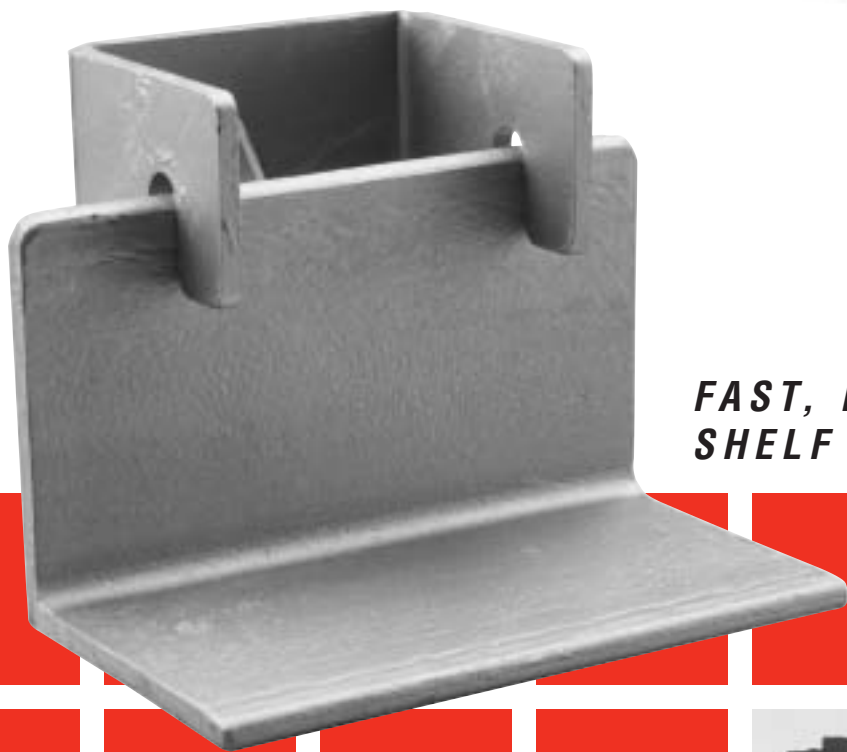
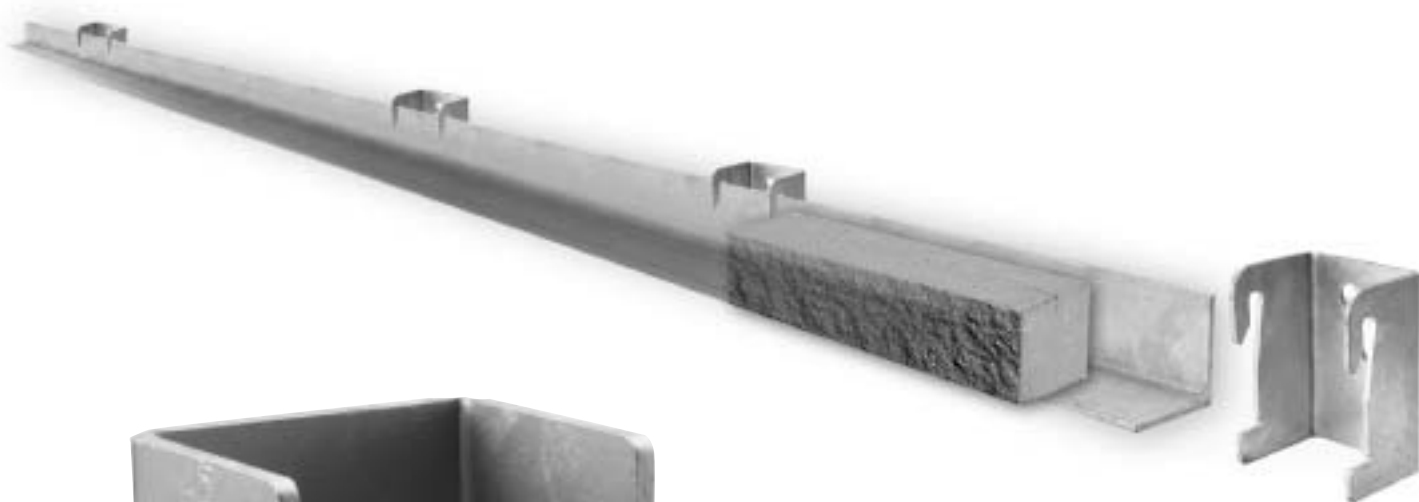


