

DOUBLE WALL

installation manual





AUSTRAL PRECAST

The Guide to be used by Qualified Structural Engineers, Architects, Builders and Associated Industries.

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The installation of the Austral Precast Double Wall must be carried out by a suitably qualified and experienced installer, who considers both the temporary and final installation state of the walls as a whole.

This material has been prepared in the context of relevant Australian Standards, the National Construction Code (NCC), the Building Code of Australia (BCA) and the French specific regulation for the Double Wall in accordance with Eurocode 2 and Eurocode 8.

Users should make themselves aware of any recent changes to the referenced documents and to local variations or requirements.

CONTENTS

Page Section

05	1. Austral Precast Double Wall Overview					
06	1.1 General					
07	1.2 Features and Benefits					
10	1.3 Installation Process					
11	1.4 Applications					
12	2. Project Planning					
13	2.1 Project Stakeholders					
14	2.2 Key Application Considerations					
17	2.3 Project Organisation					
17	2.3.1 Project Timeline					
17	2.3.2 Lifting Requirements					
18	2.3.3 Transport Planning					
18	2.3.4 Site Access					
18	2.3.5 Preparation of Panel Rotation Area					
19	2.3.6 Lifting Requirements					
20	2.3.7 Transport Planning					

20 2.3.8 Connection Reinforcement

- 21 3. Installation
- 22 3.1 Site Preparation
- 22 3.1.1 Material List
- 23 3.1.2 Delivery Booking
- 23 3.1.3 Preparation of Site Reinforcement
- 23 3.1.4 Site Survey
- 24 3.1.5 Bracing
- 24 3.1.6 Rotation Area Preparation
- 25 3.2 Panel Installation
- 25 3.2.1 Panel Installation Horizontal Panels (No Rotation)
- 31 3.2.2 Panel Installation Vertical Panels (Rotation On Site)
- 35 3.2.3 Connection Reinforcement
- 38 3.3 Concreting
- 38 3.3.1 Concreting Preparation
- 39 3.3.2 Concrete Delivery
- 39 3.3.3 Concreting
- 41 3.3.4 Concrete Inspection
- 42 3.4 Temporary Works Removal
- 43 3.5 Joint Treatment
- 43 3.5.1 Walls Above Ground
- 44 3.5.2 Walls Below Ground
- 45 3.5.3 Walls with Hydrostatic Pressure

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1.1 General

The Double Wall is a monolithic structural wall with all the quality and efficiency advantages of precast manufacture, together with the engineering benefits of in-situ construction for both load bearing and non-load bearing walls.

The Double Wall consists of a pair consists of a pair of thin precast reinforced concrete shells, connected by a steel lattice girder (trusses). The trusses are fabricated from bar and span the cavity between the two precast shells.

The first shell is cast as a slab on a vibrating table with mesh, connecting trusses and spacers to control the overall thickness of the wall.

Once the first shell has cured to sufficient strength, it is inverted and lowered into the second shell whilst maintaining the void between shell, vibrated and cured.





Figure 1.2 – Double Wall Manufacturing Stages

Additional steel reinforcement, edge forms, openings and cast-in components may be incorporated into the Double Wall panel in the factory as part of the system. On site, panels are placed into final position, braced temporarily, edge forms and adjacent panel and slab reinforcement connections are completed and the core cavity is filled with premixed concrete to create a monolithic concrete structure.

The result is a permanent formwork system with a high-quality surface finish that is designed for fast and economical site construction processes with flexibility for individual planning and architectural objectives.

Figure 1.1 – Double Wall Possibilities

Truss

1.2 Features and Benefits

The major advantage of Double Wall over other systems is that the majority of structural components that are required to achieve the design application are integrated in the factory under strict quality-controlled conditions, ready for delivery and installation to site. Many items can be incorporated into the wall in the factory including:

- Lifting points
- Structural reinforcement in each precast shell
- Formwork for cut-outs such as windows, doors and other penetrations
- Cast in items including pull-out bars, ferrules, conduits, electrical outlets, etc.

