

# Stainless steel fish scale façade

Molybdenum-containing ferritic stainless steel plays an important role in sustainable construction at the new headquarters of the U. S. Army Corps of Engineers in Seattle, Washington. The material was utilized in the innovative façade, which helped the building win many awards for its cost- and energy-saving features.

One of the U. S. Government's responses to the world's recent economic crisis was the 2009 American Recovery and Reinvestment Act (ARRA), which injected billions of dollars into the U.S. economy. Much of this money was directed to build a more energy-efficient and sustainable infrastructure. The U.S. Army Corps of Engineers (USACE) was one beneficiary of this program. The Corps needed a new headquarters with more space to serve the ever-expanding requirements of the Northwest United States. The new Federal Center South building, constructed with ARRA funding, is an example of the U.S. General Services Administration's (GSA's) Design Excellence Program. The new 19,400 m<sup>2</sup> building occupies a waterfront site in Seattle, WA, on the tidal Duwamish River. Sellen Construction and ZGF Architects LLC delivered it in 2012 as a GSA design-build project.

## The building

GSA made sustainability a primary requirement in the construction and operation of the building, targeting Leadership in Energy & Environmental Design (LEED) Gold certification. Specifically, the team designed a building that would obtain an Energy Use Intensity (EUI) of 230 MJ/m<sup>2</sup>/year or less<sup>1</sup>, use 100% filtered outside air, achieve a minimum Energy Star score of 97, and obtain energy performance 30% better than specified in ASHRAE<sup>2</sup> 90.1 2007. These criteria put the building in the top 1% of energy-efficient office

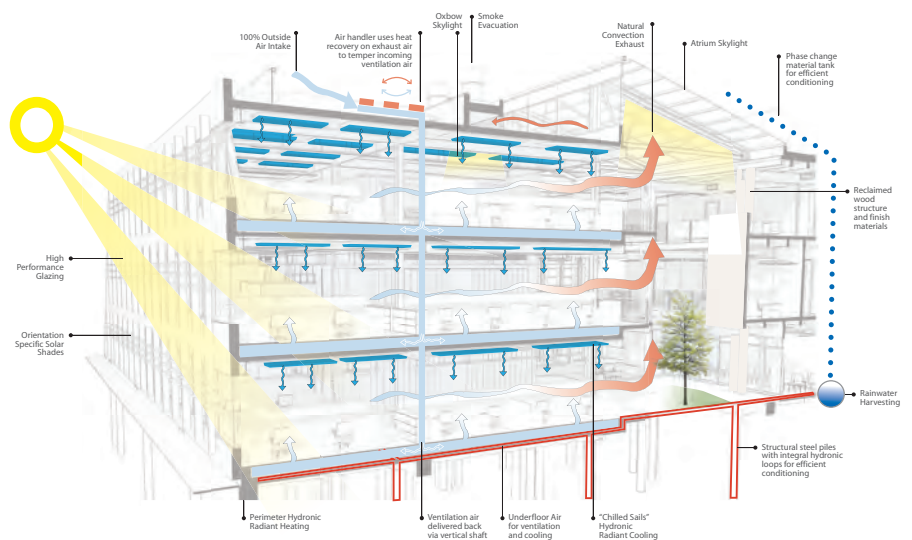
buildings in the U.S. without sacrificing comfort, amenities, or design innovation.

The oxbow-shaped design provides an ideal workplace environment for the USACE, emblematic of their mission of "Building Strong". The diagrid structural frame extending around the building perimeter meets the GSA's security requirements for progressive collapse, ensuring that the building will remain intact should one of the column elements be compromised. This is a very important consideration in the earthquake-prone Northwest. The exterior stainless steel shingle cladding also emphasizes "Building Strong" through the reflective power of the shiny silver skin of the building.

## Materials of construction

Material reuse, long-term maintenance, and life-cycle cost were three important material selection criteria. The site's corrosive location along a salty waterway and adjacent to a cement plant, was an important additional consideration for the exterior cladding system.

Ferritic Type 444 stainless steel containing 2% molybdenum was selected for the façade. Due to its molybdenum content, Type 444 has better corrosion resistance in the demanding environment than the lower cost Type 304 stainless steel. Its corrosion resistance is similar to that of the better known, but more costly, Type 316 which also contains 2% molybdenum. ➤



Building section showing sustainable systems and integrated strategies.  
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1 Average EUI for an office building in Seattle is 680 MJ/m<sup>2</sup>/year, according to the report "Seattle 2011/2012 Building Energy Benchmarking Analysis".  
2 ASHRAE, founded in 1894, is a building technology society with more than 54,000 members worldwide.



The stainless steel shingles on the façade shimmer in many shades like fish scales. © Benjamin Benschneider/OTTO

An additional factor in selecting Type 444 was its ability to be readily colored electrochemically to the pewter color required by the architect. Also, Type 444 can be brake formed into a variety of parts for siding and cladding, but requires a more generous bend radius than Type 316.

### **Stainless cladding design details**

In order to support his vision of a nautical theme, the architect helped Millennium Tiles of Elkhorn, WI redesign one of their standard tiles (shingles) into something that looked like a fish scale. The electrochemically colored stainless steel mimics fish scales by varying the reflectivity of the tiles. Being next to a brackish tributary of the Puget Sound, the tiles capture the theme perfectly. Vertical and horizontal sun-shading elements create an additional layer of texture to the façade and provide a relatable human scale to the building. Woods from the Northwest are used liberally in public interior areas;

they blend very well with the exterior stainless steel façade.

### **Average costs but better sustainability result**

Owners, developers and architects sometimes dismiss stainless steel cladding because they think it too expensive. However, according to the GSA, the Federal Center South building was constructed for \$2,900/m<sup>2</sup>, which includes the warehouse demolition and the build-out, and is about average for prime office space in the region. This is all the more remarkable when the building's high performance is considered. The requirement for a building with a 50-year minimum lifespan and mechanical equipment that lasts at least 20 years inspired and drove the design process. Because GSA is a long-term property owner, payback calculations have a longer timeline than for a conventional office building. This allowed the design to

include a broader range of sustainability enhancing systems.

Building energy use intensity turned out to be only about 170 MJ/m<sup>2</sup>/year and the resulting energy performance is 40% better than that of an ASHRAE standard building. Carbon dioxide emissions are expected to be lower than the standard by a similar amount. To add to its impressive credentials, its energy bill should be approximately \$200,000/year less than comparable new office buildings.

Federal Center South Building 1202 has won many awards, including the Engineering News-Record Best Project award: 2013, ENR Best Projects: Government/Public Buildings. The awards are a testament to the success of the building, which now provides a productive, green and light-filled workspace for the Corps of Engineers, cost savings for the American taxpayer, and a more sustainable future for all. (Tim Weyand)