INDUSTRY GUIDANCE FOR FLOOD RESILIENT HOMES

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Australian Government

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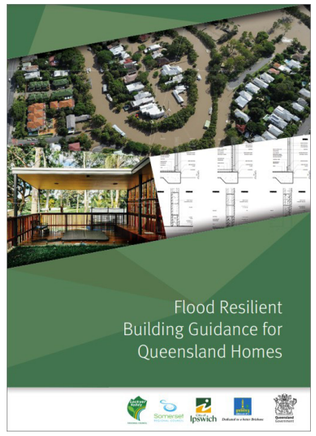
Acknowledgements

This guide is based on and acknowledges original work sourced from the Flood Resilient Building Guidance for Queensland Homes (2019) delivered by the Queensland Reconstruction Authority in partnership with Brisbane City Council, Ipswich City Council, Lockyer Valley Regional Council, Somerset Regional Council and Seqwater.

The Flood Resilient Building Guidance for Queensland Homes was developed as part of the Brisbane River Catchment Strategic Floodplain Management Plan and Flood Studies, in response to the Queensland Floods Commission of Inquiry Final Report (2012) calling for an appropriate mix of measures including building controls to minimise the impacts of floods and help to reduce the cost of property damage and time taken to restore a building after a flood.

The Flood Resilient Building Guidance for Queensland Homes involved extensive consultation with the building industry and local and state agencies on the flood resilient design principles, strategies, construction details and materials, and the expected benefits and costs of flood resilient design to develop guidance suitable for building industry professionals, state and local authorities, and owners of residential properties in flood prone areas across Queensland.



Interpreter

The Queensland Government is committed to providing accessible services to Queenslanders from all culturally and linguistically diverse backgrounds. If you have difficulty in understanding this report, you can access the Translating and Interpreting Services via www.qld.gov.au/languages or by phoning 13 14 50.

Foreword

Queensland is the most disaster impacted state in Australia, with flooding being the highest risk to the community. We can't stop floods from occurring, but we can take steps to reduce their impact.

Flood resilient design is one of the many ways Queenslanders can build their resilience to floods. It involves adapting the design, construction and materials incorporated into buildings to minimise damage caused by floodwaters.

Incorporating resilient building design can significantly reduce the effort, cost and time to return people to their homes and workplaces following a flood.

This Industry Guidance for Flood Resilient Homes provides information about improving the flood resilience of new and existing Queensland homes.

The benefits of flood resilient design are far reaching and support the economic, social and environmental recovery of a community following a flood.

Contents

Introduction to flood resilient homes

Industry Guidance for Flood Resilient Homes

The purpose of this guidance is to share innovative, practical and affordable solutions for adapting Queensland homes to be flood resilient. The guidance is based on lessons learned through consultation with the building industry, local governments and Queensland Government agencies.

This guidance provides information about reducing the impact of floods on Queensland homes and families. It is suitable for building industry professionals, state and local authorities, and owners of residential properties in flood prone areas across Queensland. It provides clear guidance on flood resilient design principles, strategies, construction details, materials and the expected benefits and costs of flood resilient design. It is a non-mandatory document, and does not replace the mandatory requirements for building work as set out in the Building Act 1975.

What is flood resilient building design?

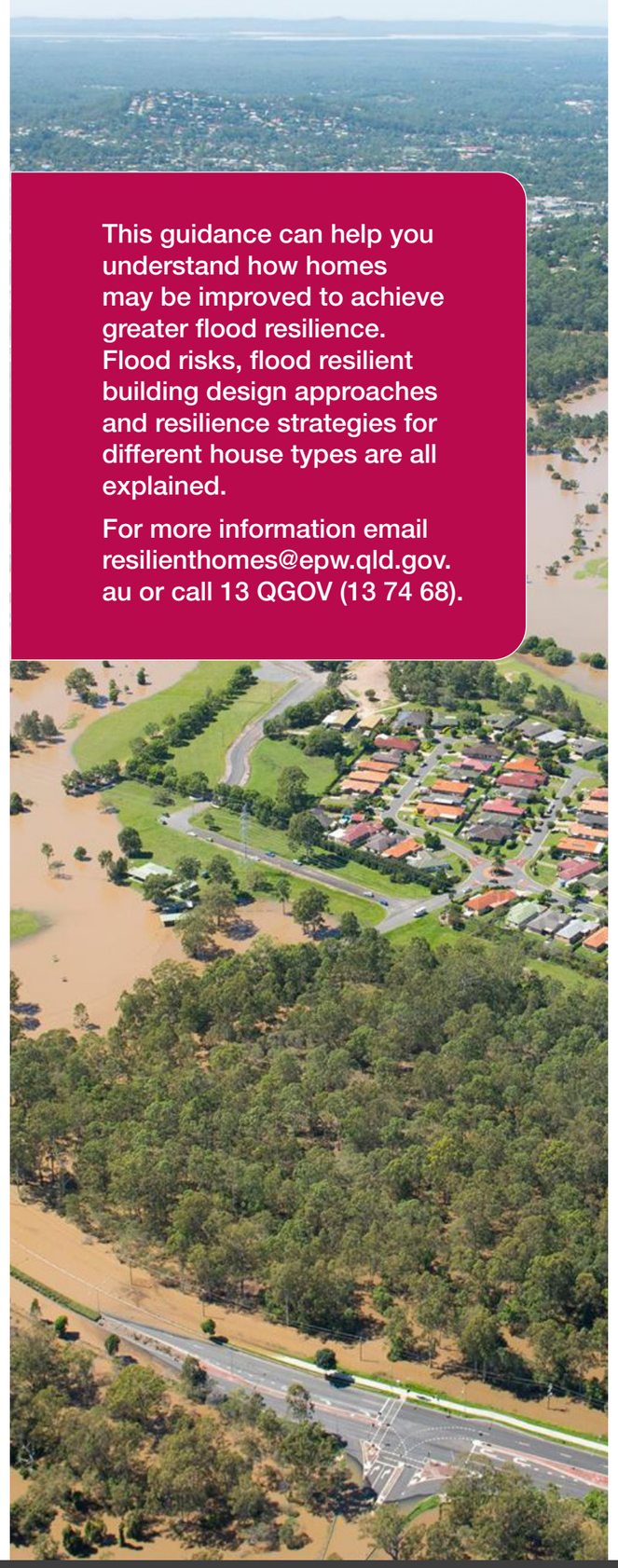
The use of materials, construction systems and house design types that can withstand substantial and multiple inundations by actively mitigating the effects of, and decreasing the consequences of flooding.

Flood resilient building design enables homeowners to safely remove and store belongings prior to a flood event and easily clean, repair and quickly resume normal life after the flood waters recede, with minimal long term disruption to family and finances.

The benefits of a flood resilient home

A flood resilient home may help:

- Minimise the chance of flood damage to your property.
- Minimise the costs and inconveniences of getting your life back to normal after flood events.
- Save you in the long-term from having to pay for repetitive repairs to your home following flood events.
- Prepare your home for changing flood conditions in the future, particularly from climate change.



This guidance can help you understand how homes may be improved to achieve greater flood resilience. Flood risks, flood resilient building design approaches and resilience strategies for different house types are all explained.

For more information email resilienthomes@epw.qld.gov.au or call 13 QGOV (13 74 68).

Resilient Homes Fund

Queensland homeowners who experienced damage to their residential property as a result of flooding in 2021–22 can register their interest for the $741 million Resilient Homes Fund.

The Resilient Homes Fund was developed following the 2021–22 disaster season and applies to flood-affected residential properties within 39 local government areas (LGA) activated for Disaster Recovery Funding Arrangements for recent flooding.

The program recognises there is not a 'one size fits all' approach. Funding will be used to repair, retrofit, raise or buy-back eligible properties.

Different options for homeowners will be considered on a case-by-case basis, which will be specific to their level of flood damage, future flood risk, property type and personal circumstance.

Resilient Retrofit Program

Funding is available to both insured and uninsured homeowners to repair and retrofit their homes using resilient design and materials. This funding is limited to liveable rooms or areas and to raise or relocate services essential to the continued liveability of the home, and does not include the yard or other ancillary structures.

Home Raising Program

Funding is available to both insured and uninsured homeowners to raise their home to reduce the impact of future flood events. The home is to be raised to meet or exceed the Assessed Flood Level as defined by the relevant local government planning scheme.

Flood resilient home diagrams

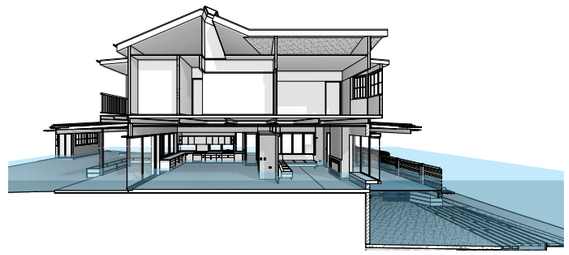
The following diagrams illustrate a variety of different resilience strategies applicable to common building typologies in Queensland, both historic and contemporary. The water levels shown in these diagrams indicate a hypothetical flood.

Sectional perspective 1

Lightweight | VJ board

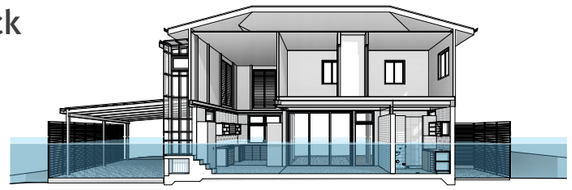
Sectional perspective 2

Lightweight | Rendered FC



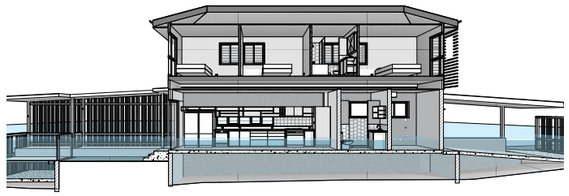
Sectional perspective 3

Masonry | Rendered concrete block



Sectional perspective 4

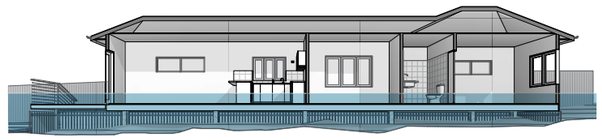
Masonry | Rendered AAC block



If a home is likely to experience prolonged periods of flood inundation, resilient measures are highly recommended.