Typical Features

- Overall Dimensions: up to 3.60m x 13.20m
- Overall Wall Thickness: 170,180,200,220,250,300,350 and 400 mm
- Precast Shell Thickness: 50 to 70mm
- Typical mass: 250 to 375 kg/m 2
- Maximum total mass: 12,000kg per panel
- Reinforcement: All reinforcement integrated for columns, beams, lintels, etc.
- Cast-In items: Integration of inserts for props, electrical outlets, conduits, etc.
- Formwork: Integration of formwork for openings where specified
- Finish: Class 2 steel table finish both sides of wall (AS3610)



Figure 1.3 – Double Wall Features

- 1 Precast Shell Reinforcement
- 2 Exposed lapping reinforcement
- 3 Keybox
- 4 Void / Opening
- 5 Timber shutter
- 6 PVC void
- 7 Electrical outlet
- 8 Electrical conduit
- 9 Bracing Ferrule
- 10 Extended shell
- 11 End shutter

Double Wall Specification	Overall Wall Thickness (mm)	Precast Shell Thickness (mm)	Core Thickness (mm)	Precast Mass (kg/m2)	Reinforcement Cover (mm)	Max. Horizontal Reinforcement (mm)	Max. Vertical Reinforcement (mm)
DW170-55/60/55	170	55	60	275	20	6	16
DW180-60/60/60	180	60	60	300	25	8	16
DW200-65/70/65	200	65	70	325	25	10	16
DW220-70/80/70	220	70	80	350	25	16	16
DW250-70/110/70	250	70	110	350	25	16	16
DW300-70/160/70	300	70	160	350	25	16	16
DW350-70/210/70	350	70	210	350	25	16	16
DW400-70/260/70	400	70	260	350	25	16	16

Table 1.0 - Double Wall Standard Specification (alternate specification available upon request)

Installation Advantages

No hot works, no dowel voids

Double Wall is a safer and faster construction option as there are fewer activities and hence fewer people required on site. No grouting or patching of dowel voids is required. Hot-works are eliminated on-site for the installation of Double wall as there is no welding of plates for panel to panel connections on site.

Surface finish

The finished product quality of Double Wall supersedes other walling systems. The manufacturing process is such that each shell is cast on a steel pallet, giving a Class 2 Finish from the steel face that is ready for surface preparation treatment for painting as supplied from the factory. No rendering is required. This can give significant benefits in both overall cost and time for the customer.

Water resistance capabilities

Double Wall is suitable for construction where waterresistance is required and capable of withstanding a hydraulic water pressure of up to 0.2MPa (20m water head). Water resistance is maintained by the properties of the Double Wall, meeting the requirements of AS 3735-2001 Concrete Structures for retaining liquids.

Handling and Transportation

Other advantages include reduced transport and crane requirements in comparison to traditional precast as each shell has maximum thickness of 70mm from the factory, reducing the overall mass of the wall.

NCC Compliant

Double Wall is designed to AS3600 – Concrete Structures and is a deemed to satisfy solution under the 2019 NCC.

DOUBLE WALL IS THE IDEAL TECHNICAL SOLUTION FOR CONSTRUCTION OF SUBSTRUCTURE AND SUPERSTRUCTURE STRUCTURES, INCLUDING IN SEISMIC AREAS.





– Truss – – s

Concrete

1.3 Installation Process

Installation of Double Wall has many advantages over other systems.

The majority of structural components are installed in the factory thus reducing the on-site labour required for handling both steel and formwork.

Wall elements are lifted into the installation position by crane and secured by temporary props or braces.

The joint splicing steel is placed inside the core cavity of the wall and subsequent wall elements are placed and secured into position.

Once elements have been placed into position, the core of the wall is filled with concrete to complete the process.



Figure 1.5 – Day 1 Double Wall Installation Process Panels delivered to site, craned into position, secured into final position and joint reinforcement installed.



Figure 1.6 – Day 2 Double Wall Installation Process Double Wall core is wet immediately prior to concrete placement and core filled according to pouring schedule.

1.4 Applications

Double Wall is a versatile product with a wide variety of applications where reinforced concrete may be used. These include, but are not limited to:

- Retaining walls
- Basement walls
- Shear walls
- Lift and stair shaft core walls
- High rise façade and infill walls
- Tanks and silos
- Underground walls
- Structural and non-structural walls
- Perimeter and boundary walls
- Noise walls
- Industrial, residential and commercial buildings
- Car parks
- Public buildings
- Civil and government infrastructure









Figure 1.7 – Double Wall Applications



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2.1 Project Stakeholders

The roles and responsibilities of the relevant stakeholders for the project are as follows:

User (Contractor)

The company that orders and implements the Double Walls according to the recommendations of the relevant stakeholders.

