

# Getting the Green Light

BY TAMARA ALLEN, S.E.



An attractive, sustainable DMV near the California-Mexico border gives maximum exposure to structural steel.

Satoshi Asakawa-Zoom Inc.

**WHEN YOU THINK OF VISITING THE DEPARTMENT OF MOTOR VEHICLES**, it's difficult not to conjure up images of a dark, gloomy, uninspiring, oppressive waiting environment tempered with bureaucratic waste buried in inefficiency. So when the growing community of San Ysidro, Calif. was slated for an improved DMV Field Office, every attempt was made to break this stereotype.

This new DMV office is designed to alleviate overcrowding from the functionally deficient existing leased facility. Built on a 3.39-acre site, the new 14,656-sq.-foot facility provides a healthier, more enjoyable environment for both employees and customers. The state-of-the-art structure is one of the few buildings owned by the State of California that has been successful in obtaining the United States Green Building Council's (USGBC) LEED Gold Certification. The design incorporates sustainable features geared toward enhancing the user's experience while reducing the building's impact on the environment.

## Good-looking and Energy-efficient

Visually, the building is striking. This unique single-story structure is predominately framed with structural steel members placed in synergy with localized areas of masonry walls. Upon first arriving at the building, visitors are treated to dramatic sweeping steel roofs that seemingly float, with grand cantilevers providing shade and shelter for not only the entry to the structure, but also for the vehicle driving exam lanes.

A pair of 30-in.-deep structural steel girders extend from the building, creating an overhang of nearly 45 ft at the western entry. This impressive overhang endows the structure with an expansive shaded area, encouraging users to enjoy the outdoors while waiting. The 30-in. girders continue to the east to form a powerful cantilever of more than 32 ft, providing shelter at the drive aisle for motorists waiting to take their driving exam. A repetitive series of smaller secondary roof beams frame over the top of these massive girders, tailing out with varying lengths to form a gently curved roof edge, thereby softening the appearance

of the building at this primary face. Having such a large roof area in Southern California created an ideal location for placement of rooftop photovoltaic solar panels, which serve to compensate for the building's energy load and help the building exceed California Title 24 minimum energy requirements by 34%.

The exposed steel roof beams give character to the roofline. According to the architect, the intent of the long overhang at the drive aisle is to mimic the feel of a Pueblo cave, as the steel projects from the textured masonry block walls, which are designed to invoke the feel of the earth's strata. These masonry walls serve as visual, structural, and environmental anchors. Structurally, they are designed to provide gravity support as well as to serve as shear walls to resist the earthquake forces that play such an important part in building design in this seismically active region. Functionally, the masonry wall placement was chosen to minimize heat gain, as the walls will behave as a thermal mass, absorbing heat and naturally insulating the structure.

### Bringing it to Life

Structural steel was the ideal material choice for the primary framing. The structural engineer recognized that steel would be the best means to bring the architect's vision of an open, light-filled space to life, while still accommodating varied roof slopes and flexibility in the placement of braced frames for earthquake resistance throughout the structure. Steel's reputation for being a recycled material also helped in keeping with the design team's aspiration to minimize the environmental footprint of the building.

Architecturally, the choice to expose the structural steel roof framing at the exterior of the building continues to the interior as well, creating an open, airy feel to the public areas. Exposed steel is used as finish material as well, contributing to the building's aesthetics and also minimizing the waste and cost associated with added finishes. Clerestory windows inset between the high and low roofs over the lobby area allow natural light to filter into the room. To support the roofs at the clerestory windows, while also maximizing the window spacing, a large engineered structural steel truss was provided at this juncture. Extensive northern windows, including clerestory and skylight, maximize natural daylight.

These measures, along with efficient lighting and heating and cooling systems provide a comfortable environment. An impressive 98% of the regularly occupied spaces have outdoor views. Additionally, natural daylight is provided for 89% of the regularly occupied spaces.

Steel erection underway at the high roof. The roof framing was left exposed to the interior of the building.



Anney Rosenthal, RNT Architects

## Sustainable in San Ysidro

The new California Department of Motor Vehicles facility in San Ysidro received USGBC Gold LEED Certification through the following measures:

- 🌱 **Recycled materials:** At least 5% of the building's materials are recycled. The contractor recycled 60% of the construction waste (not to mention that structural steel is 95% recycled).
- 🌱 **Non-heat island roof:** The roofing material is Energy Star rated and is highly reflective.
- 🌱 **Solar panels:** Rooftop photovoltaic panels compensate for 9% of the building's energy load, helping to exceed the California Title 24 minimum requirements by 34% (40% by LEED standard).
- 🌱 **Energy efficiency:** A raised floor allows the building's displacement ventilation system to efficiently serve the open office work area through under-floor air distribution. Overhead and under-floor ducts act to distribute air to the public service area's diffuser units.
- 🌱 **Daylight and views:** Natural daylight is provided for 89% of the regularly occupied space. Skylights, clerestory, and northern windows maximize natural light. Outdoor views are achieved for 98% of the regularly occupied spaces.
- 🌱 **Thermal energy management:** To minimize heat gain, west- and south-facing windows are tinted and concrete masonry acts as a thermal mass.
- 🌱 **Air quality:** All paints, sealants, adhesive, and carpeting contain minimally volatile, organic compounds. Floor grates are installed at major entrances to trap outside dirt. These measures help to maintain a high quality of indoor air.
- 🌱 **Storm water drainage filters:** All catch basins contain filters to trap harmful particles, keeping them from entering the public waterways.
- 🌱 **Highly efficient irrigation and landscaping:** Water use is reduced by 68% through an efficient irrigation system and drought-resistant planting with low water-use plants.
- 🌱 **Crash buffers:** Landscaped traffic barrier walls surround the building and define the edge of the facility, protecting the building and its occupants from inexperienced drivers.
- 🌱 **Reduced water use:** Efficient plumbing fixtures reduce typical water use by 41%.



Daniel Komtved, SDSE Structural Engineers

Interior of the San Ysidro DMV.

### Different Dimensions

While not immediately evident from the exterior of the building, the building's footprint is such that the layout is dimensionally quite complex, with very few 90° corners and angles at walls. These plan irregularities, combined with the complex sloping curved roof system, drove the need to preserve dimensional stability as the project transitioned from the schematic model stage through design and into construction. To address this need, three-dimensional modeling was used during design by the structural engineering team, as well as during fabrication by the structural steel fabricator and erector.

Bentley Ram software was used during the design phase, allowing for simplification of the framing layout and design, as well as helping with the economy of the design for both lateral and gravity analysis. To create the structural steel shop drawings, the steel detailer used SDS2. Employing 3D modeling for design and detailing was critical to fabricating and erecting this dimensionally intricate building with little error.

San Ysidro's new DMV facility is a leading example of a "healthy building." The energy-efficient structure combines the beauty of exposed building materials with the comfort of a clean environment.

MSC

*Tamara Allen is a principal with Stedman and Dyson Structural Engineers (SDSE) in San Diego.*

### Owner

State of California, Department of General Services  
Department of Motor Vehicles, Sacramento

### Architect

Roesling Nakamura Terada Architects, Inc., San Diego

### Structural Engineer

Stedman and Dyson Structural Engineers, San Diego

### General Contractor

Cox Construction Company, Vista, Calif.

### Steel Fabricator and Erector

Aero Steel, San Diego (AISC Member)

### Structural Steel Detailing

AirCAD, Inc., San Diego (AISC Member)