FASTTM

FERO ANGLE SUPPORT TECHNOLOGY

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***FAST, LOW-COST
SHELF ANGLE INSTALLATIONS***



COMPONENTS

The **FAST™** (*FERO Angle Support Technology*) system was devised to meet a demand for building technology that offers fast, low-cost, and effective shelf angle installations. Thoroughly tested and proven both in the laboratory and the field, the pre-engineered **FAST™** system is used to support dead load from:

- MASONRY VENEER
- THIN GRANITE VENEER
- PRE-CAST CONCRETE
- LARGE STONE PANELS
- *AND MORE!*

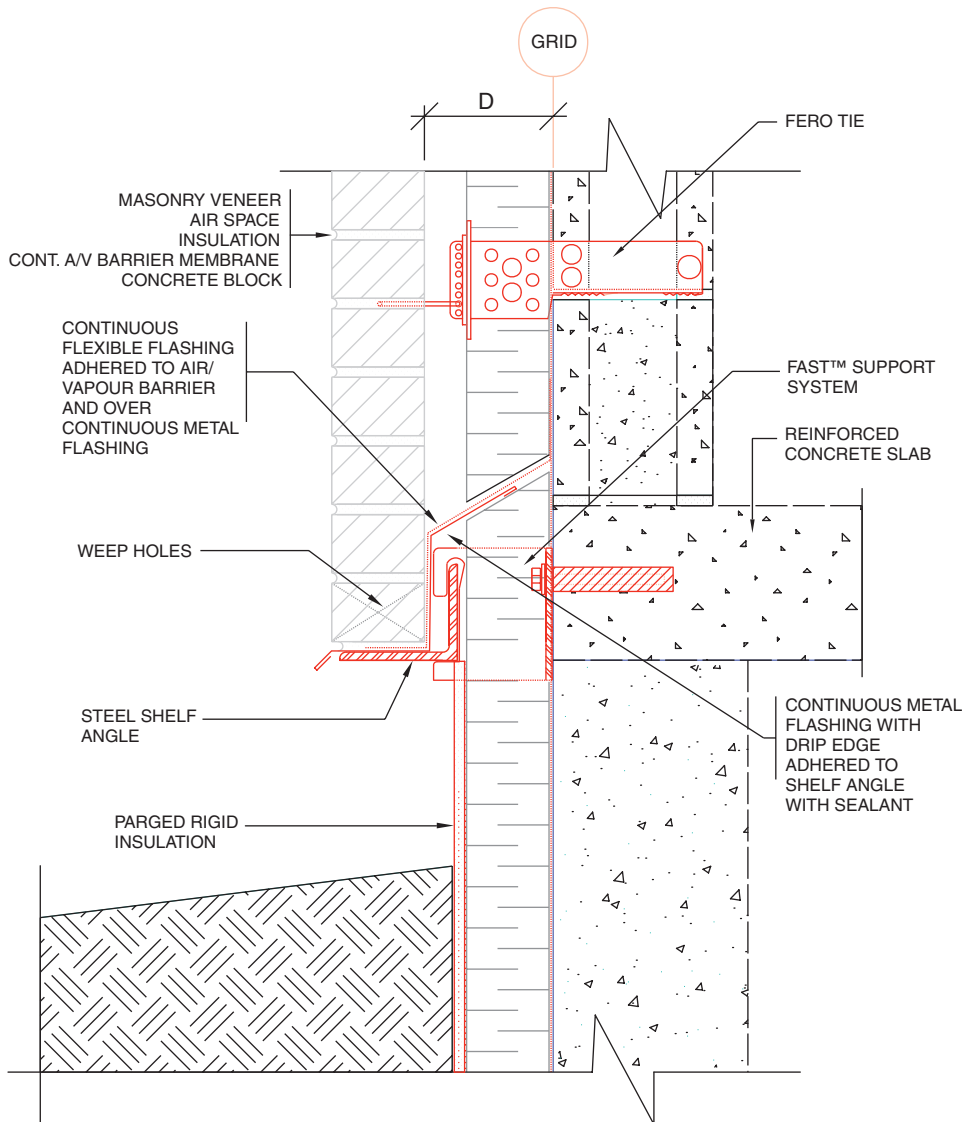


FIG. 1 - Typical FAST™ system detail

The **FAST™** system eliminates the need for welded connections, and therefore:

- Can be installed by one trade
- Requires less time to install
- Ensures integral corrosion protection
- Lowers overall costs

The system is designed to offset the shelf angle from the structural backing, and to allow cavity insulation and the air/vapour barrier to be continuous behind the steel shelf angle, which:

- Dramatically reduces thermal bridging
- Reduces the number of penetrations through the insulation
- Minimizes joints/junctions in the AVB
- Reduces shelf angle cross-section and material cost
- Reduces insulation and AVB installation time

When compared to alternative offset shelf angle supports, such as gusset plates, the **FAST™** system requires a fraction of the time to install and is proven to be more economical and buildable, and better performing. In fact, the supply and installation cost for the **FAST™** system is about 50% less than other support systems. With the **FAST™** system, the size of the shelf angle remains the same, and the supporting brackets vary in size to accommodate a wide range of design cavity widths. The **FAST™** system uses a 100 x 100 x 6 mm (4" x 4" x 1/4") angle which is readily available from local suppliers, and less expensive than using larger non-standard angles.



FAST™ FERRO ANGLE SUPPORT TECHNOLOGY

The **FAST™** system consists of a **FAST™** bracket, anchor bolt, (optional) Shim Plates and Wedge Shims, and a retaining pin. **FERRO** supplies the **FAST™** bracket, shims, and retaining pin. The anchor bolt and shelf angle are obtained readily from local suppliers.

All steel components supplied by **FERRO**, including the **FAST™** brackets, Shim Plates and Wedge Shims, bolt washers, and retaining pins are hot dipped galvanized after fabrication in accordance with ASTM A123. **FERRO** brackets, Shim Plates, and bolt washers are manufactured from 4.76 (3/16") mild steel plate.

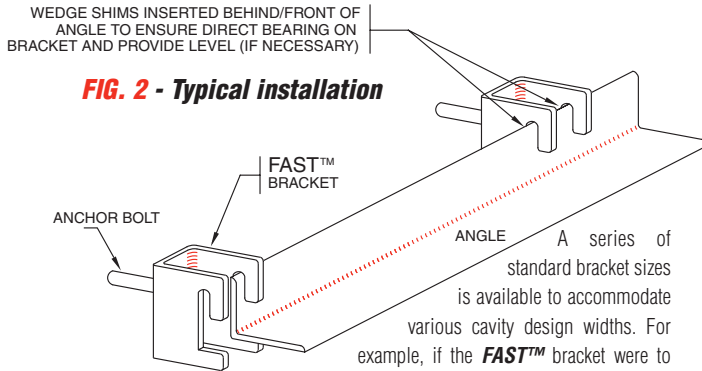


FIG. 2 - Typical installation

A series of standard bracket sizes is available to accommodate various cavity design widths. For example, if the **FAST™** bracket were to support a masonry veneer that includes a 51 mm (2") insulation and a 25 mm (1") air space, the required size of bracket would be 51 mm (2") + 25 mm (1") = 76 mm (3"). **Figure 1** shows the bracket specification depth labeled as "D", which is the width of the cavity (air space and insulation). The bracket specification depth, or "Bracket Size", is available in 12.7 mm (1/2") increments, extending from a cavity width of 25 mm (1") to 165 mm (6-1/2"). The slot in the back of the bracket is designed to receive one 15.9 mm (5/8") diameter bolt and allows for 45 mm (1-3/5") of vertical adjustability. The slot is placed at a +/- 22.5 degree angle from the vertical, which reduces the likelihood of bracket slippage under load. When two or more brackets are used, and adjacent brackets are installed so as to alternate the orientation of the slot as illustrated in **Figure 3**, bracket slippage becomes prohibitive. An oversize, 5 mm (3/16") thick rectangular washer is supplied by **FERRO**, and is required for use with the anchor bolt; standard round washers should not be used. The **FAST™** system is designed to receive a 100 x 100 x 6 mm (4" X 4" X 1/4") angle. The optional Shim Plate is sized and configured to fit the back surface of the bracket and provide full bearing. **Figure 1** shows a typical detail of the system installed on concrete structural backing.

