

# THiN-Wall the All-in-One Exterior Wall Solution

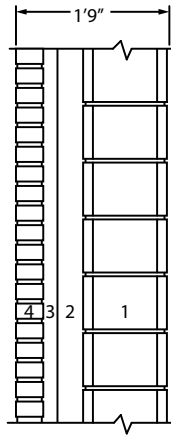
THiN-Wall is a patented wall panel system currently used by 27 US precast concrete licensees and growing at a fast rate. This insulated panel system uses a proprietary zig-zag shaped glass fiber reinforced polymer (GFRP) connector (see figure) to achieve composite action between the exterior and interior concrete wythes.

The strength of the GFRP zig-zag connector, also known as the NU-Tie, is nearly twice that of conventional Grade 60 ksi reinforcing bars, thus achieving excellent strength of the wall with minimal concrete in the two wythes and very few connectors. Yet, the low modulus of elasticity of the connector ensures that panel bowing, caused by exterior/interior temperature differential is minimized. Thus, the system achieves the best of both worlds high strength and high flexibility.

THiN-Wall is not just energy and structurally efficient, it is an integrated system that allows the precaster to use a relatively small total thickness to achieve the various requirements for moisture barrier, fire resistance, exterior finish and often a smooth interior finish surface. For example, consider three possible choices for an exterior wall system:

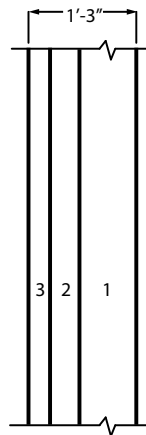
1. Masonry cavity wall;
2. Precast concrete non-composite wall;
3. THiN-Wall composite wall.

Assuming the minimum required R rating is 20. For this comparison we will assume using extruded polystyrene (XPS), which is preferred over expanded polystyrene (EPS) due to its closed cell form and high insulation rating. An R20 rating requires 4 inches of XPS. A typical thickness of a 30 ft tall masonry cavity wall is 21-inches with a 12" nominal concrete masonry unit (CMU) load bearing wythe, see figure. A noncomposite precast concrete wall which depends on the interior wythe for structural capacity would have a total width of 15 in., with the interior 8-in. wythe designed to resist the full load. For the THiN-Wall system only 10" thickness is adequate, 3" interior



1. 12" CMU
2. 4" rigid insulation
3. 1 3/4" air space
4. 3 5/8" brick veneer

CAVITYWALL



1. 8" precast/prestressed concrete
2. 4" rigid insulation
3. 3" precast concrete

NONCOMPOSITE PRECAST PANEL



1. 3" precast/prestressed concrete
2. 4" rigid insulation
3. 3" precast/prestressed concrete
4. 8" deep by 32" long, 3/8" diameter NU-Tie

THiN-Wall PRECAST PANEL

wythe plus XPS insulation plus 3" interior wythe. Both wythes would be designed to share in resisting the load. The exterior could be clad with 1/2" thin brick facing that is integrally precast with the panel. Both the appearance and the material of the exterior are the same for all three types of wall system.

The THiN-Wall panel system, and also the non-composite precast panel system, are made of high quality precast prestressed concrete. They can take advantage of high performance self consolidating concrete with high levels of fly ash and other recycled pozzolans. The inside face could be smooth-finished and painted to form the final surface. The primary advantage of the THiN-Wall system is that it uses only a total of 6 inches of concrete, only 75% of the concrete used in a non-composite wall.