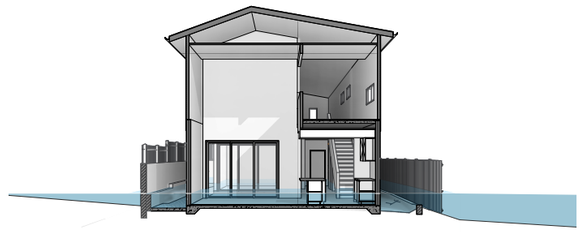
Sectional perspective 5

Lightweight | Weatherboard



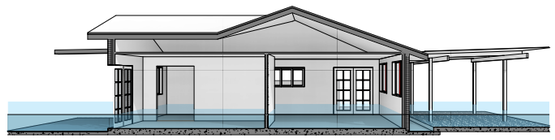
Sectional perspective 6

Lightweight | Rendered FC



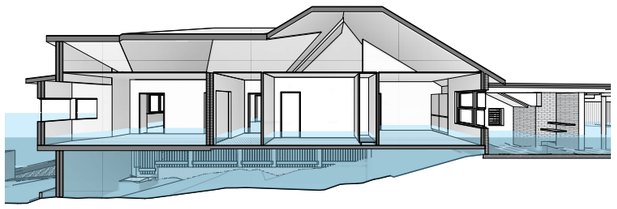
Sectional perspective 7

Lightweight | Brick veneer



Sectional perspective 8

Lightweight | Double brick

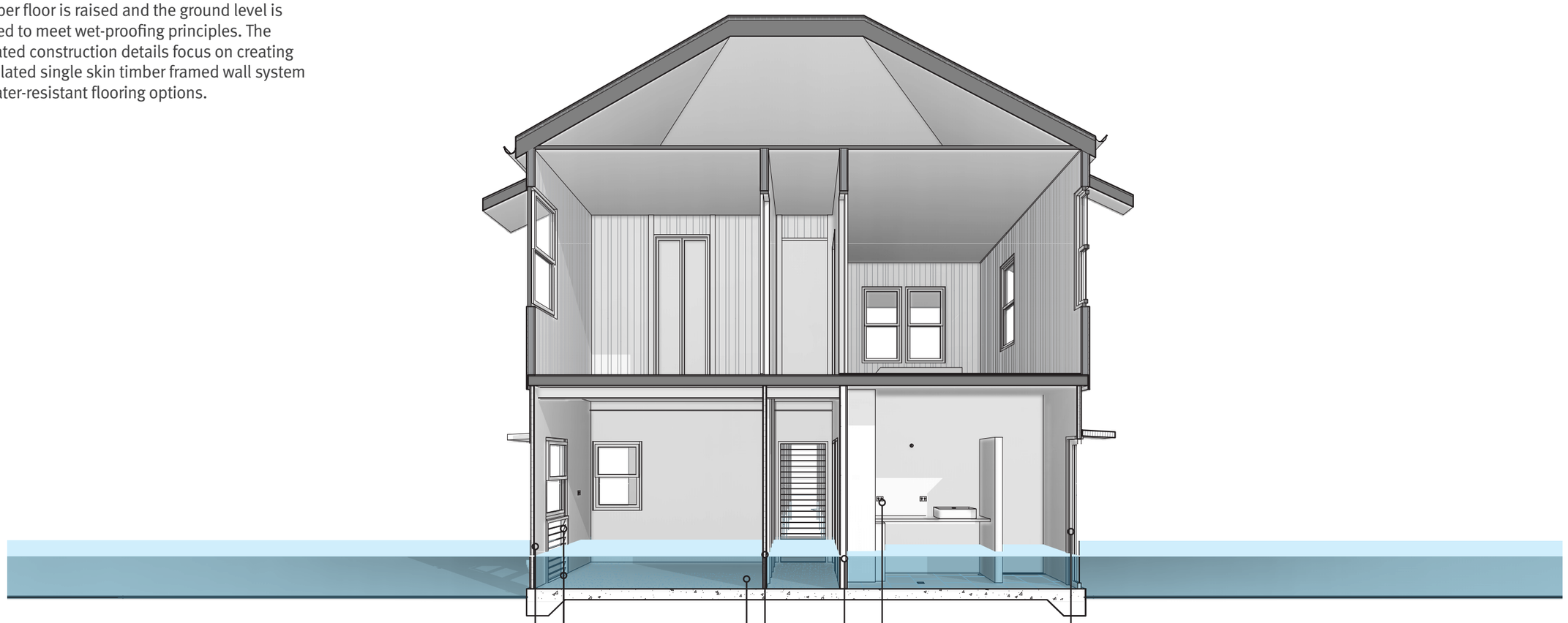


Sectional perspective 1

The design strategies, materials and associated construction details contained in this building type are relevant for:

- raising an existing house and building underneath.

The upper floor is raised and the ground level is designed to meet wet-proofing principles. The associated construction details focus on creating an insulated single skin timber framed wall system with water-resistant flooring options.



Detail EXT-101 (Page 35)
External wall with exposed hardwood framing.

Strategy 10.2 - 10.3 (Page 31)
Threshold Detail SILL-104 (Page 52)
Louver windows and flush thresholds enable flushing out of water and debris after a flood event.

Strategy 6.1 (Page 30)
Polished and sealed concrete slab.

Detail INT-101 (Page 39)
Lightweight exposed stud internal wall.

Strategy 11.1 (Page 32)
Elevated powerpoints and datapoints.

Detail INT-302 (Page 47
Rendered AAC block internal wall.

Detail EXT-103 (Page 36)
External wall with tiled and waterproofed internal face and externally exposed hardwood framing.

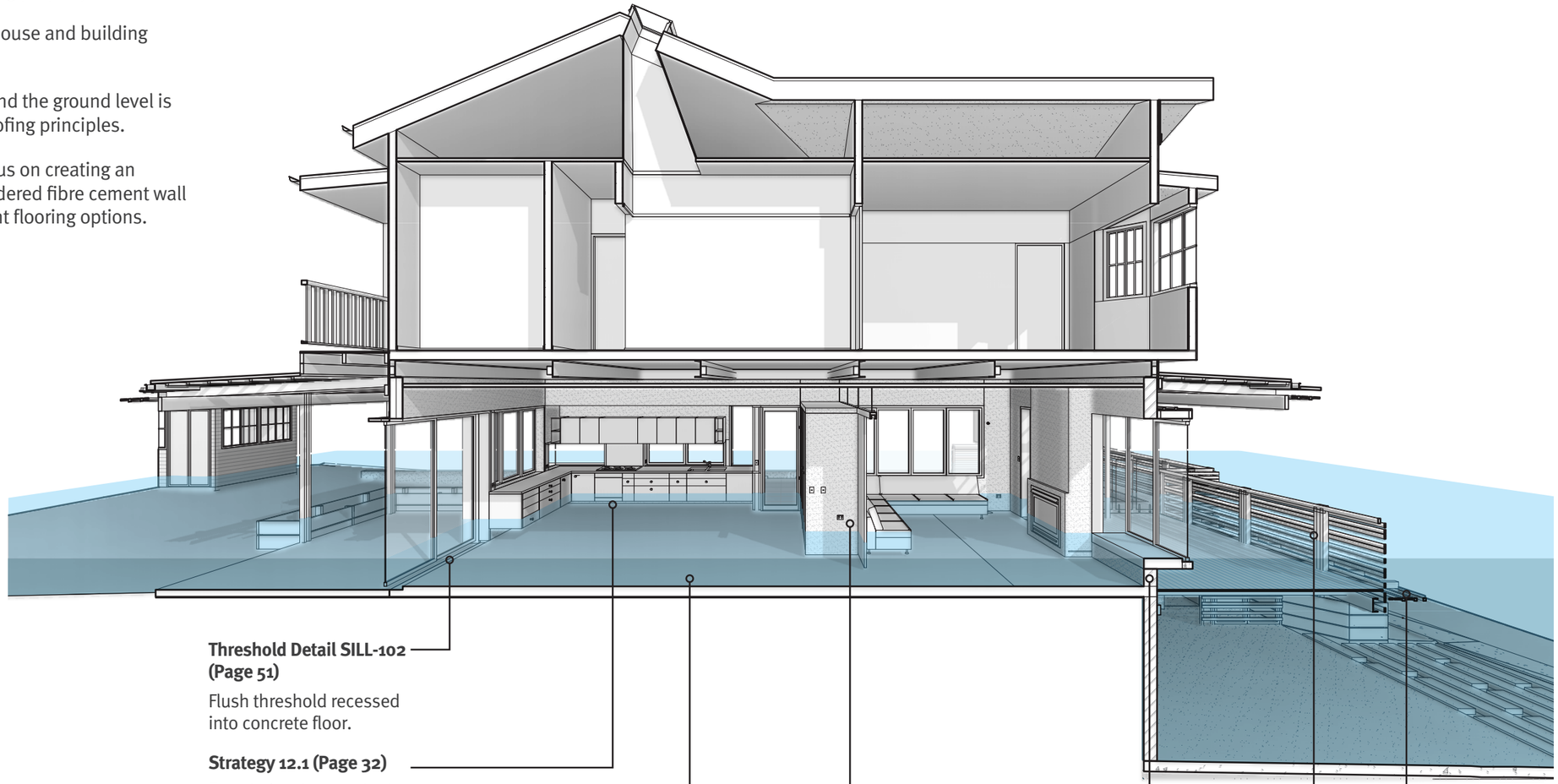
Sectional perspective 2

The design strategies, materials and associated construction details contained in this building type are relevant for:

- retrofitting an existing property
- raising an existing house and building underneath.

The upper floor is raised and the ground level is designed to meet wet-rpoofing principles.

Construction methods focus on creating an insulated, single skin, rendered fibre cement wall system with water-resistant flooring options.



Threshold Detail SILL-102 (Page 51)

Flush threshold recessed into concrete floor.

Strategy 12.1 (Page 32)

Elevated water-resistant cabinetry.

Strategy 6.1 (Page 30)

Polished and sealed concrete slab.

Detail EXT-701 (Page 55)

External rendered fibre cement wall.

Strategy

Permeable hardwood screening.

Strategy

Hardwood decking and structure.

Strategy 11.1 (Page 32)

Elevate powerpoints and datapoints.

