ICC-ES Evaluation Report

ESR-3899

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DIVISION: 07 00 00—THERMAL AND MOISTURE PROTECTION Section: 07 46 46—Fiber-Cement Siding	REPORT HOLDER: TAKTL, LLC	EVALUATION SUBJECT: TAKTL STANDARD AND SELECT ULTRA HIGH PERFORMANCE CONCRETE (UHPC) PANEL SYSTEM	

1.0 EVALUATION SCOPE

Compliance with the following codes:

- 2015 and 2012 *International Building Code*® (IBC)
- 2015 and 2012 *International Residential Code*® (IRC)

Properties evaluated:

- Physical characteristics
- Weather resistance
- Wind load resistance
- Durability

2.0 USES

The TAKTL Standard and Select UHPC Panel Systems are used as an exterior wall cladding. The TAKTL Panel systems may be installed on buildings of all construction types under the IBC and on buildings constructed in accordance with the IRC. When installed on exterior walls of buildings of Types I, II, III or IV construction installation must comply with Section 4.3 of this report.

The system may also be used for interior applications as part of a Class A interior wall finish.

3.0 DESCRIPTION

3.1 General:

The TAKTL panels are part of a ventilated cavity wall assembly with an open-jointed wall cladding system that allows air to circulate between the panels and the exterior face of the back-up wall. The panels are mounted with either visible fasteners through the face of the panels or with concealed undercut anchors on an extruded aluminum attachment system composed of rails and clips. When used as an exterior wall cladding, the system must be installed over a water-resistive barrier. The TAKTL Panel System is shown in Figure 1.

3.2 Components:

3.2.1 Panels: The TAKTL panels are glass fiber-reinforced, ultra high performance concrete panels manufactured from portland cement, silica fume and fine sands; alkali-resistant glass reinforcing fibers; two layers of alkali–resistant glass mesh; and additives. The panels comply with ASTM C1186 as Type A, Grade IV, fiber-cement sheets; have a flame-spread index of 0 and a smoke-developed index of 0 when tested in accordance with ASTM E84; and are classified as noncombustible when tested in accordance with ASTM E136.

The TAKTL Exterior panels are available in a maximum untrimmed width of 58.5 inches (1485 mm) and a maximum untrimmed length of 144 inches (3658 mm). Standard thickness is $^{5}/_{8}$-inch (16 mm) nominal, with a maximum base thickness of ¾-inch (19 mm). The panels are available in a variety of standard colors and various surface textures.

3.2.2 Attachment System: The TAKTL attachment system is for use on interior and exterior installations.

For the concealed attachment system, the TAKTL panels are to be supported by an attachment system consisting of structural rails and clips made of 6005A-T5 extruded aluminum. The rails and clips are 1.18 inches (46 mm) deep, 2.5 inches (63.5 mm) high, and 0.118-inch (3 mm) thick and have a C-shape configuration. The rails are available in various uncut lengths of 12 feet (3.67 m), 16 feet (4.88 m), or 20 feet (6.10 m), and the clips are 2 inches (51 mm) wide. The rail and clip profile is shown in Figure 2. For the visible system, the panels are fastened directly to support framing.

The attachment system may be fastened directly to the back-up wall for close-cladding installation, or to a sub-girt framing system for an increased air gap, using stainless steel fasteners.

Sub-girt framing supporting the TAKTL Panel system must be attached to the structure as designed by a registered design professional to resist the superimposed loads.

For the concealed system, the clips and rails interlock and are secured using bolts and fasteners made of Type 304 stainless steel supplied with the attachment system. TAKTL panels are fastened to the clips with undercut anchors for concealed attachment in accordance with 4.3.2. For the visible system, the panels are fastened directly to the supporting framing with SFS Intec SX3-D12 Torx® self-drilling stainless steel fasteners in accordance with 4.3.3. The fasteners used with the visible system must be designed by registered design professional to resist applicable loads. The undercut anchors and bolts must be made of high-corrosion resistant Type 316 austenitic stainless steel.

Connection of the attachment system to the underlying back-up wall or sub-girt framing must be designed in accordance with Section 4.2.

4.0 DESIGN AND INSTALLATION

4.1 General:

The TAKTL Panel System (panels and attachment system) must be installed over existing wall assemblies and/or sub-girt framing capable of supporting the imposed loads including, but not limited to, transverse wind loads. The system must be securely connected to the supporting wall with fasteners that are compatible with the wall assembly substrate.

4.2 Design:

The allowable loads for the TAKTL UHPC Panel System, given in Table 1, and the wind-load capacity of the underlying wall and substrate must be equal to or exceed the design uniform transverse wind loads determined in accordance with Chapter 16 of the IBC or Section R301.2.1 of the IRC, as applicable. The attachment system connections used to connect the TAKTL panel attachment system to the underlying wall or substrate must be designed by a design professional, and the details must be submitted to the code official for approval.

