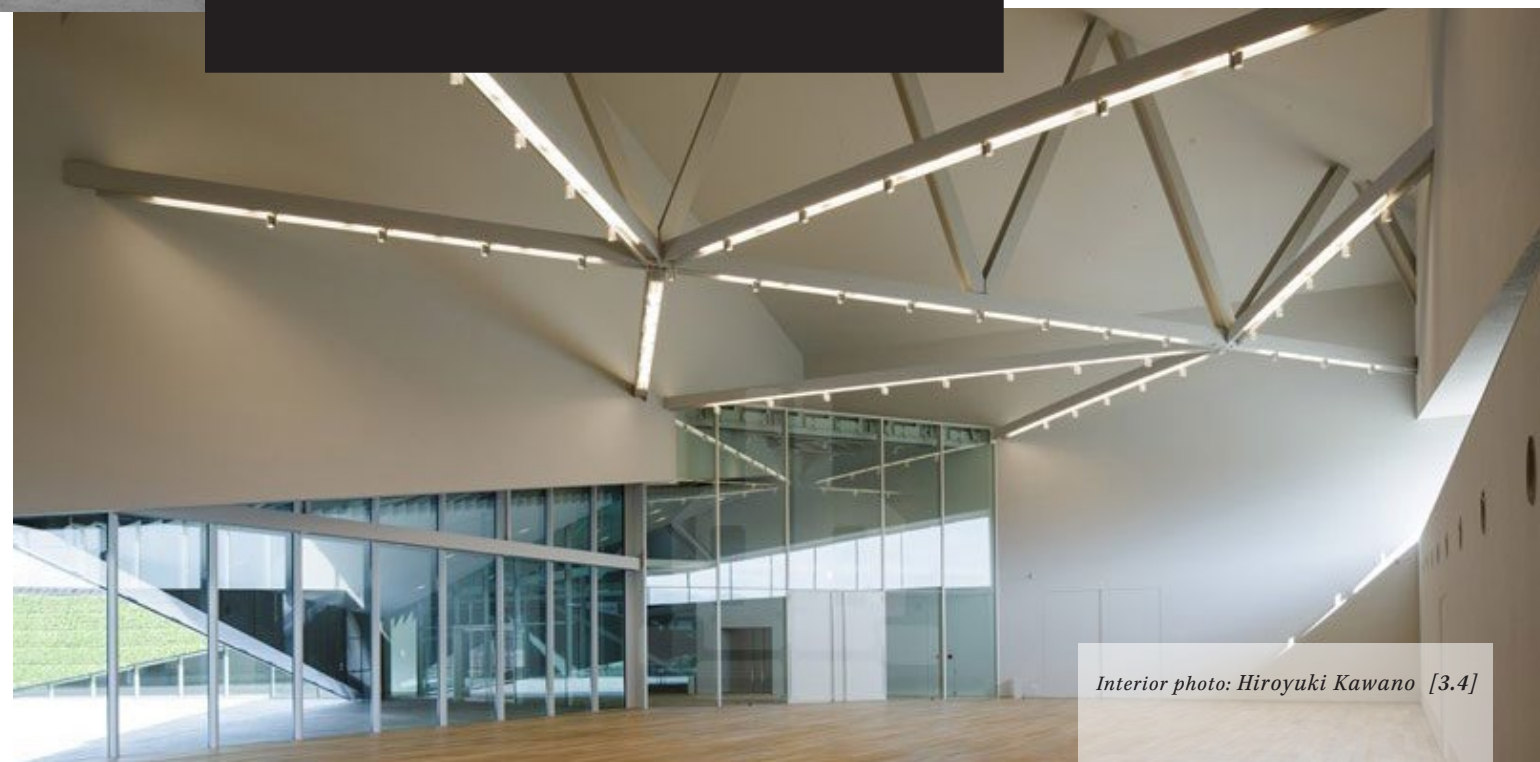


Exterior Photo: Erieta Attali [3.3]

STRUCTURE

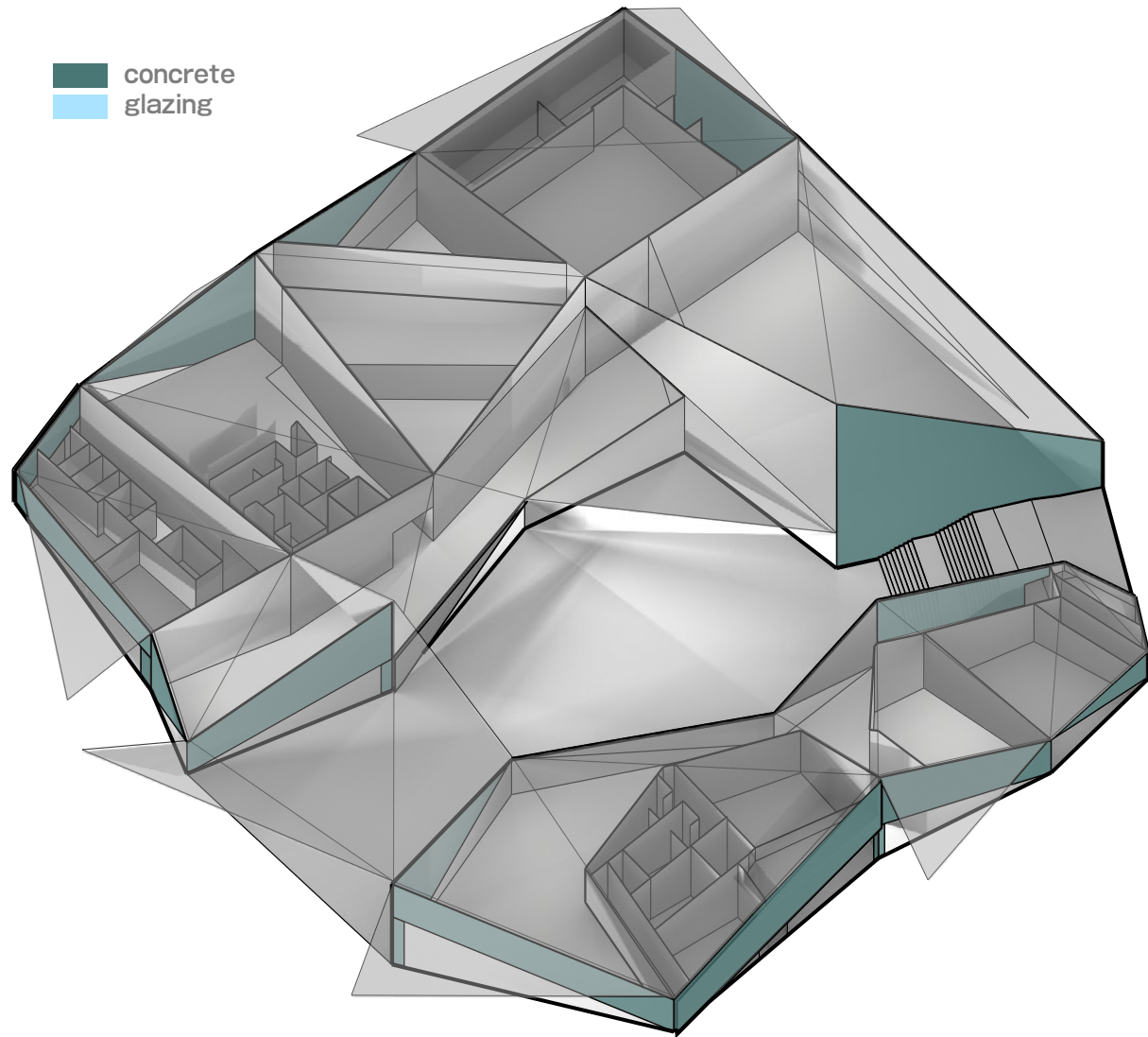
The building's unique geometry is carried by a series of well-placed columns and large-span beams. The roof topology reflects an integrated network of rafters and I-beams that rests atop the columns and creates the sense of a rooftop landscape almost levitating above the walls below.

