MyTiCon Timber Connectors Whitepaper

Wood-Concrete-Composite With **ASSY®** Screws

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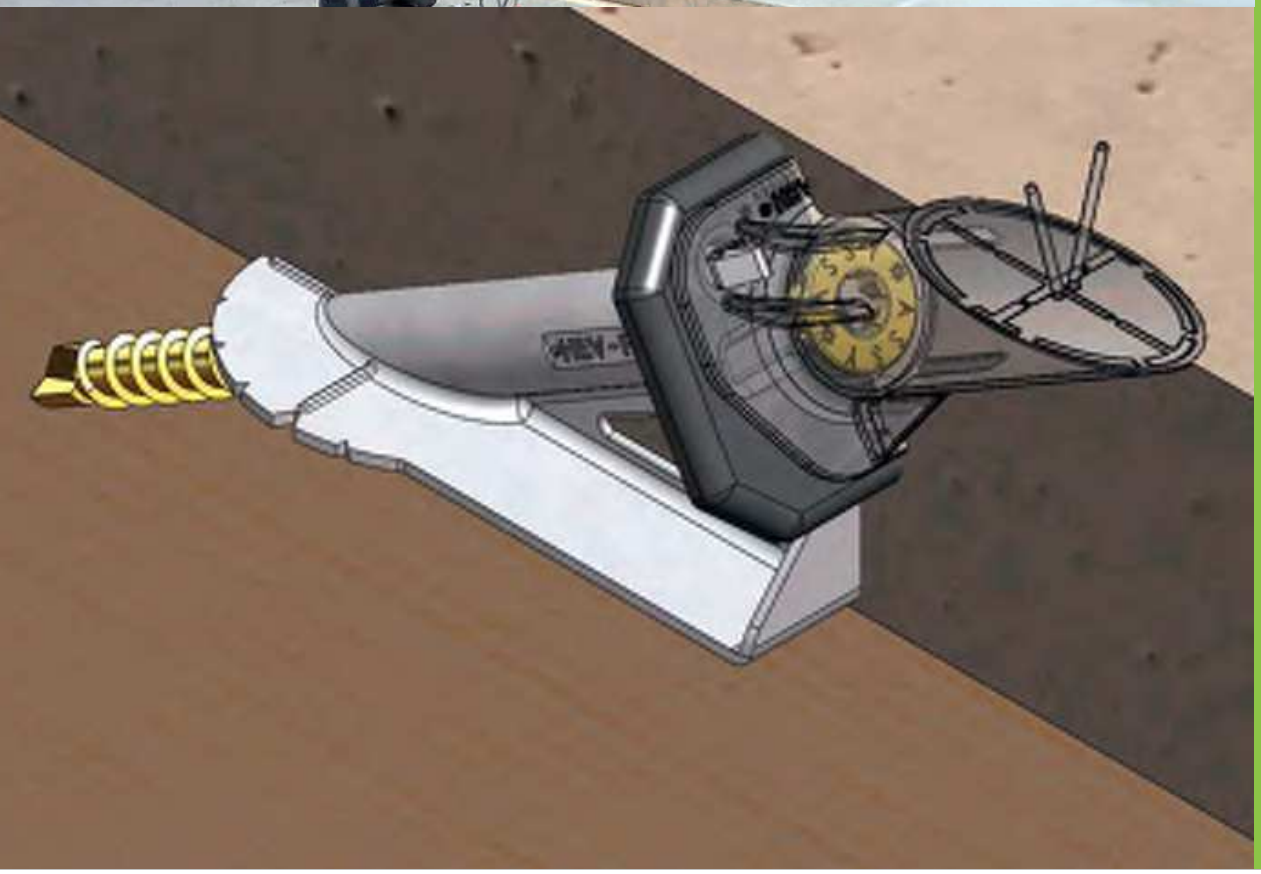
ASSY® Screws in Wood to Concrete Composite



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Application and Use for Wood-Concrete-Composite Materials

Larger scale structures were commonly built with steel and concrete in the past century and are still being designed using these carbon footprint heavy materials. New engineered wood products such as Cross-Laminated-Timber (CLT) or engineered timbers made from a combination of soft and hardwood species, were recently added to the engineers toolbox. Of course, wood can not entirely substitute steel and concrete in structures but their use can be reduced when engineered wood products are incorporated into the design.