4.3 Installation:

4.3.1 General: The TAKTL UHPC Panel System must be installed in accordance with the manufacturer's published installation instructions and this report. A copy of the manufacturer's published installation instructions must be available on the jobsite at all times during construction.

The TAKTL Panel System must be installed over wall assemblies complying with IBC Section 1403.3, using the Attachment Systems described in Section 3.2.2. Exterior wall assemblies, on which the TAKTL Panel System is to be installed, must include flashing, a water-resistive barrier, a means of draining water, and protection against condensation in accordance with IBC Section 1403.2. The panels may be field cut to accommodate various architectural designs. The system boundaries at the top, bottom, and around building openings must be finished in accordance with the registered design professional's requirements. A ventilation path must be maintained to allow air to flow into, out of, and within the cavity between the water-resistive barrier and the TAKTL Panel System panels. The minimum spacing between panel joints is $^{3}/_{8}$ inch (9.5 mm).

4.3.2 Concealed Fastening System: The attachment system rails described in Section 3.2.2 must be fastened to the back-up wall structure or sub-girt frame as required by the registered design professional. The aluminum rails must be installed as determined by the registered design professional. Butting rails should be spaced at a minimum of ¼-inch per 10-feet of rail to allow for expansion. The TAKTL aluminum clips interlock with the aluminum rails and must be spaced as determined by registered design professional along the rails.

A ¼-inch-diameter-by-¾-inch-long (6 mm by 19 mm) stainless steel hex head bolt must be installed on each clip attached to the panel top rail to allow for leveling. The mid-panel and lower-panel clips interlock mechanically with the rails but the top clips need to be secured to the rails to prevent lateral displacement. The center top rail clip must be secured to the rail with a No. 10 x 1-inch-long (25.4 mm) hex head self-tapping screw.

Prior to installing the clips onto the rails, the TAKTL panels must be attached to the clips with stainless steel undercut anchors. The undercut holes for the anchors are pre-drilled at the factory and may be drilled in the field using appropriate drilling equipment in accordance with TAKTL published installation instructions. The panels are attached using one KEIL® undercut anchor per clip, unless otherwise determined by registered design professional. The panels are pre-drilled with a 7 mm diameter hole with a 9 mm wide under-cut with a 0.33-inch (8.5 mm) to 0.57-inch (14.5 mm) embedment. The KEIL® undercut anchor bolt is a M6 with a hex head with the required length determined by the undercut embed length and the clip thickness. The minimum edge distance is 3 inches (76 mm) and the maximum edge distance is 6 inches (152 mm).

The surface of the TAKTL clips in contact with the panel must have a $^{1}/_{16}$-inch-thick (1.6 mm) closed cell neoprene pad.

Prior to placing the undercut anchor, the under-cut hole must be free of debris. Insert the undercut anchor in the predrilled hole and attach the clip, with the neoprene padding attached, using the provided setting bolt and secure firmly. Once all clips are fastened to the panel, install the panel to the rails per manufacturer's published installation instructions.

4.3.3 Visible Fastening System: The TAKTL UHPC panels are attached directly to metal framing using No. 12, ½-inch-diameter (12.7 mm) pan head, stainless steel, self-drilling screws. The fasteners must be spaced as determined by a registered design professional. The minimum edge distance is 3 inches (76 mm) and the maximum edge distance is 6 inches (152 mm).

4.4 Types I, II, III and IV (Noncombustible) Construction: When installed as described in this section, the TAKTL Panel System may be used on the exterior face of exterior walls of buildings required to be of Types I, II, III or IV construction.

The base wall assembly must be framed with minimum 16 gauge by $3^{5}/_{8}$-inch (92 mm), C-channel steel studs at 24 inches (610 mm) on center. One layer of $^{5}/_{8}$-inch-thick (15.9 mm), Type X gypsum wallboard must be installed in a horizontal orientation, on the interior face of the studs. One layer of $^{5}/_{8}$-inch-thick (15.9 mm), glass mat gypsum sheathing complying with ASTM C1177 must be installed in a horizontal orientation, on the exterior face of the studs. Both gypsum layers must be installed using No. 6 by 1¼-inch-long (31.8 mm), bugle-head, self-drilling screws spaced 8 inches (203 mm) around the board perimeter and 12 inches (305 mm) in the field. The exterior gypsum sheathing was coated with a 60 wet mil thickness of Henry® Air-Bloc® 16 MR fluid-applied water-resistive barrier. Prior to application of water-resistive barrier, the sheathing joints were treated with Henry® 925 BES Silicone Sealant. All interior gypsum board joints must be taped and mud per ASTM C840 or GA-216. Minimum 4-lb/ft^3 (64 kg/m^3) density mineral wool must be installed at each floor line within the stud cavity.

