Burj Khalifa

CASE STUDY TWO
Case Study: Burj Khalifa

Hospitality, Residential, and Corporate Tower

**Location:** Dubayy, United Arab Emirates

**Design Firm/Designer:** Skidmore, Owings & Merrill LLP (SOM)
Nada Andric

**Research:** (Cohen, 2011)


**Building Information:**

The Burj Khalifa is a triparte tower rising more than 160 stories above Dubayy. It is currently the world’s tallest building. On a colossal scale the Burj breaks down into residential, hospitality, and corporate components.

(In this case study the various spa areas are the main focus, but the lobby designs are also discussed.)

The Burj Khalifa is a very contemporary design. The features that I am focusing on are either smooth organic shapes amid a more geometric grid, or spaces that are completely covered with flowing fluid lines—both in the spa area and the lobbies. This interior mixes the geometric and the organic in such a way that the space feels almost whimsical. It becomes an oasis from the rest of the world. The Burj spa area in particular is wonderfully fluid, but still has a layout that is understandable to someone who has never experienced the space before. These are concepts and feelings that I would like to, on some level, duplicate in the design of HARMONIQUE Health and Spa.
Spa and Pool Area:
(Located on levels 43 & 76 of the Burj Khalifa)

Flowing lines style reminiscent of Art Nouveau connect the three areas shown here. The type of banister in the entrance hallway (bottom left) is used throughout the spa while the shape of the built in ceiling lights is mimicked by the ceiling in the pool room (top right) and the pergola-like sun shield on the spa terrace (top left). Even though the spaces are not exactly the same, aspects of the design like the repeated organic shape, chrome handrails, and gold tinted tile carry the concept throughout linking the design together. Each space is unique but still tied to the overall concept.

_How this is accomplished:_
- Consistency of select materials
- Consistent use of shape
- Slight difference in color or material defines different areas (grey tile vs. concrete, blue floor vs. blue pool tile)
- Shapes reinterpreted (Light fixture in hallway is like the pergola on the terrace whose wood detail imitates the ceiling in the pool room.)
The fluid and organic shapes used in the lobby areas is juxtaposed and accented with more geometric features such as the industrial looking façade (far left), and the interesting lines in one of the residential hallways (left).

This provides a sense of order to the space that would otherwise be lacking. Perhaps it would always serve well to balance flowing natural shapes with the 90 degree angles and linear elements.
Gallaudet University is the world leader in liberal education and career development for deaf and hard of hearing students. Part of the reason that Gallaudet has maintained this international reputation is how accommodating and beautiful the campus is to the deaf and hard of hearing. Gallaudet has an extensive amount of research dedicate to creating creative solutions to problems posed by the limited sensory input of their students. For someone without hearing, a dimension of the world that we know is inaccessible. Because of alternate methods deliberately utilized someone with auditory impairment can still experience a space fully.

Through study of Gallaudet University I have identified relevant and useful information that could translate easily to the HARMONIQUE Health and Spa facility; this is outlined in the pages below.
While many of Gallaudet's buildings are massive and inward looking, this new structure is almost transparent. Inside, gentle angles at corners make it easier for deaf people to move through the building. A rethinking of most traditional lighting and audio systems led to the use of special features to facilitate communication: diffused lighting that is not glaring, powerful speaker systems to encourage reverberation, and open flexible classrooms with good visual access. The finished center features long, open sight lines, visibility between floors, gently curving corners, and ample windows.” (SmithGroup JJR)

The top three photos are a good visual demonstration of the extensive windows on the façade of the Sorenson building. Having such an open curtain wall is sometimes detrimental because it is harder to control, but with high performance glazing as well as architectural techniques such a cantilevered roof Smith Group has made it an efficient and functional aspect of the building.
DeafSpace Concepts 3, 4 & 5: Mobility and Proximity, Acoustics, & Space and Proximity

Stairway and Small Lounge Area:

- Chairs that move easily are a necessity so that signing groups can rearrange furniture as necessary.
- Space is filled with bright diffused natural and artificial light.
- Glass panel on stairway gives a clear sight line to the lounge going up or down the steps.
- Linear light fixtures repeated on stair wall and ceiling, providing a good continuation of concept from space to space.

