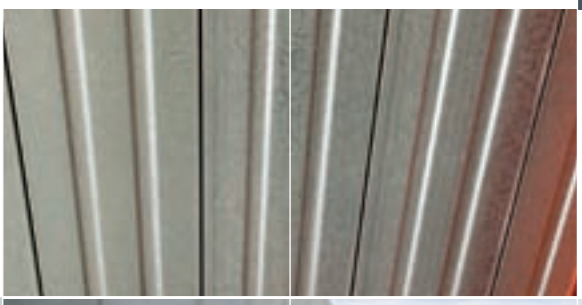
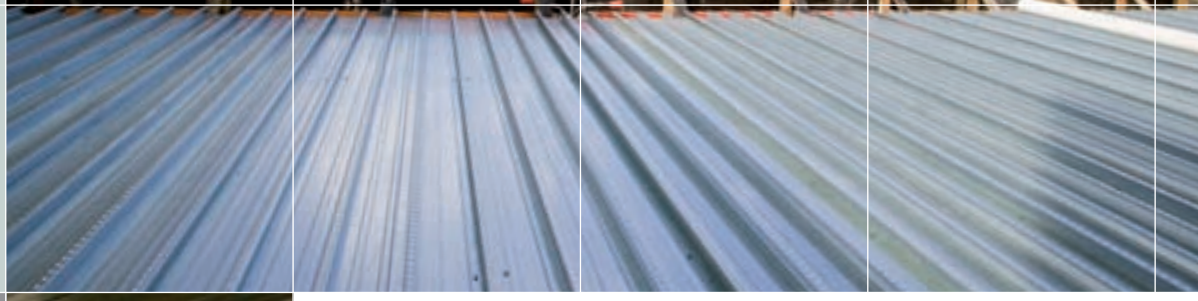
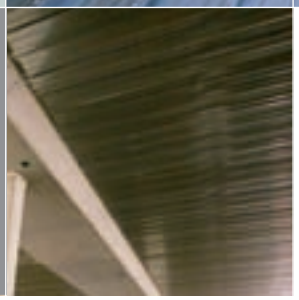
Bondek® structural decking

Performance enhancements





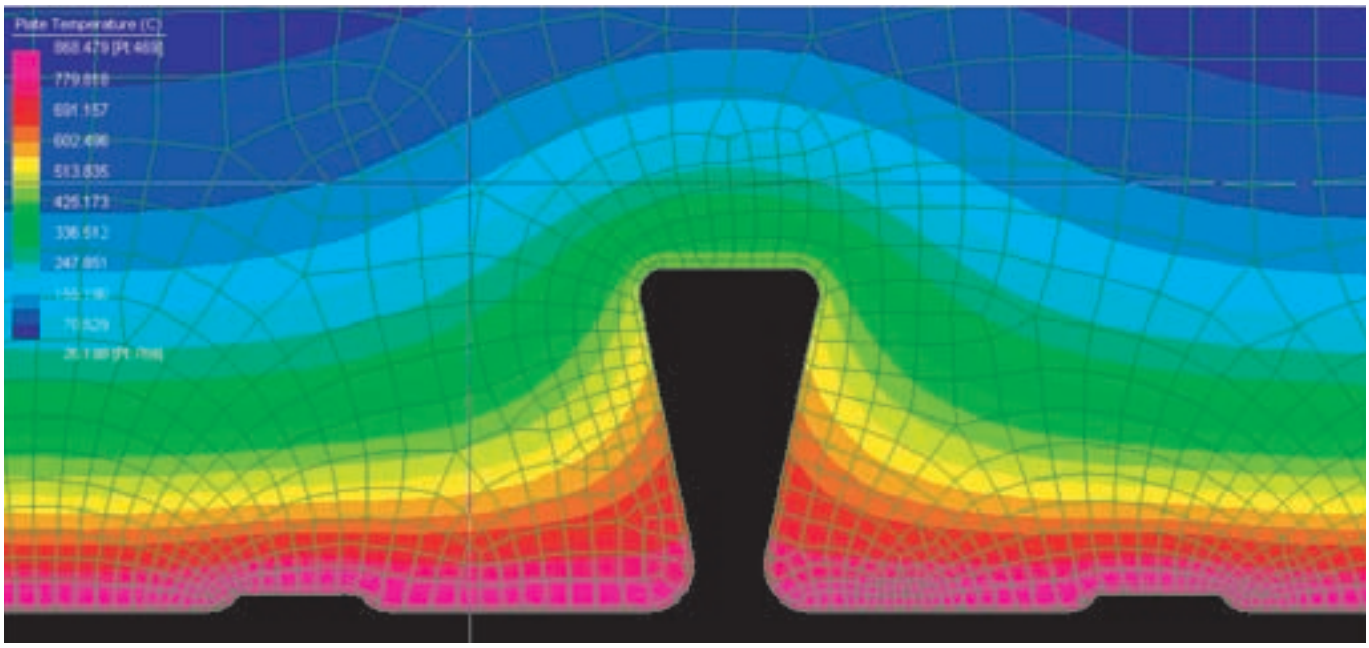


- Additional testing and continuous product refinement reveals BONDEK steel sheeting is capable of longer formwork spans than previously published
- New formwork tables optimised for steel frame construction
- Enhanced performance in design for fire reduces or eliminates the need for additional fire reinforcement

AUSTRALIAN MADE®

LYSAGHT

LYSAGHT BONDEK® improved design for fire



LYSAGHT products are subjected to extensive testing and analysis before our product performance claims are made. Our preference is to understate the performance our products.

