PROJECT PROFILE:

Camp Pendleton Naval Hospital
San Diego, California

Challenge

The Naval Hospital Replacement Project at Camp Pendleton, the largest military training facility on the West Coast, is a 500,000-square-foot, five-story hospital funded by the American Recovery and Reinvestment Act. This is the largest ARRA project awarded by the Department of Navy. The facility will accommodate inpatient medical facilities with 54 patient rooms and up to 60 beds, ancillary departments, emergency care, primary care, specialty care clinics, support spaces and facilities for non-ambulatory patients who require stays in excess of 24 hours. The project also includes a 1,500-space, multi-level parking structure.

The original hospital built between 1969 and 1974 with 600 beds had become functionally obsolete. Military medical practices had shifted over the years to an emphasis on outpatient care treating an average of 1,850 patients daily by 2,100 staff personnel. Being a medical facility, control of air and moisture infiltration to prevent environments prone to mold and mildew and protect fragile immune systems was imperative.

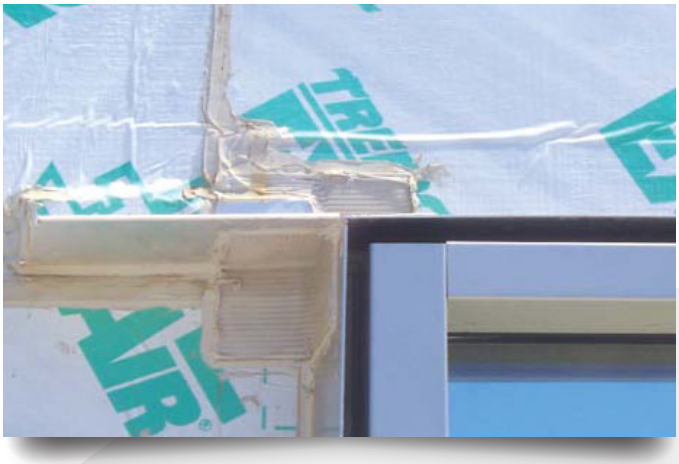
The new state-of-the- art facility also needed to be in tune with California's seismic safety standards, which were adopted following the 1994 Northridge earthquake that caused 23 hospitals to suspect all or part of their services in the wake of $3 billion in damages. The military does not have to comply with state standards, but patient vulnerability dictated design and construction standards that would ensure protection.

With a portfolio totaling 2.2 billion square feet of space in 300,000 buildings, the Department of Defense is strongly committed to enhancing sustainability, making energy efficiency a critical initiative in the design of the new facility. Plans include LEED Gold certification.

TREMCO

Project Architect
HKS Architects, Inc., Los Angeles
Master Architect:
HDR, Inc., San Diego
Joint Venture Design-Build Team:
Clark McCarthy a Joint Venture
Glass and Glazing Contractor:
Tower Glass, San Diego
Roofing Contractor:
Letner/Bishop
Waterproofing Contractor:
Courtney
Tremco Products/Solution:
• **ExoAir® 110 Self-Adhered Air & Vapor Barrier** • **Proglaze® ETA Engineered Transition Assembly** • **Spectrem® 1 Silicone Sealant** • **TREMproof® 6100 Hot Rubberized Asphalt Waterproofing Membrane (green roof) with PowerPly and TREMDrain™** • **Vulkem® Waterproofing System**

Camp Pendleton Naval Hospital



▲ Where the window was set from the plane of the ExoAir 110 Air & Vapor Barrier weather-barrier surface, a silicone "boot" was formed using Tremco's Proglaze ETA 3-D Molded Corners connected to ribbed silicone extrusions and the air barrier with Spectrem 1 Silicone Sealant.

▲ The only solution able to accommodate such movement and still retain the airtight environment required was Tremco's Proglaze® ETA Engineered Transition Assembly.

Solution

With aggressive energy initiatives, seismic conditions and ultimate sustainability goals, the design and construction teams were looking for a level of commitment that could prove all participants in the construction process could not only meet government specifications, but that would demonstrate performance throughout required warranties and beyond. Manufacturers had to be willing to be involved at the outset, signing off on the application for their products and its requirements and remain involved throughout installation. Products selected were required to have documented tested performance not only in the manufacturer's own testing environment, but during mockup testing.

In order to meet energy requirements, continuity throughout the building environment was essential to achieve a truly "tight system." "While it is our desire to use small business in our subcontractor selection," states Craig Winters, QC Superintendent on the Clark/McCarthy Joint Venture on the Camp Pendleton Replacement Naval Hospital, "it is a great benefit for a complete product assembly to be provided by a sole source. It simplifies the procurement process and management of the system. It also provides accountability and the expertise that comes with it as well as a system warranty. If you provide more scope to a manufacturer and have a problem or a question, you only have to go to one source for assistance. There is less confusion, less ambiguity and you avoid overlap of products or solutions."