Aluminum brackets fastened through gypsum sheathing must be secured to the steel studs using corrosion resistant fasteners. After the brackets are secured to the studs, aluminum extrusions installed vertically at 24 inches on center are secured to the aluminum brackets. Two-inch-thick (51 mm) mineral fiber insulation batts complying with ASTM C612 having a density of 4.4 lb/ft^3 (70 kg/m^3) are installed over the water-resistive barrier and gypsum sheathing. The insulation batts are installed using 3-inch-long friction pins at every 24 inches vertically and horizontally. Once the aluminum extrusions are installed, horizontal TAKTL rails must be installed across the full width of the wall assembly at predetermined locations to provide support the TAKTL panels. The TAKTL panels are supported with TAKTL clips, which must be attached to undercut anchors as described in Section 4.3.2. The TAKTL clips interlock with the TAKTL rails. Installation of the TAKTL panel system must comply with this section (Section 4.4) and the provisions in Section 4.0 of this report. The TAKTL panels must be installed with a maximum ½-inch-wide (12.7 mm) joints. The openings must be flashed with 0.080-inch-thick (2 mm) aluminum trim.

5.0 CONDITIONS OF USE:

The TAKTL Panel System described in this report complies with, or is a suitable alternative to what is specified in, those codes listed in Section 1.0 of this report, subject to the following conditions:

5.1 Installation must comply with this report, the manufacturer's published installation instructions, and the applicable code. In the event of a conflict between the manufacturer's published installation instructions and this report, this report governs.

5.2 The TAKTL Panel System must be installed by qualified installers recognized by TAKTL, LLC.

5.3 The allowable wind pressures for the TAKTL Panel System shown in Table 1, the capacity of the supporting wall or substrate, and the capacity of the connections used to attach the system to the wall must be equal to, or exceed, the design wind pressure.

5.4 Drawings, design details, and calculations verifying the adequacy of the fastening to connect the TAKTL panel attachment system to the supporting wall must be submitted to the building code official for approval. These must be prepared by a registered design professional when required by the statutes of the jurisdiction in which the system is to be installed.

5.5 When installed on exterior walls, the TAKTL Panel System must be installed only on exterior walls incorporating sheathing capable of resisting the design wind pressures, both positive and negative. The sheathing must be covered with a water-resistive barrier, as required by the applicable code, and a ventilation path must be maintained between the water-resistive barrier and the panels.

5.6 When installed with spaces between adjacent panels on interior walls required to have a Class A finish, the TAKTL UHPC Panels and attachment system must be installed over a substrate having a Class A finish.

5.7 The TAKTL panels are manufactured in Turtle Creek, PA under a quality control program with inspections by ICC-ES.

6.0 EVIDENCE SUBMITTED

6.1 Data in accordance with the ICC-ES Acceptance Criteria for Fiber Cement Siding Used as Exterior Wall Siding (AC90), including ASTM C1186 testing, dated June 2012 (editorially revised September 2015).

6.2 Reports of testing in accordance with ASTM E84, Test Method for Surface Burning Characteristics of Building Materials.

6.3 Reports of testing in accordance with ASTM E330, Test Method for Structural Performance of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference.

6.4 Reports of testing in accordance with ASTM E136, Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C.

6.5 Reports of testing in accordance with ASTM E488, Standard Test Method for Strength of Anchors in Concrete Elements.

6.6 Reports of testing in accordance with NFPA 285, Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-load Bearing Wall Assemblies Containing Combustible Components.

7.0 IDENTIFICATION

7.1 The TAKTL panels are labeled with the name of the manufacturer (TAKTL, LLC), the panel, the evaluation report number (ESR-3899), and the statement "Panels conform to ASTM C1186, Type A, Grade IV specifications". Attachment systems used with TAKTL panels must be identified by manufacturer.

7.2 The report holder's contact information is the following:

TAKTL, LLC
230 BRADDOCK AVENUE
KEYSTONE COMMONS
TURTLE CREEK, PENNSYLVANIA 15145
www.taktl-llc.com

TABLE 1—TRANSVERSE WIND LOAD ESTABLISHED THROUGH ASTM E330 WIND LOAD TESTS FOR USE OF THE TAKTL PANEL SYSTEM[2]

NOMINAL PANEL THICKNESS	ATTACHMENT SYSTEM[3]	ALLOWABLE TRANSVERSE WIND LOAD[1]	
		Positive (psf)	Negative (psf)
16 mm ($^5/_8$-inch) Panels	Concealed Attachment System: TAKTL rails installed vertically at a spacing of $35^7/_8$ inches (911.2 mm). TAKTL clips spaced at $20^3/_{16}$ inches-on-center (512.8 mm) along the rails. KEIL undercut anchors must be M6 x 16 mm with a hex head, with a 1-inch x 9 mm hex head KEIL anchor setting bolt.	65	32.5
	Visible Fastening System: Installed using fasteners described in Section 4.3.3 of this report and fastener spacing not to exceed spacing for TAKTL rails and TAKTL clips described above for concealed attachment system.		