Additional testing of BONDEK steel decking has revealed two important performance enhancements.

Proven performance

BONDEK steel formwork has proven its performance in the building industry for over 40 years.

A series of tests were conducted at Victoria University of Technology to determine BONDEK's performance under fire conditions. Fire design influences additional reinforcement requirements, and therefore additional costs. This research has direct implications in the design and cost of construction of composite concrete slabs.

Specifically, it has been proven that in fire conditions, the BONDEK ribs or parts of the ribs may be sufficiently cool to act as effective fire reinforcement.

Finite Element Analysis

Extensive finite element analysis has been performed to evaluate the contribution of BONDEK profile sheeting on the structural performance of composite slabs during fire.

Analysis showed that BONDEK profiled sheeting is partially effective for up to 120 minute fire resistance. This is based on the conservative assumption limiting the contribution of cold-formed steel to temperatures up to 600ºC, recommended by BS5950-8:2003

Fire Testing

Fire tests on composite slabs incorporating BONDEK profiled steel sheeting have been conducted at the Centre for Environmental Safety and Risk Engineering, also at the Victoria University of Technology, Australia.

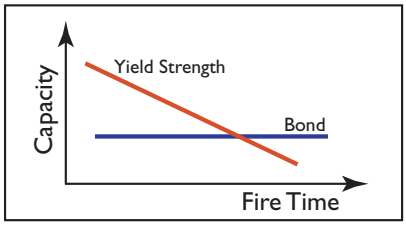
The tests have been used to validate the finite element analysis results.

Subsequent tests were performed to evaluate shear bond capacities of BONDEK profiled sheeting during fire. The tests at VUT revealed reduced shear bond capacities during fire. Test specimens failed due to shear bond failure, but not reduced yield strength, as was predicted based on the assumption of constant shear bond performance.

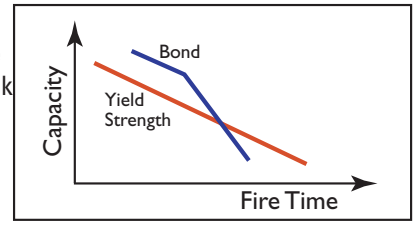
This proved composite performance to be the critical parameter during fire as opposed to reduced yield strength (illustrated below), therefore the location of these embossments is critical. It is a key element which gives BONDEK superior performance in fire.

Conclusion

BONDEK has superior composite performance during fire because the embossments are located on top of ribs, where steel is relatively cool. Locating embossments at the bottom makes a deck ineffective during fire. Our test results prove it.



Commonly assumed capacities



Actual test capacities

No additional fire reinforcement is necessary for typical BONDEK composite slabs with fire resistance up to 90 minutes. Significantly less fire reinforcement will be necessary for 120 minute fire resistance.

And finally, there is no need to increase slab depth when designing for fire.

In conclusion, tests prove BONDEK acts as reinforcement in fire conditions up to 120 minutes, which makes desiging with BONDEK economical. BlueScope Lysaght R&D Centre's NATA accredited laboratory uses a point load test rig to test the design of BONDEK profiled steel sheeting as formwork for wet concrete and construction loads. (See photo above.)

Improved BONDEK formwork spans

BlueScope Lysaght Research & Development Centre's NATA accredited laboratory uses a point load test rig to test the design of BONDEK profiled steel sheeting as formwork for wet concrete and construction loads.

Measuring performance

In the absence of an Australian Standard, the design rules for BONDEK sheeting acting as formwork were developed in the late 1980s, based on extensive full scale testing of BONDEK sheeting in single and multi-span arrangements. As a consequence, empirical design methods were developed to predict the behaviour of BONDEK sheeting for strength and stiffness, under wet concrete and construction loads.

Since then construction experience and changes in work practices have shown BONDEK formwork spans to be conservative for a range of applications.

Research and Testing

BlueScope Steel has completed a research program to further investigate the behaviour of BONDEK sheeting as formwork for both the strength and serviceability (deflection) limit states.

This research more accurately reflects current construction practices in relation to using BONDEK as formwork.

This latest research considered the existing test procedures and design methods developed for BONDEK, as well as those adopted overseas, including the British Standard BS 5950:Part 4.