The user must carry out the work with the respective architectural and structural plans. The choice of the construction technique (in-situ or precast concrete) is usually made by the user after the structural study phase by the structural engineer.

If Double Wall is chosen, the technical study of the structural engineer (formwork, reinforcement and calculations) is transmitted by the user to the supplier with all the information describing the constraints of the site to enable it to prepare the Double Wall drawings and documentation.

On the site, all operations related to Double Wall are completed under the direct authority of the user's personnel in charge of the implementation of the Double Wall system.

Depending on size and organization of the company, this person will be a member of the site supervision, works manager, site manager or team leader chosen preferentially in the supervision of vertical structures.

The person in charge of the implementation of the Double Walls is required to give instructions and training to all site operators in regards to the use and safety requirements of the Double Wall.

It is therefore appropriate for the user to designate a competent person on all aspects of this technique in charge of the implementation of the Double Walls as soon as possible.

Supplier

The company that is the producer whom is able to provide construction drawings and manufacture the Double Walls by integrating the information provided by the User and the Structural Engineer.

The supplier develops drawings in accordance with the design of the structural engineer and specific user requirements. The supplier transmits the necessary drawings (building plans and shop drawings) to the user for approval by the user and structural engineer. The user may provide additional information relevant for the project on the basis of the suppliers expertise and experience with Double Wall.

Following approval, the user will manufacture and deliver the Double Walls in accordance with the contract between the supplier and user. Prior to installation, the user will make available the necessary plans and quality assurance documentation prior to delivery of the Double Walls. *Supplier*

Structural Engineer

The suitably qualified engineering person or business that specifies and verifies the structural specification for the Double Walls.

The structural engineer will design the requirements of the structure and provide the user and the supplier with the wall reinforcement, joint and formwork requirements as well as any specific notes or details relevant to the project on the basis of the structural study. Final approval of Issued for Construction (IFC) drawings is required from the User and Structural Engineer before proceeding with manufacture and installation of the Double Walls.

Temporary Works Engineer

The suitably qualified engineering person or business that specifies and verifies the temporary condition of the Double Walls for lifting, bracing and core-filling in the temporary state for the specified construction drawings in accordance with relevant Australian regulations (typically in accordance with AS3850 and AS3610). Final approval of temporary works drawings is required before proceeding with manufacture and installation of the Double Walls.

Architect

The company or persons that are responsible for the architectural requirements of the building.

KEY APPLICATION CONSIDERATIONS

2.2 Exposure Classifications

The exposure classification dictates the durability of the structure as per the NCC and Australian Standards. Primarily, the exposure classification will determine the cover and concrete requirements and will dictate if any further treatment is required to achieve the design life of the structure.

Double Wall is typically manufactured to comply with a B2 exposure classification with a minimum of 25mm cover to reinforcement using 50MPa concrete for the precast shells as per AS3600-2018 Table 4.10.3.3, making it suitable for use for internal and external walls in most locations of Australia. The strength class of the concrete and the required cover (given by the formwork face of prefabricated shells horizontally cast on industrial formwork) allows to modulate the recommended structural class with a view to the determination of the minimum concrete covers with regard to durability.

Exposure Classification	Required Cover mm ($c_{_{min}}$)							
	Characteristics Strength (f 'c)							
	20 MPa	25 MPa	32 MPa	40 MPa	> 50 MPa			
A1	20	20	20	20	20			
A2	(45)	30	20	20	20			
B1	-	(45)	30	25	20			
<i>B2</i>	-	-	(50)	35	25			
Cı	-	-	-	(60)	45			
C2	-	-	-	-	60			

 Table 2.0 – Reinforcement Cover for given exposure classification and concrete strength

 (Source: Standards Australia, AS3600-2018)

Note: Bracketed figures are the appropriate covers when the concession given in Clause 4.3.2 relating to the strength grade permitted for a particular exposure classification is applied.

Waterproofing

The Double Walls, when implemented using appropriate concrete admixtures, make it possible to provide a sealing plan (storage of water, resistance to hydrostatic pressure, etc.) by means of the concrete alone when using the following principles:

- Double Wall thickness greater than 250mm (the in-situ core must be more than 100mm)
- Effective reinforcement linking between Double Walls and the foundations through the use of a stitched or fixed reinforcement connection
- Appropriate joint treatment
- Appropriate concrete mix design

Fire Rating

Double Wall is designed in accordance with AS3600 and by default has a 180 minute Fire Resistance Period (FRP) for Insulation and Structural Integrity (180mm thick wall, exposed on one side).