Instead of strictly distinguishing between wood, steel and concrete as a structural material we should rather think about how to combine the most advantageous properties of our most popular structural materials. Utilizing new, innovative timber products with small carbon foot prints in combination with steel and concrete may allow timber, as a structural material, to enter non-residential, industrial and high rise construction in many cases.

As an example Newsletter #6 addresses an innovative approach on a composite material made from:

Wood

Steel

Concrete

Application and Use for Wood-Concrete-Composite Materials

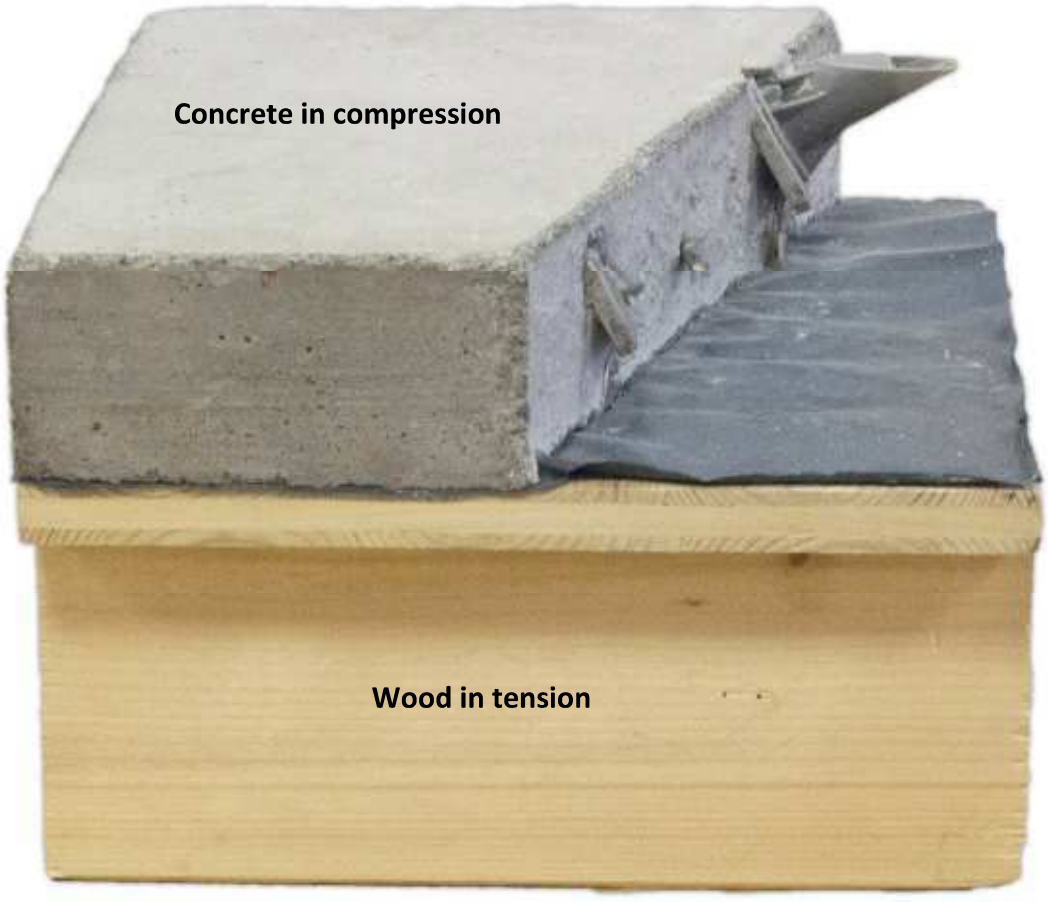
Composite materials such as wood-concrete composite slabs allow combination of the most advantageous properties of our main structural materials. In addition to the combination of material properties, designers must also address the issue of constructability, noise transmission, vibration, cost efficiency and possibly allow for a high grade of pre-manufacturing. Because concrete typically introduces large amounts of water when poured on site, designers must also account for water evaporation from the curing concrete. Evaporating water may be absorbed by structural timber elements and therefore increases moisture contents. During service the timber will eventually reach equilibrium moisture content and checks or cracks may develop if no proper ventilation or dehumidification is provided. Often, customer needs are not satisfied when checks occur in new glulam or timber beams or columns even though checking may be considered a natural behaviour of wood. Bearing in mind that checks or cracks caused by drying of wood may also reduce structural capacities any available technology shall be used to satisfy customer needs.

