TDA's Flatline System at a Glance

The "Flatline" concept aims to assist adoption of a new approach to timber cladding. The system is the result of a project funded by the Forest and Wood Products Research and Development Corporation. The system is based on the use of treated Radiata Pine cladding boards but with adjustments it could also be applied to other species. The system aims to improve timber cladding from being an *ad hoc* kit of components to an integrated construction system. The system also aims to be able to compete with the features of non-timber cladding systems while providing a number of unique features that differentiate it in appearance, functional performance and construction efficiency.

The system is being promulgated to interested parties in the timber industry by way of template quality installation manual which can be downloaded at www.timber.net.au/flatline. The site also contains market intelligence reports and other information relating to the development of the system.

Photo 1: The Flatline prototype building

Importantly, the system offers concepts for suppliers and marketers to adopt under their own branded versions of the Flatline system. As a result, the template manual is primarily an aid for individual companies to create their own "branded" installation manuals.

A Market Driven Approach

The Flatline System responds to market research concerning trends in housing design and construction. Of note, there are trends in the upper end of the housing market towards modern facades with sleek and minimalist detailing. Typically, this includes use of lightweight materials – especially timber cladding – which is used to visually counterbalance and combine with the appearance of masonry, steel and glass finishes. In particular, timber can achieve this in a desirable way via a flat faced board with a strong deep shadow line – a feature which architects see as a desirable alternative to splayed boards. It is also hard for non-timber board products to copy this approach.

Photo 2: Timber cladding in modern housing designs

Lightweight cladding is also in demand in hot and humid parts of Australia (e.g. Queensland) where well ventilated buildings have advantages over the thermal mass of heavy masonry. Flatline aims to take advantage of these trends.

The main customer base likely to respond to the Flatline System (and the above design trends) includes:

- Those involved in the design of modern, up-market and custom designed homes.
- Those involved in prestige housing estate developments.
- Those designing housing in coastal, regional and tropical areas.

Flatline's Board Profile

Flatline provides a new board profile suited to all horizontal and/or vertical cladding situations as well as ceiling, gable and eave installations. The board profile (refer Figure 1) incorporates a deeper rebate and therefore a deeper shadow line than similar board profiles. The board also features a raked tongue and groove which allows easier installation onsite. A larger than normal board overlap also improves weather resistance and facilitates hidden nailing. Grooves machined into the opposing faces of the overlapping boards also create a 2 mm wide anti-capillary groove which aims to improve weather resistance.

