The clear finding is that AFS Logic Wall DOES NOT COMPLY WITH AS3600 – 2009 for the reasons explained below.

The presence of the AFS metal ‘C’ sections as metallic embedments can be incorporated into a conventional concrete wall design provided that CO$_2$ and chlorides are prevented from penetrating the AFS Wall system. This mechanism of protection is normally achieved by having adequate concrete cover which prevents the entry of contaminants into the concrete wall. AS 3600 – 2009 DEEMED TO SATISFY compliance can only be achieved when there is concrete cover. The AFS Logic Wall as shown in the below diagram does not have concrete cover over the metal ‘C’ sections. The current and legal commentary, AS3600 – 2009 – Supplement 1 : 2014, states that protective coating is outside the scope of AS3600.

**AFS LOGIC WALL REPORTS FOR AS3600 COMPLIANCE**

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<tr>
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<td>Professor Bijan Samali, author of the UTS Report dated 23rd May 2014 (download) *</td>
<td>19th December 2014</td>
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*Added to August 2014 AS3600 Durability Compliance Assessment of AFS Logic Wall.*

**August 2014 version of this assessment updated to incorporate newly released commentary AS3600, Supplement 1 : 2014 which replaced the 1994 version. For the subject topic referred in this document, the 1994 and 2014 versions are identical.*

**UNIVERSITY OF NSW Report**  
**Dated 5th May 2014**

**CONDITIONAL COMPLIANCE**

- Metal ‘C’ sections must not corrode.
- AFS Logic Wall must be protected (Dulux-Acratex render specified) and the render protection must be maintained for the life of the structure (i.e. 60 years).
QUESTIONS TO ASK FOR CONDITIONAL COMPLIANCE

• What is the minimum concrete cover as per AS3600 – 20mm.
• Does AFS Logic Wall’s metal ‘C’ sections have concrete cover? NO
• Can metal sections of AFS Logic Wall corrode? YES – as shown in the photos below. Therefore, the University of New South Wales, 5th May 2014 condition is not satisfied.
• Does AS3600 accept protection against corrosion by galvanising, membranes or epoxy coating in lieu of concrete cover? NOT in accordance with AS3600 Commentary.
• Can a render system such as Dulux Acratex be used as a protection system since AS3600 does not even accept galvanising, membranes or epoxy coating without concrete cover? NO
• Does the Dulux Acratex Technical Document 1.3.8 require concrete cover? YES. Therefore, the University of New South Wales, 5th May 2014 condition is not satisfied.
• Is there a legislative requirement to enforce the ongoing maintenance required by the UNSW Report for 60 years on the building owners? NO
• If you accept the Conditional Certification of AFS Logic Wall, will you be responsible for the life of the structure as the building professional/builder? YES

THE REASONS WHY THE CONDITIONAL COMPLIANCE OF THE UNISEARCH – UNSW ASSESSMENT DATED 5TH MAY 2014 CANNOT BE ACHIEVED ARE AS FOLLOWS:

1. Corrosion resistance of the AFS metal sections cannot be guaranteed because of the following factors:

   The metal ‘C’ sections of AFS Logic Wall are manufactured from zinc coated sheets first, cut to length, bent to form the ‘C’ section and punched to create concrete flow holes. The Unisearch Report dated 5th May 2014 fails to recognise that it is not possible to hot-dip galvanise the metal ‘C’ sections of AFS Logic Wall after they have been formed, cut to length and punched to form web holes as the thin walls (material is less than 1mm thick) of the ‘C’ section will warp and twist in the hot zinc bath.

   The manufacturing process significantly compromises galvanising: The AFS metal ‘C’ sections are manufactured from thin galvanised (Z275) metal sheets that are less than 1mm thick by:

   i) Cutting the metal sheet to suit the length of the ‘C’ section – no galvanising at the ends where the sheet is cut.
   ii) Bending the metal to form a ‘C’ section – bending to form a ‘C’ section significantly compromises galvanising.
   iii) Punching the ‘C’ sections to create many web holes – no galvanising at the periphery of the punched web holes.
   iv) Spot welding the ‘C’ sections – galvanising is destroyed at the welds.

2. The metal sections with thin galvanising will most likely be damaged by the concrete aggregates and vibrator use.
3. **Air voids are a common occurrence** (refer attached Photo No: 1) in the absence of minimum 180mm – 200mm concrete slump and vibrator use which means an alkaline environment offered by concrete cannot exist to protect the metal ‘C’ sections in the presence of air voids. The absence of concrete cover where the fibre sheet is glued to the metal stud also significantly compromises the galvanising due to the lack of an alkaline environment on this surface.