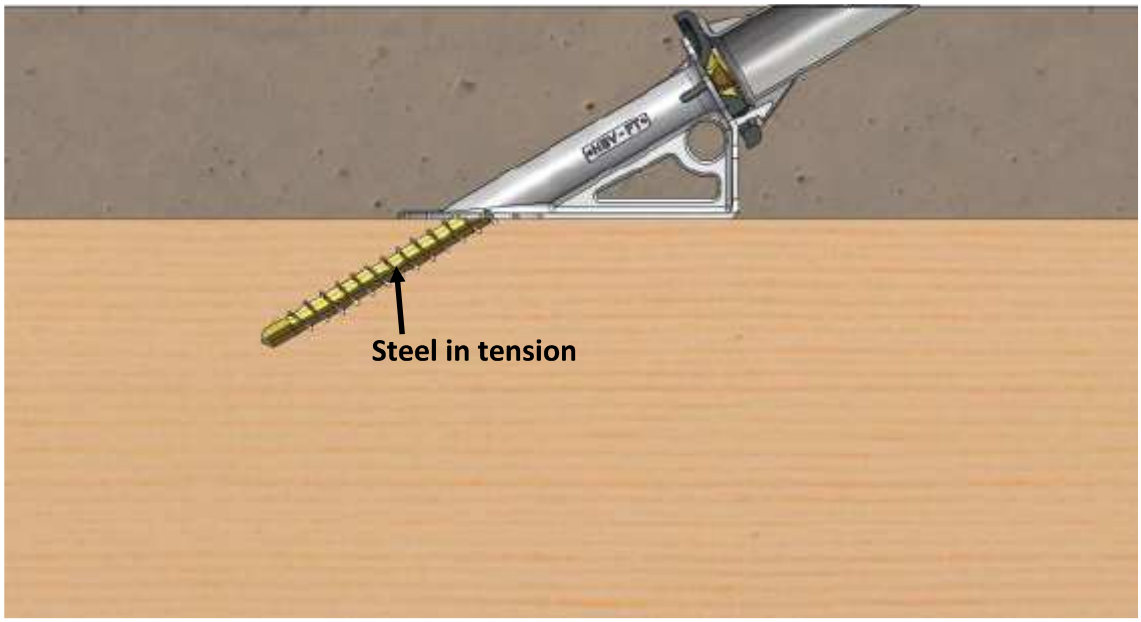
The system introduced with newsletter #6 is suitable to reduce the risk of excessive timber swelling or shrinkage and may be also considered as means to reduce checking and cracking due to the high grade of possible pre-manufacturing.

The ASSY® wood-concrete composite system features the following:

1. Combining advantageous properties of three structural materials (Wood, Steel, Concrete)
2. High grade of pre-manufacturing (eliminates on site concrete pouring)
3. Easy installation and fast construction time

1. Combination of Advantageous Properties





2. Pre-Manufacturing

The concrete slab is entirely pre-manufactured in the concrete plant including required rebar, lifting anchors and ASSY® wood concrete composite connector.

The pre-manufactured wood-concrete composite element is lifted into place. One crane lift per element.

Significant reduction of construction noise—no concrete pump, no shoring installation.

Concrete is delivered to site, cured and near full structural capacity at time of installation.

Since no shoring is required plenty of work space can be assured.

