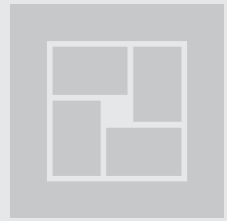
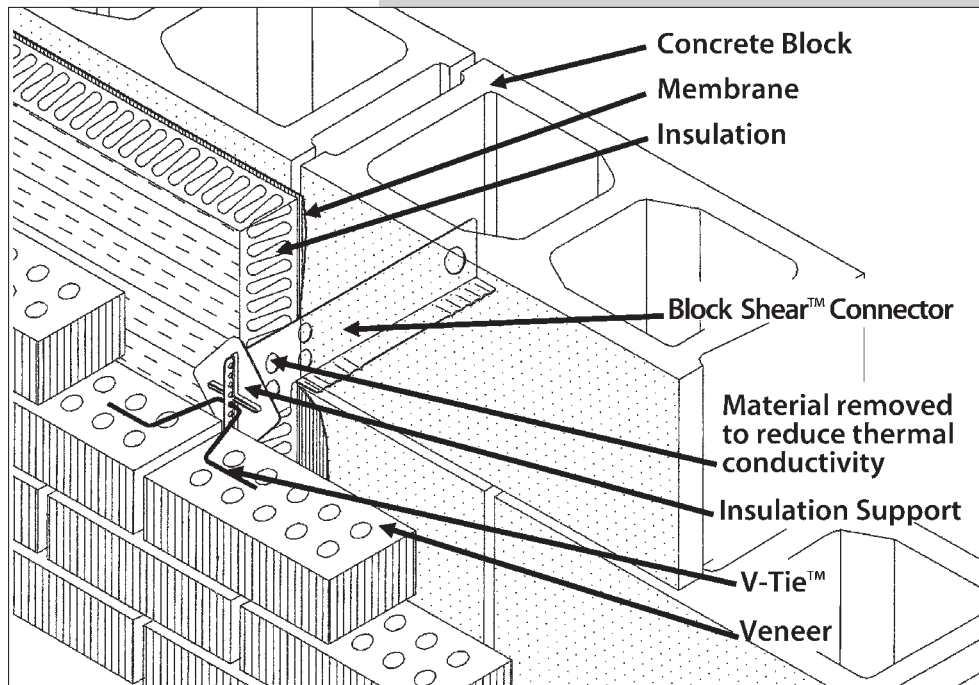


# BLOCK SHEAR™ CONNECTOR



## BLOCK SHEAR™ CONNECTOR APPLICATION



## Introduction

Presently, exterior brick veneer on a building is used primarily for aesthetics and to provide a weathering surface. No consideration is given to the utilization of the veneer as a structural component. All lateral loads (i.e., wind and earthquake) acting on the brick veneer must be transferred to a backup wall system by means of appropriately designed ties. In most cases, the backup wall consists of concrete masonry units and is designed to resist all of the applied loads.

The Block Shear™ Connector was developed to transfer shear between the brick veneer and the backup wall. **With the use of this shear resisting connector, composite load carrying action is achieved between the brick veneer and backup wall, resulting in a wall system with a changed and improved load resisting capacity.**

# Block Shear™ Connector Description

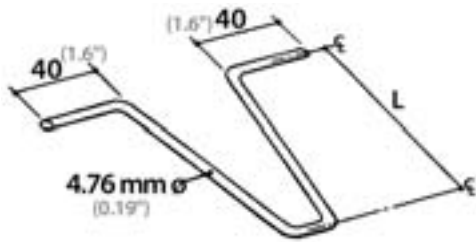


Figure 2 V-Tie™



Figure 3 Insulation Support

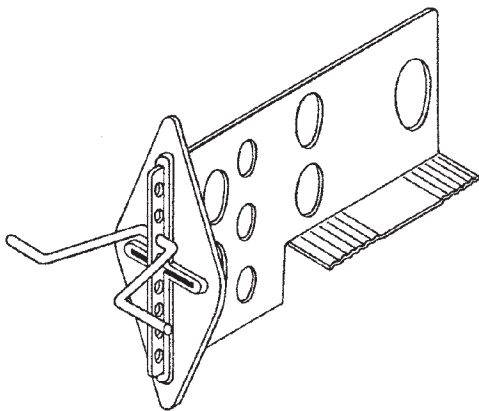


Figure 4 Block Shear™ Connector

The Block Shear™ Connector assembly consists of a Block Shear™ Connector Plate, a V-Tie™, and an optional Insulation Support.