Many of the thin concrete walls are triangular, resting on a singular fulcrum and a column opposite that vertical edge. This, coupled with the abundance of wall-length shopfront windows creates the need for uninterrupted shear walls throughout the floor plan to add lateral rigidity.



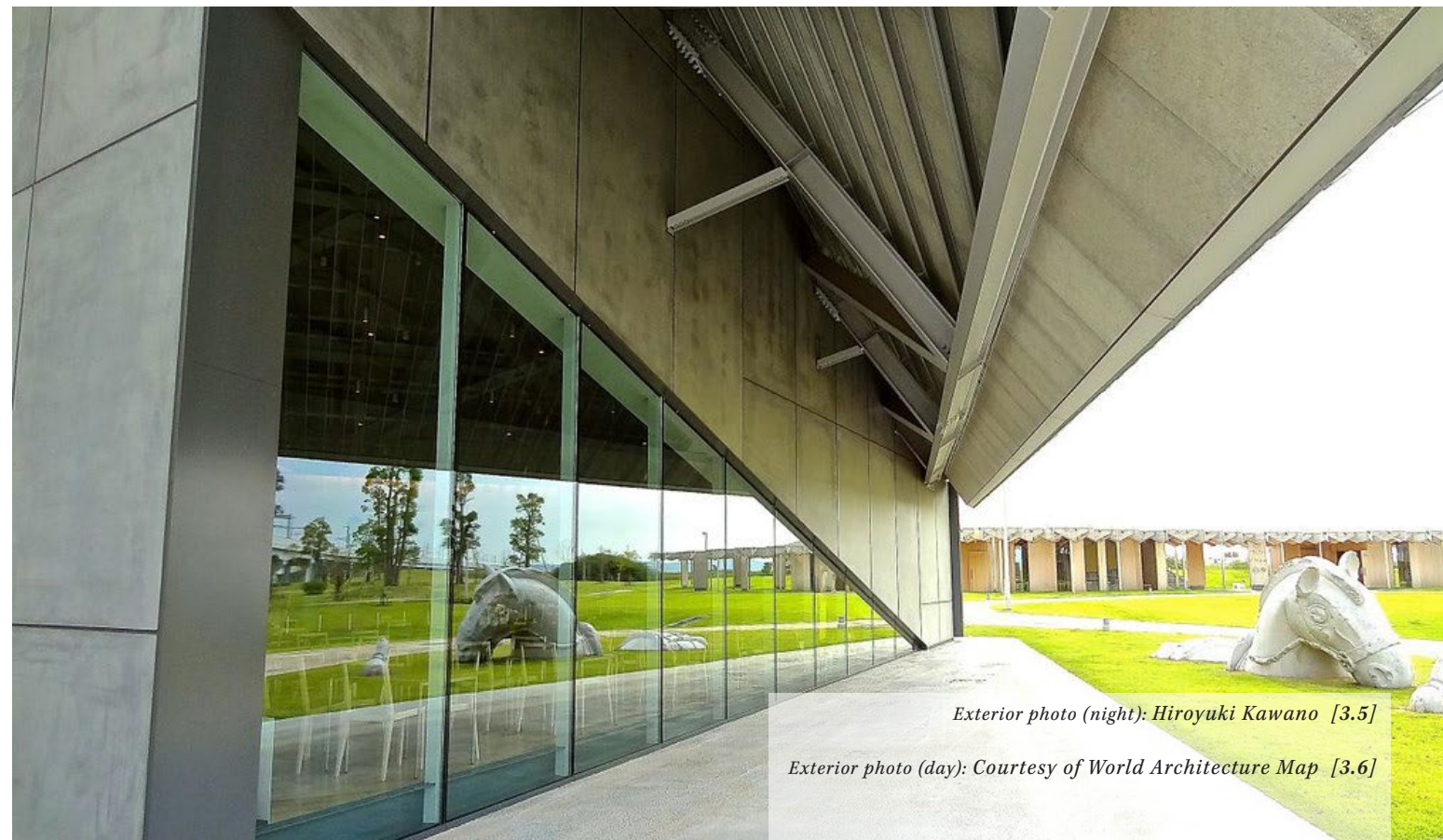
Interior photo: Hiroyuki Kawano [3.4]

