CENTRIA
EXPERT ANALYSIS

Date: 9/4/19
Memo # EA-19-05
Issued By: Benjamin Sorek

Architectural Aesthetics & Performance: Intercept Modular Panel System

Overview

CENTRIA's Intercept™ modular metal panel system is fabricated to function as a back-ventilated, concealed-fastener rainscreen system. This multiple-component wall assembly is designed to discourage water accumulation along with preventing mold growth inside the building envelope. Without consideration of wind loads that may limit panel module, CENTRIA can manufacture Intercept panels ranging in sizes from 12.5" - 48" with panel lengths as large as 12' in some instances. Intercept panels are manufactured from a variety of natural metals: standard substrates CENTRIA offers include aluminum, zinc, high-chromium stainless steel, and copper. Intercept HLZ can be perforated with only an aluminum substrate in 75+ different custom patterns. Finally, Intercept panels can be employed for wall and soffit applications in various directions and depths.

The purpose of this document is to address the expectations in the metal exterior cladding marketplace related to the design, manufacturing and installation of Intercept to optimize panel aesthetics. First, this document will provide a performance summary and competitive analysis of CENTRIA's Intercept modular metal panel system: offering optimal, architectural cladding performance as a simple, constructible rainscreen solution. Second, the manufacturing process to fabricate Intercept Modular Metal Panels will be outlined, along with the various finish options CENTRIA offers. Finally, some of the natural phenomena will be discussed that regularly occur with single-skin, light-gauge metal panels, focusing specifically on "oil canning", and how to minimize these issues to ensure optimal panel aesthetics when installed. Furthermore, associated factors will also be examined that could prompt these phenomena, while defining reasonable expectations for acceptable panel flatness and aesthetics.

Intercept Performance Summary and Competitive Analysis

Meticulous and thorough engineering in conjunction with advanced manufacturing techniques deliver the premium Intercept rainscreen panel system. The structural capacity of the panel offers unprecedented performance across a wide variety of structural testing specifications. For instance, the Florida Building Code requires rigorous testing to simulate the high wind speeds from hurricanes or tropical storms. Using the results for the Florida Building Code as a baseline for comparison, the results from the testing procedure are summarized below (*Table 1*). An important point-of-difference from other rainscreen options is that Intercept does not require plywood back-up to pass large missile impact rating.

Allowable Module	Approved for Use in Florida (non-HVHZ)	Approved for Use in Florida (HVHZ)	Design Pressure (psf)	Impact Rating
34"	Y	Y	+/- 90	Large Missile

Table 1: Intercept Panel System Florida Product Approval Summary

- *Attachment to 16 GA metal studs spaced @ 16" o.c. with (2) fasteners/connection*

The structural performance of Intercept can be attributed to the proprietary interlocking joinery. In *Figure 1*, the horizontal Intercept panel joint illustrates an extremely strong structural interaction between the "hook-and-grab" panel track extrusion and the engagement leg of the adjacent panel. Typical panel joinery offered for other rainscreen cladding systems are comprised of the folded substrate: significantly differentiating the design of the Intercept Modular Panel joinery compared to alternative rainscreen products. CENTRIA utilizes a separate, thicker extruded piece of aluminum. This extruded piece provides unparalleled stiffness relative to other concealed-fastener panels available in the marketplace. The installation procedures for Intercept are cost-effective because incrementally reducing the installation time of the rainscreen directly reduces the project's labor costs. Additionally, lightweight rainscreen panels indirectly reduce the overall budget for a construction project. The Intercept panel system transfers small amounts of dead load to the structural framing. Regarding rainscreen system performance, the Intercept modular metal panel system adheres to the AAMA 508 test standard when required. Finally, Intercept panels are noncombustible and do not contribute to fuel loads associated with NFPA 285 compliance. The advantages from utilizing Intercept panels create cost-effective benefits while simultaneously augmenting the overall sustainability of a construction project.

