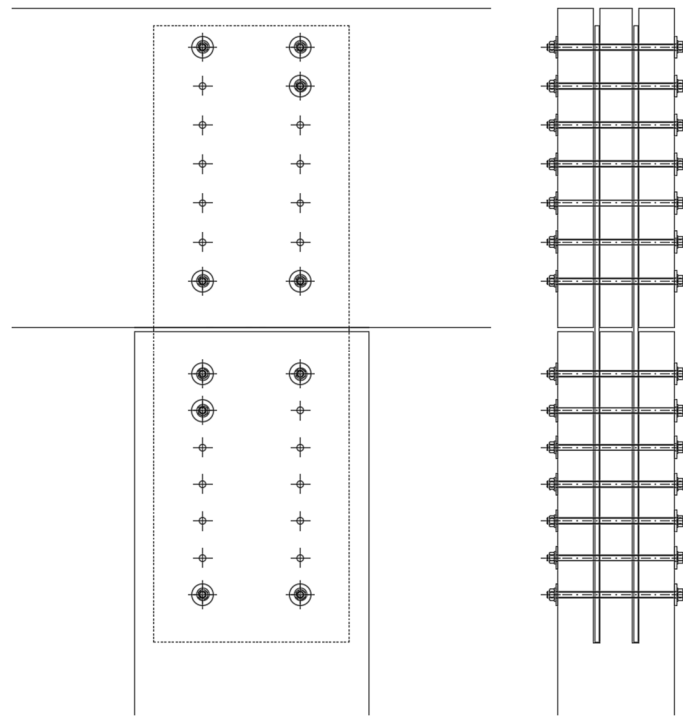


Moment-resisting timber connections: a point of attention for architects

Why a connection that looks simple can call for extensive substantiation

1. A connection that looks simpler than it is

A timber column that transfers a moment to a cantilevering beam via a steel plate and bolts, dowels, screws or nails is a connection type that quickly looks simple in design drawings: a plate, a few fasteners, done. The same applies to moment-resisting connections between timber members only, with multiple shear planes. Structurally speaking, however, this connection type is among the more complex parts of a timber structure.



In short: no version of Eurocode 5 contains a ready-made calculation method for this connection type. Repeating the same detail makes thorough substantiation feasible; a unique application, by contrast, makes it harder.

2. Why the design is complex

Eurocode 5 contains, in neither the current nor the draft version, a calculation method specifically tailored to moment-resisting timber connections with dowel-type fasteners. Designers therefore

fall back on simplified theoretical approaches or on practice-based methods such as that of Porteous & Kermani, which are admittedly usable, but have not been substantiated by dedicated experimental or numerical research for this specific connection type.

An additional difficulty is that such connections can be susceptible to brittle failure due to tensile stress perpendicular to the grain, a phenomenon that has been repeatedly observed in recent international technical literature. Eurocode 5 prescribes that this possibility must always be investigated as soon as a force acts at an angle to the grain direction, but the common practice-based methods do not always carry out that check in a way that is adapted to the connection. This is no cause for alarm, but it is an indication that this connection type demands more than a routine calculation.

3. Why repetition makes the difference

Where no normative calculation method is available, Eurocode 0 (EN 1990) offers a way out: substantiating the design by means of physical testing. This route, however, is not without obligations. A design supported by testing requires a sufficient number of tests to demonstrate the required level of reliability statistically, which entails considerable cost and lead time.

That cost can only be justified when the same connection detail is applied several times: within a single project, or across a series of comparable projects. For a unique, non-repetitive connection, substantiation by testing is seldom feasible, even though it is precisely then that most reliance has to be placed on assumptions and engineering judgement. Repetition is, in other words, not merely an execution advantage: it is also a technical precondition for designing a timber connection of this type on a thoroughly substantiated basis.

4. Points of attention for the design process

- Involve the structural engineer early in the design, as soon as a moment-resisting connection with dowel-type fasteners is being considered.
- Consider, where possible, applying the same connection detail repeatedly within the project or across a series of comparable projects, so that substantiation by testing becomes economically feasible.
- Allow sufficient time and budget for additional verification, such as numerical analysis or testing, where the connection cannot be applied repetitively.
- Avoid filling in a moment-resisting connection late in the design process, as an ad-hoc finishing touch: its complexity calls for early attention.

5. Conclusion

A moment-resisting timber connection with laterally loaded dowel-type fasteners is seldom a routine detail. The absence of a normative calculation method, combined with a real risk of brittle failure, makes thorough technical substantiation necessary. A design that applies the same detail

repeatedly to such a connection gives the structural engineer the room to actually deliver that substantiation, if need be through testing.

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