concrete
glazing



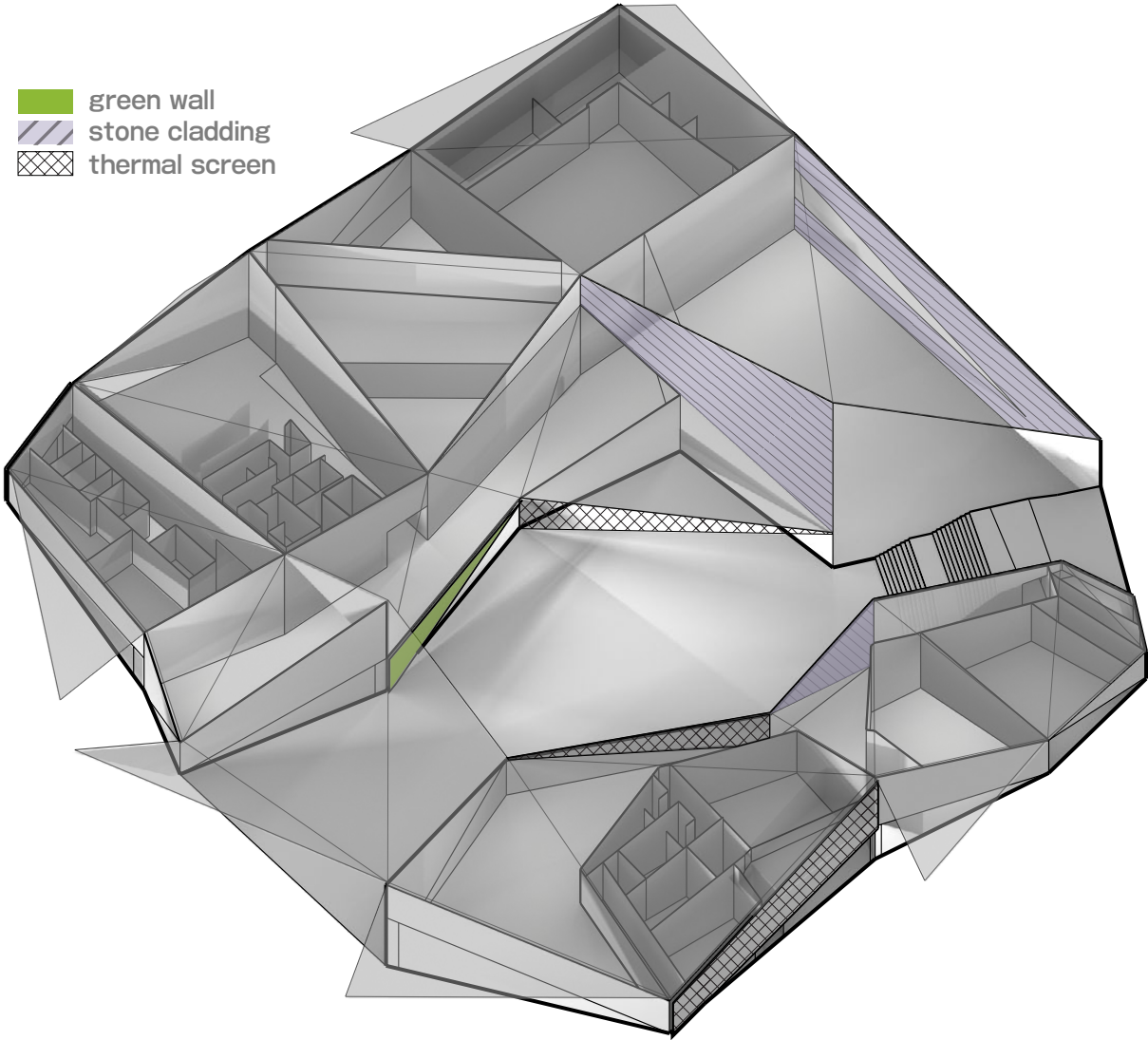
CONCRETE & CASEMENTS

The building's primary envelope is a series of monumental concrete walls which would seem to actually be the final layer of a structural steel system. Evidence of this system being carried through the interior are visible on the periphery of the windows. The unexpected geometries of the building - primarily triangular, and featuring little in the way of plain, structural walls - create a vivid contrast with the heavy appearance of concrete panels levitating above entire walls of glazing.



Exterior photo (night): Hiroyuki Kawano [3.5]

Exterior photo (day): Courtesy of World Architecture Map [3.6]



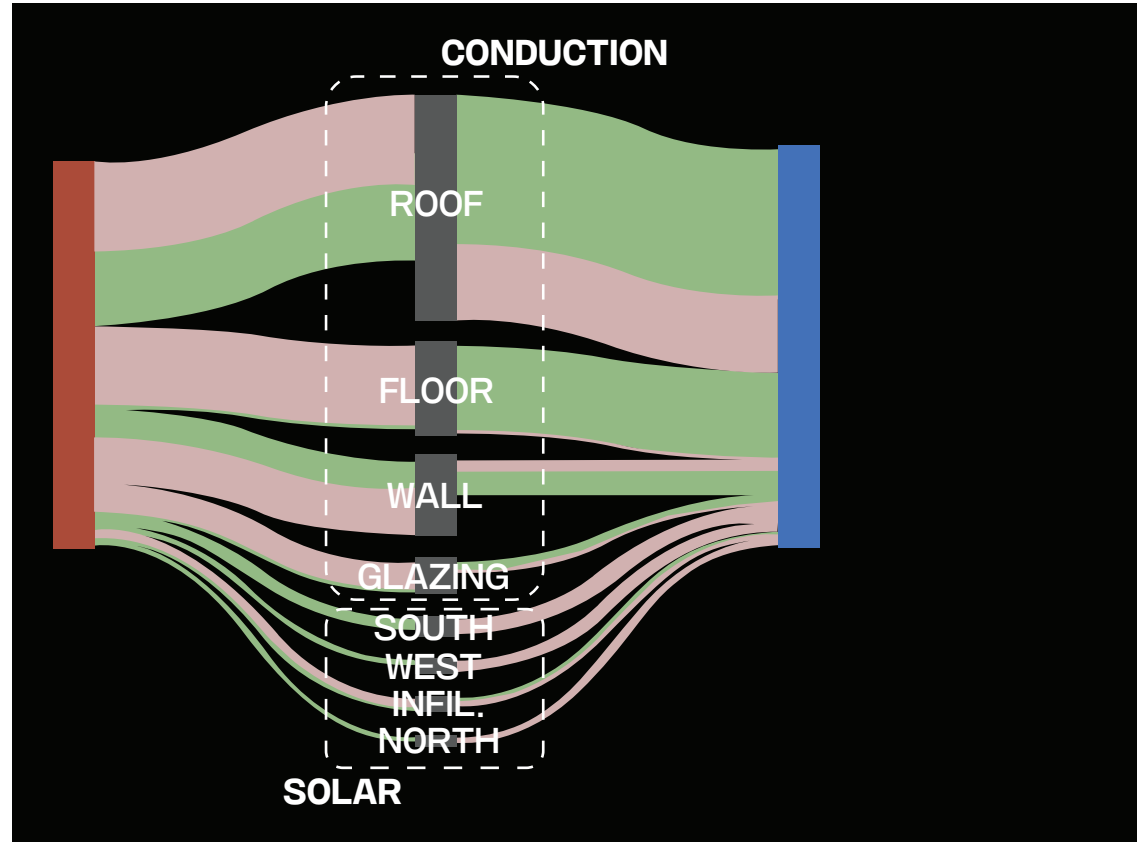
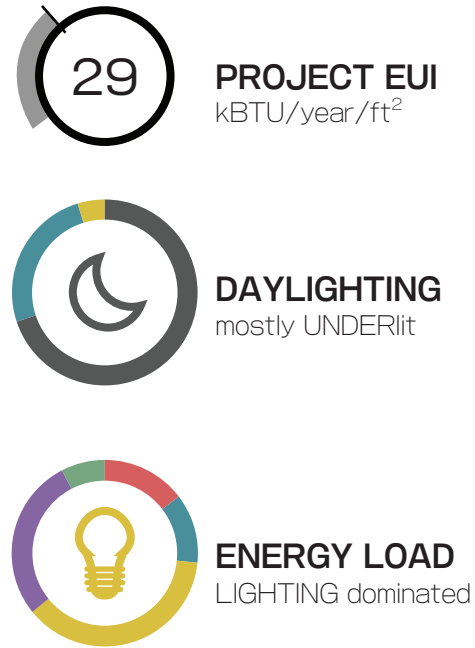
■ green wall
▨ stone cladding
▩ thermal screen