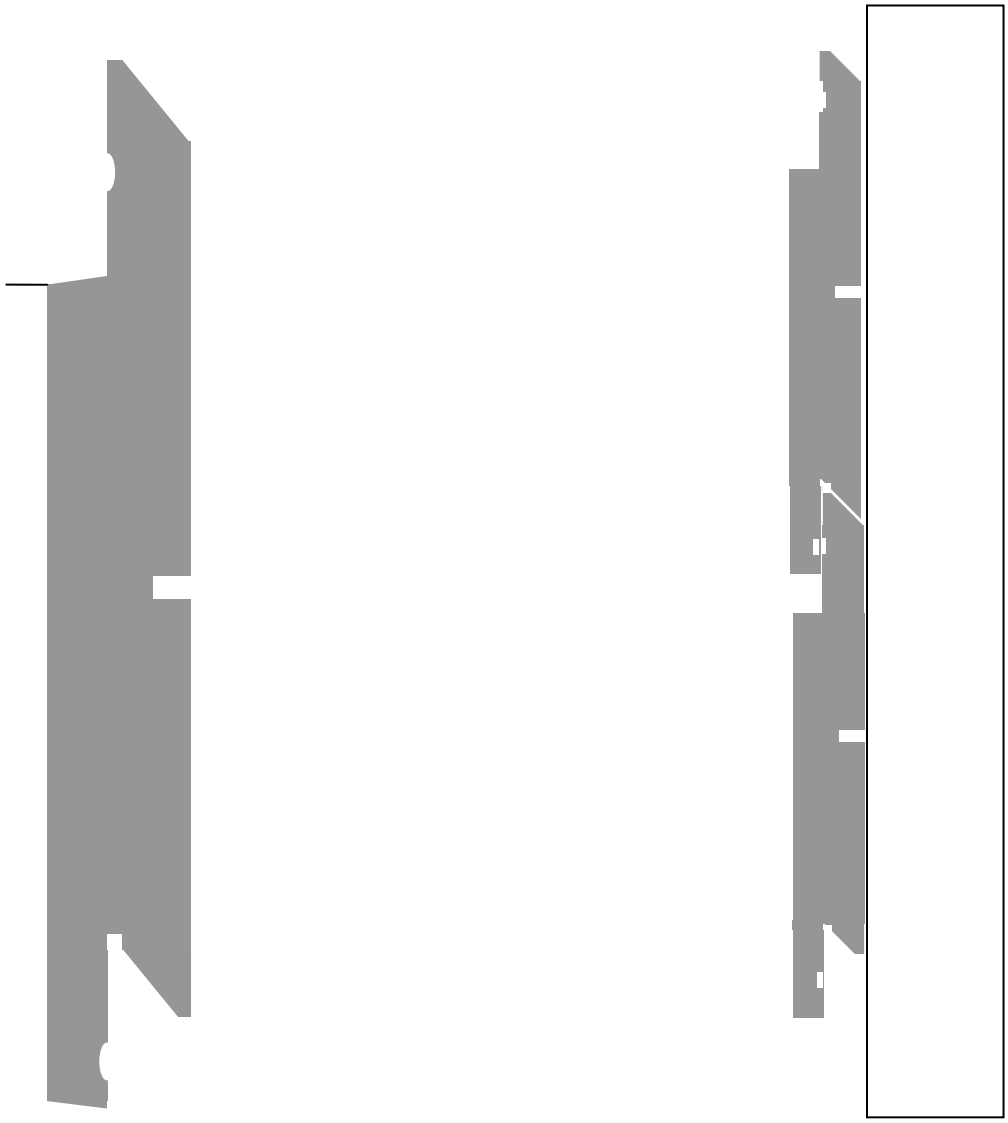

Figure 1: Detailed and conceptualised views of the Flatline board profile

Flatline's Hidden Nailing System (for non-cyclonic wind zones)

The Flatline system adopts a different approach to traditional nail fixing of cladding boards. For instance, nails are located centrally in the anti-capillary groove of the board (refer Figure 2) and are ultimately hidden when the next board is laid i.e. by virtue of the enlarged overlap between boards. There is also only one nail per board per stud. As a result, there are no nails seen on the outside face of the cladding and so an associated advantage is that there is no need to punch, fill and sand nail holes. This also makes it possible to pre-coat boards prior to erection, requiring only touch-up or minimal finishing coats once installed.