The above Items, Nos: 1, 2 and 3, explains the reasons why the metal ‘C’ studs of AFS Logic Wall can corrode. THE PHOTOS SHOWN IN THIS DOCUMENT CLEARLY SHOW THAT CORROSION OF THE METAL ‘C’ STUDS TAKES PLACE WHICH IS CONTRADICTION TO THE CONDITION BY THE University of New South Wales Report dated 5th May 2014.

4. **AFS Wall is required to be protected and maintained for 50 years +/- 20% (i.e. 60 years) as required by AS 3600.** The maintenance for 60 years cannot be achieved in the absence of strata laws forcing building owners to maintain the required membrane system. The diagram below represents the AFS Wall system as referred in the Unisearch Report dated 5th May 2014.

5. **Metal ‘C’ studs are considered non-structural by AFS.** The argument is NOT whether the metal ‘C’ studs are structural or non-structural. The issue is what happens to the crack width if and when the metal ‘C’ studs corrode. The permanent gap shown in the below diagrams as per the University of New South Wales’ report dated 5th May 2014 is 0.14mm. The Australian crack width limit for water retaining structures is 0.1mm, for corrosion protection is 0.2mm, provided there are concrete to concrete surfaces at each face of the crack (which is not the case in the AFS Logic Wall as self-healing; autogenous healing cannot happen between the concrete surface and the metal ‘C’ stud surface) to promote concrete’s self-healing function. The corroding metal ‘C’ studs as shown in the photos will expand and the gap will be much wider than 0.14mm in time. However, the important issue is that the gap will remain as permanent in the absence of autogenous healing. This will most likely ensure that corrosion of the steel bars in the wall will take place.

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**FIGURE 1 – CORROSION PATH**
IMPORTANT NOTES

- Concrete crack at each metal ‘C’ stud having 0.14mm width upon concrete pour.
- Autogenous Healing cannot occur between the concrete and the metal ‘C’ stud sections. If the metal ‘C’ studs are allowed to corrode, the 0.14mm wide crack will therefore get wider in time due to corrosion and expansion of the metal ‘C’ studs.
- This will further exacerbate the potential of the main steel bars corroding as well.
- The corrosion problem is therefore unavoidable in the absence of concrete cover.
- No concrete cover means NO AS3600 COMPLIANCE.

The above figure shows the dispersion of CO$_2$ and Chlorides within the permanent gap.

**FIGURE 2 – CO$_2$ AND CHLORIDES CONTAMINATION**

THE FOLLOWING NEEDS TO BE FURTHER CONSIDERED IN THE ASSESSMENT:

(i) AS3600 – 2009, Clause 4.10.3.7 require minimum concrete cover. The metal ‘C’ section shown in the above diagram does not have concrete cover over the metal ‘C’ section. This minimum concrete cover is required to protect the metal ‘C’ section (with already compromised galvanising) and steel reinforced bars (with no galvanising). Without concrete cover there is no compliance with AS3600 hence the DEEMED TO SATISFY condition cannot be applied. If the protective coating (render and top coat) shown in the above diagram is to be relied upon, only an ALTERNATIVE SOLUTION can be considered, not the “deemed to satisfy” condition.
(ii) The Unisearch, UNSW Report dated 5th May 2014 clearly states that AFS Logic Wall is required to be protected by a protective coating and refers to the Dulux Acratex Coating System. *(Download)* Dulux Protective Coating Technical Document No: 1:3:8 clearly states that the abovementioned concrete cover requirement must be achieved for the Dulux protecting coating to be effective.

(iii) The Dulux Acratex render protection cannot be relied upon as AFS Logic Wall has no concrete cover. In addition the Dulux protective coating is not impervious (check with Dulux if they can provide a guarantee for the installed Dulux protective coating in the form of render and top coat installed condition that will provide total imperviousness for CO₂ and chlorides penetration into AFS Logic Wall). The effectiveness of the Dulux protective coating depends on the workmanship reliability of the applicator to ensure that adequate dry film thickness of top coat and render (which should not shrink and crack) is achieved when applied in weather conditions, excluding hot, humid, rainy and windy days. Other factors will also influence the effectiveness of the protective coating including necessary concrete cover, cracking at the fibre cement sheet joints due to building movements (lateral forces, foundation/floor settlements), shrinkage and temperature movement of concrete infilled AFS walls and biological/chemical degradation of organic wood fibre contained within the fibre cement sheets. *(Download)* Leaky Buildings – Are Fibre Cement Sheets Suitable.