SOIL, SCREENS, & STONE

Accents such as shading screens and stone facades are scattered about the building. These play into Kuma's goal of creating a miniature village of diverse materiality and geometry, and his playful use of material creates a more inviting exterior condition visible from the central courtyard.



4 PERCEPTION & PERFORMANCE

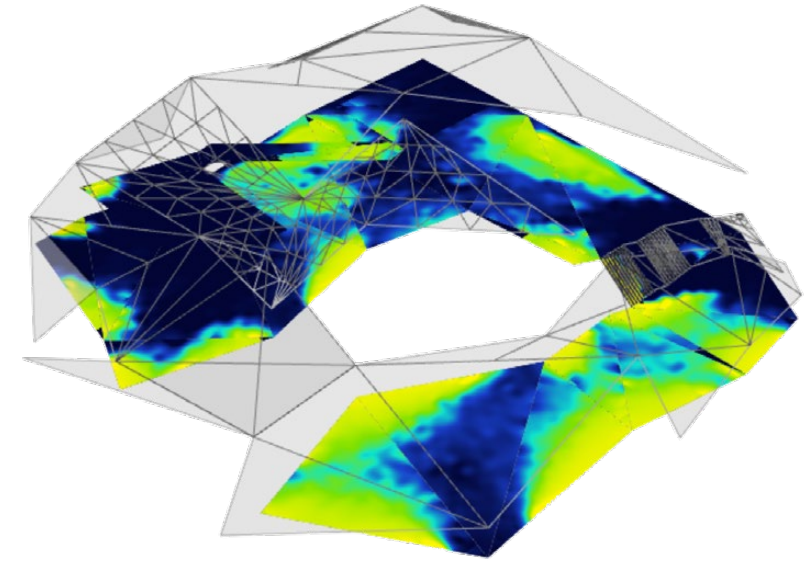


ENERGY + DAYLIGHTING

It is no surprise that the project's massive overhangs and predominantly-closed roofs provide for a dark experience inside, if lit solely by daylight. Being a combination of museum and public workspace, this works to the advantage of Kuma's design, as energy input is relegated to providing a comfortable experience for visitors and protecting artwork from direct sunlight. It also makes sense that (in simulation, at least) most of the building's physical climate load is a result of roof conduction and to a lesser degree, floor and wall infiltration. While the building's geometry seems to have ample surface area for infiltration and conduction, analysis actually provides for a great EUI of 29 kBTU per year per square foot - a benchmark for all modern buildings if accurate.

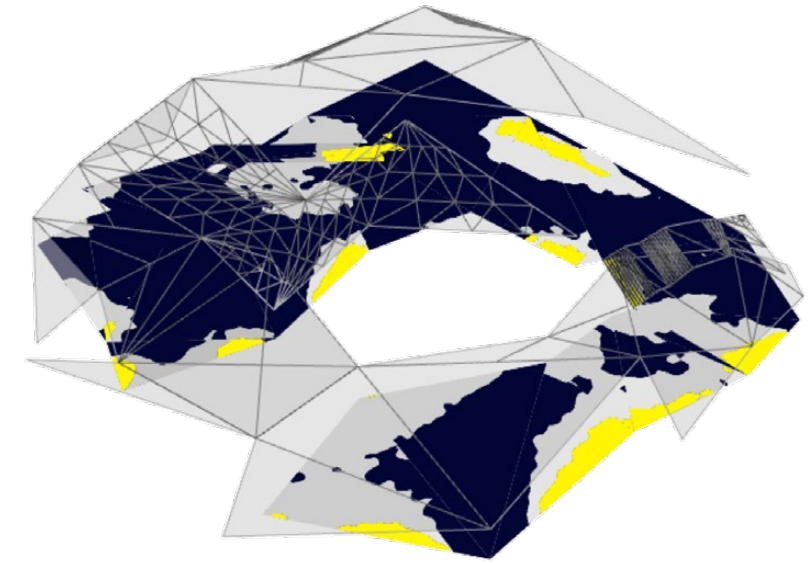
ANNUAL DAYLIGHT

PERCENTAGE OF USAGE HOURS WHEN ILLUMINANCE IS >28 FC



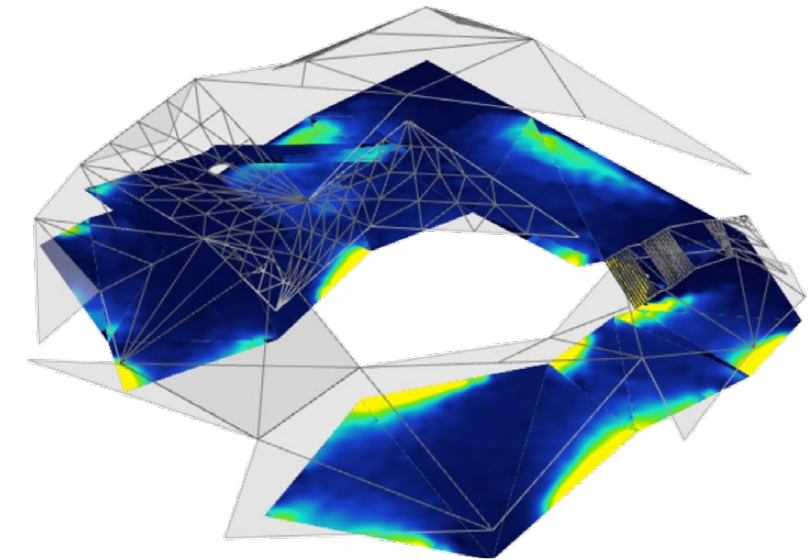
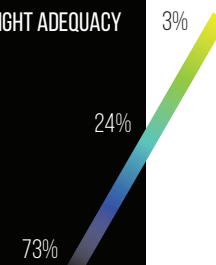
OVER / UNDERLIT

