

STATEMENT OF COMPLIANCE

AS 3610



SECTION 1: SCOPE AND GENERAL

SCOPE AND APPLICATION

1.1.1 SCOPE

This Standard sets out minimum requirements for the design and construction of concrete structures and members that contain reinforcing steel, or tendons, or both. It also sets out minimum requirements for plain concrete members.

Noted. Permaform is modeled on these criteria.

DESIGN 1.4.2 DESIGN DETAILS

The drawings or specification for concrete members and structures shall include, as appropriate, the following:

(c) Class of formwork in accordance with AS 3610 for the surface finish specified.

Noted for cross-reference to AS 3610.

SECTION 2: DESIGN REQUIREMENTS AND PROCEDURES

DESIGN REQUIREMENTS 2.1.1.AIM

The aim of structural design is to provide a structure that is durable, serviceable and has adequate strength while serving its intended function and that satisfies other relevant requirements such as robustness, ease of construction and economy.

A structure is durable if it withstands expected wear and deterioration throughout its intended life without the need for undue maintenance.

As a permanent formwork material, Permaform satisfies the intended function as a temporary component and in use a long-term durable finished surface.

However, with Permaform acting integrally with other building elements providing very deep beams and arching design principles, the designer can take advantage of these attributes to:

- + Reduce slab depths
- + Optimise vertical components
- + Minimise or eliminate
- + Slab/beam requirements
- + Consider options for sway resistance

2.6 DESIGN FOR DURABILITY

The structure and its component members shall be designed for durability in accordance with the requirements of Section 4

2.7 DESIGN FOR FIRE RESISTANCE

The structure and its component members shall be designed for the appropriate fire resistance in accordance with Section 5.

See Later Section & Review BCA

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SECTION 3 LOADS AND LOAD COMBINATIONS FOR STABILITY, STRENGTH AND SERVICEABILITY

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Accommodated by Permaform.

SECTION 4: DESIGN FOR DURABILITY

4.1.3 COVER FOR CORROSION PROTECTION

Code requirements for cover relate to standard formed elements rather than permanent formwork.

Whilst the presence Permaform does not relax this code requirement an added benefit of the product is to provide an additional measure to combat the effect of water permeating into concrete below ground. Permaform recommends that cover requirements are not relaxed with its use generally.

SECTION 5: DESIGN FOR FIRE RESISTANCE

5.7.4 STRUCTURAL ADEQUACY FOR WALLS

A laterally supported wall has the required fire-resistance period for structural adequacy if the following are satisfied:

- a) The wall complies with the requirements of Clause 11.2.
- b) Its effective thickness is not less than the thickness required by Clause 5.7.2 for that period.
- c) If $N^* \leq 0.03f'_c A_g$ and H_{we}/t_w is not greater than 50.
- (d) If $N^* \leq 0.03f'_c A_g$
 - i) H_{we}/t_w is not greater than 20; and
 - ii) The cover from the fire-exposed face to the vertical reinforcement or tendons is not less than the corresponding cover given in Table 5.7.4 for that period.

Permaform does not prejudice the performance of a concrete element under fire conditions and does not affect the cover criteria as detailed in this section of AS 3600.

The effect of smoke generated from the effect of fire is dealt with elsewhere in this document under the BCA provisions, noting that Permaform does comply with the relevant section of the subject Code.

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SECTION 6: DESIGN PROPERTIES OF MATERIALS

DESIGN PROPERTIES OF MATERIALS

Applicable to elements formed in Permaform.

SECTION 7: METHODS OF STRUCTURAL ANALYSIS

METHODS OF STRUCTURAL ANALYSIS

Applicable to elements formed with Permaform.

SECTION 8: BEAMS FOR STRENGTH AND SERVICEABILITY

BEAMS FOR STRENGTH AND SERVICEABILITY

Applicable to Permaform formed elements.

SECTION 9: DESIGN OF SLABS FOR STRENGTH AND SERVICEABILITY

DESIGN OF SLABS FOR STRENGTH AND SERVICEABILITY

Applicable to Permaform formed elements.