Entrance and Lobby seen from the Second Floor:

The large windows unseen to the right of this picture bathe the lobby area in natural light. This large open space creates an optimal gathering space and with other spaces branching off it allows for easy way-finding and eliminates safety problems that are caused by navigating through small spaces while signing.

(Left) Social Area:

This proposed design solution for one of the dormitories provides clear sight lines through spaces via translucent materials and finishes.

This allows for better space, mobility, communication, and proximity for students. It also helps to regulate acoustics throughout the space.
These three pictures are different viewpoints of the same space. This space is one of the focal points of both the facility and the design itself. Through research and application of DeafSpace principles SmithGroup JJR has created a space which is optimal for large groups, classes, meetings to take place, more so if the groups are signing. The shape of this unique and beautiful amphitheater is conducive to seeing and being seen, for anyone in the circle not just standing on the podium integrated staircase. A neutral color used on the surrounding walls provides a backdrop for signing that I not distracting. A huge problem for the deaf in schools is communication. This solution makes that easy in a highly innovative way.

Because of it smooth curved edges this amphitheater does not cause any kind of safety hazard.

Bibliography


College-bound students know Gallaudet University is the place to see and be seen. After all, the Washington, D.C.-based institution was founded to serve deaf and hearing-impaired students who learn and communicate visually.

Not only does Gallaudet embrace technology that enhances visual learning, it promotes communication through American Sign Language to help students and faculty hear and speak with their hands, facial expressions and body language.

When university officials decided to construct the new Sorenson Language and Communications Center, they recognized the importance of focusing on the institution’s unique visual-centric requirements.

“For the first time in its history, Gallaudet convened a group of deaf and hearing individuals to lay the groundwork and develop a vision for the facility,” says Becky Hill, Heery International project manager. “Not only were we establishing brick and mortar goals but philosophical ones as well.”

Following the visioning session, Architect Hansel Bauman, of Hansel Bauman Architects + Planners, created and led a two-day deaf space workshop. The goal was once again to bring together a diverse group of students, faculty and administrators, along with Heery and John Dickinson, a deaf architect, to determine what a deaf space meant.

“Deaf people rely on windows versus walls to communicate,” says MJ Bienvenu, Gallaudet ASL and Deaf Studies associate professor. “Other campus buildings have barriers and columns that are hard to see through. They make communication difficult.
“We wanted to make communicating in this building easier, as well as create a collaborative environment for departments such as Assistive Technologies and ASL that hadn’t typically worked together before.”

Gallaudet strived to bring nature into the design, and create a facility that would earn LEED certification and serve as a role model for future facilities.

Laying the groundwork for the facility, however, proved more challenging than initially imagined.

“When we began the design phase, we initially relied on a geotech investigation from the neighboring building,” Hill says. “When we commissioned a study of the specific site, we realized those assumptions were incorrect. The site, which probably housed a waste dump in the past, had soil challenges. After a great deal of analysis that included costs and schedule, we scrapped the idea of using caissons, and instead specified auger cast piles.”

While the change in materials meant adapting the steel design, it facilitated the reduction of vibrations into the building, which pleased deaf and hearing-impaired users.

From the outset, the design and construction team recognized how important it was to focus on client communication.

“I took a signing class early on to learn some basics,” Hill says. “As a group, we spent a great deal of time making our presentations more visual so the content could be more easily understood by our deaf or hard-of-hearing clients.”

The group sent materials to interpreters ahead of time to give them an opportunity to learn to finger-spell certain construction terms that have no formal signs. Hill says the team also had to establish safety standards for deaf subcontractors who were involved with the project. With an understanding of deaf culture, SmithGroup crafted a floor-plan that encourages interaction through the location of formal and informal spaces set along natural paths.

“To fully understand the design, it’s vital to understand how Gallaudet students and faculty use the facility,” says Lori Cappuccio, project designer with SmithGroup. “In spending time there, you can see how conversations happen across the atrium or from the balconies above.”