Lightweight | Rendered FC

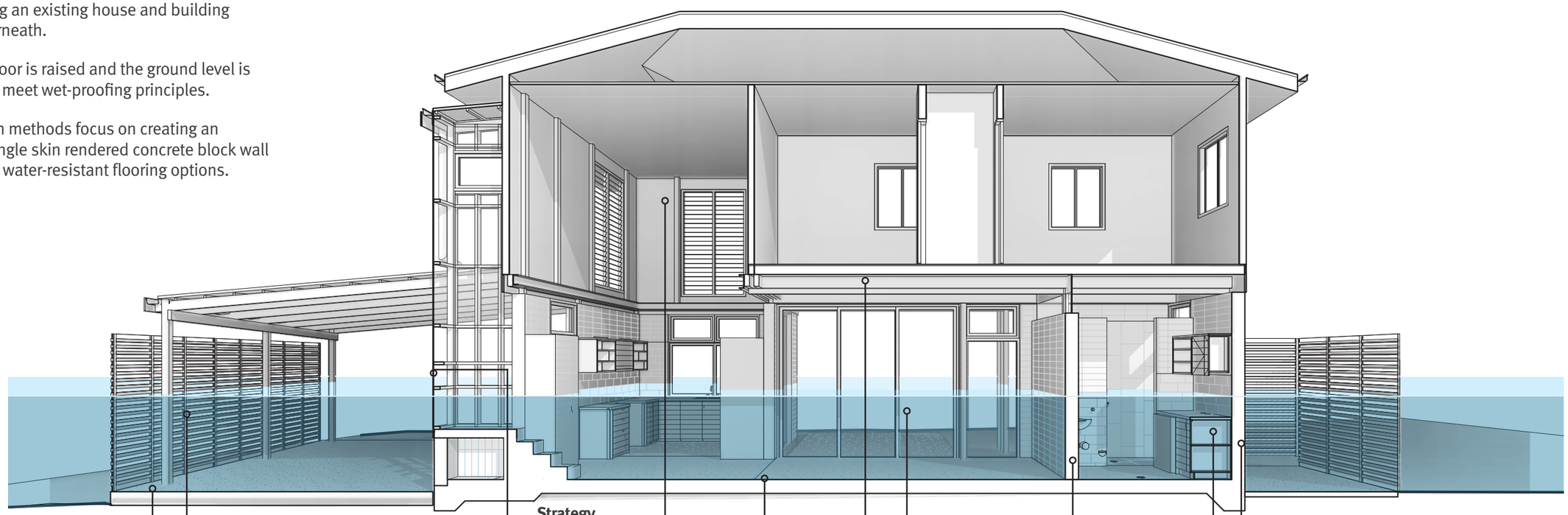
Sectional perspective 3

The design strategies, materials and associated construction details contained in this building type are relevant for:

- retrofitting an existing property
- raising an existing house and building underneath.

The upper floor is raised and the ground level is designed to meet wet-proofing principles.

Construction methods focus on creating an insulated single skin rendered concrete block wall system with water-resistant flooring options.



Strategy
Permeable hardwood screening. (Landscape strategies are not covered under program funding).

Strategy
External hard landscaping falls away from the house. (Landscape strategies are not covered under program funding).

Strategy
Internal void to allow the relocation of contents upstairs prior to a flood event.

Strategy 6.1 (Page 30)
Polished and sealed concrete slab.

Detail EXT-201 (Page 37)
Stud wall with exposed hardwood framing adjacent a non-habitable space.

Detail INT-201 (Page 43)
Internal rendered concrete block wall.

Strategy 10.1 (Page 31)
Aluminium and glass doors.

Strategy 12.1 (Page 32)
Removable water-resistant cabinetry for relocation above flood waters prior to a flood event.

Detail EXT-301 (Page 41)
External rendered concrete block wall.

Strategy 6.2 (Page 30)
No ceiling linings to steel or hardwood structure (depending on flood heights).

Masonry | Rendered concrete block

Sectional perspective 4

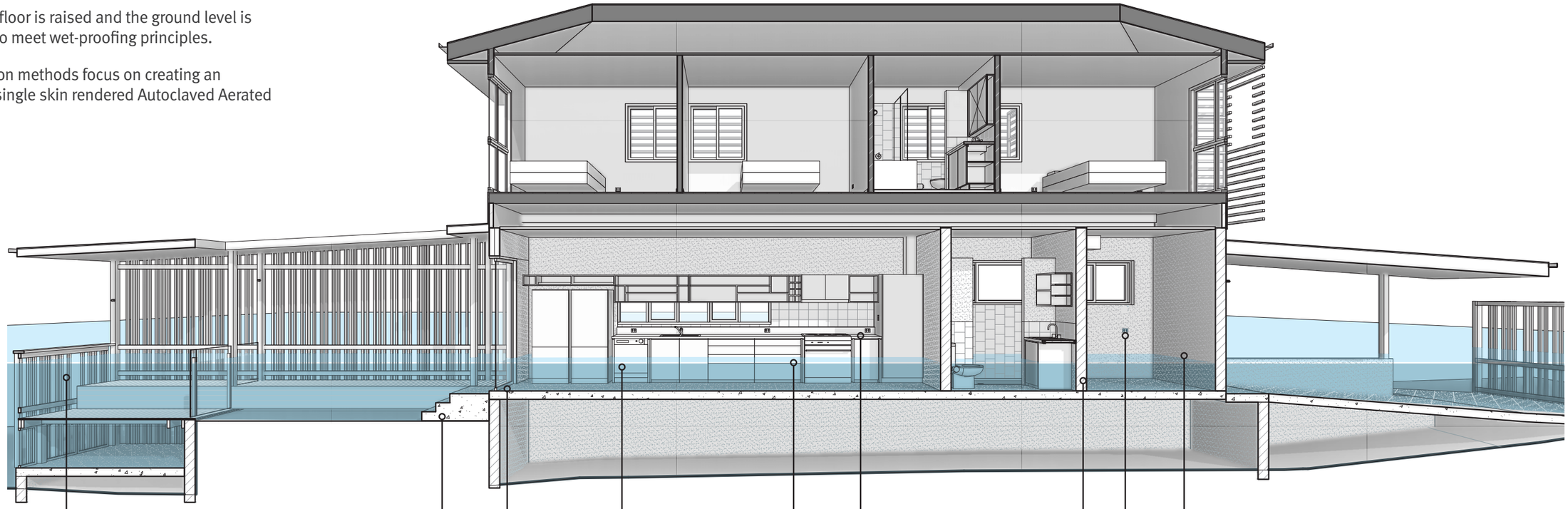
The design strategies, materials and associated construction details contained in this building type are relevant for:

- retrofitting an existing property
- raising an existing house and building underneath.

The upper floor is raised and the ground level is designed to meet wet-proofing principles.

Construction methods focus on creating an insulated single skin rendered Autoclaved Aerated Concrete (AAC) panel wall system, with water-resistant flooring options.

Given its aerated composition, the AAC system provides the highest thermal rating of all wall systems presented in this guidance. This system includes a concrete render surface treatment which ensures water resistance.



Strategy 9.1 (Page 31)

Durable and water-resistant stairs without cavities under.

Threshold Detail SILL-102 (Page 50)

Strategy 10.2 -10.3 (Page 31)

Flush threshold recessed into concrete floor.

Strategy

Permeable hardwood screening.

Strategy 12.2 (Page 32)

Stand-alone appliances can be easily removed and relocated above flood waters prior to a flood event.

Detail INT-303 (Page 48)

Internal rendered autoclaved aerated concrete (AAC) block walls.

Strategy 12.1 (Page 32)

Water-resistant benchtop on independent steel frame.

Strategy 12.1 (Page 32)

Removable water-resistant cabinetry for relocation above flood waters prior to a flood event.

Detail EXT-401 (Page 45)

External rendered autoclaved aerated concrete (AAC) block walls.

Strategy 11.1 (Page 32)

Elevate powerpoints and datapoints.

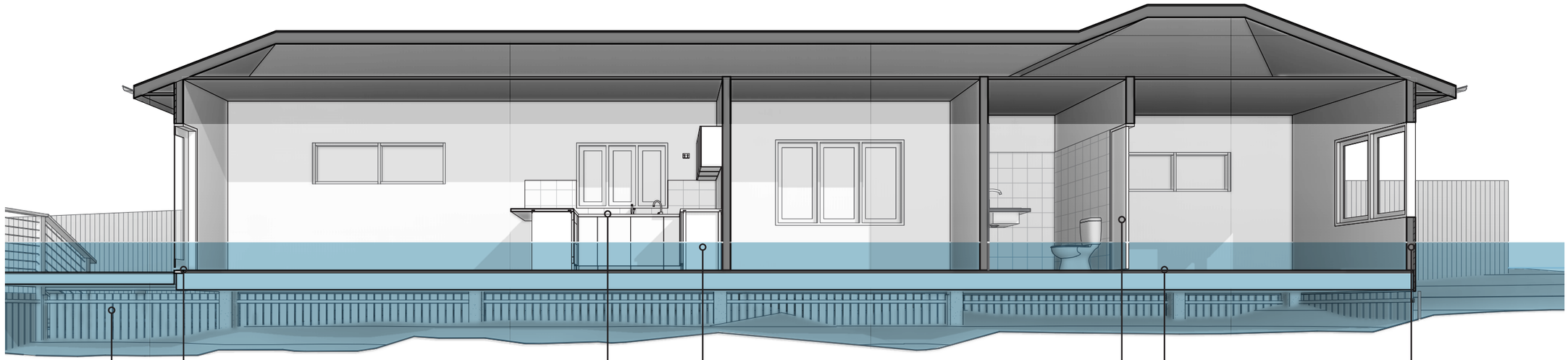
Sectional perspective 5

The design strategies, materials and associated construction details contained in this building type are relevant for:

- retrofitting an existing lightweight timber or steel framed house.

Retrofitting an existing house for flood resilience is more complicated than new building construction. Where an enclosed space exists inside walls, it is almost impossible to keep water out of the exterior walls, which can lead to mould growth inside the wall over time. Construction methods follow the principle that it is more effective to introduce better ventilation systems for airflow into the space inside exterior walls so that water can easily escape and the space inside the wall can quickly dry out after a flood.

Construction details align with industry building standards. In addition, greater use of waterproofing is recommended to protect existing timber wall structure.



Strategy 12.1 (Page 32)

Water-resistant benchtop on independent steel frame.

Strategy 12.1 (Page 32)

Removable water-resistant cabinetry for relocation above flood waters prior to a flood event.

Strategy 10.2 - 10.3 (Page 31)

Threshold Detail SILL-103 (Page 52)

Flush threshold recessed into concrete floor.

Strategy

Existing permeable hardwood screening is water-resistant.

Strategy 10.1 (Page 31)

Replace hollow core doors with solid core.

Strategy 6.1 (Page 30)

Existing hardwood floors are water-resistant.

Detail EXT-603 (Page 54)

Replace weatherboard cladding below flood line with new cement composite cladding. Spray existing structural members with liquid waterproof membrane. Replace existing batt insulation with new rigid cell insulation.