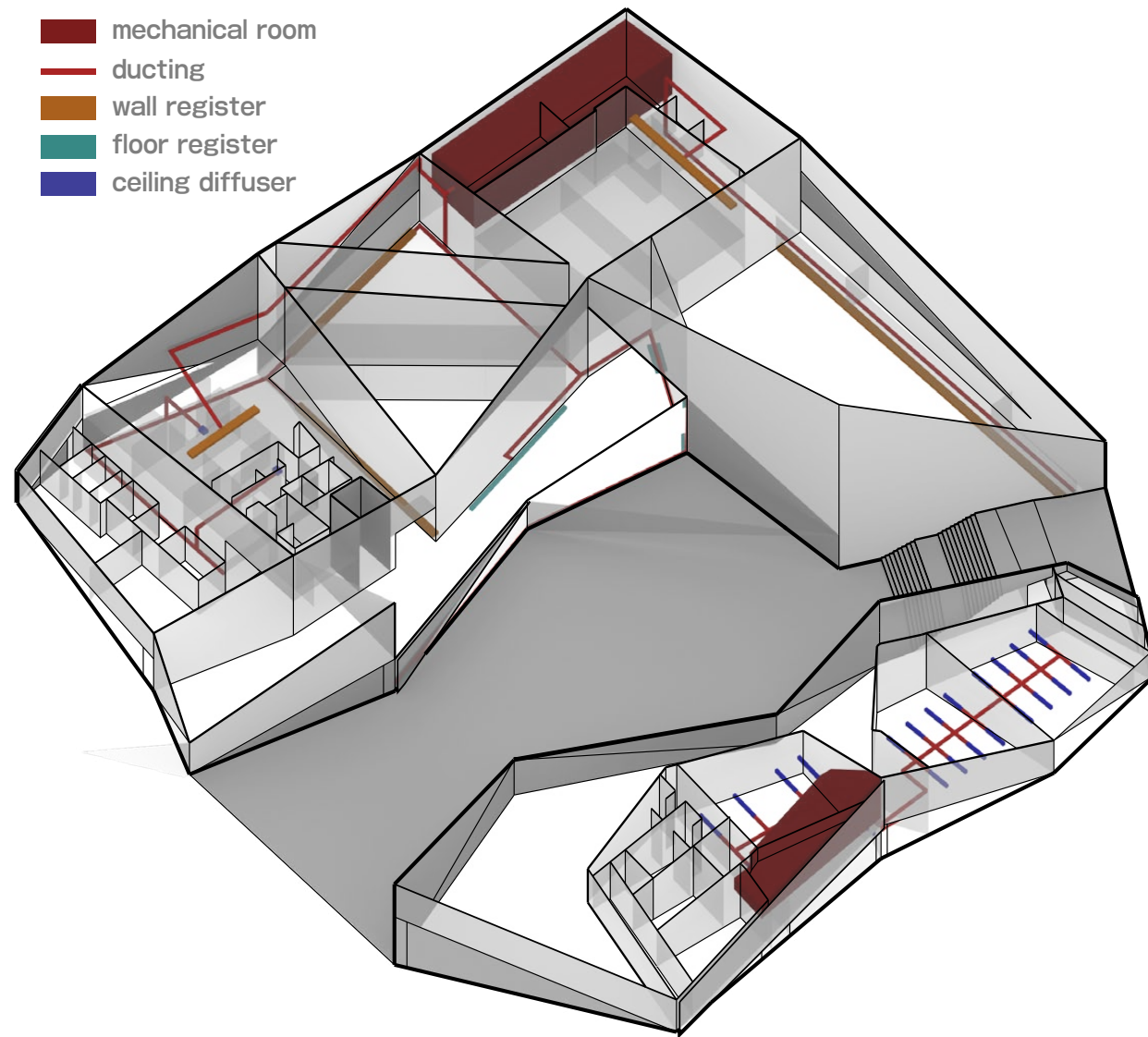
UNDERLIT
OVERLIT



DAYLIGHT FACTOR

PERCENT OF FLOOR AREA BY DAYLIGHT ADEQUACY

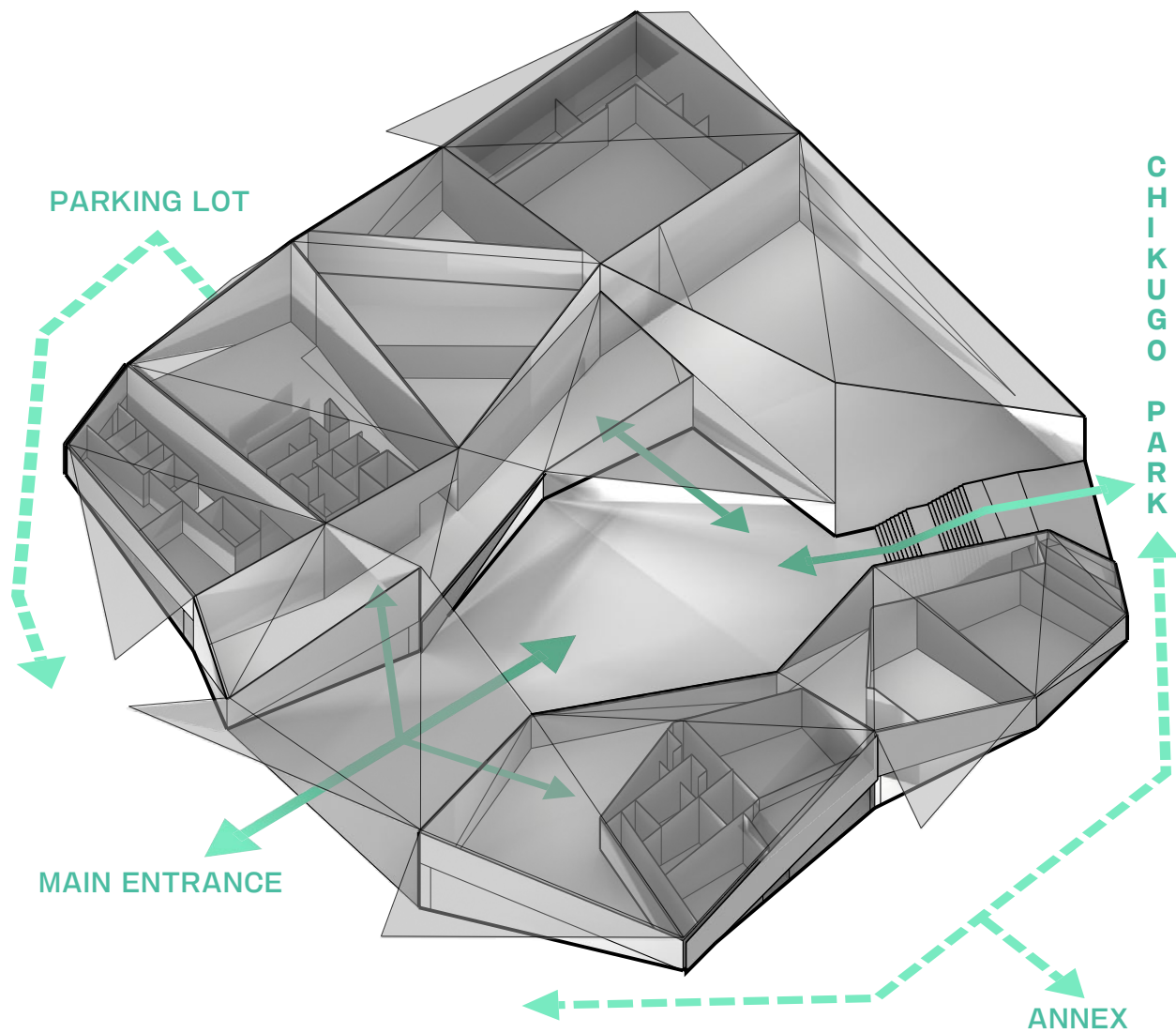




THERMAL & VENTILATION

The building operates in two distinct climate “zones” - the major and minor wings both feature separate mechanical rooms with associated condensers and evaporators situated above. These fixtures are identifiable by their subtraction of the roof planes, while metal screens help to conceal the equipment from the ground. Inside the building, conditioned air is delivered through a variety of ducts, both concealed in the dropped ceilings and through a presumed plenum for underfloor distribution to floor registers near windows.