This investigation sought to develop a better understanding of the complex behaviour and influence that the various construction parameters have on bending moment capacities and stiffness of BONDEK sheeting, under wet concrete and construction loads.

These parameters include span configurations, support conditions and loading arrangements. Moment capacities and stiffness in relation to dovetail and lap ribs have also been investigated.

A series of tests were conducted simultaneously on a direct pressure rig and a point load test rig, thus improving the reliability and verification of test results.

Superior performance

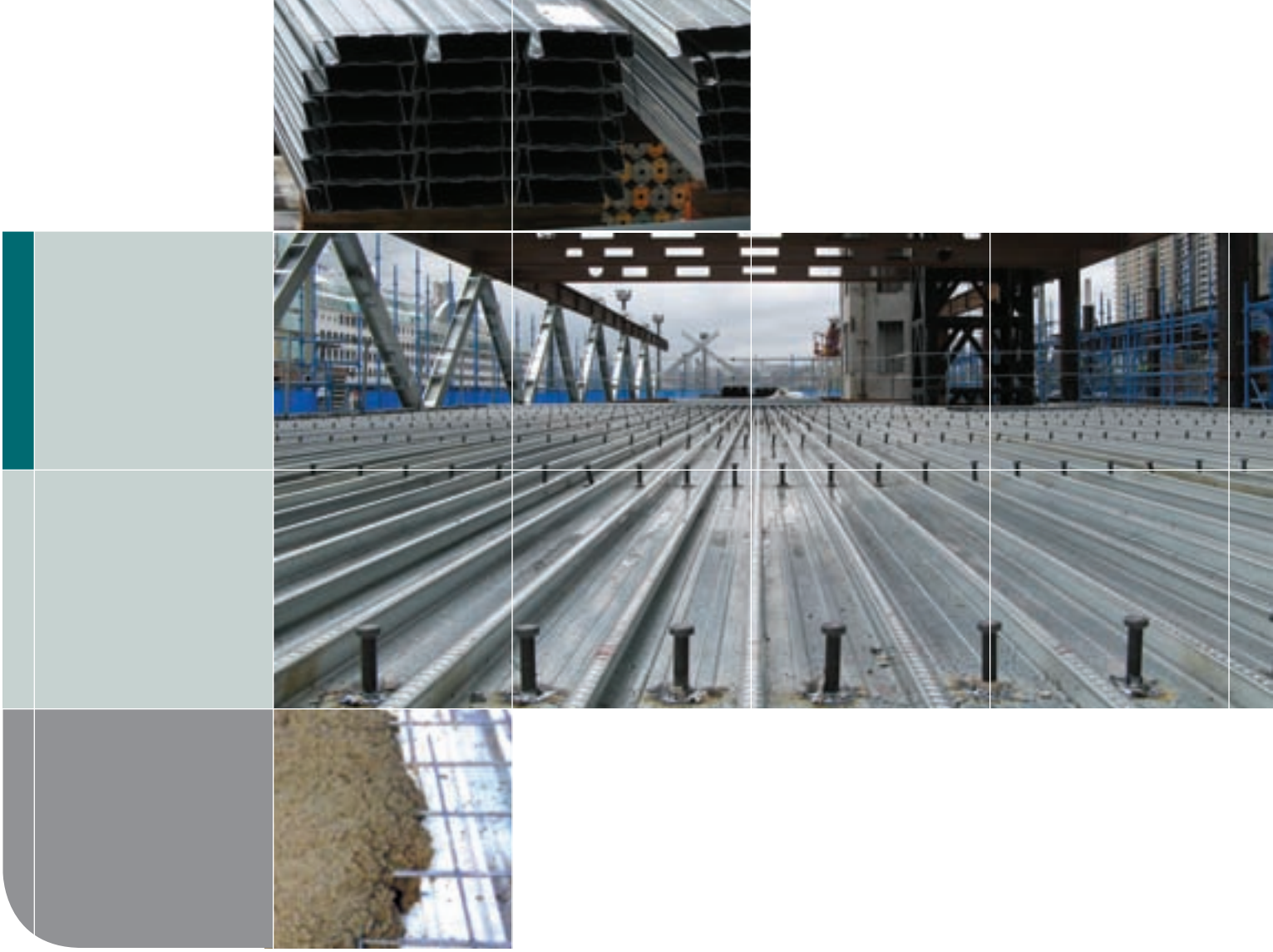
Our initial research investigation confirms that for BONDEK acting as formwork, both the design capacity for strength and stiffness (deflection) of BONDEK sheeting were underestimated.

Maximum BONDEK formwork spans have been increased in the new published values.

The new values can be found in the BONDEK User's Guide.

BlueScope Lysaght continues its commitment to research and development, to ensure BONDEK remains in the forefront with superior design solutions in composite slab construction.

Please contact the nearest BlueScope Lysaght office for design assistance.



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For technical information contact steelditrct@bluescopesteel.com or call 1800 641 417

www.lysaght.com

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