Any higher requirements should be reported to the supplier, and necessary increases of of wall thickness, reinforcement quantity or cover be identified and made after agreement between the supplier and user.

Seismic / Earthquake Requirements

Double Walls can be used in seismic areas. Specific connections may need to be developed in order to meet the requirements of the structural engineer. The details should be developed with collaboration of all parties (user, structural engineer and supplier) in order to identify any impacts on manufacture, installation and final service of the Double Walls.

Complex structures

Specialised or complex parts of the buildings structure must be reported to the supplier. Additional modifications of the reinforcement of the Double Walls may be required and should be done in close collaboration and verification by the Structural Engineer.

Some examples of complex structures are:

- Retaining walls
- Beam walls
- Deep beams
- Columns
- containing
- Cantilevered walls

Temporary Works

Double Walls are manufactured and supplied in accordance with AS3850 – Prefabricated Concrete Elements. Temporary works design for lifting and temporary bracing are to be performed by the temporary works engineer and incorporated into the design before Double Walls are manufactured.

Lifting is to be performed in accordance with the lifting points and rigging arrangements as per the Double Wall shop drawing. Temporary bracing of elements is to be performed in accordance with the bracing layout. Removal of any bracing is only to be performed after the written approval of the structural engineer.

Earth Thrust Loads in the Temporary Phase

In accordance with the safety regulation, the Double Walls are not designed to withstand the thrust force from earth loads in the temporary phase and do not serve as protection of excavations.



Figure 2.1 - Double Wall cannot support earth thrust loads during the temporary phase

Exposed and Architectural Walls

Walls that are exposed for architectural reasons require an in-depth development with the design team who will have to validate the choices of all facade details (joints, false joints, angles, window details, etc.

Exposed Double Walls must be treated with an opacifying background regulator before any treatment of external surface treatment.

Architectural walls with recessed patterns may require the use of formliners. Close collaboration with the design team is necessary to validate the type of formliners and define all the aesthetic details (angles, interface openings, etc.). Particular attention should be made towards the alignment of architectural features from panel to panel and the tolearances achievable on site.

Double Walls with formliner architectural features require much longer supply and production lead times than standard Double Walls. A control sample panel is required to be validated prior to commencing project production.

Exposed Edges

Double Wall surfaces exposed to weather and parallel to the horizontal plane (e.g. balustrade upper surface) should be protected by the placement of a metallic cover or equivalent.

Dimensional Tolerances for Double Walls

Double Wall is manufactured and installed in accordance with tolerances in AS3610. Typical tolerances are as follows:

– Double Walls thickness:	+/- 3 mm
– Length and width:	+/- 6 mm
 Squareness of corners: 	+/- 6 mm
– Flatness per meter width:	+/- 3 mm
 Positioning of fitments: 	+/- 10 mm

Electrical Fitments

Voids for electrical items can be cast into the Double Wall. The positioning plans of the electrical inserts must be provided by the electrician to the supplier, via the user, during the study phase.

The electrical inserts must be positioned and dimensioned on the plans in relation to the concrete elements (concrete walls, concrete surface, etc.).









Figure 2.2 – Location dimensions required for electrical fitments.

PROJECT ORGANISATION

2.3.1 Project Timeline

Typical lead times for delivery of the first panels on site following award of project and receiving Issue for Construction Drawings from user:

- Standard Double Walls: 6 weeks
 Complex Walls: 8 weeks
- Architectural Double Walls: 10 weeks

The above timeline allows an initial 4 weeks for submission and approval of shop drawings. Any delays to approvals will result in an increased timeline.

2.3.2 Lifting Requirements

As a general rule, lifting of Double Walls is done using a tower crane or mobile crane.

During the project study phase, a weight of 350 kg/m^2 is suitable for initial estimates. The user should take into consideration the delivery, panel rotation (if required) and final position locations.

The user will provide all the necessary crane and loading information to the supplier prior to commencing shop drawing.

Prior to approving shop drawings, the user must verify the suitability of the selected crane on the basis of the weights and dimensions of the Double Walls as provided by the supplier (information available on the plan view of the panel layout and on shop drawings). The lifting and handling details required are provided by the user on the shop drawings.