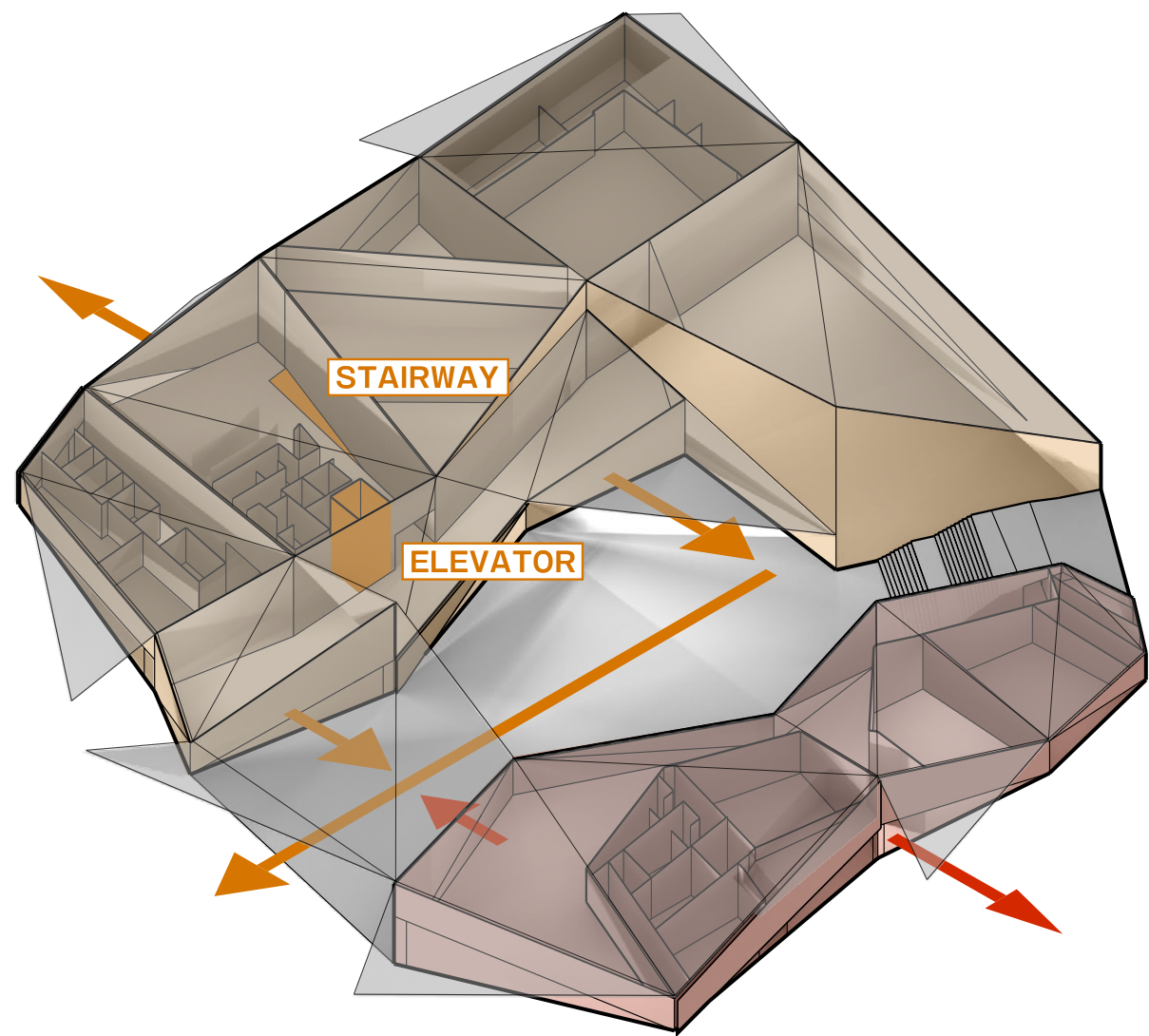


CIRCULATION

Visitors to the building are expected to circulate about the ground floor via each wing's primary corridor, while accessory rooms bud outward from the center. On the exterior, access to the parking lot on the building's north side translates into a short walk to the main entrance "gate" which is overhung by exaggerated roof panels. The southern side of the building, accessible from foot along the outer circumference of the building or the central staircourt, brings visitors to either the outdoor studio annex or the Chikugo park nearby. The second floor is accessible via the building's only staircase and elevator.