Once inside the 87,700-square-foot facility, it’s easy to spot the visual-centric elements. Daylight flows freely from ample banks of windows. The glass-lined balconies allow users to communicate unimpeded by obstacles. Even the rear wall of the elevator is paneled in glass to allow for easy conversations.

“Almost every space in this building has access to natural light,” says SmithGroup Architect Greg Mella.

Even more important than the quantity of light flowing into the facility is the quality of light flowing into the facility. “Because deaf people use their hands, facial expressions and body language to communicate, the design and construction team had to be sensitive to the issue of glare,” Hill says.

The sun coming from the west was hardest to control, leading SmithGroup to design deep porches and specify a silk-screen ceramic-dot pattern for the low-E glass from the third floor to the ceiling. Energy costs could have also been hard to control given the intense sunlight flowing into the building. “Careful massing allows a portion of the building to shade itself,” says Cindy Cogil, SmithGroup’s mechanical engineer.

A gently curved balcony and overhangs on the classroom wing provide subtle but effective solar shading. Another common LEED point made more complex by the building’s end users was the specification of concrete for the sidewalks. “We had to replace the original white concrete sidewalks with a different color concrete to minimize glare,” Hill adds. “It took the deaf consulting architect several weeks to decide on the most appropriate color.”
Ceiling tiles also required the team to pay close attention to its end users. “We selected ceiling tiles, not only for their recycled value, but for their reflective benefits,” Mella says. “The lights hanging from the ceiling here wash upward rather than facing down where they might create shadows on hands.”

SmithGroup paid close attention to lighting because of how brightness is perceived. “We took advantage of a variety of direct and indirect light sources,” Cogil says. “Our goal was to promote energy efficiency and uniformity through the specification of materials such as T-5 light sources while increasing the perceived level of brightness through strategic placement.”

The team was also challenged with minimizing building vibrations that could disturb and distract students. “While we knew we were going to install efficient mechanical systems, which would earn a LEED credit, the question was where to place them,” Hill says. “Even though it’s more expensive space, we chose the basement to maximize occupant comfort.”

The team also incorporated an economizer cycle into the air handling system to bring in more outside air during cooler times of the year. Aesthetic details at the facility are not only sustainable, but they also lend a strong design sense. The glass elevators, for example, are sheathed in bamboo paneling, lending a soft natural feel. “Bamboo is a great green material because it is rapidly renewable,” Mella says.

SmithGroup’s judicious use of three-form color resin panels reference the stained glass scattered throughout the campus. “They’re made from 40 percent recycled PET, a plastic derived from post-consumer waste like plastic Coke bottles,” Mella says. The design team selected a different colored resin for each of the three floors to represent earth, sky and water. The colored panels also simplify way-finding.

Zinc cladding, applied to the exterior, will patina with age and offer another stained glass reference. “What I love about zinc is that it’s highly recyclable and is a material that will look even better five years after installation,” Mella says.

Of course, the zinc installation was not without its challenges. “Because zinc isn’t widely used yet in this country, it was difficult to find professionals who could define the details and install it to meet the schedule,” Hill says.

Administrators, faculty and students believe the design and construction team’s added efforts will pay dividends such as attracting and retaining top instructors, researchers and students.

“It’s important to have a building that recognizes the needs of its students,” Bienvenu says. “I get very excited when I walk in.”

Gallaudet President Robert Davila agrees.

“The Sorenson Language and Communication Center sets the standard for all future construction on our campus,” he says. “This may be the first deliberately designed deaf space in the world, but I assure you, it is not the last.”

(Wasserman, Gallaudet Eyes the Future with Visual Design, 2008)
March 27, 2008

**Designing a City for the Deaf**

By: Kim A. O’Connel

Most cities aren’t designed for deaf people. Sidewalks are frequently too narrow or too crowded for deaf persons engaged in a conversation that requires so-called “signing space.” Public benches are often set in rows or squares, limiting the ability of the deaf to create the “conversation circles” and open sight lines that they require. Urban landscapes are so visually stimulating that they hinder communication among people who rely on visual cues. And light fixtures may be too dim or shine directly into signers’ eyes.

