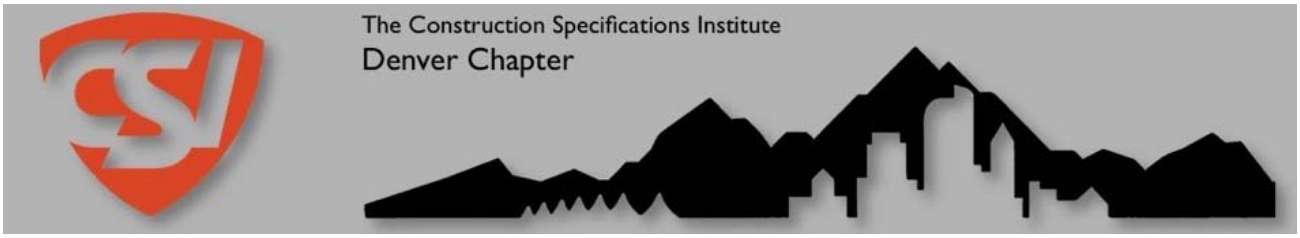

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COR-TEN and Other Weathering Steel Alloys in Architectural Applications

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by Liz O'Sullivan

Weathering Steel in Architectural Applications: The Problems

COR-TEN and other weathering steel alloys are popular among architects for their rusty appearance, which is caused by the actual rusting of the metal. Once the rusting starts, the metal begins to turn orange, and over time can become a dark brownish color. On thick weathering steel panels, this corrosion can act as a protective layer that prevents further corrosion. Weathered weathering steel can be aesthetically pleasing, yet the same corrosion which causes the rust can actually perforate thin-gage weathering steel sheets. Typically, with thick panels of weathering steel, corrosion eventually stops before perforation of the panels occurs. But with thin-gage sheets, corrosion may not stop before eating all the way through the panel.

According to U.S. Steel, the manufacturer of COR-TEN, "*COR-TEN steel sheet products should not be sold when the intended use is for an architectural application, such as roofing and siding. U.S. Steel has consistently maintained this position because of the risk of corrosion from factors beyond the control of the COR-TEN steel licensee (e.g. improper design, fabrication, erection and/or maintenance).*"[1]

If steel is to be used as the weather protection portion of an exterior wall assembly, the 2009 International Building Code (IBC) requires the use of "*approved corrosion-resistant steel.*"[2] (*Approved* is defined as "*Acceptable to the code official or authority having jurisdiction.*"[3]) The 2009 IBC requires that "*The materials used for metal-sheet roof coverings shall be naturally corrosion resistant or provided with corrosion resistance...*"[4] Essentially, the IBC prohibits steel that corrodes from being used as part of the building enclosure, unless the authority having jurisdiction approves the specific metal for the specific project.

Some distributors of weathering steel require a purchaser to sign a form that explains that the purchaser disclaims implied warranties of merchantability and implied warranties of fitness for a particular purpose, and all other warranties, express or implied.[5] Insurers may exclude rusty walls and roofs from insurance policies on buildings that do get built with weathering steel making up part of the building enclosure. Basically, there is no warranty, and there may be no insurance coverage, on weathering steel.

Water that has been exposed to weathering steel is likely to stain surfaces it subsequently touches. Rusty water from rain that touches weathering steel is likely to turn adjacent components of buildings or sidewalks an orange color. Rust can rub off of wet and dry weathering steel panels, and can stain the hands and clothes of passers-by.

Weathering Steel in Architectural Applications: The Solutions

A building enclosure (or exterior wall envelope, as IBC calls it) should be composed of a rain control layer, an air control layer, and a thermal control layer. Depending on your climate, you may also need an exterior vapor control layer.[6] Rusty metal should not make up any of these layers. Corrosion-resistant metal panel veneers often make up the vertical rain control layers on buildings, but when using weathering steel, it is not advisable to use the metal as the rain control layer, since the weathering steel might become compromised by perforations from the corrosion process.

The proper way to use weathering steel in an exterior wall application is in a rainscreen assembly. In a rainscreen assembly, materials other than the exterior cladding make up the rain control layer, air control layer, and thermal control layer. The exterior cladding is set off at a distance from the other layers, with airspace between the cladding and the rain control layer, which allows water to get in behind the cladding, and to drain out. The rain control layer should be permanently UV resistant, not just in open joint cladding applications, but in all rainscreens incorporating weathering steel, in case the cladding is perforated by corrosion.

Roofing presents a bigger challenge. A rainscreen type of system may be able to be designed and detailed, with the actual roof below a false weathering steel roof. But, because of the absence of a known developed assembly for a rainscreen for roofs, a substitution for weathering steel should be considered. U.S. Steel manufactures a prefinished sheet metal product that has an appearance similar to weathered COR-TEN (from a distance). This product is COR-TEN AZP Prepainted Steel Sheet.[7]

To control rusty stains on adjacent surfaces, drainage should be carefully detailed to control rainwater that has touched weathering steel, so that runoff is

directed to areas where it will not stain parts of the building or sidewalk. Passers-by should be protected from from weathering steel exposure by keeping weathering steel elements away from pedestrian paths of travel.

In summary, weathering steel rainscreens and false roofs should be detailed as decorative element, not as part of the building enclosure. Runoff from weathering steel must be managed. Owners should be informed that their insurance policies may not cover these decorative elements.

Notes:

1. See U.S. Steel's **website**.
2. 2009 International Building Code, Chapter 14, "Exterior Walls," Sections 1402 "Definitions," 1403 "Performance Requirements," 1404 "Materials," and 1405 "Installation of Wall Coverings."
3. 2009 International Building Code, Chapter 2 "Definitions," Section 202 "Definitions."
4. 2009 International Building Code, Chapter 15 "Roof Assemblies and Rooftop Structures," Section 1507 "Requirements for Roof Coverings," Subparagraph 1507.4.3 "Material Standards."
5. According to common law, everything purchased in the United States has an implied warranty of merchantability or fitness for a particular purpose, except when a purchaser is explicitly informed that it doesn't.
6. For more information see this Building Science Corporation article on **The Perfect Wall**.
7. See this information on U.S. Steel's prefinished **COR-TEN AZP**.

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