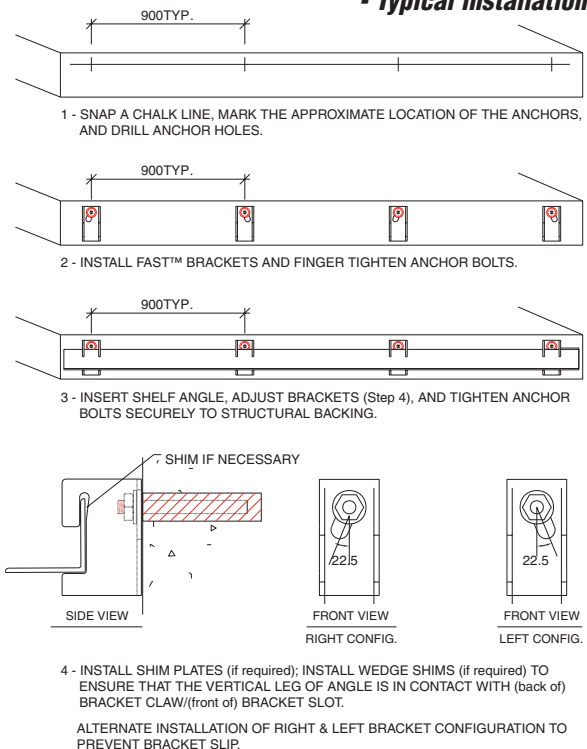
Installation of the system is typical and simple. A chalk line is snapped to establish the location of the brackets in elevation, and anchor holes are predrilled at the required spacing. One of two methods may be used to position and fasten the brackets:

Method 1. Accurately position the shelf angle temporarily or by installing brackets at its outer ends. Hook the intermediate brackets onto the angle and spread them horizontally to their bolt locations. Securely fasten the brackets against the structural backing. **or:**

Method 2. Accurately position the brackets at each anchor location, both in elevation and perpendicular to the wall. Securely fasten the brackets against the structural backing. Rotate the angle into the claws of the brackets.

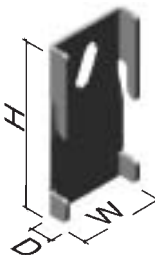
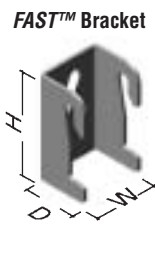
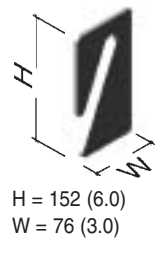
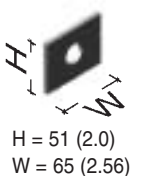



To accommodate tolerances in the position of the structural backing that otherwise cannot be accommodated by selecting a different sized bracket, **FAST™** Shim Plates are placed between the structural backing and the backside of the bracket. The Shim Plates must bear directly against the structural backing and extend over the full surface and height of the bracket. Where the number of Shim Plates per bracket would exceed two, the next size bracket should be installed in lieu of shimming. Each bracket is installed so that the shelf angle rests firmly on the lower supporting legs of the bracket. After adjusting and positioning the brackets, the anchor bolts are seated by torquing in accordance with the manufacturer's recommendations. The lower end of the angle's vertical leg (heel) must rest against the back of the bracket slot, as shown in **Figure 1**, and the upper end of the leg (toe) should be in direct contact with the bracket claw (see side view of **Figure 2**). **FERRO** Wedge Shims are inserted between the shelf angle and bracket, as required, to ensure that the vertical leg of the shelf angle bears properly against the bracket at the toe and heel. Care must be taken to ensure that the shelf angle properly contacts and bears against the bracket so the angle will not rotate or drop under the weight of the veneer. If an air/vapour barrier membrane is installed behind the **FAST™** bracket, only use one layer of membrane, and destroy the plastic finish (if present) to reduce the likelihood of bracket rotation and slip under load. Once all adjustments have been made, veneer can be laid on the angle, respecting the requirements of all applicable standards for veneer installation and positioning with respect to the toe of the angle. **Figure 3** shows the installation sequence. To temporarily brace a shelf angle so that it will not dislodge from the **FAST™** bracket during construction (by vertical impact, before placement of the veneer), **FERRO** provides a 9.5 mm (3/8") diameter steel pin that is driven between the backside of the vertical leg of the angle and the bracket claw. Only one pin per length of angle is required. The pin is hot dipped galvanized and can be left in-place if desired.

