UNStudio

MERCEDES BENZ MUSEUM

A STUDY FROM CONCEPT TO DETAIL

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UNSTUDIO

PRINCIPALS
Ben van Berkel
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OVERVIEW
UNStudio, founded in 1988 by Ben van Berkel and Caroline Bos, is a Dutch architectural design studio specializing in architecture, urban development and infrastructural projects. The name, UNStudio, stands for United Network Studio referring to the collaborative nature of the practice.

UNStudio tackles a large variety of projects, from master planning new cities in China to designing single lounge chairs. What remains constant, however, is their commitment to collaboration, technology, and a unique design process. Each one of their projects seems to push the relations between program, structure, and architectural intent. In order to facilitate this kind of work, UNStudio relies heavily on computer modeling and diagramming. Their fixation on circulation and the way architecture changes in relation to time and use has also led them to pioneer animated 3D diagrams.

DESIGN MODELS
What makes UNStudio’s design process unique is the concept of design models. According to the firm’s founders, it made little sense to them to simply drift from project to project, starting with a blank sheet of paper each time. Instead, the firm developed design models. Design models are hybrid entities that are akin to a conceptual parti. They often center on circulation. One example would be a Center Courtyard Design Model. Imagine if UNStudio would have designed Rapson Hall. They would have started with the Center Courtyard Design Model. As the project progressed and they figured out the impact of a central courtyard on this type of project, this information stays attached to the Design Model. The next time a commission comes around asking for a project type that fosters community, centers on display space, and is full of natural light, they could then go back to the Center Courtyard Design Model and start with a wealth of information.
OVERVIEW
Mercedes Benz began in 1900 when a group of engineers came together to build a race car for a wealthy Austrian businessman. Upon receiving the car, he named it Mercedes after his daughter, and a legend was born. Over the last century, Mercedes Benz has cemented its status as a premier auto brand, constantly fusing performance with a deeply rooted design history.

In 1923, Mercedes Benz opened their first museum and it became central to their business strategy. By 2000, the aging museum admitted almost a half-million visitors a year, stretching its capacity to the limit. In 2001, the car company held a closed competition for the design of a new museum with a clear program - keep the car and our history in the forefront. UNStudio won the competition, completing its winning design in 2006.

CLIMATE
The Mercedes Benz Museum is located in Stuttgart, Germany. Stuttgart has a temperate climate that resembles a gentler version of Minnesota’s climate. The temperatures can hit summer extremes of 90F and winter extremes of 15F, but usually summers are warm with an average temperature of 70F and a winter temperatures hover around 40F. Precipitation is also similar to Minnesota, although the warmer winter temperatures mean that winter precipitation comes most often in the form of rain. Snow does fall, however, but accumulation usually never exceeds an inch or two.

SITE
The site lies next to the existing Diamler-Chrysler production plant in Stuttgart’s industrial north west. A highway runs directly to the south west of the site, putting the building on display as people drive by.
As the Mercedes Benz Museum program progressed, the idea began to take shape that the exhibits should be split into two groups, The Legend Tour and the Collections Tour. It was at this point that the selection of UNStudio as the architect had its greatest reward. UNStudio combined its interest in pushing the limits of circulation with Mercedes Benz’s program. The architects looked to a Double Helix Design Model, and began to envision a museum where the two paths constantly circled one another. As the design progressed, a final wrinkle was added by UNStudio - the Double Helix Design Model was augmented by a Trefoil Design, allowing the two paths to constantly converge and diverge as visitors circumambulated the exhibits. The end result was a geometry of a clover, with display spaces connected between two helical ascending ramps, around a central atrium.

Spaces dedicated to The Legend Tour are single height spaces that often face the central atrium to control light. These spaces concentrate on telling the history of Mercedes Benz. The Collections Tour, however, features double height spaces, natural light, and views to the outside to highlight the collections of cars they contain.

This convergence between program and architectural intent was the genesis of the project. It led to a dynamic museum experience where visitors enter on the ground floor, are taken up to the top floor by elevators in the atrium, and then continue down along the pathways as they follow a single exhibit’s helix or flip between the two. The design constantly juxtaposes a visitor’s foreground with open views to the rest of the museum, in effect placing each individual exhibit within the continuum of Mercedes Benz history.

The exterior is simply an aluminum and glass skin that wraps the structure and responds directly to its programmatic layout.
The double helix circulation program was at the crux of this project. It was also the most difficult part for us to wrap our heads around. We ended up creating two study models. The first breaks the circulation paths and shared display levels into simple component parts - circular platforms and linear blue ramps. This distilled the double helix concept down to a digestible form. Also, the single and double height spaces showed up in the model, lending clarity to the connection between the concept and the program.

The second model uses the building’s actual floor plates to recreate the interior circulation path. Ramps cut from one floor connect to the next, and it is possible to read circulation patterns. We also wanted to explore how these floor plates and this circulation path informed the exterior. The model accomplishes both tasks, albeit in a compressed manner. It is possible to see how the double helix translates to the exterior, and how each program’s lighting requirements (artificial for The Legend Tour and daylight for The Collections Tour) further informed where the ribbons of glazing appeared.