SECTION 10: DESIGN OF COLUMNS FOR STRENGTH AND SERVICEABILITY

DESIGN OF COLUMNS FOR STRENGTH AND SERVICEABILITY

Applicable to Permaform formed elements.

SECTION 11: DESIGN OF WALLS

REINFORCEMENT REQUIREMENTS FOR WALLS

11.6.1 MINIMUM REINFORCEMENT

Walls shall have a reinforcement ratio (p_w)—

a) in the vertical direction of not less than the larger of either 0.0015 or the value required by structural analysis; and

b) as horizontal reinforcement is necessary to control cracking where conventional formwork is used with Permaform permanent panels, this requirement is not relevant as multiple cracks are generated by the internal ribs. In some circumstances therefore, the minimum ratio of 0.0025 may be reconsidered as necessary by the designer for the actual wall reinforcement and relocated to floor slabs where more convenient and effective in overall structural stability.

It should be noted that compressive axial strength of walls by the Code is based on unreinforced section properties.

The internal configuration of Permaform allows any array of either horizontal or vertical reinforcement (or equivalent thereto by adjustment if necessary).

Horizontal reinforcement which is normally placed as shrinkage distribution, steel is discretionary in the hands of the Engineer with permanent formwork.

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SECTION 11: DESIGN OF WALLS CONTINUED

11.6.2 HORIZONTAL REINFORCEMENT FOR CRACK CONTROL

Where a wall is restrained horizontally against shrinkage and temperature effects, then in some crack control situations a reinforcement ratio of 0.0025 may be desirable for a Permaform installation. Such reinforcement may however be more effective if placed in floor slabs.

Keeping in mind that the acceptance of cracking or otherwise is partly for cosmetic reasons and also to minimise the ingress of moisture, technically horizontal rebar is not required as Permaform will hide the vertical cracks and provide a near 100% barrier for the ingress of water/moisture into the concrete substrate and subsequent attack on reinforcement.

To sum up, horizontal reinforcement is a choice and for expediency and cost saving deletion is a positive option. However as mentioned above the final choice should be up to the designer.

SECTION 12: DESIGN OF NON-FLEXURAL MEMBERS, END ZONES AND BEARING SURFACES

DESIGN OF NON-FLEXURAL MEMBERS, END ZONES AND BEARING SURFACES

Applicable to Permaform in deep beam configuration.

SECTION 13: STRESS DEVELOPMENT IN REINFORCEMENT AND TENDONS

STRESS DEVELOPMENT IN REINFORCEMENT AND TENDONS

13.2.2 Lapped splices for bars in tension

Applies to reinforcement embedded in the Permaform element.

SECTION 14: JOINTS, EMBEDDED ITEMS, FIXINGS AND CONNECTIONS

14.2 JOINTS, EMBEDDED ITEMS, FIXINGS AND CONNECTIONS

Embedded items and penetrations can be included in Permaform elements provided that necessary external support to the shutter is provided.

Joints can be generated similar to conventional methods but in many cases can be eliminated by use of Permaform and its ability to mask shrinkage effects.

Notwithstanding the fact that Permaform is an engineered and robust system drilling and cutting through the PVC is relatively easy with drill and hole saw or cutting blade. Furthermore compared to conventional timber formwork which is effectively sterilised once cut in this way Permaform being a permanent system does not suffer from this downside.

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SECTION 15: PLAIN CONCRETE MEMBERS

PLAIN CONCRETE MEMBERS

Not applicable to Permaform.

SECTION 16: CONCRETE PAVEMENTS, FLOORS AND RESIDENTIAL FOOTINGS

CONCRETE PAVEMENTS, FLOORS AND RESIDENTIAL FOOTINGS

Not applicable to Permaform.

SECTION 17: LIQUID RETAINING STRUCTURES—DESIGN REQUIREMENTS

NOTE

Reinforced or pre-stressed concrete structures, which are intended for the retention of aqueous liquids at ambient temperatures, shall be designed and detailed in accordance with AS 3735 or AS 2783 as appropriate.

Reference to other codes tabled for convenience of reader. Such elements can be formed using the Permaform system.