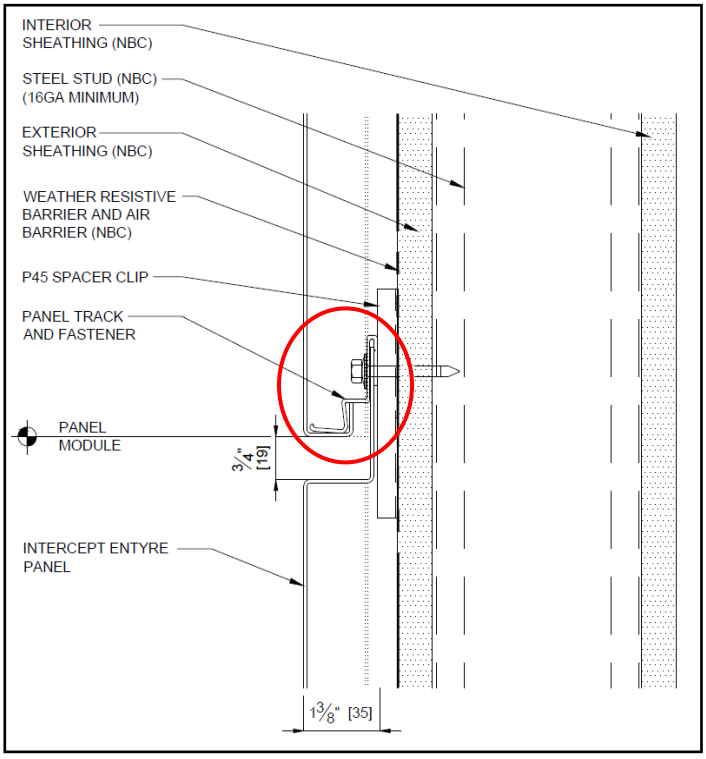

Figure 1: Intercept Horizontal Panel Joint – Horizontal Application

Intercept Manufacturing Process

The Intercept modular panel system is produced with a state-of-the-art custom folding system optimized to provide a premium, concealed fastener rainscreen. Prior to fabrication, the metal coils are tension-leveled and roll-leveled to remove as many material imperfections as possible. Then, the precision, automated folding process bends the customized panel shape based on desired panel depth, orientation, and additional aesthetics required for a project. Finally, the "hook-and-grab" extrusion is mounted and attached to complete the panel assembly. The manufacturing process for the Intercept product line is designed to deliver the highest quality product while mitigating associated structural, application, and aesthetic risks. The Intercept product line is totally and manufactured by CENTRIA, allowing complete and total control over panels' quality-assurance. Moreover, CENTRIA aims to be environmentally conscious: Intercept panels can contribute to LEED v4.0 credits.

Flatness Criteria

The construction industry applies a wide variety of acceptable tolerances for the fabrication and installation of exterior rainscreen cladding. The Metal Construction Association (MCA) uses the following rule of thumb for visual acceptance: “Everything should look straight when viewed from a distance of 25’. Particular products or applications might require more stringent tolerances to assure performance.” Remembering this guideline for perspective, MCA has formally defined acceptable fabrication and installation tolerances: CENTRIA has implemented even more stringent tolerances in order to deliver the highest-quality aesthetics for architectural applications.

Oil-Canning

During manufacturing, light-gauge material is folded so that the interlocking joint seamlessly integrates with adjacent panels, leaving the large, flat face of the panel displayed for architectural aesthetics. Architectural siding panels like Intercept, under certain conditions, could be susceptible to “oil-canning.” This natural phenomenon is an inherent aspect of light-gauge, cold-formed metal products, particularly those with broad, flat areas. The MCA defines oil-canning as a perceived waviness in flat areas of roofing and siding panels, where the period and amplitude of the wave is dependent on the surface area of the panel face. This should not be confused with MCA’s Fabrication Tolerance regarding camber (*Figure 2*); camber refers to the deflection of the panel section, whereas oil-canning pertains to the sinusoidal profile of the panel’s face. MCA primarily considers “oil-canning” to be an aesthetic issue that does not affect the structural integrity of the panel and is not grounds for panel rejection.

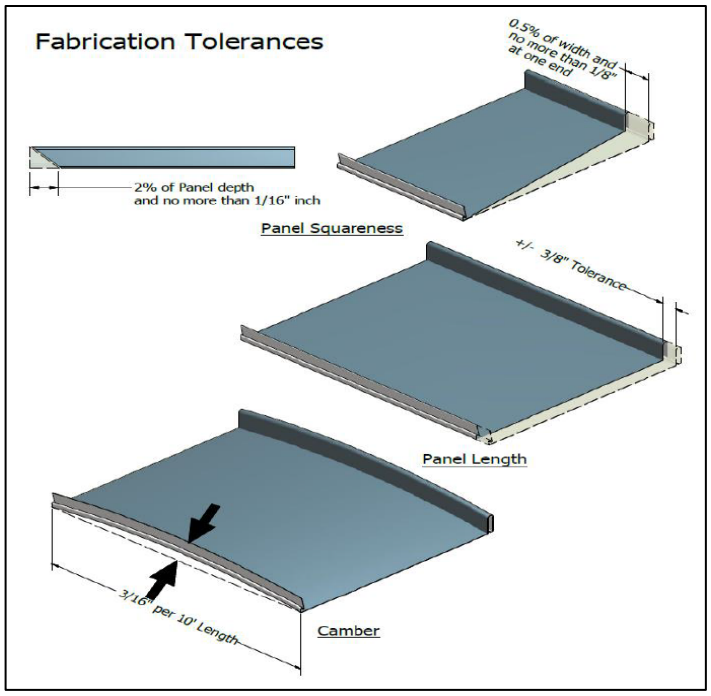

Figure 2: MCA Fabrication Tolerances

CENTRIA has implemented specific mechanisms in the panel design, along with steps in the manufacturing process, to mitigate as much oil-canning occurrence as possible. The folding process is automated with extremely stringent specifications to ensure that the Intercept panels adhere to or are better than the manufacturing fabrication tolerances mandated by the MCA. In order to address the risks with installation, CENTRIA publishes acceptable construction tolerances for panel supports, in addition to offering proprietary stiffener patterns to minimize local distortion on the panel face. Beyond the preventative measures taken during manufacturing, the CENTRIA Field Services department is available to assist the installer with quality issues that may arise from oil-canning.