For **SI:** 1 inch = 25.4 mm, 1 psf = 0.0479 kPa.

[1]The allowable positive and negative transverse wind loads described above are based on ASTM E330 testing on full-scale wall assemblies and fastener pull and shear tests on undercut anchors and self-drilling screws. The attachment system supporting the TAKTL panels must be designed to resist the applied forces by a registered design professional.

[2] Recognition of alternate allowable transverse wind load capacity and attachment system not described in Table 1 of this report must be designed by registered design professional.

[3] Allowable capacity of undercut anchor is 168 lbf for pull-out and 239 lbf for shear based on safety factor of 4.0.

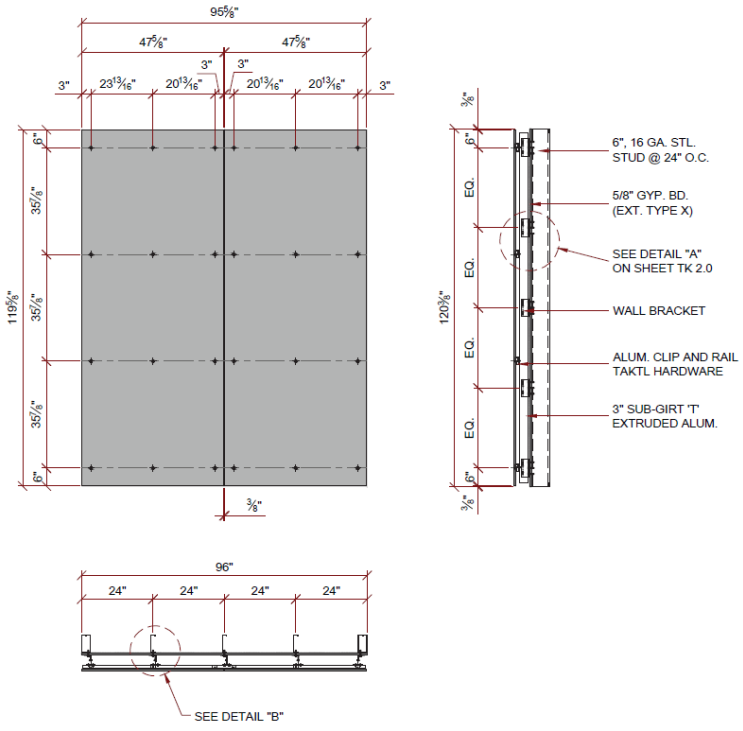

FIGURE 1—TAKTL FIBER-CEMENT PANEL SYSTEM (TYPICAL INSTALLATION DETAILS)

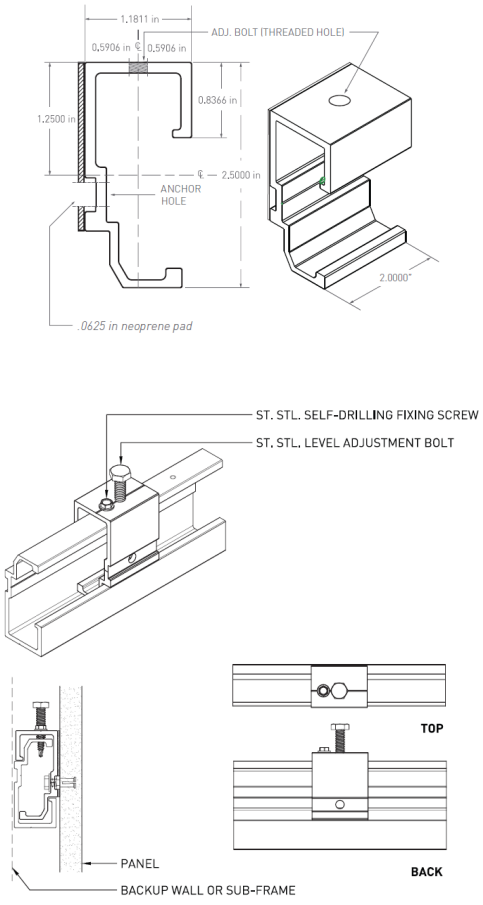

FIGURE 2—TAKTL ATTACHMENT SYSTEM RAIL AND CLIP PROFILE