FIG. 3 - Typical installation



INSTALLATION PROCEDURE

TABLE 1 - DESIGN INFORMATION

FAST™ Bracket	FAST™ Bracket Size			Maximum Allowable Vertical Load per Bracket ¹ [kN (lb.)]	Bracket Spacing ⁶ [m (ft.)]	MAXIMUM ALLOWABLE VENEER HEIGHT ¹			
	D mm(in)	W mm (in)	H mm (in)			Clay Brick ³ [m (ft.)]	Lightweight Concrete Block ³ [m (ft.)]	Normal weight Concrete Block ³ [m (ft.)]	Natural Stone ³ [m (ft.)]
	25 (1.0)	95 (3.75)	188 (7.37)	6.7 (1500)	600 (2)	6.0 (20.0)	8.4 (27.5)	5.5 (18.0)	4.6 (15.3)
					900 (3)	4.0 (13.0)	5.6 (18.3)	3.7 (12.0)	3.1 (10.4)
					1200 (4) ⁸	3.0 (10.0)	4.2 (13.8)	2.7 (9.0)	2.3 (7.7)
	38 (1.5)	95 (3.75)	188 (7.37)	6.2 (1400)	600 (2)	6.0 (20.0)	8.4 (27.5)	5.5 (18.0)	4.6 (15.3)
					900 (3)	4.0 (13.0)	5.6 (18.3)	3.7 (12.0)	3.1 (10.4)
					1200 (4) ⁸	3.0 (10.0)	4.2 (13.8)	2.7 (9.0)	2.3 (7.7)
	51 (2.0)	95 (3.75)	151 (5.93)	9.3 (2100)	600 (2)	9.2 (30.0)	12.5 (41.0) ⁵	8.2 (27.0)	7.1 (23.3)
					900 (3)	6.0 (20.0)	8.3 (27.3)	5.5 (18.0)	4.7 (15.6)
					1200 (4) ⁸	4.6 (15.0)	6.2 (20.5)	4.1 (13.5)	3.6 (11.6)
	64 (2.5)	95 (3.75)	151 (5.93)	9.3 (2100)	600 (2)	9.2 (30.0)	12.5 (41.0) ⁵	8.2 (27.0)	7.1 (23.3)
					900 (3)	6.0 (20.0)	8.3 (27.3)	5.5 (18.0)	4.7 (15.6)
					1200 (4) ⁸	4.6 (15.0)	6.2 (20.5)	4.1 (13.5)	3.6 (11.6)
	76 (3.0)	95 (3.75)	151 (5.93)	9.3 (2100)	600 (2)	9.2 (30.0)	12.5 (41.0) ⁵	8.2 (27.0)	7.1 (23.3)
					900 (3)	6.0 (20.0)	8.3 (27.3)	5.5 (18.0)	4.7 (15.6)
					1200 (4) ⁸	4.6 (15.0)	6.2 (20.5)	4.1 (13.5)	3.6 (11.6)
	89 (3.5)	95 (3.75)	151 (5.93)	9.3 (2100)	600 (2)	9.2 (30.0)	12.5 (41.0) ⁵	8.2 (27.0)	7.1 (23.3)
					900 (3)	6.0 (20.0)	8.3 (27.3)	5.5 (18.0)	4.7 (15.6)
					1200 (4) ⁸	4.6 (15.0)	6.2 (20.5)	4.1 (13.5)	3.6 (11.6)
	102 (4.0)	95 (3.75)	151 (5.93)	8.6 (1925)	600 (2)	8.4 (27.5)	11.5 (37.6) ⁵	7.5 (24.8)	6.5 (21.4)
					900 (3)	5.6 (18.5)	7.6 (25.0)	5.0 (16.5)	4.4 (14.3)
					1200 (4) ⁸	4.2 (13.7)	5.7 (18.8)	3.8 (12.4)	3.2 (10.6)
	114 (4.5)	95 (3.75)	151 (5.93)	7.8 (1750)	600 (2)	7.6 (25.0)	10.4 (34.1)	6.9 (22.5)	5.9 (19.4)
					900 (3)	5.1 (16.7)	7.0 (22.8)	4.6 (15.0)	4.0 (13.0)
					1200 (4) ⁸	3.8 (12.5)	5.2 (17.0)	3.4 (11.2)	2.9 (9.7)
	127 (5.0)	95 (3.75)	151 (5.93)	7.0 (1575)	600 (2)	6.9 (22.5)	9.4 (30.8)	6.2 (20.2)	5.3 (17.5)
					900 (3)	4.6 (15.0)	6.2 (20.5)	4.1 (13.5)	3.6 (11.7)
					1200 (4) ⁸	3.4 (11.2)	4.7 (15.4)	3.1 (10.1)	2.7 (8.7)
	140 (5.5)	95 (3.75)	151 (5.93)	6.2 (1400)	600 (2)	6.0 (20.0)	8.3 (27.3)	5.5 (18.0)	4.7 (15.5)
					900 (3)	4.0 (13.3)	5.6 (18.2)	3.7 (12.0)	3.2 (10.4)
					1200 (4) ⁸	3.0 (10.0)	4.1 (13.6)	2.8 (9.0)	2.4 (7.7)
	152 (6.0)	95 (3.75)	151 (5.93)	5.6 (1250)	600 (2)	5.4 (17.9)	7.4 (24.4)	4.9 (16.1)	4.2 (13.9)
					900 (3)	3.6 (11.9)	5.0 (16.2)	3.3 (10.7)	2.8 (9.3)
					1200 (4) ⁸	2.7 (8.9)	3.7 (12.2)	2.5 (8.0)	2.1 (6.9)
	165 (6.5)	95 (3.75)	151 (5.93)	4.9 (1100)	600 (2)	4.8 (15.7)	6.5 (21.5)	4.3 (14.1)	3.7 (12.2)
					900 (3)	3.2 (10.5)	4.4 (14.3)	2.9 (9.4)	2.5 (8.2)
					1200 (4) ⁸	2.4 (7.8)	3.2 (10.2)	2.1 (7.1)	1.9 (6.1)