These things don’t just make a deaf person’s life more challenging; they can make it dangerous. In January, three deaf people were struck by a vehicle and seriously injured in Olathe, Kansas*, as they left a deaf cultural event. The same thing happened to a deaf man last year in Sacramento.

In 2009, Deaf411, a public relations firm serving the deaf community, released a report on Deaf-Friendly Cities in the U.S., saluting places like Washington, D.C., Chicago, Seattle, Raleigh, and Denver for their efforts to accommodate the deaf or hard of hearing. But for every city on the list, countless others—including San Francisco, St. Louis, Atlanta, and Philadelphia—did not make the cut.

Now Gallaudet University in Washington, D.C., the nation’s leading institution for the deaf and hard of hearing, has produced a set of so-called DeafSpace Guidelines that address those aspects of the urban environment that inhibit communication and mobility among those who communicate with their hands. In doing so, architects and design researchers have used technology to gather information on how deaf people use public spaces and modify them to meet

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*Reference Article (O’Connel, Designing a City for the Deaf, 2008)
their needs. Campus officials say that the guidelines have already begun a dialogue that they hope will have an impact on urban development nationwide.

“The clarity with which a deaf person communicates relates to the clarity and clutter of what’s around them,” says Hansel Bauman, director of campus design and planning at Gallaudet, who led the multiyear effort to create the DeafSpace Guidelines. “Space becomes an essential part of how you communicate.”

Through a series of university courses, Bauman worked with Gallaudet faculty, students, staff, and others to research and codify how deaf and hard of hearing people use public spaces. The resulting document details five major elements involved in deaf interactions with the built environment, including space and proxemics (the study of how space is used in interpersonal communication), sensory reach, mobility and proximity, light and color, and acoustics and electromagnetic interferences. In one experiment, the design team analyzed footage from video cameras to determine how students were using a campus dining hall. They soon realized that the chairs in the facility ought to be lighter, so that students could move them around easily to create conversation circles, as well as armless, to allow people ample elbow room for signing.

“We are codifying ideas that have existed for centuries,” Bauman says. “Even when deaf people are renting an apartment, they may take the bold act of knocking down a wall, because having that clarity of vision is so critically important. We’re building on an age-old sensibility that is deeply embedded in deaf culture.”

Gallaudet has already applied the DeafSpace Guidelines to new buildings on campus, including the Sorenson Language and Communication Center, designed by SmithGroup, a D.C.-based architecture firm, which features long, open sight lines, visibility between floors, gently curving corners, and ample windows. A new residence hall on campus is now under way using similar principles.

The DeafSpace Guidelines are also in use at five existing residence halls. Working closely with campus faculty and students, Studio Twenty Seven Architecture, another D.C.-based firm, is now designing a complete renovation of the buildings using DeafSpace principles. The process will improve visual connections within the buildings and with the campus at large, through new window openings and circulation patterns, according to the firm.

The Studio Twenty Seven team used extensive computer modeling to communicate their ideas with staff and students. They also used a 3D Tactile Braille program to allow blind students to understand the new spaces. Electronic drawings with variations in line heights and thicknesses help to differentiate interior and exterior walls, as well as doors and windows, according to Studio Twenty Seven Principal Todd Ray. The drawings were then loaded into a special resin 3D printer to create raised surface floor plans. Each Braille letter was three-dimensionally modeled as part of the document, since no AutoCad Braille font was available.
“If you look at the DeafSpace Guidelines, you realize that understanding the essence of space and making connections leads you toward really good architecture,” Ray says. “It’s the foundation of what makes architecture good and rich and sensual.”

The social implications of this work are profound, proponents say. “Imagine how we would design a public transportation system that is based on this one goal – to promote and support visual contact and interaction between people,” says Robert Sirvage, a Gallaudet design researcher and professor who helped to develop the DeafSpace Guidelines. “Consider the sociopolitical implications of designing the world in ways that compel people to look at each other eye-to-eye much more often. DeafSpace really is about bringing a new perspective to the meaning of good design.”