If the crane is inadequate, the user chooses alternative lifting equipment and ensures the adequacy of the device. Alteration of the panel dimensions and splits will result in further time and works required for re-submission of shop drawings which should be avoided through appropriate checking at the start of the project.

Unless otherwise specified by the supplier, the Double Walls are not designed to be transported by a hoist (for example : excavator, forklift, etc.) due to the higher dynamic load when handling the panels.

Common lifting arrangements are as follows:



Figure 2.3 - Lifting Arrangements for Horizontal and Vertical Panels.

2.3.3 Transport Planning

The user and supplier must work together to determine a suitable transport and delivery schedule for the project. In particular, the following should be considered:

- Quantity of panels to be delivered per day
- Crane availability for installation team on scheduled installation days
- Transport route: maximum height, width and payload
- Traffic control- Unloading area: suitable area for delivery via truck, operator access for attachment of panel rigging, operator safety equipment & elevated working platforms as necessary
- Time required for unloading and installation of panels on site

2.3.4 Site Access

The user must ensure that the site is accessible, particularly in the case of building sites in the city centre, and that the delivery location is suitable.

Prior to booking a delivery, the user must validate the delivery location and any site-specific route and plan together with the supplier the agreed delivery time and duration required on site for unloading.

2.3.5 Preparation of Panel Rotation Area

Due to transport limitations, Double Walls greater than 3.50m are likely to be rotated on site prior to installation in final position.

The user will confirm if panels require rotation with the supplier.

The area where the rotation device is to be used (rotation platform) must have a ground capacity of 50kPa.

The slope of the rotation platform in any direction must be less than 5%,

The rotation platform must be a secure area, with a minimum exclusion zone for all unnecessary personnel as shown below, with clear visibility for the crane operator and dogmen for rotation of panels.

The orientation of the rotation should be aligned with the axis of the crane boom as below.

All safety requirements must be verified and supervised by the user prior to rotation of panels in accordance with the site safety requirements.



2.3.6 Temporary Bracing

Temporary bracing must be performed in accordance with the temporary works design supplied by the temporary works engineer. Temporary bracing for walling elements will typically require a minimum of two propping braces per panel. Braces are fixed to the panel by a ferrule and bolt as and either to a footing, concrete deadman anchor or slab via a bracing anchor with an optimal bracing angle of 30 degrees as shown below:



Figure 2.5 – Typical Temporary Bracing (Pad Footing, Concrete Deadman, Slab)

For Double Walls greater than 5m in height, it is recommended to brace by additional props in the temporary phase. The latter can be obtained by setting up a double row of bracing to the slab, footing or concrete deadman as shown below:



Figure 2.6 – Temporary bracing with additional brace for panels greater than 5m in height.

The bracing to the panel is completed through the use of cast in metal ferrules. The bolt thread, length and grade used must be in accordance with the shop drawings taking into account the thickness of the profiles used on the head of the props and the any setting washers.

2.3.7 Temporary Bracing - Multi-Level Panels

Careful consideration of bracing requirements must be taken when panels span beyond the height of a mid-slab (e.g. double height panels) in order to ensure that the panels are installed in a safe manner and to also minimise the effect on subsequent site operations.

Due to overall panel height being in excess of 5m (H = 5m), panels will typically require a dual row of bracing, one underneath the first slab soffit (minimum 0.4*H), and the other at 0.66*H of the overall height of the panel.

Once the Double Wall panel has been core-filled to the first slab soffit and reached the required concrete strength (typically 25MPa), the additional row of props can be removed. The subsequent slab and remaining Double Wall must be concreted and reach the required concrete strength as set by the structural engineer prior to the removal props.

2.3.8 Connection Reinforcement

The phasing of the placement of the connection reinforcement must be analysed and anticipated before the Double Walls are placed in position (see section on reinforcement) as some reinforcement is required to be placed in the joint before the subsequent panel is installed.



Figure 2.8 – Temporary Works Sequence for Multi-Level Panels



TECHNICAL MANUAL

SITE PREPARATION

3.1.1 Material List

The equipment necessary for the installation of the Double Walls must be defined in collaboration with the user's site supervisor and installer.



3.1.2 Delivery Booking



Minimum Delivery - 72h

Prior to manufacture of panels, the user is required to notify the supplier a minimum of 14 days in advance of proposed installation date in order to allow enough time for the manufacture of Double Wall panels and planning of installation teams.