The Block Shear™ Connector Plate component, presented in *Figure 1*, is manufactured from 16 gauge (1.61 mm [0.063"] thick) sheet metal conforming to ASTM Standard A570, and is available in hot dipped galvanized finish (conforming to CSA CAN3-A370 and ASTM A123 requirement of 401 g/m<sup>2</sup>/side [1.31 oz/ft<sup>2</sup>/side] of zinc coating), and stainless steel.

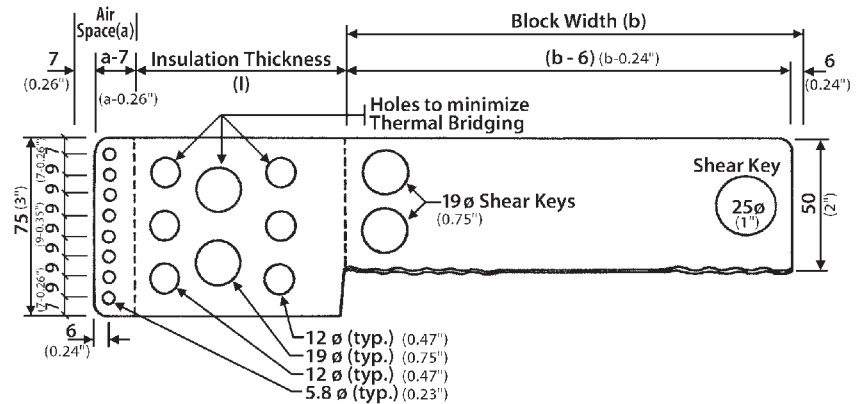


Figure 1 Block Shear™ Connector Plate

The length of the Block Shear™ Connector can vary to accommodate block width (b), of 90 (4"), 140 (6"), 190 (8"), 240 (10") and 290 mm (12"), insulation thickness (i), of 0 mm (0") and up, and air space width (a), of 25 mm (1") and greater.

Shear keys and corrugated sections provide for adequate fixity within the concrete block wythe. The notch in the plate assures proper positioning within the concrete block wythe.

Thermal bridging reducing holes are incorporated within the insulation thickness portion of the Block Shear™ Connector Plate.

The V-Tie™, as shown in *Figure 2*, is manufactured from 4.76 mm (0.19") diameter wire conforming to CSA Standard G30.3, and is available in hot dipped galvanized (conforming to CSA CAN3-A370 and ASTM A123 requirement of 458 g/m<sup>2</sup>/side [1.5 oz/ft<sup>2</sup>/side] of zinc coating), or stainless steel.

The legs of the V-Tie™ are mortared into place at the centerline of the brick veneer. V-Tie™ sizes of 60 (2.4"), 80 (3.1"), 100 (3.9"), 120 (4.7"), 140 (5.5"), 160 (6.3"), 180 (7.1"), 200 (7.9"), 225 (8.9") and 250 mm (9.8") lengths are available.

The Insulation Support is manufactured from polyethylene and is optionally used to secure the sheet insulation in place.

A Block Shear™ Connector assembly is shown in *Figure 4*, with an installation wall section given in *Figure 5*.

## Benefits

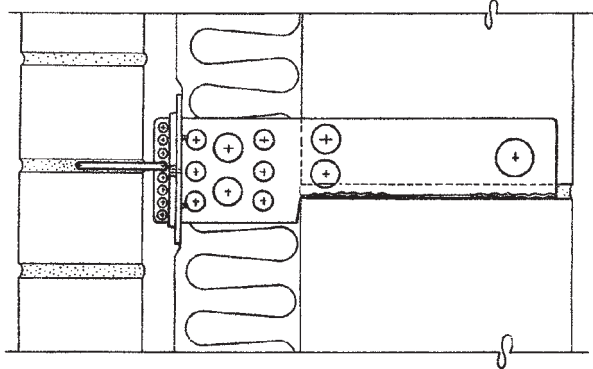
1. The Block Shear™ Connector greatly increases the stiffness of the wall system through composite action, thereby significantly reducing the lateral deflection of the wall assembly.
2. By providing composite action between the brick veneer and the concrete block backup wall, the block reinforcing requirements, the size of concrete block and thus the wall cost can all be reduced. These savings are again realized in greater useable floor space provided, and lower floor slab and foundation loads resulting in structural frame and foundation cost savings. *Table 1* illustrates examples of the improved structural performance provided by the Block Shear™ Connector wall system.
3. The Block Shear™ Connector provides fixity to the sheet insulation in all three directions, minimizing separation at sheet insulation junctions.