Lightweight | Weatherboard

Sectional perspective 6

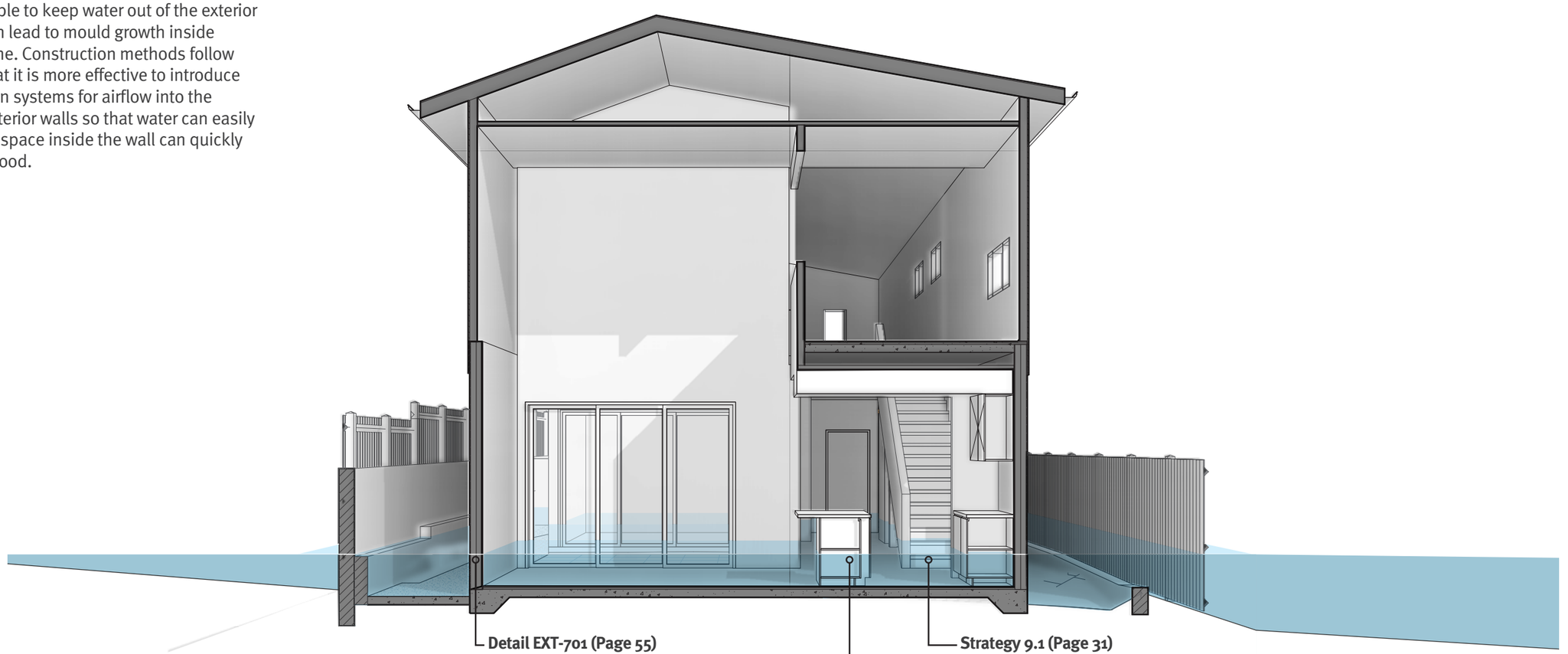
The design strategies, materials and associated construction details contained in this building type are relevant for:

- retrofitting an existing lightweight timber or steel framed house with rendered fibre cement sheet cladding.

Where an enclosed space exists inside walls, it is almost impossible to keep water out of the exterior walls, which can lead to mould growth inside the wall over time. Construction methods follow the principle that it is more effective to introduce better ventilation systems for airflow into the space inside exterior walls so that water can easily escape and the space inside the wall can quickly dry out after a flood.

The interior linings of the house have been replaced with water-resistant materials.

Construction details align with industry building standards. In addition, greater use of waterproofing is recommended to protect existing timber wall structure.



Detail EXT-701 (Page 55)

Retain existing rendered fibre cement cladding. Replace batt insulation with new closed cell rigid insulation. Replace non-water-resistant internal wall lining with water-resistant wall lining.

Strategy 9.1 (Page 31)

Retrofit stair to allow for open and removable treads.

Strategy 12.1 (Page 32)

Install water-resistant cabinetry.

Sectional perspective 7

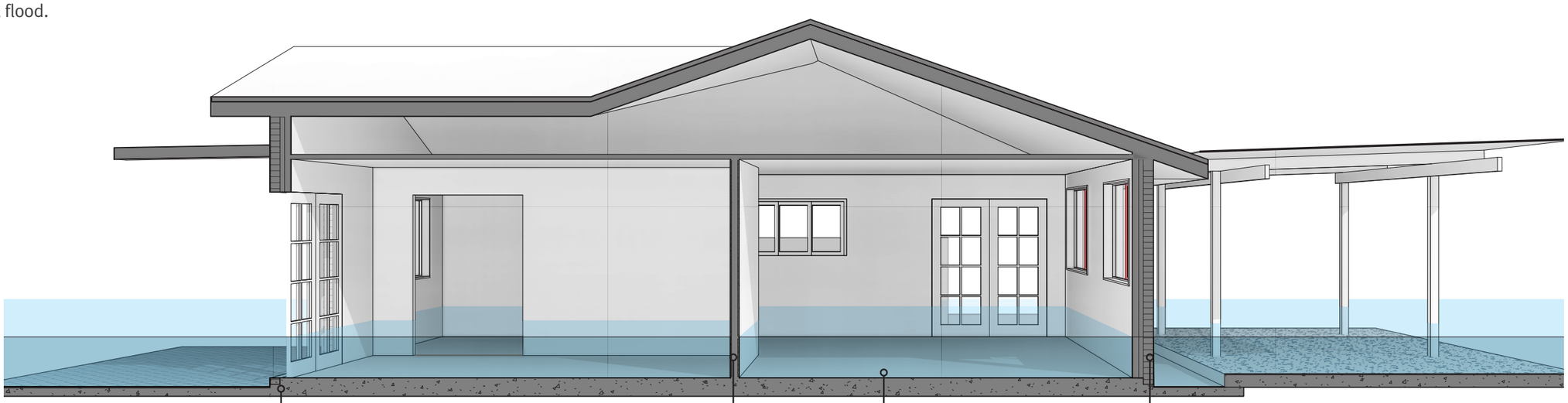
The design strategies, materials and associated construction details contained in this building type are relevant for:

- retrofitting an existing concrete slab-on-ground brick veneer home.

Where an enclosed space exists inside walls, it is almost impossible to keep water out of the exterior walls, which can lead to mould growth inside the wall over time. Construction methods follow the principle that it is more effective to introduce better ventilation systems for airflow into the space inside exterior walls so that water can easily escape and the space inside the wall can quickly dry out after a flood.

The interior linings of the house have been replaced with water-resistant materials.

Construction details align with industry building standards.



Strategy 10.2 - 10.3 (Page 31)

Threshold Detail SILL-103 (Page 52)

Door sills set down into concrete.

Detail INT-401 (Page 59)

Existing stud walls retrofitted. Replace batt insulation with new closed cell rigid insulation. Replace non-water-resistant internal wall lining with water-resistant wall lining.

Detail EXT-912 (Page 63)

Existing brick veneer walls retrofitted. Replace batt insulation with new closed cell rigid insulation. Replace non-water-resistant internal wall lining with water-resistant wall lining.

Strategy 6.1 (Page 32)

Remove non-resilient materials to reveal existing concrete slab. Seal existing concrete or install resilient flooring.

Sectional perspective 8

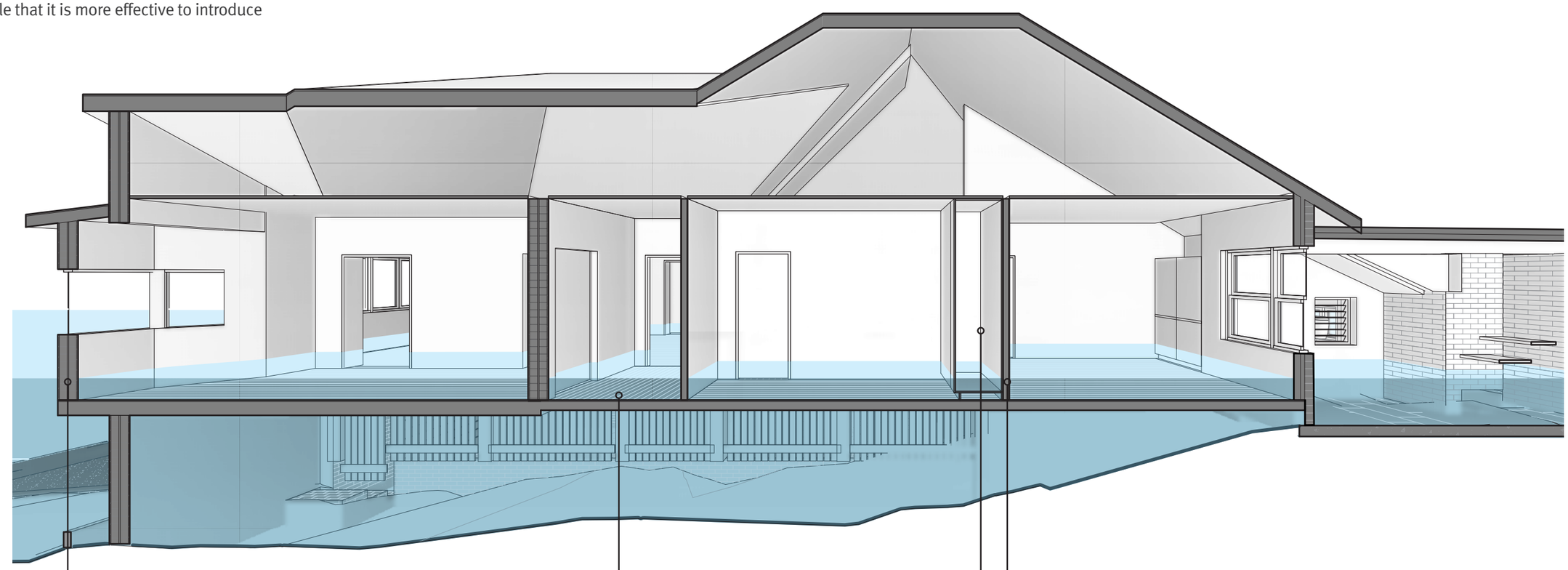
The design strategies, materials and associated construction details contained in this building type are relevant for:

- retrofitting an existing double-brick house with a raised frame.

Where an enclosed space exists inside walls, it is almost impossible to keep water out of the exterior walls, which can lead to mould growth inside the wall over time. Construction methods follow the principle that it is more effective to introduce better ventilation systems for airflow into the space inside exterior walls so that water can easily escape and the space inside the wall can quickly dry out after a flood.

The interior linings of the house have been replaced with water-resistant materials.

Construction details align with industry building standards.



Detail EXT-921 (Page 65)

Existing double brick to be retained. Additional weep holes to be added.

Strategy 6.1 (Page 30)

Remove non-water-resistant floor material to reveal existing floor structure. Install resilient flooring.