NOTE: Issue for Construction Drawings are required at this point in time.

Bookings for deliveries need to be made by the user a minimum of 72 hours prior to planned installation. Confirmation of the planned order and time on site of deliveries needs to be agreed.

The delivery location and route for the driver both to the site and on the construction site must be communicated by the user to the supplier when making the booking including any site specific traffic control requirements.

3.1.3 Preparation of Site Reinforcement

The user must ensure all site reinforcement be installed in accordance with the shop drawings and starter bar layout provided by the supplier and any instructions by the structural engineer. Adherence to the starter layout is critical to an efficient installation of Double Wall panels.



Figure 3.1 – Site Reinforcement Preparation

3.1.4 Site Survey



Minimum Delivery - 24h

A site survey should be supplied by the user to the supplier and installer a minimum of 24 hours prior to the installation of Double Wall. The site survey is to confirm the slab heights, reinforcement location and temporary bracing anchor points and allow the user time to rectify any error on the site.





Figure 3.2 - Site Survey

3.1.5 Bracing

Prop bracing locations must be identified and positioned to match the location as specified in the bracing layout drawing. It must be noted that a minimum concrete compressive strength of 20MPa is typically required when using standard bracing anchors post-fixed into a concrete slab (slab thickness: 150mm min., anchor diameter: 20mm, anchor embedment: 95mm min.).

Alternative cast in anchors can be used to reduce program time in instances when panels must be installed prior to the slab reaching 20MPa.

h

Figure 3.3 – Temporary Bracing Locations

3.1.6 Rotation Area Preparation

The area to be used for rotation of panels must be set up as below:



Figure 3.4 - Panel Rotation Area Setup

PANEL INSTALLATION

3.2.1 Panel Installation - Horizontal Panels (No Rotation)

Verification of the equipment required on site:

- Chain hoist (recommended);
- Suction cup (recommended);
- Access Equipment -> Platform Ladder, E.W.P (Elevated Work Platform)
- Rigging Equipment -> chains, slings, sheaves, rope, etc.

Panel Installation Chronology

Step 1: Collate necessary documentation for the Double Walls



Step 3: Verify on the drawing the lifting arrangement

1- 3D Drawing

- 2- Layout of the Double Walls
- 3- Reinforcement Specification
- 4-Connection Details
- 5- Double Walls Specification
- 6-General Information

Step 2: Identify the Double Wall by the manufacturers label on the panel.



Step 5: Lift the Double Wall.

Step 6: Adjust the orientation of the Double Wall with the chain hoist if necessary.

Step 7: If necessary, align the Double Wall with the rope.

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INSTALLATION

Step 10: Adjust the plumbness of the Double Wall by adjusting the prop.

Step 11: Secure the temporary works bracing in final location.

Step 12: Unhook the slings of the Double Wall.

3.2.2 Panel Installation - Vertical Panels (Rotate on site)

Verification of the equipment required on site:

- Chain hoist (recommended);
- Suction cup (recommended);
- Access Equipment -> Platform Ladder, E.W.P (Elevated Work Platform)
- Rigging Equipment -> Sheave with slings for rotation of panel (as per shop drawing), Chains, slings, rope, etc.

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INSTALLATION

Step 7c: Attach the props and slightly tighten the bolt to the prop ferrule. Place the connection reinforcement in the joint and secure to the panel.

Step 7d: Attach the sheave and slings as per the shop drawing. Apply slight tension to check the rigging attachment to panel.

All unnecessary personnel to move outside of the exclusion zone.

Step 7e: Progressively lift of the Double Wall while ensuring that the crane trolley or the mobile crane head is positioned so that the slings are always tensioned.

Step 7f: Detach the rotation device by unscrewing the returning equipment screws. Lift the Double Wall out vertically.