A variety of extraneous factors may contribute to oil-canning throughout the entire lifecycle of the rainscreen panel. Three specific areas of interest where residual stresses can accumulate are during coil production, fabrication of the metal panel, and installation of the rainscreen at the construction site. For

example, stress is induced into the raw material during coil production. Some instances where material imperfections can become problematic include:

- Metal coil is longer in the middle of the strip, where the gradient in material thickness is susceptible to localized buckling
- Metal coil exhibits waviness along the edge of the coil
- Metal coil edges display cambering where two sides of metal coil are not parallel

CENTRIA purchases tension-leveled material and roll-levels all raw material from our suppliers to manage aesthetic risks from any existing material imperfections.

The fabrication process produces additional stress in the material while the panel is worked to become a finished product, creating another situation where “oil-canning” could occur. A few steps during manufacturing where this may occur are:

- Slitting - slitting of a master coil can release and redistribute residual forces. The coil’s response can create or increase “oil-canning.”
- Forming – new residual stresses can be created during some forming operations. Architectural panel profiles typically require more forming along panel sides than in the middle, and more often require additional forming along one side than the other.

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Finally, oil-canning can occur as a result of stresses accumulating from environmental factors associated with installation on the jobsite. Several conditions can contribute to this, such as:

- Misalignment of the support system
- Over-engagement of panels
- Over-driving of fasteners
- Improper material handling
- Thermal expansion & contraction
- Excessive deflection, racking, drift, or settlement of the primary structure

Oil-canning may occur with a misaligned support system because a non-planar bearing surface forces unanticipated deflection in the panel. The other difficulties that MCA identified highlight the restriction of the natural thermal expansion and contraction cycle of light-gauge metal. Panels cannot allow transverse thermal expansion if the joint is overly constrained. Additionally, over-driving fasteners at the panel connection augments the localized stress in the joinery, again inhibiting expansion and contraction.

The last condition associated with CENTRIA Intercept panels is longitudinal expansion spurred by significant thermal forces. Oil-canning often appears where the panel edges are constrained by mechanical connections to either the building or other adjacent panels. “Waviness” from localized distortion of the metal substrate will occur if the panel’s design does not incorporate functional mechanisms to accommodate thermal movement. Intercept has one edge with fastener connections and another edge featuring interlocking joinery. Concealed-fastener panel systems are especially vulnerable to stress concentrations from the examples above—where both end-conditions are constrained and restricted from accommodating thermal movement.

Oil-canning caused by thermal movement can appear and disappear as the sun rises and moves around the building; sunlight not only induces thermal stresses in the panel, but also augments the visual appearance of oil-canning under certain weather conditions that might not be apparent at a different time or from another point of view. Exposure to sunlight is another significant factor that must be considered in the building's architectural design. Each and every stress inducer must be considered in order to deliver a premium rainscreen system.

Conclusion

The Intercept modular panel system deliver a simple, constructible rainscreen system with superior performance. By the same token related to panel aesthetics, acceptable fabrication tolerances, installation tolerances, and flatness criteria defined by MCA are the foundation for the Intercept panel design. CENTRIA accounts for every possible risk to prevent "oil-canning" with state-of-the-art manufacturing processes and innovative design considerations to deliver a high-quality, premium architectural rainscreen. The Intercept product line provides impeccable aesthetic value, cost-effective building envelope advantages, and amplifies the environmental impact of construction with a sustainable rainscreen solution.

Discover more at www.CENTRIA.com/Intercept.

Benjamin Sorek is a Structural Engineer at CENTRIA.

Appendix

MCA White Paper: Preformed Metal Wall Fabrication/Installation Tolerances
MCA White Paper: Oil Canning Position Paper
Intercept Florida Product Approval No. – 20676.1 (Entyre), 20676.2 (LVLZ), 20676.3 (RZR)
TAS 201-94 – Impact Test Procedures
TAS 202-94 – Criteria for Testing Impact and Non-Impact Resistant Building Envelope Components Using Uniform Static Air Pressure
TAS 203-94 – Criteria for Testing Products Subject to Cyclic Wind Pressure Loading
ASTM E1886-05 – Performance of Exterior Windows, Curtain Walls, Doors and Storm Shutters Impacted by Missiles and Exposed to Cyclic Pressure Differentials
ASTM E1996-05 – Performance of Exterior Windows, Glazed Curtain Walls, Doors and Storm Shutters Impacted by Windborne Debris In Hurricanes
AAMA 508 - Voluntary Test Method and Specification for Pressure-Equalized Rainscreen Wall Cladding Systems

Technical Bulletins
TB-05-09 – CENTRIA Products for Florida and Other Coastal Zones
TB-05-10 – CENTRIA Products Used as Rainscreens
TB-19-04 – Architectural Aesthetics & Performance: Intercept Modular Panel System