Detail INT-401 (Page 61)

Existing stud wall framing to be retained and sprayed with waterproof membrane. Existing internal wall lining to be replaced with new water-resistant wall lining to above flood level.

Strategy 12.1 (Page 32)

Install water-resistant cabinetry.

Masonry | Double brick

Flood resilient strategies

The following strategies in the flood resilient strategy table have been organised according to building element type as follows:

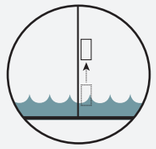
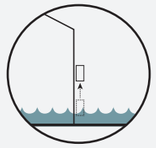
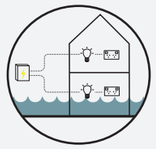
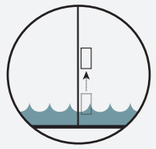
1 External services
2 External cladding & structure
3 Wall framing
4 Insulation
5 Internal structural members
6 Internal floors & ceilings
7 Internal walls
8 Wet areas
9 Internal stairs
10 Doors & windows
11 Internal services - electrical
12 Cabinetry

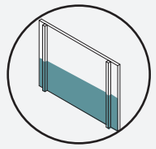
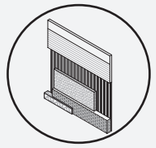
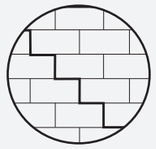
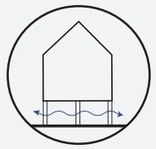
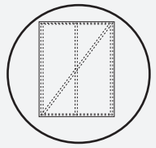
The following additional considerations are applicable to some of the strategies outlined in the following table:

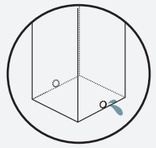
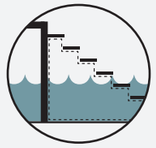
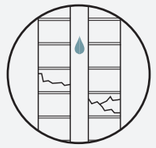
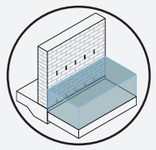
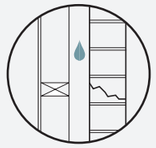
- Strategy may be within the scope of the Building Assessment Provisions. Local governments may only refer to this guidance material as an optional matter for consideration in the assessment of building work
- Strategy may require planning approval. Reference should be made to local planning provisions to ensure legislative requirements are met
- Ensure no adverse impact on neighbouring properties
- Strategy may require advice from a registered RPEQ structural, hydraulic, or civil Engineer

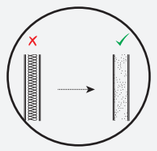
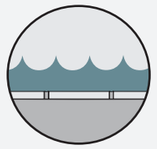
All resilient retrofit works should be installed up to, or above, the Assessed Flood Level or the highest practical level, whilst considering safety, functionality, and relevant industry standards.

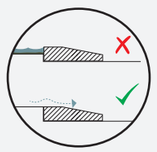
The requirements of the Building Assessment Provisions must be met with respect to safeguards against illness and disability access.

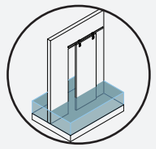
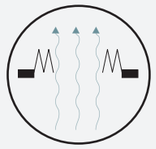
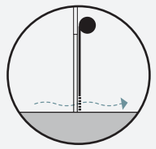
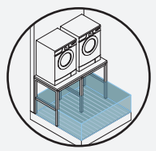
Strategy / Material No.	Flood Resilient Strategy	Diagram
1	**External services**	
1.1	**Raise the electrical switchboard** Ensure the electrical switchboard and all other services are installed above the Assessed Flood Level or as high as practicable. Height must comply with Australian Standards.	
1.2	**Raise the hot water unit** Ensure the hot water unit and all other services are installed above the Assessed Flood Level or as high as practicable.	
1.3	**Install separate circuits (with breakers) on ground and upper levels**	
1.4	**Raise the air conditioning condenser unit** Ensure the air conditioning condenser unit and all other services are installed above the Assessed Flood Level or as high as practicable.	
1.5	**Raise the water tank's pump and electrical systems** Ensure the water tank's pump and electrical systems are installed above the Assessed Flood Level or as high as practicable.	
1.6	**Anchor rainwater tanks, relocate if necessary*** Flood events have the ability to uplift rain water tanks and sweep them downstream toward other properties. Ensure rainwater tanks are anchored to the slab they sit on. *Program funding may be considered on a case-by-case basis.	

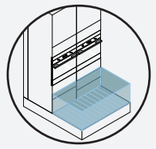
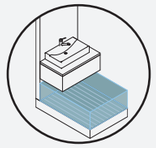
Strategy / Material No.	Flood Resilient Strategy	Diagram
2	**External cladding and structure**	
2.1	**Install water-resistant external cladding** Refer to the *flood resilient materials table.*	
2.2	**Use single skin construction systems** When building new walls or modifying existing walls, single skin construction systems allow for easy cleaning after floods while avoiding cavities where mould may grow and water can get trapped.	
2.3	**Use composite construction systems** Use composite construction systems with single skin systems below the Assessed Flood Level to allow for easy cleaning while avoiding cavities where mould may grow.	
2.3	**Consult a registered RPEQ Structural Engineer for advice on regarding damage to the external structure and cladding**	
2.4	**Provide adequate drainage and ventilation to subfloor area** When retrofitting an existing house, install additional air vents or weep holes above the Assessed Flood Level to allow for wall and subfloor areas to dry-out quickly. NOTE: Consult a registered (RPEQ) Structural Engineer for recommendations.	
2.5	**Install air vents with automatic water prevention** When retrofitting an existing house, install additional air vents or weep holes above the Assessed Flood Level to allow for wall and subfloor areas to quickly dry-out. NOTE: Consult a registered (RPEQ) Structural Engineer for recommendations.	
2.6	**Replace water damaged or non-water-resistant structural bracing** Re-install water-resistant bracing (refer to the *flood resilient materials table)*. NOTE: Consult a registered (RPEQ) Structural Engineer for recommendations.	

Strategy / Material No.	Flood Resilient Strategy	Diagram
2.7	**Allow water to drain from within steel columns** Drill small holes at the base of steel posts to allow water to drain. NOTE: Consult a registered (RPEQ) Structural Engineer for recommendations.	
2.8	**Design without cavities under stairs (external)** To enable post-flood clean-out, the following strategies may be appropriate: • Remove all cavities below the Assessed Flood Level under stairs and replace with open, bolt-fixed removable treads made of water-resistant materials • Replace the existing stair with a solid concrete stair below the Assessed Flood Level	
2.9	**Consult a registered (RPEQ) Structural Engineer for recommendations on any structural damage to external cladding and structure**	
2.10	**Clean out any blocked weep holes and brick vents** Ensure all termite protection systems remain intact. NOTE: Consult a registered (RPEQ) Structural Engineer for recommendations.	
2.11	**Add additional weep holes above the assessed flood level to allow the cavity to dry out quicker, and additional weep holes on the bottom of the wall for water to escape** Installing additional weep holes will help to quickly dry out the cavity of a double brick or brick veneer wall. It is important to clean out any existing weep holes to prevent water getting trapped in the wall cavity. NOTE: Consult a registered (RPEQ) Structural Engineer for recommendations.	
2.12	**Replace non-water-resistant internal linings** Replace with water-resistant internal linings (Refer to the *flood resilient materials table*).	
2.13	**Consult a registered (RPEQ) Structural Engineer for recommendations on any structural damage**	

Strategy / Material No.	Flood Resilient Strategy	Diagram
3	**Wall Framing**	
3.1	**Install water-resistant framing** Refer to the *flood resilient materials table.*	
4	**Insulation**	
4.1	**Install suitable closed-cell insulation** The following closed-cell insulation types may be appropriate: • Extruded Polystyrene (XPS) • Thermoset Polyisocyanurate (PIR) • Phenolic Consider energy efficiency and fire rating requirements when selecting insulation.	
5	**Internal structural members**	
5.1	**Consult a registered (RPEQ) Structural Engineer for recommendations on any damaged internal structural members**	
6	**Internal floors & ceilings**	
6.1	**Install water-resistant flooring** Refer to the *flood resilient materials table.*	
6.2	**Design ceilings without linings and cavities** This strategy is only recommended where flood levels reach ceiling heights. Ceilings under roofs are typically used as diaphragms for horizontal loading. If removed, an alternative mechanism will be required.	
6.3	**Use flood resilient grout when tiling or re-tiling** When tiling or re-tiling, ensure flood resilient grout is used. Otherwise referred to as 'epoxy' or 'semi-epoxy' this grout is less porous and ensures that the wall lining beneath tiles is protected and minimises the chance of mould.	

Strategy / Material No.	Flood Resilient Strategy	Diagram
7	**Internal walls**	
7.1	**Install water-resistant linings** Refer to the *flood resilient materials table.*	
8	**Wet areas**	
8.1	**Install a removable panel or replace cavity bathtubs with freestanding bathtubs or showers** Built-in baths with cavities, often built into cabinetry or in tiled areas, are prone to trapping water, damaging the framing and forming mould. A removable panel, freestanding bathtub or shower eliminates gaps where water can be trapped and enables easy access for cleaning.	
9	**Internal stairs**	
9.1	**Design without cavities under stairs (internal)** To enable post-flood clean-out, the following strategies may be appropriate: • Remove all cavities below the Assessed Flood Level under stairs and replace with open, bolt-fixed removable treads made of water-resistant materials • If it is not feasible to replace or retrofit the entire stairs, or there is a built in room underneath the stairs, adjusting the bottom riser so that it can be removable is an appropriate strategy making it much easier to clean out under a stairs • Replace the existing stairs with solid concrete stairs below the Assessed Flood Level • Use steel, hardwood (Kwila or greater grain density hardwood), or concrete	
10	**Doors & windows**	
10.1	**Replace hollow core doors / Install:** • Solid core doors • Aluminium and glass doors • Hollow core doors with lift-off hinges	
10.2	**Install flush thresholds (sills)** To enable post-flood clean-out, remove all thresholds which step up to obstruct the drainage and discharge of flood waters from the interior.	

Strategy / Material No.	Flood Resilient Strategy	Diagram
10.3	**Seal all frames to building fabric** Ensure door and window frames are weatherproof sealed to avoid the ingress of water into the house.	
10.4	**Install corrosion-resistant door and window hardware** Install corrosion resistant door and window hardware so these do not need to be repaired or replaced following a flood event.	
10.5	**Replace cavity sliding doors with swing or face of wall sliding doors** Replace cavity sliding doors with swing or face of wall sliding doors to minimise the chance of flood water ingress into your cavity wall. Ensure when you replace the door that you also seal off the existing cavity.	
10.6	**Change door configuration to maximise the existing opening** Large openings help when cleaning out after a flood event. Door configurations with fixed panels such as typical sliding glass doors, only make use of half their potential opening. Replacing these with bi-folding or double swing doors enable maximum use of existing opening to aid in cleaning after a flood event.	
10.7	**Retrofit garage doors with permeable doors to allow water to flow through** Permeable garage doors allow water to flood in and out quickly, and minimise damage to the door itself.	
11	**Internal services - electrical**	
11.1	**Raise power points and data points** Ensure the power points, data points and all other fixed electrical services are installed above the Assessed Flood Level or as high as practicable.	
11.2	**Raise or relocate the washing machine and dryer** Ensure washing machines and dryers are installed above the Assessed Flood Level or as high as practicable.	