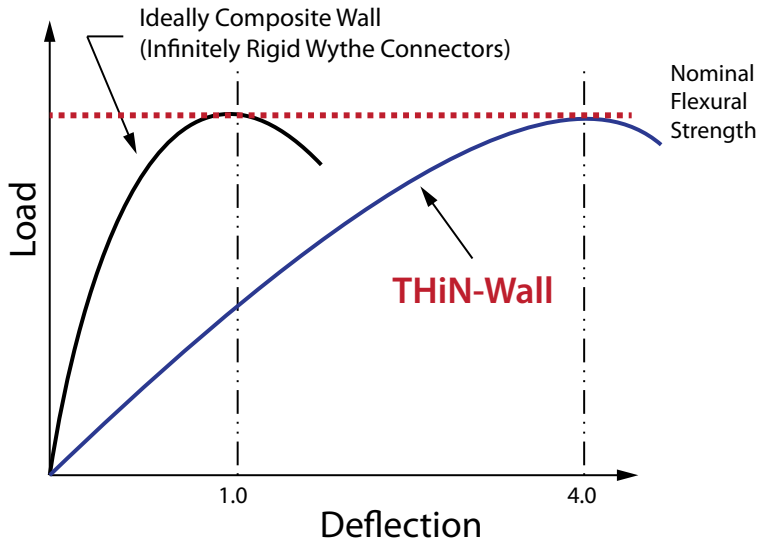
All composite walls exhibit thermal bowing to various degrees. This behavior is accounted for by designers. One of the great advantages of THiN-Wall is the low modulus of elasticity of the connectors. They stretch and shorten as the outside temperature changes relative to



the inside conditioned space. More pronounced bowing would result when stiff concrete block-outs and/or steel connectors are used to achieve composite action. The accompanying figures show the degree of composite action used in design of THiN-Walls and the relatively small bowing expected in service.

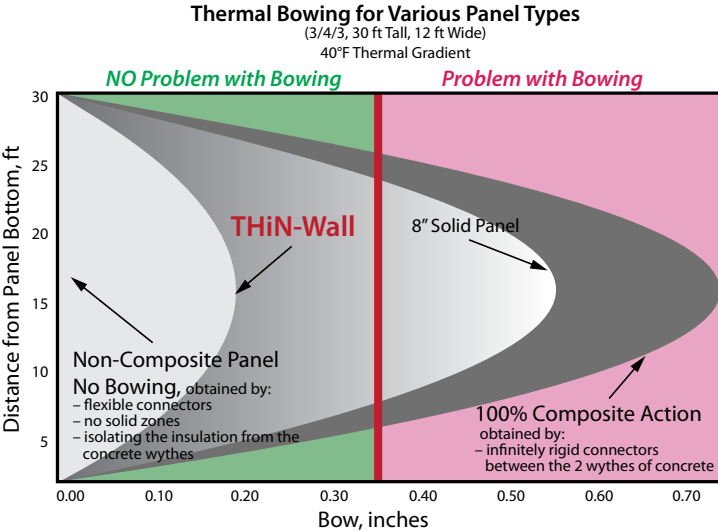
THiN Wall systems are only 25% as stiff as solid panels of the same span and thickness. Tall, slender THiN-Walls are designed with conservative assumptions:

1. P-Delta analysis is performed



# THiN-Wall Design

100% Composite Action for "Nominal Strength"  
 75% Composite Action for "Flexural Cracking Checks"  
 25% Composite Action for "Deflection Analysis"



- with only 25% of the stiffness of an ideally composite section,
- Cracking moment is reduced by 25% and also applied to factored load effects (no cracking allowed even under factored strength limit state), and
- Flexural strength satisfied with strands which also satisfy a requirement for minimum prestress 225 psi.

This conservative approach has resulted in several million square feet of successfully completed projects around the US.

### Additional Features of the THiN-Wall System

- Simple and production friendly.** NU-Ties preinstalled in insulation. Adequate NU-Tie embedment and thus

outstanding anchorage are ensured. Modular tie and transverse reinforcement spacing ensures no interferences.

- Versatile.** Every wall panel project can be engineered to accommodate different panel widths and specific structural capacity, including tornado-level wind loads.
- Durable.** Can obtain 2 hour fire endurance rating using standard design. NU-Ties do not corrode.
- Sustainable.** Reduced carbon footprint by virtue of using less concrete volume and more pozzolans; virtually no energy used for curing; significant energy savings for in-service conditions; long service life with virtually no maintenance; improved indoor air quality;
- Continued Enhancements.** New corbel system with zero thermal bridging. New patented non-conductive side-lift device; wall connection details that ensure full thermal insulation barrier; 24 inch pitch NU Ties to be used with welded wire reinforcement; etc. **A**

For more information, [www.http://thin-wall.com](http://thin-wall.com). Qualified PCI-certified precast concrete companies who wish to obtain a THiN-Wall license may contact Doug Gremel, Hughes Brothers, 210 N 13th St., Seward, NE, 402-643-2991, [doug@hughesbros.com](mailto:doug@hughesbros.com).