- Design load is based on results of testing 25 mm (1") and 89 mm (3.5") FAST™ brackets using a 90 x 90 x 6 mm (3-1/2" x 3-1/2" x 1/4") stiffened shelf angle. Brackets were connected to a steel column with a 12.7 (1/2") bolt vertically centered in the bracket slot. A point load was applied 20 mm (0.79") o/c from the end (toe) of the angle. Tabled allowable loads are (unfactored) service loads, and have been established by test and calculation, and demonstrate a level of safety and performance consistent with North American design standards. Tabled allowable veneer heights are calculated as (maximum allowable vertical load per bracket) ÷ (weight of veneer per unit area x bracket spacing).
- Bolt slip resistance is higher than the stated design loads.
- Veneer weights used are: 170 kg/m² (34.8 lb/ft²) for clay brick; 125 kg/m² (25.6 lb/ft²) for 1600 kg/m³ (100 lb/ft³) concrete block; 190 kg/m² (38.9 lb/ft²) for 2400 kg/m³ (150 lb/ft³) concrete block; and 220 kg/m² (45.0 lb/ft²) for natural stone. All veneer widths are 90 mm.
- A 15.9 mm (5/8") diameter anchor bolt is recommended for use with the FAST™ system. Comply with all manufacturer's design and installation requirements pertaining to capacity, edge distances, torquing, etc.
- Where the FAST™ system is designed/intended to support masonry veneer having panel height exceeding 11m (36'), contact FERO for additional design information.
- The bracket spacing may vary by ±100 mm (4").
- Use a heavy duty washer manufactured by FERO under the bracket bolt head of the FAST™ system.
- If bracket spacing is designed/intended to exceed 900 mm, contact FERO for additional design information.

RECOMMENDED USE

The FAST™ system can be used to support masonry veneer of all types. It can also be used to support granite panels and precast concrete. The system is ideal to accommodate construction tolerances because it is available in a wide range of sizes, and provides adjustability in all directions.

TECHNICAL INFORMATION

The FAST™ system is pre-engineered by assuming a point load acts near the edge (toe) of the shelf angle. Table 1 shows maximum allowable veneer heights for various bracket spacings.

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FAST is a trademark of FERO Corporation, patent pending.



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