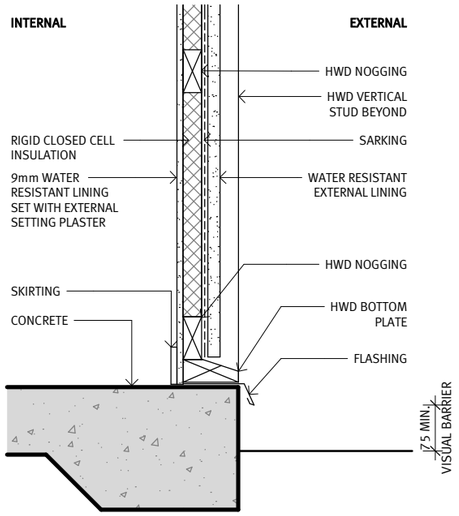
Strategy / Material No.	Flood Resilient Strategy	Diagram
12	**Cabinetry**	
12.1	**Install water-resistant cabinetry** Strategies include: • Water resistant cabinetry materials • Raising cabinetry above the Assessed Flood Level on feet or wall-hung • Designing removable cabinetry that sits below the Assessed Flood Level to be able to be transported to storage areas above the Assessed Flood Level • Installing removable kick plates to enable cleaning under cabinetry Refer to the ***flood resilient materials table.***	
12.2	**Install stand-alone appliances*** Stand-alone appliances can be easily removed and relocated above the Assessed Flood Level. *New appliances are not covered under program funding.	
12.3	**Raise kitchen appliances** Relocate appliances above the Assessed Flood Level in cabinetry design.	
12.4	**Install wall hung cabinetry** Where possible, install wall hung cabinetry above the Assessed Flood Level, or install wall-hung vanity basin with no cabinetry.	

Flood resilient construction details

This section contains construction details with reference to suitable floor resilient materials. Refer to the Flood resilient materials table for information about the advantages and disadvantages of various material types.

This section provides information about flood resilient construction systems applicable to retrofitting existing homes.

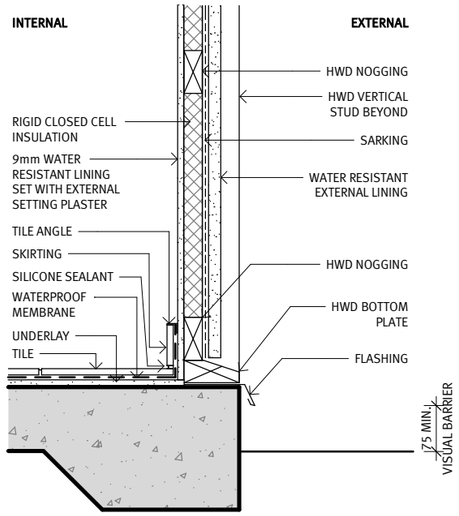
Note: the details on the following pages are not represented to scale.



TYPOLOGY: LIGHTWEIGHT
WALL TYPE: EXTERNAL | EXPOSED STUD WALL
FLOOR FINISH: CONCRETE

Framing:	Hardwood timber.
External lining:	Water resistant external lining
Insulation:	Rigid closed cell insulation. Thickness of insulation to match depth of stud frame. Seal edges of insulation to frame.
Internal lining:	9mm water resistant lining set with external setting plaster to above flood level
Skirting:	Hardwood or other water resistant skirting.
Floor finish:	Concrete with non-slip penetrative sealant.

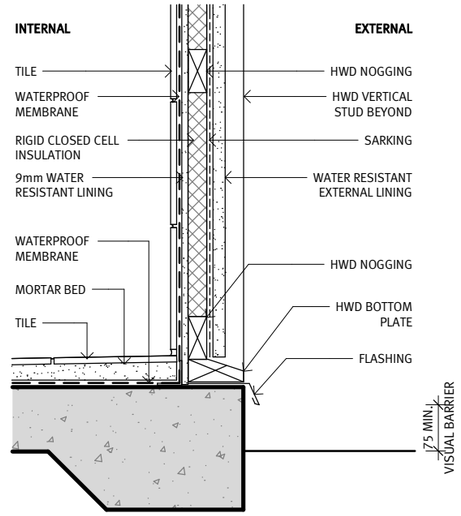
EXT-101
EXTERNAL | EXPOSED STUD WALL
CONCRETE FLOOR FINISH



TYPOLOGY: LIGHTWEIGHT
WALL TYPE: EXTERNAL | EXPOSED STUD WALL
FLOOR FINISH: TILE

Framing:	Hardwood timber.
External lining:	Water resistant external lining
Insulation:	Rigid closed cell insulation. Thickness of insulation to match depth of stud frame. Seal edges of insulation to frame.
Internal lining:	9mm water resistant lining set with external setting plaster to above flood level.
Skirting:	Tile with tile angle or other water resistant skirting . Silicone sealant at junction to the floor finish.
Floor finish:	Tile + waterproof membrane + underlay. Semi-epoxy grout and water-resistant adhesive for all tiling.

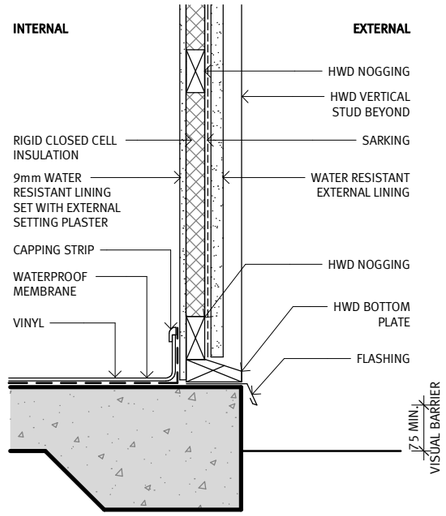
EXT-102
EXTERNAL | EXPOSED STUD WALL
TILE FLOOR FINISH



TYPOLOGY: LIGHTWEIGHT
WALL TYPE: EXTERNAL | EXPOSED STUD WALL
FLOOR FINISH: TILE | WET AREA

Framing:	Hardwood timber.
External lining:	Water resistant external lining
Insulation:	Rigid closed cell insulation. Thickness of insulation to match depth of stud frame. Seal edges of insulation to frame.
Internal lining:	Tile + waterproof membrane + 9mm water resistant lining to above flood level. Silicone sealant at junction to the floor finish. Semi-epoxy grout and water-resistant adhesive for all tiling.
Skirting:	N/A
Floor finish:	Tile + bedding + waterproof membrane. Semi-epoxy grout and water-resistant adhesive for all tiling.

EXT-103
EXTERNAL | EXPOSED STUD WALL
TILE FLOOR FINISH | WET AREA

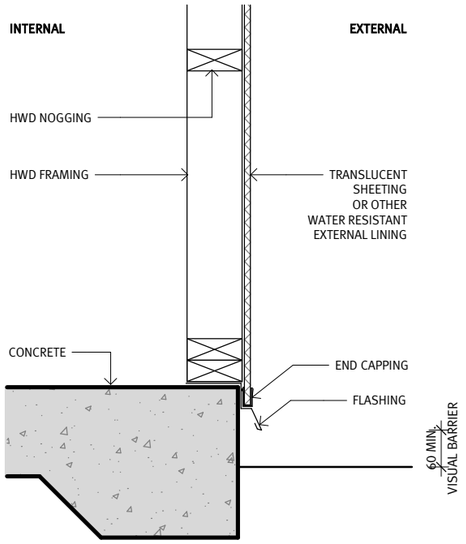


TYPOLOGY: LIGHTWEIGHT
WALL TYPE: EXTERNAL | EXPOSED STUD WALL
FLOOR FINISH: VINYL

Framing:	Hardwood timber.
External lining:	Water resistant external lining
Insulation:	Rigid closed cell insulation. Thickness of insulation to match depth of cavity. Seal edges of insulation to frame.
Internal lining:	9mm water resistant lining set with external setting plaster to above flood level.
Skirting:	Coved vinyl or other water resistant skirting.
Floor finish:	Vinyl + waterproof membrane.

EXT-104
EXTERNAL | EXPOSED STUD WALL
VINYL FLOOR FINISH

Lightweight | External Wall

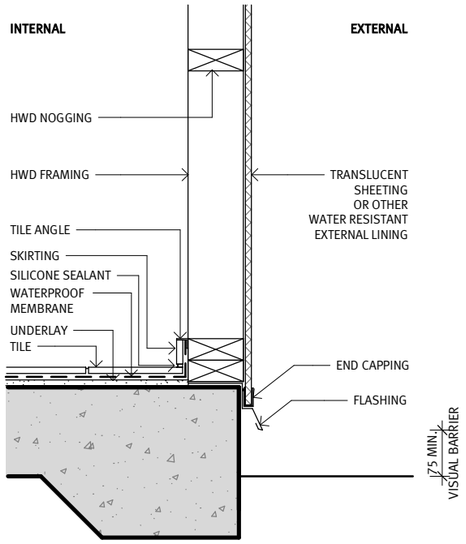


TYPOLOGY: LIGHTWEIGHT
WALL TYPE: EXTERNAL | SINGLE SKIN NON-HABITABLE
FLOOR FINISH: CONCRETE

Framing: Hardwood timber.
External lining: Translucent sheeting or other water resistant external lining.
Insulation: N/A
Internal lining: N/A
Skirting: N/A
Floor finish: Concrete with non-slip penetrative sealant.

NOTE: This detail only applies to a non-habitable room.