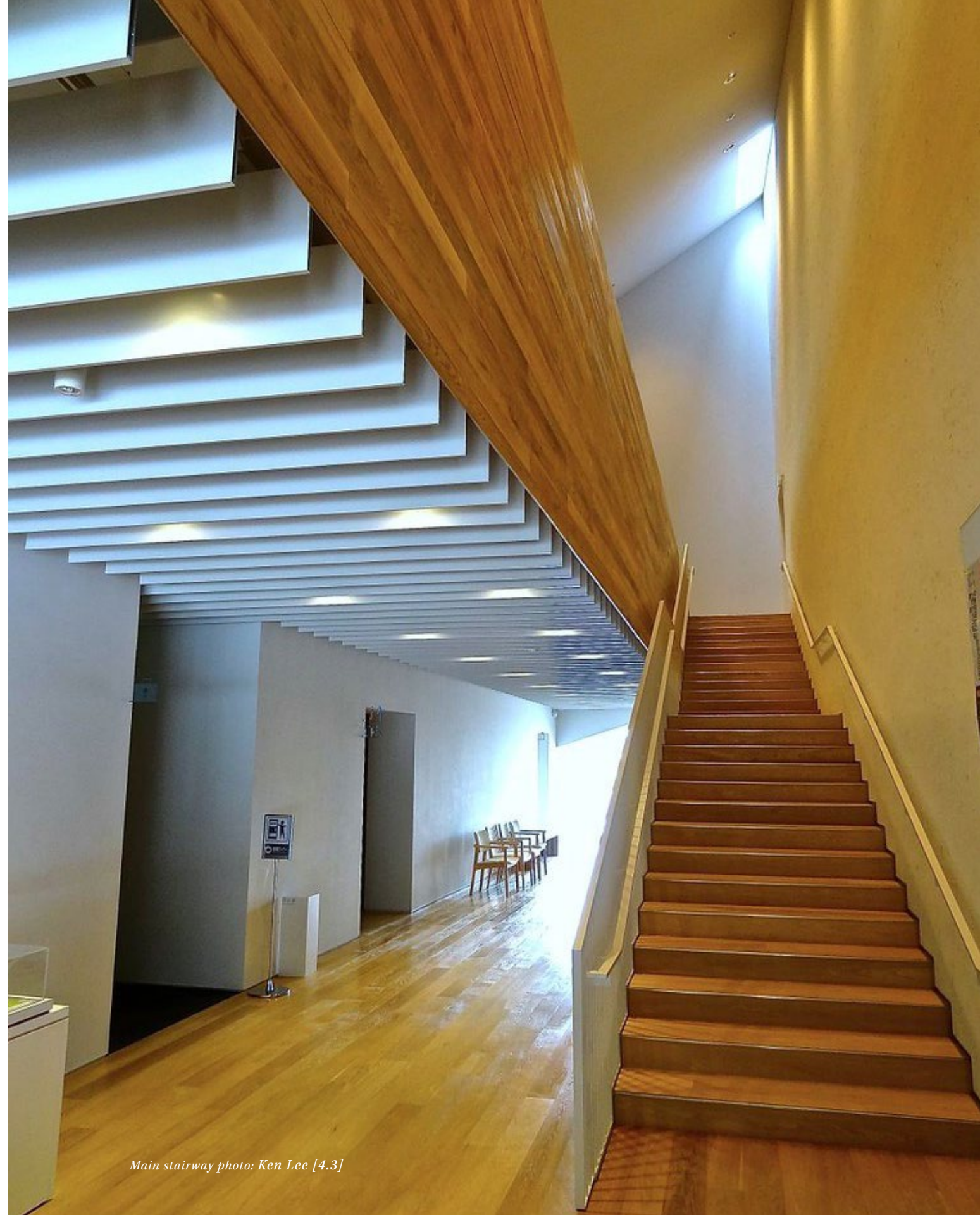


Main stairway photo: Erieta Attali [4.2]



EGRESS & FIRE SAFETY

Both wings of the building are designed to facilitate separate paths to egress, as if functioning as two discrete structures. Each has a primary entrance which leads to the front of the central courtyard, while also providing an emergency exit on the opposite edge of the building. In the case of the larger major wing, this exit is conveniently located underneath the main stairwell, and therefore as quickly accessible as possible from the second floor.



Main stairway photo: Ken Lee [4.3]

5 REFERENCES

PHOTOGRAPHY

- 0.1** Kawano, Hiroyuki. "Kengo Kuma & Associates." Architects' Website. Accessed November 2019.
3.1 <https://kkaa.co.jp/works/architecture/kyushu-geibun-kan/>
3.2
3.4
3.5
3.7
3.8
- 1.1** Attali, Erieta. "Kyushu Geibun Kan Museum." Photography Portfolio. Accessed November 2019.
1.2 <http://www.erietaattali.com/architectural-photography/kengo-kuma-associates/kyushu-geibun-kan-museum/>
1.8
3.3
4.2
- 1.9** Ewen, David. "Kengo Kuma" Flickr. Accessed December 2019.
1.10 <https://www.flickr.com/photos/davidaewen/albums/72157662088364400>
4.1
- 1.5** Ano, Daichi. "Kengo Kuma & Associates." Architects' Website. Accessed November 2019.
1.6 <https://kkaa.co.jp/works/architecture/prostho-museum-research-center/>
<https://kkaa.co.jp/works/architecture/xinjin-zhi-museum/>
- 1.7** Associates, Kengo Kuma &. "Kyushu Geibunkan." Arch2o. Accessed September 2019.
<https://www.arch2o.com/kyushu-geibunkan-kengo-kuma-associates/>
- 1.3** Photographer unknown. "Kengo Kuma." Walter K. Accessed September 2019.
<https://www.walter-k.com/en/inspiration/designer/designer-kengo-kuma>
- 1.4** Yamagichi, Takeshi. "Kyushu Geibun Kan Museum." Photography Portfolio. Accessed November 2019.
<http://www.erietaattali.com/architectural-photography/kengo-kuma-associates/kyushu-geibun-kan-museum/>
- 3.6** Photographer unknown. "Kyushu Geibunkan." World Architecture Map. Accessed December 2019.
<http://www.worldarchitecturemap.org/buildings/kyushu-geibunkan>
- 4.3** Lee, Ken. "福岡Fukuoka." Flickr. Accessed December 2019.
<https://www.flickr.com/photos/kenlee2010/albums/72157629136697579>

