

Guidance Note

In-situ to precast connections

A common way to connect in-situ concrete members to precast elements (or sometimes to connect two precast elements) is to anchor the reinforcement bars of the in-situ member in the precast element using headed inserts. The most common application for this detail is the connection of in-situ slabs to precast-wall-panels.

It has been brought to our attention that some engineers are detailing a possible non-compliant use of threaded inserts (also referred to as ferrules) for this application. We recommend you pass this information on to your engineers.

As members will know, threaded inserts are designed for fixing steel or other architectural elements to precast concrete or temporary bracing and propping. In general, these inserts have a short embedment depth, which is not designed to anchor the tension capacity of a reinforcement bar.

When engineers use standard threaded inserts to anchor reinforcing as starter bars, the failure load of the concrete surrounding the anchor will be lower than the tensile capacity of the bar.

This would not comply with the design intent of AS 3600 and AS 5100, both of which require a ductile failure mode (AS 3600 19.3.1 (c): "Fixings shall be designed to yield before ultimate failure in the event of overload")

It has been reported to us that there have been several failures around Australia - particularly with post-tensioned floors - because of the large stresses that can be developed. The following issues are of concern:

1. Cast-in headed anchors must develop the design capacity of the bar they are anchoring, and the connection must fail in a ductile manner;
2. To be code compliant the area of the anchor head must be greater than or equal to 4 times the cross section of the bar (AS 3600 – section 13.1.4); and
3. Published data suggests that cutting a metric thread into N-grade reinforcing bars downrates them to the equivalent of 2 bar-sizes smaller, e.g. N24 threaded to M20 is equivalent to N16.

Instead of using a proprietary system, details that use standard threaded inserts with metric threaded bars (such as that shown on the right), do not develop the full capacity of the connected reinforcement bar and therefore do not comply with AS3600 – section 19.3.1 (c).

Leviat, Reid and PSA supply headed anchors as part of their proprietary reinforcement bar systems that can comply with the design intent of AS 3600. Leviat offers the Ancon KSN Anchors that work in conjunction with Ancon BT Starter Bars, PSA offers the PSA Forge Bar Inserts that work in conjunction with the PSA Forge Bar Starter Bars and PSA Threadbar Inserts that work together with PSA Threadbar Bars and REID offers Reidbar Inserts in conjunction with Reidbar. All suppliers provide detailed guidance on the design of their systems.

Concrete design strength, centre-to-centre spacings, edge distances and embedment depth of the anchor have an influence on the design capacity of the connection, thus these connections should be designed by an engineer with relevant experience.

For the correct design and detailing of headed anchors refer to your supplier's technical information or contact their technical support.