**Table 1 Concrete Block Backup Wall Design Comparison**

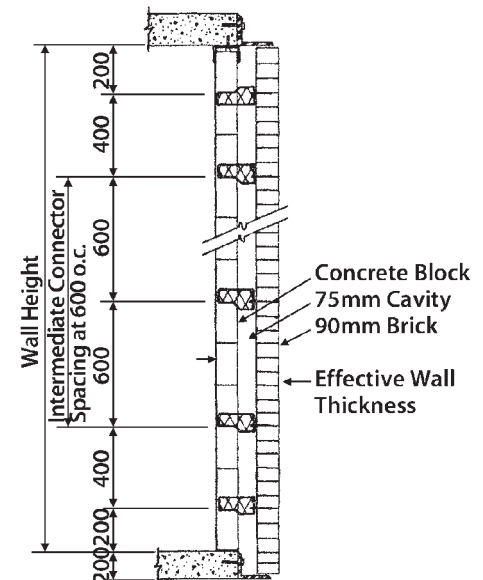
Wall Height H (mm)	Concrete Block Backup Wall Design Requirements		
	Wall Type	Conventional Design Options	Shear Truss™ Composite Design Options
3,000 (10')	Infill	(i) 140 mm (6") block w/ 1-15M Vert. @ 1,000 mm (39") o.c. (ii) 190 mm (8") block w/ 1-15M Vert. @ 2,000 mm (78") o.c.	(i) 90 mm (4") block w/ 1-15M Vert. @ 1,600 mm (63") o.c. (ii) 140 mm (6") block, plain
6,000 (20')	Infill	(i) 240 mm (10") block w/ 1-15M Vert. @ 600 mm (24") o.c. (ii) 290 (12") mm block w/ 1-20M Vert. @ 1,200 mm (48") o.c.	240 mm (10") block w/ 1-15M Vert. @ 1,600 mm (63") o.c.
	Load Bearing	240 mm (10") block w/ 2-15M Vert. @ 1,200 mm (48") o.c.	190 mm (8") block w/ 1-15M Vert. @ 1,600 mm (63") o.c.

Notes:

- (i) Design lateral wind load = 1.0 kPa (20.8 psi) (pressure and suction).
- (ii) Full mortar bedding is assumed for the 90 mm (3.5") clay brick veneer. Face shell mortar bedding is assumed for the concrete block wythes. Type S mortar is assumed throughout.
- (iii) Only those concrete block cores containing vertical reinforcing steel are assumed grouted.
- (iv) A cavity width of 75 mm (3") is assumed.
- (v) Block Shear™ Connectors are spaced horizontally at 800 mm (32") o.c. and vertically as per *Figure 6*.



*Figure 5 Block Shear™ Connector Installation*



*Figure 6 Block Shear™ Connector Vertical Spacing*

## Recommended Design Load and Deflections (Conventional Tie Usage)

1. Free Play (maximum):	0.80 mm (0.031")	
2. 0.45 kN (100 lbs) Deflection		
- free play not included:	0.15 mm (0.006")	
- including free play:	0.95 mm (max) (0.037")	
3. Recommended Design Load:	1.65 kN (371 lbs)	
4. Recommended Design Load Deflection		
- free play not included:	0.50 mm (0.02")	
5. Maximum Recommended Spacing:	Horizontal:	Vertical:
	800 mm (32")	600 mm (24")

### Notes

- (i) The above design load and deflections pertain to use of the Block Shear™ Connector in conventional tie applications. For composite wall utilization, engineering analysis is required to determine allowable loads and deflections.
- (ii) The design value reflects both the windward and leeward capacity of the Block Shear™ Connector tie system, with the governing value listed.
- (iii) The tie system recommended design load value was formulated using working stress design following the procedures of CSA CAN3-A370-M94 "Connectors for Masonry", ACI/ASCE/TMS/518 and U.B.C. The value has been reduced to account for test result variation, and reflects a factor of safety of 2.25 (i.e., 75% of 3.0), as per Table 3 (A370).
- (iv) The allowable mortar pull-out or push-out design load for the V-Tie™ embedded at the centerline of 90 mm (3.5") brick veneer utilizing Type S mortar, exceeds or equals the recommended design load listed above.
- (v) The allowable mortar pull-out or push-out design load for the Block Shear™ Connector Plate embedded in the mortar joint of the concrete blockwork utilizing Type S mortar, exceeds or equals the recommended design load listed above.
- (vi) The spacing of the Block Shear™ Connector ties for composite walls will be governed by design, with decreased vertical spacing occurring at the top and bottom of the wall system.
- (vii) The above design values are based on tests utilizing a 114 mm (4.5") cavity (25 mm [1"] air space). No insulation was used. Note that for smaller cavity widths and/or with the addition of insulation sheathing providing lateral tie support, increased tie system design loads and reduced tie system deflections may be realized.
- (viii) Maximum recommended spacing reflects the maximum allowable by CSA-A370-94, ACI/ASCE/TMS/518 and U.B.C. Design will ultimately govern spacing.



Fero Corporation