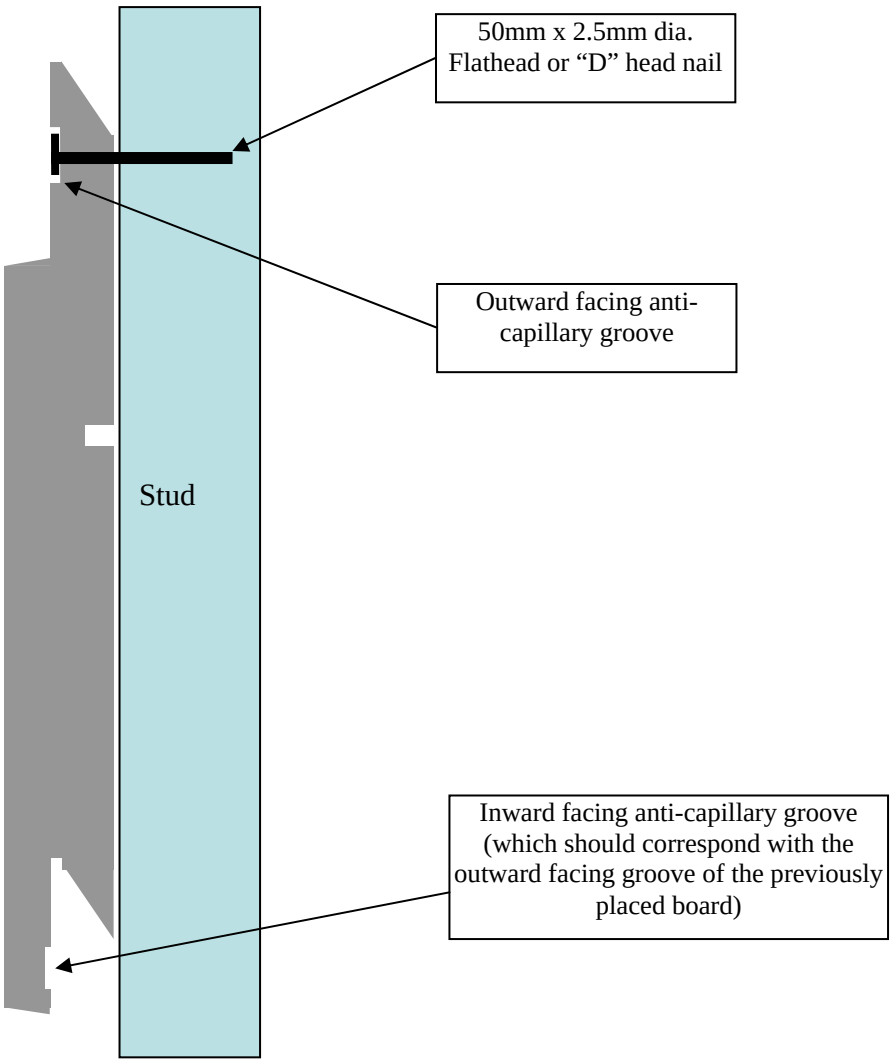

Figure 2: Nail positioned in anti-capillary groove

Flatline's Cavity Batten System (for tropical, high wind areas)

The Flatline system incorporates the concept of a metal cavity batten that offers an alternative to direct nail fixing and is well suited to hot tropical climates. The concept was designed to perform well in high wind areas (i.e. greater than N3) while still providing a hidden fixing system[1]. Here, the battens are fixed to studs (max. 600 mm spacings) and the metal holding fins protruding from each batten fold down the rebated face of the boards. This aims to provide greater resistance to board pull off forces than nails. The battens are also designed for:

- *Superior weatherproofing* i.e. the cavity assists drainage of rain that may occur in high wind driven rain environments
- *Improved installation efficiency:*
  - The battens can be quickly gun fixed through the metal into the face of studs.

[1] *AS 4055:1992 Wind Loads for Housing, Standards Australia, Sydney*

  - Setout, alignment and installation are simplified because boards hook into position between the pre-determined fold out fins.
  - Improved installation speed i.e. boards simply slot into place between the fold out fins which are then bent over the top of boards with a hammer
- *Improved thermal performance* i.e. the air cavity contributes to insulation and the performance of reflective air spaces. Thermal performance software programs such as AccuRate can model the cavity space as either a ventilated or non-ventilated cavity depending on hot or cold climate conditions.
- *Battens can be used to hold sarking in place* i.e. by tacking the top of the sarking in place, then using the over fixing provided by the battens to hold the rest of the sarking in place.

Photo 3: Metal battens fixed to the face of studs with fins protruding

Photo 4: Side view of boards placed in between fins protruding from batten

Flatline's Random End Jointing of Boards

The Flatline system incorporates the concept of a metal plate connector (refer Photo 5) which is applied with adhesive to make end joints between boards, thus removing the need to join boards over studs. Key advantages are that site cutting is reduced, waste is minimised and board setout is simplified. The first step in making the joint involves removing 20 mm of the back shoulder of the tongue from the ends of the two boards being butt jointed. This and the other steps are shown in Photo 6 to Photo 8.