EXT-201
EXTERNAL | SINGLE SKIN | NON-HABITABLE
CONCRETE FLOOR FINISH

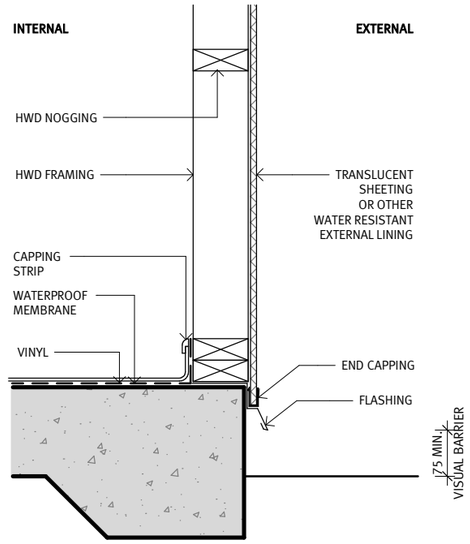


TYPOLOGY: LIGHTWEIGHT
WALL TYPE: EXTERNAL | SINGLE SKIN NON-HABITABLE
FLOOR FINISH: TILE

Framing: Hardwood timber.
External lining: Translucent sheeting or other water resistant external lining.
Insulation: N/A
Internal lining: N/A
Skirting: Tile with tile angle or other water resistant skirting. Silicone sealant at junction to the floor finish.
Floor finish: Tile + waterproof membrane + underlay. Semi-epoxy grout and water-resistant adhesive for all tiling.

NOTE: This detail only applies to a non-habitable room.

EXT-202
EXTERNAL | SINGLE SKIN | NON-HABITABLE
TILE FLOOR FINISH

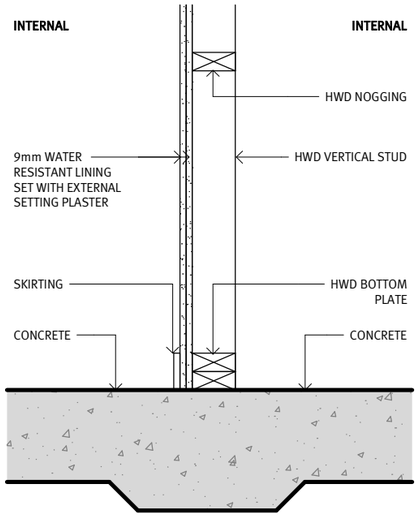


TYPOLOGY: LIGHTWEIGHT
WALL TYPE: EXTERNAL | SINGLE SKIN NON-HABITABLE
FLOOR FINISH: VINYL

Framing: Hardwood timber.
External lining: Translucent sheeting or other water resistant external lining.
Insulation: N/A
Internal lining: N/A
Skirting: Coved vinyl or other water resistant skirting.
Floor finish: Vinyl + waterproof membrane.

NOTE: This detail only applies to a non-habitable room.

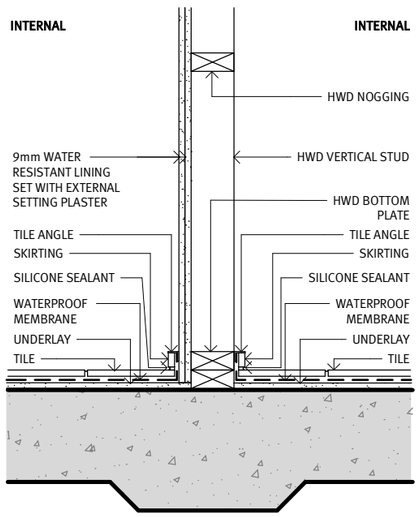
EXT-203
EXTERNAL | SINGLE SKIN | NON-HABITABLE
VINYL FLOOR FINISH



TYPOLOGY: LIGHTWEIGHT
WALL TYPE: INTERNAL | EXPOSED STUD WALL

Framing:	Hardwood timber.
Insulation:	N/A
Internal lining:	2 x 9mm water resistant lining set with external setting plaster .
Skirting:	Hardwood or other water resistant skirting.
Floor finish:	Concrete with non-slip penetrative sealant.

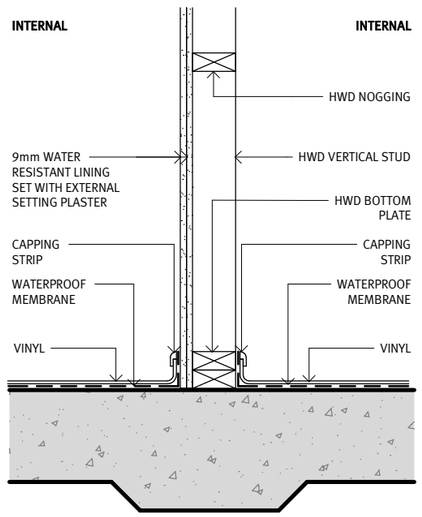
INT-101
INTERNAL | EXPOSED STUD WALL
CONCRETE FLOOR FINISH



TYPOLOGY: LIGHTWEIGHT
WALL TYPE: INTERNAL | EXPOSED STUD WALL

Framing:	Hardwood timber.
Insulation:	N/A
Internal lining:	2 x 9mm water resistant lining set with external setting plaster.
Skirting:	Tile with tile angle or other water resistant skirting . Silicone sealant at junction to the floor finish.
Floor finish:	Tile + waterproof membrane + underlay. Semi-epoxy grout and water-resistant adhesive for all tiling.

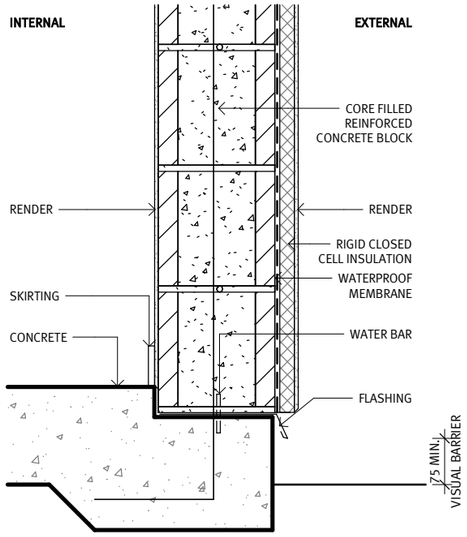
INT-102
INTERNAL | EXPOSED STUD WALL
TILE FLOOR FINISH



TYPOLOGY: LIGHTWEIGHT
WALL TYPE: INTERNAL | EXPOSED STUD WALL

Framing:	Hardwood timber.
Insulation:	N/A
Internal lining:	2 x 9mm water resistant lining set with external setting plaster
Skirting:	Coved vinyl or other water resistant skirting.
Floor finish:	Vinyl + waterproof membrane.

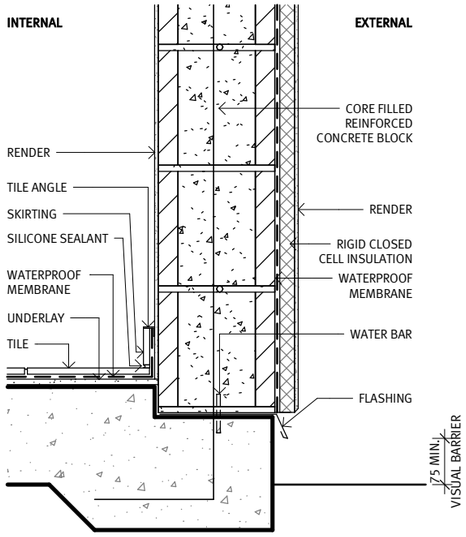
INT-103
INTERNAL | EXPOSED STUD WALL
VINYL FLOOR FINISH



TYPOLOGY: MASONRY
WALL TYPE: EXTERNAL | CONCRETE BLOCK WALL
FLOOR FINISH: CONCRETE FLOOR FINISH

Structure:	Core filled reinforced concrete block.
Insulation:	Rigid closed cell insulation.
External lining:	Render + waterproof membrane to above flood level.
Internal lining:	Render.
Skirting:	Hardwood or other water resistant skirting.
Floor finish:	Concrete with non-slip penetrative sealant.

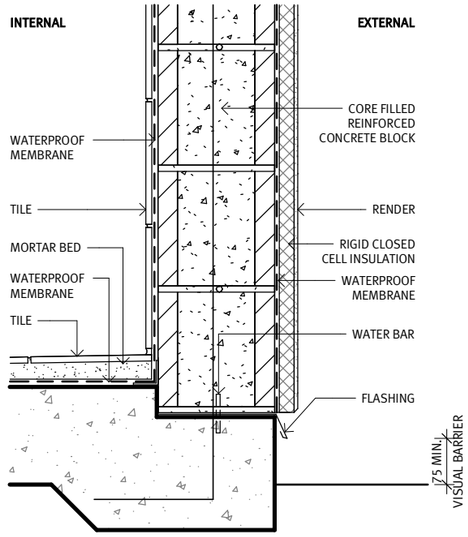
EXT-301
EXTERNAL | CONCRETE BLOCK WALL
CONCRETE FLOOR FINISH



TYPOLOGY: MASONRY
WALL TYPE: EXTERNAL | CONCRETE BLOCK WALL
FLOOR FINISH: TILE

Structure:	Core filled reinforced concrete block.
Insulation:	Rigid closed cell insulation.
External lining:	Render + waterproof membrane to above flood level.
Internal lining:	Render.
Skirting:	Tile with tile angle or other water resistant skirting. Silicone sealant at junction to the floor finish. Semi-epoxy grout and water-resistant adhesive for all tiling.
Floor finish: underlay.	Tile + waterproof membrane + Semi-epoxy grout and water-resistant adhesive for all tiling.

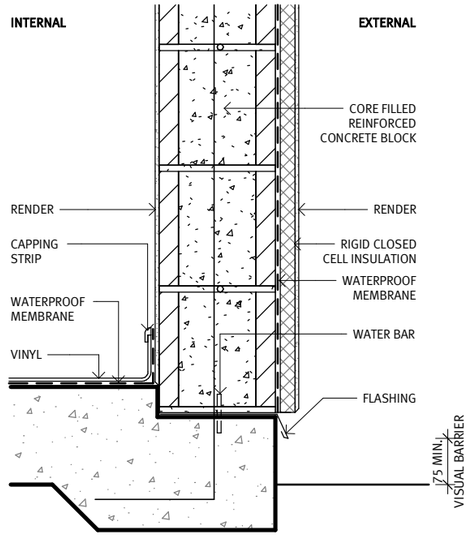
EXT-302
EXTERNAL | CONCRETE BLOCK WALL
TILE FLOOR FINISH



TYPOLOGY: MASONRY
WALL TYPE: EXTERNAL | CONCRETE BLOCK WALL
FLOOR FINISH: TILE | WET AREA

Structure:	Core filled reinforced concrete block.
Insulation:	Rigid closed cell insulation.
External lining:	Render + waterproof membrane to above flood level.
Internal lining:	Tile + waterproof membrane + 9mm water resistant lining to above flood level. Semi-epoxy grout and water-resistant adhesive for all tiling. Silicone sealant at junction to the floor finish.
Skirting:	N/A
Floor finish:	Tile + bedding + waterproof membrane. Semi-epoxy grout and water resistant adhesive for all tiling.