Finally, we began to hint at the structure of the building by modeling the angled structural columns that support the structure.
The museum's structural elements include the vertical cores, ramps, "twists," and four-legged steel columns.
The structure of the Mercedes Benz Museum is made up of three elements - a cast in place concrete core, cast in place concrete box girders, and exterior load bearing angled columns.

The core is made up of three cast in place concrete elements that circle the atrium, hold the elevators, and are permeated by mechanical and service space. These cores are the structural center of the building.

The curved box girders work in conjunction with the floor plates to span between the core and the exterior angled columns. These curved box girders are extremely complex and had to be engineered three dimensionally because of their loading and complex curvature.

The angled steel columns support the edges of the floor slab. The angles are not only structural; their shape also helps break the glazing that follows them into triangular pieces which can then follow the exterior curvatures.

The complexity enters the building when one realizes that almost every element bleeds into another. The architects worked hard to continue the concept of a double helix circulation path, and took it to the extent where walls curve into ceilings and floors, structural elements become finished surfaces, and architectural elements soon become difficult to distinguish from one another. The overall effect is that these elements recede into the background, allowing Mercedes, its cars, and its history to take center stage.
MEETING THE SKY - Exterior rhythm of cladding / fenestration just stops cleanly at the sky. No emphasis on parapet cap.

MEETING THE SKY - Interior circulation shaft terminates in light surrounding the Mercedes Benz symbol

MEETING THE GROUND - The exterior rhythm of cladding and fenestration stops at the street level, but the entrance is sunk to create an entry court and create the illusion that the building is spiraling up from the ground

CREATING A WALL - Sitecast concrete allows walls and slabs to bleed into each other. Folded plates are structural and also give the interior the duality of being fluid and massive at the same time

CREATING AN OPENING - Floor plates are supported by angled steel columns at the exterior. The glazing between columns provides openings. The shape of the openings directly follows the ramping floor plates and circulation areas. There is a strong contrast between the massive concrete and the thin linear steel openings

TURNING THE CORNER - Aluminum panels, angled columns, and glazing all make it possible to blend the distinction between corner and straight elevation, giving the exterior a continuous flow
MEETING THE GROUND (street level) - Angled load bearing perimeter steel columns straighten to vertical to denote opening where the building meets the ground

TURNING THE CORNER - The building is based around a double helix circulation path that ramps from top to bottom. The building constantly turns the corner, so the corner becomes the base condition

By sketching the 5 conditions, I was able to really dive into where and how the architecture blended its concept and the perceptual experience of a visitor.
The pink circles indicate where this corner detail occurs.
THE PROJECT

THE DETAIL

HOW THE BUILDING TURNS THE CORNER

In a building that constantly turns the corner, that really is one continuous corner, it was initially challenging to know where to focus in on a corner detail. However, as I looked further into the project, I became interested how the project was generated from the inside out. The concept began with the program, was wedded to a circulation system around a central core, and then the structural system was developed, and finally, the exterior facade became yet another manifestation of the central concept at the project’s farthest edges. I decided to focus on an exterior detail to show that the project’s concepts really do permeate the entire building.

The detail is taken from the facade at an area where it angles back before ultimately folding into the building as the bottom of another floor plate. I was interested in how the metal panel cladding system handles this condition from a water shedding perspective. Because the metal panels act as a rain screen for the concrete structure, I focused on how water was allowed into the metal panels but kept off of the structure.

UNStudio also wanted the exterior to have the appearance of plasticity, that it was once again formed by the complex circulation inside. Therefore, the metal panels had to meet each other in such a way that their seams were minimized and the overall effect was that of a smooth curve.

I built the detail like I assume construction workers actually built the real thing. I did this to focus special attention on how they tried to make the insulation and air barrier as continuous as possible around the metal panel’s attachment system.

The project has rigid insulation on the exterior of the concrete structure. At first this was puzzling, given the climate. However, I believe the insulation was put here because of the complex way exterior concrete structure folds back into the building. Insulating the interior side of the structure simply wasn’t an option. The most continuous face to insulate was the exterior side of the structure. To mitigate water from building up between the insulation and the structure due to temperature differences between the interior and exterior of the building, I believe that UNStudio installed an air barrier, NOT a water barrier over the rigid insulation. By combining this with waterproof exterior insulation and a metal panel rain screen with drainage opportunities in its cavity, the design meets its climactic conditions while continuing the expression of the project’s central concepts.

1) Steel angles are welded to steel plates cast in the concrete

2) Rigid insulation is installed between the steel angles

3) An air barrier is installed over the insulation, taking care to create a continuous surface

4) A secondary structure of steel I beams are welded onto the steel angles

5) The aluminum paneled rain screen is installed, attaching to the secondary steel structure