Built to Withstand Seismic Conditions and Remain Airtight

Most products or systems available today could not meet the air infiltration requirements specified for this project. In past seismic events, columns and beams had had damage so the design of this facility was beefed up to allow movement to occur in three dimensions. Deflection joints were incorporated into the design allowing pronounced up and down and in and out movements at corners as well as across the head of the windows positioned under the deflection joints. Self-adhered flashing materials and metal flashing assemblies would not have been viable. The facility design incorporated a rainscreen system. Tremco's ExoAir® 110 Self-Adhered Air & Vapor Barrier Membrane was selected for use on the wall. With a stand-off out to the exterior system of stone, terra cotta and metal panels, the air barrier membrane had to be self-gasketing around fasteners. The "pop out" windows created a 90 degree angle from the wall. The ExoAir 110 was wrapped into the opening at each floor at the top of the windows. A 3/4" deflection joint was positioned over the head of each window opening to accommodate a 3/8" movement at each floor level.

Proglaze ETA ribbed silicone extrusions were connected around each opening using 3-dimensional molded corners with Spectrem® 1 Silicone Sealant forming a silicone "boot" where the window is set forward from the plane of the weather-barrier surface. A filet bead of Spectrem 1 was placed on the outside of the windows at the corners. The Proglaze ETA extrusions are adhered to the air barrier membrane with Spectrem 1, providing clear proof through the translucent, ribbed sheet of a secure bond and durable connection across the seismic drift joints.

To ensure performance of this design, a mockup was built 50 ft in length and 30 ft tall. Rigorous testing was then conducted to determine air leakage under dynamic pressure conditions and its ability to withstand structural wind loads. A series of ten tests were conducted with racking. The mockup was also tested in accordance with ASTM E331 – Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors and Curtain Walls by Uniform Static Air Pressure Difference at 720 Pa (15 psf) Pressure. The mockup passed all tests.

▲ A 30 ft tall mockup was built and submitted to a series of ten tests to determine air leakage under dynamic pressure conditions, ability to withstand structural wind loads, racking and wind-driven rain.

▲ The ExoAir 110 Self-Adhered Air & Vapor Barrier Membrane is carried over the parapet and the ExoAir HTF is applied over it to connect them, providing continuity from the roof to wall.

Continuity at Roof-Wall

To contribute to efforts to reduce energy consumption at the new replacement hospital, a vegetative roof is included in the hospital design. The roof to wall joints, though, are some of the most challenging to seal in order to provide continuity throughout the building envelope. Connections must be compatible and sequenced appropriately to withstand maximum wind loads, building movement due to thermal, seismic, moisture content changes and creep.

Air finds any way it can to travel through a building. Joints must be able to support the same air pressures as the air barrier material without displacement. Uncontrolled air pressure across the building envelope and within the building itself can cause infiltration and exfiltration that overpower HVAC systems and can result in occupant discomfort as well as poor indoor air quality.

To provide the compatible continuity required on the replacement hospital, Tremco's TREMproof® 6100 Hot Rubberized Asphalt with PowerPly modified bitumen membrane heavy-duty protection course and TREMDrain drainage board used on the roof deck was tied into the parapet wall with ExoAir HTF High Heat Membrane, which would lap over the membrane and be protected with a metal flashing. Thorough testing was also conducted on the roofing systems to ensure watertight integrity and performance.

Ensuring Flexibility and Durability of Parking Structures

A 1500-space, multi-level parking structure is also part of the project and is connected by a bridge to the hospital. Tremco's Vulkem® low-odor, low-VOC deck coating system is being used on the two top decks due to its tenacious adhesion to concrete surfaces and its ability to retain its integrity even if substrate movement causes hairline cracks. The tough-curing polyurethane system has outstanding elongation and recovery to expand and contract with substrates, providing outstanding protection against automotive oils and fluids leaking through cracks onto lower decks.

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The Pursuit of Energy Performance

"Energy initiatives are hard to achieve," noted Winters. The government/owner, NAVFAC, was also obviously interested in aesthetics of the finish exterior and this had to be incorporated into the flashing decisions. The design and QC teams vetted many options and agreed upon an 1/8" thick extruded aluminum straight flashing that performed perfectly with the Tremco products.

On every project, the key to a successful outcome is delivering on performance. Fixes after the fact are no longer tested solutions. If it isn't integrated, coordinated design with proven solutions at connections throughout the enclosure from the start, chances are there will be problems in time. Tremco Commercial Sealants & Waterproofing demonstrates its commitment to optimizing project outcomes with wall assemblies and building enclosure solutions tested at its own **Sustainable Building Solutions Test Facility,** a Building Envelope Solutions Team dedicated to working with all those in the design and construction team on selection and design of appropriate solutions, defining continuity and detailing transitions, coordination and sequence of installation, and on-site assistance.

"It is extremely hard to achieve impenetrability or meet air and moisture vapor infiltration requirements. There was much discussion regarding flashing systems that could be used, but they would not meet these infiltration requirements. Lab testing conducted by suppliers is very important in the selection process, but we will still test them to validate the performance required. We want **proven** performance."

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