Refer to the issue noted in the above downloadable document that NO INSURANCE is possible for buildings/products demonstrating MOULD/MILDEW. Also refer to Photo No: 3 and consider if protective coating in the form of render is effective in avoiding the mould/mildew issue.

(iv) For reasons similar to the above, AS3600 – 2009, Supplement 1 : 2014 Concrete Structures Code Commentary (current and legal document) for AS3600 – 2009 states that “the protective coating is outside the scope of AS3600”. Professionals must understand that due to the difficulties of maintaining control of applied protective finishes, necessitates AS3600 not to rely on protective coatings hence the reason for minimum concrete cover of Clause 4.10.3.7. The Unisearch Report dated 5th May 2014 also ignores this very fundamental Durability consideration. If the protective coating was reliable the corrosion of the metal ‘C’ sections shown in Photo No: 2 would not have occurred.

(v) AS3600 – 2009, Table 4.3, Note 9, only allows concrete cover reduction by changing the exposure classification. The minimum concrete cover of Clause 4.10.3.7 must be maintained; there is no zero (0) concrete cover allowance that exists within AS3600.

(vi) Even if all the conditions are satisfied with the protective coatings, the maintenance requirement mentioned in the Unisearch Report dated 5th May 2014 means that there is a need for building legislation for building owners that they must maintain the protective coating system for 50 years, +/- 20% as required by AS3600. This legislation does not exist for the Unisearch Report dated 5th May 2014 to suggest that the ongoing maintenance will actually be provided.

(vii) ALTERNATIVE SOLUTION allowed by the BCA for the option that falls outside of AS3600. However, the requirement is that the outcome of the Alternative Solution must display at least the equivalent of AS3600. This is why those providing an “Alternative Solution” (i.e. manufacturers, engineers, certifiers) must display conclusive evidence that the maintenance free (there is no Australian legislation to enforce or monitor if the maintenance based alternative solution is adopted) structural life of 50 years +/- 20% is achieved. AS3600, Appendix B gives guidance to the acceptance of alternative solutions. These are:

- Durability test for a period of 50 years +/- 20%. The photos in this document are displaying that the condition for durability cannot be satisfied.
- Fire test for structural adequacy/integrity/insulation (alternative solution cannot be used beyond the test conditions).

There are more comprehensive documents, particularly for ENGINEERS/CERTIFIERS that further explain the above at *(download)* AFS Logic Wall Structural Engineering Assessment. Pages 3 to 8 of this assessment answers in more detail the following questions.

Our concerns raised above have already been provided to the previous and current AFS Logic Wall Management, Dulux Acratex Management and Unisearch – UNSW Management.

We have now concluded our duty of care as practicing professional engineers. Therefore, it is your responsibility to consider the above if you certify, specify and use this product.
PHOTO NO: 1

AIR VOIDS CAUSE CORROSION
(PHOTOS FROM A BUILDER OF A SYDNEY PROJECT THAT HAS USED AFS WALLS)

AIR VOIDS IDENTIFIED AND GROUTED BY THE INSTALLER

AIR VOIDS FAILED TO BE IDENTIFIED BY THE INSTALLER WHO GROUTED THE ABOVE VOIDS

FIBRE CEMENT SHEET JOINT

FIBRE CEMENT SHEET REMOVED FOR INSPECTION

AIR VOIDS

GLUE ON METAL CHANNELS

AIR VOIDS
PHOTO NO: 2

“PROTECTIVE COATINGS” ARE OUTSIDE THE SCOPE OF AS3600 – CONCRETE STRUCTURES CODE, BECAUSE WHAT IS SHOWN IN THE PHOTOS BELOW IS HARD TO AVOID

FAÇADE WALL – WINDOW HEAD METAL ‘C’ CHANNELS CORROSION UNDER “PROTECTIVE COATING”

METAL ‘C’ CHANNEL CORROSION
PHOTO NO: 3

PHOTOS SHOW MOULD / FUNGUS AT A SYDNEY – AFS PROJECT INDICATING THAT RENDERED FIBRE CEMENT SHEETS ARE POROUS HENCE CANNOT BE IDENTIFIED AS “PROTECTIVE COATINGS”
PHOTO NO: 4
PHOTOS FROM CANBERRA – INDICATING THAT THE PROBLEM DOES NOT ONLY OCCUR IN CLOSE PROXIMITY TO WATERFRONT PROPERTIES