3.2.3 Connection Reinforcement

The phasing of the placement of the reinforcement must be analysed and anticipated before the Double Walls are installed. There are 3 common types of reinforcement that need to be referred to the installation plan:

Step 2: Installation of Double Wall no.2

Step 3: Installation of the reinforcement

Figure 3.5 – Joint Reinforcement Installation

Shell open - Reinforcement put after installation of the Double Wall - Needs of a shutter before concreting

Step 1: Installation of Double Wall no.1

Step 2: Place reinforcement inside Double Wall no.1

Step 3: Installation of Double Wall no.2

Step 4: Slide the reinforcement into Double Wall

Reinforcement put by sliding at the advancement in the core. Impact chronology

Step 1: Installation of Double Wall no.1

Step 2: Place reinforcement inside Double Wall no.1

Step 3: Installation of Double Wall no.2

Step 4: Slide the reinforcement into Double Wall

Figure 3.7 – Joint Reinforcement Installation

Additional elements to the reinforcement may be required to be installed in the case of a waterproof structure (eg. Waterstops). Please refer to the installation drawing.

CONCRETING

3.3.1 Concreting Preparation

All the horizontal and vertical joints must be closed before concreting by either:

Foam cord

Foam cord manually pushed into position

Figure 3.8 - Panel Joint Preparation for Concreting

The use of polyurethane foam IS FORBIDDEN. The expansion of the foam in Double Wall core is not controllable and the product generates significant construction waste.

Figure 3.9 – Polyurethane is FORBIDDEN for Panel Joints

3.3.2 Concrete Delivery

The user is responsible to verify the core-fill concrete is in accordance with specification. In particular, the user shall confirm specification is correct for:

- Mix Design (if specified);
- Compressive Strength (MPa);
- Maximum aggregate diameter (Dmax);
- Slump

3.3.3 Concreting

Wet the inside of the Double Walls immediately prior to concreting the core:

The Dmax of concrete aggregates must not exceed 16 mm.

It must be reduced to a value of 12.5 mm or less when the nominal thickness of the Double Walls is less than 200mm.

Thickness of Double Walls (mm)	180mm	200mm	220mm	250mm	300mm
Dmax (mm)	12,5	12,5	16,0	16,0	16,0

Table 3.0 – Maximum aggregate diameter for Double Wall thickness

Figure 4.0 – Wet the core of the Double Wall immediately prior to concreting

 $Figure \ 4.1-Concreting \ core \ of \ Double \ Wall$

The fall height of concrete must be less than 3m in order to avoid segregation and guarantee homogeneity of the concrete.

Figure 4.2 – Concreting Fall Height Limitations

Concrete speed must be controlled in order to avoid damage to the Double Wall.

Figure 4.3 - Concreting Pour Rate

Concreting pour rates are determined in accordance with EN 14992 and AS3610. In the absence of a specific pouring schedule, pouring at a maximum of 0.70m/hour applies for temperatures above 15°C.

Figure 4.4 – Influence of Temperature on Concrete Pour Rate

3.3.4 Concrete Inspection

Inspection of the core-fill concrete can be made via the removal of shutters (e.g. block-outs, windows, timber at base of panel, etc.). Inspection voids can be cast into the panel and must be determined during the shop drawing process prior to manufacture of panels.

NOTE: testing of the core-fill concrete (compressive test cylinders) are the responsibility of the user and test certificates must be supplied to the structural engineer for certification of the wall. AUSTRAL PRECAST

INSTALLATION

3.4.0 Temporary Works Removal

All temporary works must be installed in accordance with the Temporary Works design and must only be removed in accordance with the Temporary Works design and with the written approval of the Structural Engineer.

JOINT TREATMENT

3.5.1 Walls Above Ground

Facade walls exposed, with paint, with render coating, with mortar.

Figure 4.5 – Joint Treatment for walls above ground

3.5.2 Walls Below Ground

WALLS EXTERNAL FACE AGAINST EARTH - ACCESSIBLE

Figure 4.6 – Joint Treatment for walls below ground (joint accessible)

JOINT TREATMENT

3.5.3 Walls with Hydrostatic Pressure

WALLS AGAINST EARTH

Figure 4.7 – Joint Treatment for walls with hydrostatic pressure

WE ARE **Brickworks**

Brickworks Building Products is one of Australia's largest and most diverse building material manufacturers. Under the Brickworks Building Products umbrella are some of Australia's best known building materials brands. Our products include bricks, pavers, masonry blocks, retaining wall systems, precast concrete panels, concrete and terracotta roof tiles, timber products, terracotta façades and specialised building systems.

With a broad product portfolio and manufacturing and sales facilities across Australia, Brickworks Building Products is uniquely placed to service the demands of the building industry.

With over 1,200 staff across Australia and New Zealand, we pride ourselves on our commitment to product, service excellence and our leadership position.

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