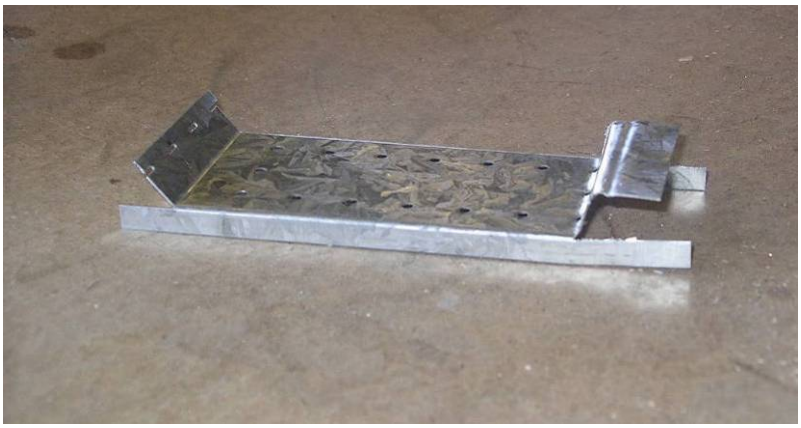

Photo 5: Metal plate connector

Photo 6: Chisel cut used to remove back shoulder of tongue

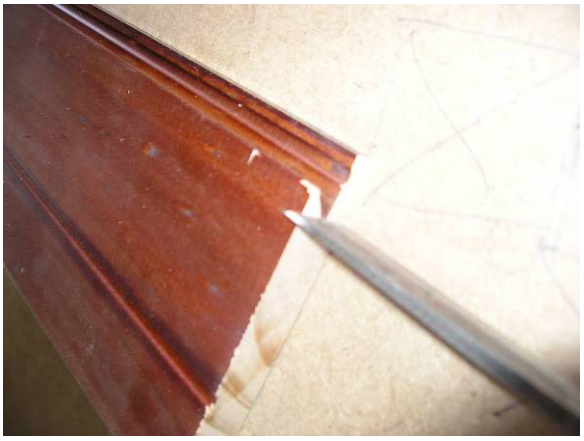

Photo 7: Connector (with adhesive applied) fitted behind board

Photo 8: Close up of completed joint (prior to final staining)

Flatline's Stain Based Factory Primer

Timber cladding's biggest advantage over other cladding boards is its ability to be finished with a natural or tinted stain. The warmth of this provides the perfect visual counterbalance for visually cold materials such as steel, concrete, glass and rendered masonry. Concurrent to this, timber's greatest weakness is its poorly perceived durability including its:

- Short recoating period for stains
- Poor dimensional stability (induced through change in moisture content)

The concept of a stain primer (instead of an opaque paint primer) aims to go some way towards addressing the above issues. The stain primer can be applied with much the same factory equipment as opaque paint primer but provides greater flexibility in terms of what it can deliver as an end appearance. For instance, stain primer makes it possible to top coat onsite with either stain or an opaque paint finish. In addition, by using a light coloured stain primer there is the option of using darker stain top coats to vary the final appearance. This allows designers many aesthetic options from the same base product. New coating technology also provides the ability to attain deeper penetration into the timber, thus presenting the prospect of greater dimensional stability. In time, such coatings may potentially be used as a vehicle for treating timber against rot and termite attack.

Photo 9: Silverseal stain primer over finger jointed Radiata Pine

Photo 10: Opaque acrylic paint applied over Silverseal stain primer

Flashings, Corner Mouldings and Cappings

Users of the Flatline System have the option of using their own flashing systems or a selection of new flashing options provided as part of the system. This includes two key types:

- Exposed bent metal flashings (in colourbond or stainless steel)
- Timber cappings with concealed flashings behind

A number of these options are shown on the following pages. Of note, one of the stainless metal corner flashings is shown in Photo 11. A new bent metal flashing that can be applied around windows and other flashing applications is shown in Photo 12 and Photo 13. Aesthtically, it provides a slim but expressed band around window/door units that can be used to either contrast or meld with surrounding construction elements. In addition, Photo 14, Photo 15, and Photo 16 show timber stop mould and timber capping options. Features of the various options include:

- The ability to fix metal flashing in a way that is hidden from view – this also prevents the aesthetic problem commonly known as “oil canning”
- The ability to provide a straight edge and stop edge for laying cladding boards
- The ability to either express or suppress the exposed parts of metal flashings
- The ability for metal flashings to be bent to deal with most offset wall angles
- The ability for head and sill flashings to maintain a small air cavity to help prevent wind blow rain from rising up behind the flashing

Photo 11: Example of stainless steel bent metal external and re-entrant corner flashings

Photo 12: Example of Flatline's bent metal window/door flashings

Photo 13: Cladding base (starter) flashing

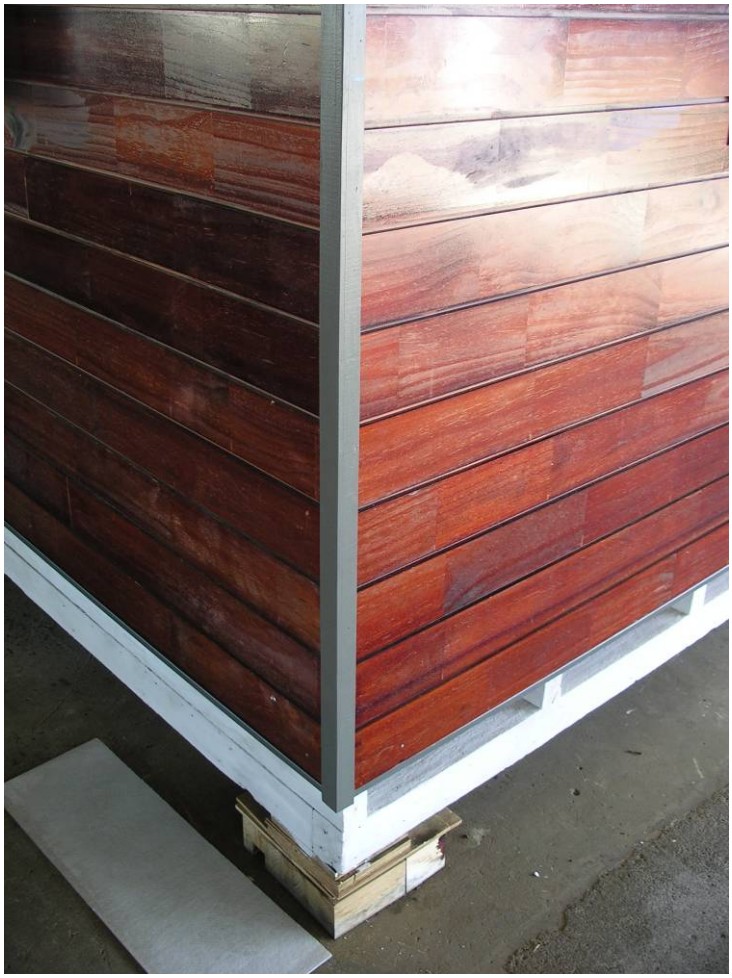

Photo 14: Perspective view of timber corner mould

Photo 15: Side view of timber corner mould (with shadow line)

Photo 16: Close up of (alternative) corner capping

Recommendations for Supplier Packaging of Flatline

There is demand among builders for timber cladding supplied in standard pack lengths and for those lengths to have precision cut square ends. In general, these features would:

- Improve the consistency and standardisation of lengths available to builders
- Improve the ability to provide neat packaging of boards – this would potentially keep boards straighter if strapped and packed appropriately
- Reduce the amount of onsite cutting i.e. minimal docking of board ends.

Arguably the best length for standard packs is either 5.4 or 6.0m. For instance, 5.4 m lengths are good for long runs and can be cut down into 2/2.7 m lengths. Such lengths are likely to be well suited to vertical board applications. 6.0 m lengths offer a similar alternative and can be cut down into 2/3.0 m lengths or mixed mid lengths (e.g. a 3.3 and 2.7 length or a 3.6 and 2.4 length). Either 5.4 m or 6.0 m lengths are longer than most competing board products and should therefore offer a competitive advantage due to the reduced number of joints in cladding installations. The above mid lengths could either be cut onsite by tradesmen or if appropriate by the supply chain i.e. as a value adding exercise.