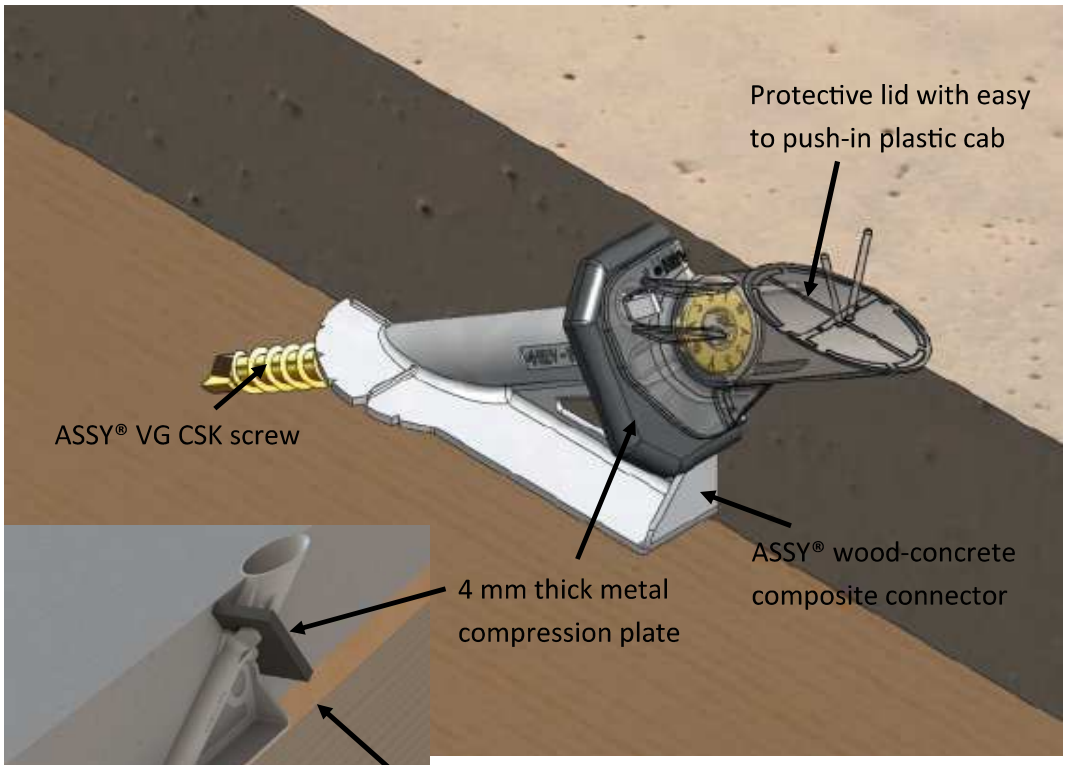
3. Easy Installation-Shorter Construction Time

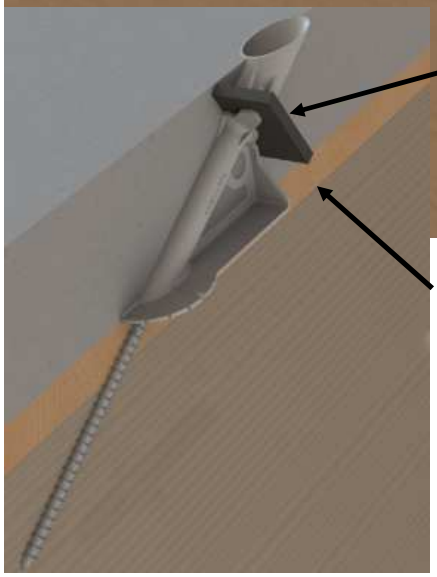
Screw installation at panel edge, for assembly purpose secures panel in place, fast

Installation of ASSY® VG CSK structural screws on an angle to the wood grain. Screw is easily driven through in concrete embedded wood concrete composite connector.

After screw installation full composite action is achieved.

System Principles





Multiple layer materials possible i.e. Plywood, OSB.

Noise reduction layer possible i.e. appropriate Styrofoam at required thickness. Styrofoam may also be used to increase structural depth of composite assembly while maintaining light weight.

Bearing of screw head on metal compression plate. Metal plate transfers compression stress into concrete.

Limitations When Using ASSY® Wood-Concrete_Composite

Limitations listed below are for introductory purpose only and cannot be assumed complete. Further limitations may apply.

-The concrete should be manufactured following local regulations regardless of the system (pre-manufactured concrete slab or on site concrete pouring). Respective formwork is to be installed according to local building codes and common construction practises.

-The minimum concrete strength shall be in excess of 20 MPa.

- a minimum concrete thickness of 50 mm shall be used for 8 mm diameter ASSY® screws and 70 mm minimum concrete thickness for 10 mm diameter ASSY® screws.

-the wood member shall be at least 100 mm thick

-the concrete depth shall not exceed 70% of the depth of the timber member below

Find more resources for our modern timber connection systems, including technical design data, installation guides, CAD files, videos, research data and more white papers on our website

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