SECTION 18: MARINE STRUCTURES

18.3.1 ADDITIONAL DURABILITY AND DESIGN REQUIREMENTS ABRASIVE TIDAL OR WAVE ACTION

Structures exposed to abrasive tidal or wave action shall be specifically designed for such cases and suitable provisions to ensure durability shall be specified.

The use of Permaform in marine environments is likely to assist in the long life integrity of concrete elements subjected to marine exposure.

18.3.3 MARINE GROWTH

Allowance shall be made for the increase in sectional area and alteration of surface characteristics due to extensive marine growth, on fully or partially submerged member's characteristics due to extensive marine growth, on fully or partially submerged members that are sensitive to such

The product will protect the surface and substrate of the concrete and also discourage attachment of marine growth. When this may occur and removal/cleaning are an issue this will be much easier to remove from the Permaform surface than concrete.

4.71 GENERAL

All formwork shall have documentation which shall include the following information as appropriate:

- a. Plans, elevations and sections sufficient to depict the general arrangement of the formwork and to identify and locate all members and components, including bracing.
- b. Details sufficient to fully describe important or unusual features of the design.
- c. Reference to documentation for proprietary items.
- d. The areas of the forms designed to carry stacked loads.
- e. Requirements of the project documentation which relate to formwork.
- f. Method of provision for field adjustment of the forms prior to and during placement of the concrete.
- g. Where required, location of weep holes, vibrator holes, clean-out holes and inspection openings.
- h. Sequence of concrete placement and minimum elapsed time between adjacent placements.

Permaform is just one of the tools to achieve a high quality and efficient formwork system. Permaform can be integrated with other forms of proprietary or conventional formwork methods.

Permaform does not replace the need for sound structural analysis and conformance with all live, dead and other loadings.

Designers should adopt (a) to (h) all of which can and should be part of the design criteria for all formwork including Permaform.

When the above procedures are adopted using Permaform as part or all of the formwork system, Permaform will satisfy these requirements of AS 3610.

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2.3 INFORMATION TO BE PROVIDED IN THE PROJECT DOCUMENTATION

Project documentation shall cover any matters associated with the formwork construction, concrete placement or formwork removal, and which are critical to the serviceability of the permanent structure. In addition to the description of the concrete element, the following shall be specified or indicated in the project documentation, where applicable:

COMPLIANCE AND NOTES

a)	Minimum formwork stripping times and stripping procedures.	Not applicable.
b)	Any limitations on the magnitude and locations of stacked materials and minimum concrete strength to be achieved prior to the stacking of materials.	Not applicable.
c)	Requirements for the minimum number of levels of supports relative to the type of formwork, timing and sequence of its use, the anticipated time between construction of subsequent floors and the expected ambient temperature for multi-storey structures.	Generally not relevant.
d)	Limitations on the use of the permanent structure for the restraint of formwork.	Should be considered if applicable.
e)	Details of and information on the effect of the post-tensioning procedures on the formwork and any special procedures to be adopted in the stripping of formwork is not applicable.	Not applicable.
f)	Location of any mandatory joints and any special procedures for locating other joints.	To be considered as for conventional formwork.
g)	Sequence of placement of the concrete if this is critical.	Yes. Concrete should be placed in layers no greater than 2 metres in height in concurrent pours.
h)	Requirements for propping of any composite construction	See manual.
i)	Details of the cambering of any slabs of beams.	Not applicable for PERMAFORM element.
j)	Design loads for the permanent structure.	Applicable.
k)	Details of any inserts, waters tops, specially formed shapes or penetrations to be constructed, the location and details of which are critical to the serviceability of the permanent structure.	To be considered as for conventional formwork.

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(l) Any known information about the foundation which is relevant to the design of the footings for the formwork assembly.	As with any wall PERMAFORM requires a stable & sound footing.
(m) Information about any permanent formwork systems, together with any limitations on deflections and any special requirements for their erection and concreting Information on the critical face of elements (see Clause 3.4.3.3), any special measuring points and more stringent tolerances for any small areas (see Table 3.4.2).	See Manual. Refer to Clauses (3) not relevant.
(o) The details set out in Table 3.4.1 relating to surface finish, colour control, surface treatment, critical elements, tolerances and repairs where relevant for all surfaces of the permanent structure.	Not applicable.