BIBLIOGRAPHY

1. "Kengo Kuma - Biography." Floornature. Web. Accessed September 2019.
<https://www.floornature.com/kengo-kuma-103/#>
2. "Kyushu Geibun Kan Museum (main building)." Kengo Kuma & Associates. Web. Accessed September 2019.
<https://kkaa.co.jp/works/architecture/kyushu-geibun-kan/>
3. "Kyushu Geibunkan / Kengo Kuma & Associates." Archdaily. Web. October 23, 2013. Accessed September 2019.
<https://www.archdaily.com/440589/kyushu-geibunkan-kengo-kuma-and-associates>
4. Carlsen, Heather. "kengo kuma's kyushu geibun kan unites nature and people." Designboom. Web. June 7, 2013. Accessed September 2019.
<https://www.designboom.com/architecture/kengo-kumas-kyushu-geibun-kan-connects-nature-and-people/>
5. "Kyushu Geibunkan | Kengo Kuma & Associates." Arch2o. Web. June 7, 2013. Accessed September 2019.
<https://www.designboom.com/architecture/kengo-kumas-kyushu-geibun-kan-connects-nature-and-people/>
6. "About Kyushu Geibunkan." Kyushu Geibun-kan. Web. Accessed September 2019.
<http://www.kyushu-geibun.jp/>
7. Lisa, Ana. "Kengo Kuma Unveils Gorgeous Geometric Pavilion For Japan's Kyushu Geibunkan Museum." Inhabitat. Web. October 14, 2013. Accessed October 2019.
<https://inhabitat.com/kengo-kuma-unveils-gorgeous-geometric-pavilion-for-japans-kyushu-geibunkan-museum/>
8. "National Energy Grid - Japan." Global Energy Network Institute. Web. Accessed October 2019.
https://www.geni.org/globalenergy/library/national_energy_grid/japan/index.shtml
9. "Electricity in Japan is supplied by the dynamic activities of ten private power companies." Global Energy Network Institute. Web. Accessed October 2019.
https://www.geni.org/globalenergy/library/national_energy_grid/japan/Electricity_Review_Japan.shtml
10. "Our company." Kyushu Electric Power Co, Inc. Web. Accessed October 2019.
https://www.kyuden.co.jp/english_company_mission_index.html
11. "Process of establishment of Water Supply Agency." Water Supply Authority of Southern Fukuoka Prefecture. Web. Accessed October 2019.
<https://www.sfwater.or.jp/english.html>
12. "Fukuoka City Waterworks (outline)." Fukuoka City. Web. Accessed October 2019.
<http://www.city.fukuoka.lg.jp/data/open/cnt/3/13551/1/eigoban.pdf>

REFLECTION

Overall, Kengo Kuma's Kyushu Geibun-kan is a successful building on many fronts.

In the category of **Form and Assemblies**, the project is very efficient. This is due to its separation of public exhibition space from its workspace & classrooms, as well as from its more private storage and administrative functions. Each of the two main functions - exhibit space and classroom space - are separated into a wing. The wing on its northern side which is more closely situated near the parking lot of the building, serves the most public of spaces - the exhibits - allowing for many people to easily access the space. The classrooms on the other hand, which are public, but for a smaller crowd, and therefore more restricted, are protected by this wing, and located within the wing on the southern side of the building. Both of these functions are guarded by long walkways and entrances with respective administrative desks at the front, allowing the museum to have adequate security. The storage areas in the building are located at the very end of these corridors in the very back of the building (eastern side). The programmatic system was designed very thoughtfully, and thus have not identified much room for improvement.

The building was also designed masterfully in terms of **Perception and Performance**. The building utilizes shading screens on many of the exterior windows, as well as large overhanging roof panels which help to shade them, allowing for diffuse light rather than direct. This allows for a much softer lighting condition in the space, keeping the exhibits away from direct sunlight which could damage them. This, of course, makes the interior spaces appear mostly under-lit in digital analysis. The workspaces, on the other hand, do not have as many overhangs, allowing for them to be more lit by the sunlight, eliminating the need for extensive use of artificial lighting in these spaces. The building's calculated energy profile reveals an EUI of 29 kBTU per year per square foot. This is a benchmark score for modern buildings, especially considering that the building has such a large surface area for conduction and infiltration. The building was oriented resourcefully, allowing for the long wings to span length-wise in the east and west directions, minimizing morning and afternoon daylight on the building. Upwards of 17 passive ventilation systems are featured across the roof of the building, aiding in the release of excess heat in summer. These systems are easily operable in order to adjust the temperature and thermal comfort of the interior of the building without the use of active climatic strategies. The building makes good use of its two distinct climate zones to efficiently cool and heat the building, with the use of condensers and evaporators that are located on the roof of each wing and carry air

down through duct work, to the ceiling diffusers in each room. In-floor registers are also used in order to prevent condensation build-up on the building's wall-length glazing.

In the case of Perception and Performance, one thing that could have been improved upon is the egress for fire safety. Due to the fact that the building is located in Japan, the building code for this likely differs from its western counterparts which have been the subject of study this quarter. Despite only one wing being a second story, we believe the egress should be expanded. There are public classrooms spaces located on the second floor, and only one egress stairway which is not enclosed but rather more of a monumental circulation stair. By extension, it would be smart to include another, enclosed exit stairway that is fire rated to direct the public down from the second floor.

Kengo Kuma & Associates designed the building very thoughtfully for its **Place**. The building was designed to fit in with its surroundings, using the angular design with triangular roof planes to match the surrounding traditional housing that is constructed with sloping roof geometries. The building was modeled to fit in with the rest of Fukuoka's suburban-rural culture, while cleverly mixing modern deconstructivist aesthetics with use of diverse materials such as stone cladding, shading meshes, and green fixtures. We believe that the design arrived at a very good solution for agreeing with its context and blending in with the expectations of its cultural background - especially with it being a center for cultural appreciation. Therefore, we see no room for improvement in this area.

Kyushu Geibun-kan is a very well-performing building overall, with most aspects of the building being very thoughtfully developed. The study of this building has informed us in many novel practices, most notably in the use of shading to create a desirable interior lighting condition, of extensive passive ventilation systems, and of marrying new construction to its cultural place. The design team of Palazzo and De La Cruz believes that these are all valuable features of this project that we can expect to carry with us into future projects.



聯合室內
INFORMATION