EXT-303
EXTERNAL | CONCRETE BLOCK WALL
TILE FLOOR FINISH | WET AREA

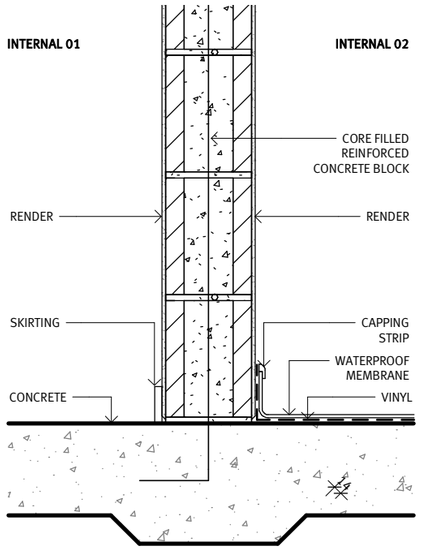


TYPOLOGY: MASONRY
WALL TYPE: EXTERNAL | CONCRETE BLOCK WALL
FLOOR FINISH: VINYL

Structure:	Core filled reinforced concrete block.
Insulation:	Rigid closed cell insulation.
External lining:	Render + waterproof membrane to above flood level.
Internal lining:	Render.
Skirting:	Coved vinyl or other water resistant skirting.
Floor finish:	Vinyl + waterproof membrane.

EXT-304
EXTERNAL | CONCRETE BLOCK WALL
VINYL FLOOR FINISH

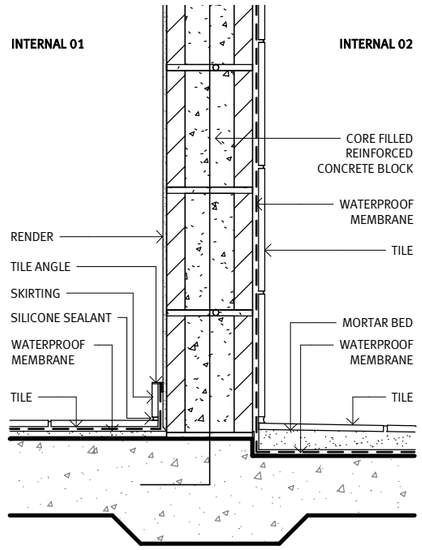
Masonry | External Concrete Block Wall



TYPOLOGY:	MASONRY
WALL TYPE:	INTERNAL | CONCRETE BLOCK WALL
FLOOR FINISH:	CONCRETE / VINYL

Structure:	Core filled reinforced concrete block.
Insulation:	N/A
Internal lining 01:	Render.
Skirting 01:	Hardwood or other water resistant skirting.
Floor finish 01:	Concrete with non-slip penetrative sealant.
Internal lining 02:	Render.
Skirting 02:	Vinyl or other water resistant skirting.
Floor finish 02:	Vinyl + waterproof membrane.

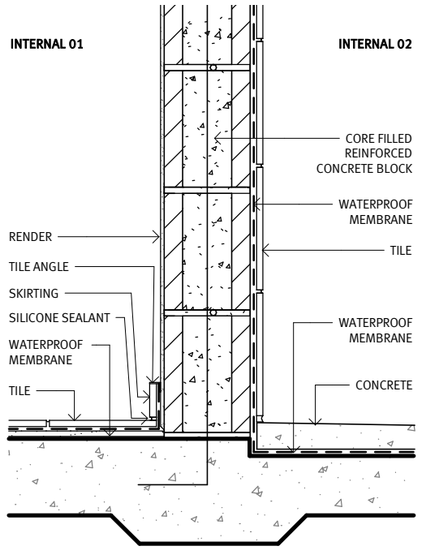
INT-201
INTERNAL | CONCRETE BLOCK WALL
CONCRETE / VINYL FLOOR FINISH



TYPOLOGY:	MASONRY
WALL TYPE:	INTERNAL | CONCRETE BLOCK WALL
FLOOR FINISH:	TILE / TILE | WET AREA

Structure:	Core filled reinforced concrete block.
Insulation:	N/A
Internal lining 01:	Render.
Skirting 01:	Tile with tile angle or other water resistant skirting. Silicone sealant at junction to the floor finish. Semi-epoxy grout and water-resistant adhesive for all tiling.
Floor finish 01:	Tile + waterproof membrane + underlay. Semi-epoxy grout and water-resistant adhesive for all tiling.
Internal lining 02:	Tile + waterproof membrane + 9mm water resistant lining to above flood level. Semi-epoxy grout and water-resistant adhesive for all tiling. Silicone sealant at junction to the floor finish.
Skirting 02:	N/A
Floor finish 02:	Tile + bedding + waterproof membrane. Semi-epoxy grout and water resistant adhesive for all tiling.

INT-202
INTERNAL | CONCRETE BLOCK WALL
TILE / TILE FLOOR FINISH | WET AREA

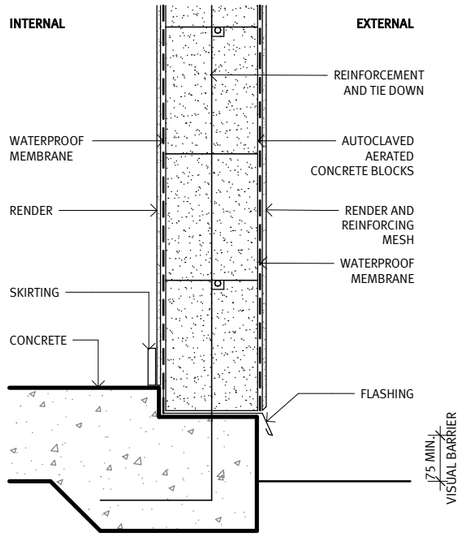


TYPOLOGY:	MASONRY
WALL TYPE:	INTERNAL | CONCRETE BLOCK WALL
FLOOR FINISH:	TILE / CONCRETE | WET AREA

Structure:	Core filled reinforced concrete block.
Insulation:	N/A
Internal lining 01:	Render.
Skirting 01:	Tile with tile angle or other water resistant skirting. Silicone sealant at junction to the floor finish. Semi-epoxy grout and water-resistant adhesive for all tiling.
Floor finish 01:	Tile + waterproof membrane + underlay. Semi-epoxy grout and water-resistant adhesive for all tiling.
Internal lining 02:	Tile + waterproof membrane + 9mm water resistant lining to above flood level. Semi-epoxy grout and water-resistant adhesive for all tiling. Silicone sealant at junction to the floor finish.
Skirting 02:	N/A
Floor finish 02:	Concrete + waterproof membrane.

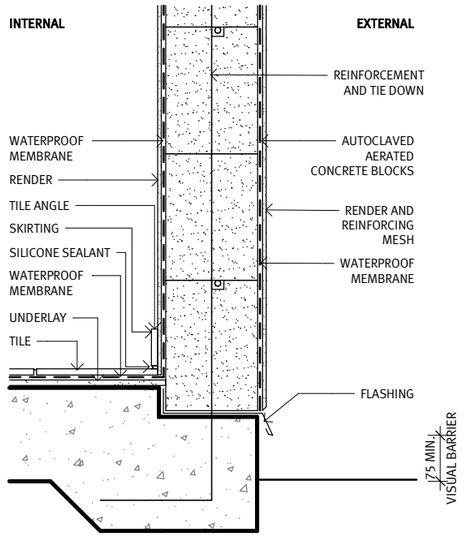
INT-203
INTERNAL | CONCRETE BLOCK WALL
TILE / CONCRETE FLOOR FINISH | WET AREA

Masonry | Internal Concrete Block Wall



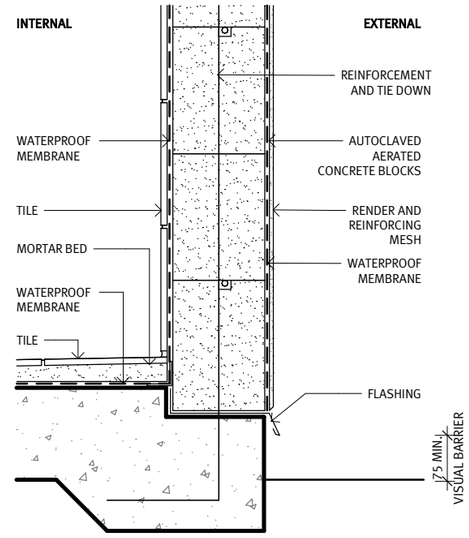
TYPOLOGY:	MASONRY
WALL TYPE:	EXTERNAL | AAC BLOCK WALL
FLOOR FINISH:	CONCRETE
Structure:	AAC block wall.
Insulation:	N/A
External lining:	Render + waterproof membrane.
Internal lining:	Render + waterproof membrane.
Skirting:	Hardwood or other water resistant skirting.
Floor finish:	Concrete with non-slip penetrative sealant.

EXT-401
EXTERNAL | AAC BLOCK WALL
CONCRETE FLOOR FINISH



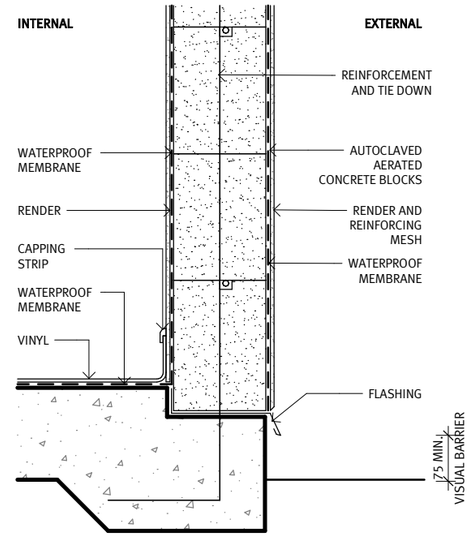
TYPOLOGY:	MASONRY
WALL TYPE:	EXTERNAL | AAC BLOCK WALL
FLOOR FINISH:	TILE
Structure:	AAC block wall.
Insulation:	N/A
External lining:	Render + waterproof membrane.
Internal lining:	Render + waterproof membrane.
Skirting:	Tile with tile angle or other water resistant skirting. Silicone sealant at junction to the floor finish. Semi-epoxy grout and water-resistant adhesive for all tiling.
Floor finish:	Tile + waterproof membrane + underlay. Semi-epoxy grout and water-resistant adhesive for all tiling.

EXT-402
EXTERNAL | AAC BLOCK WALL
TILE FLOOR FINISH



TYPOLOGY:	MASONRY
WALL TYPE:	EXTERNAL | AAC BLOCK WALL
FLOOR FINISH:	TILE | WET AREA
Structure:	AAC block wall.
Insulation:	N/A
External lining:	Render + waterproof membrane.
Internal lining:	Tile + waterproof membrane to above flood level. Semi-epoxy grout and water-resistant adhesive for all tiling. Silicone sealant at junction to the floor finish.
Skirting:	N/A
Floor finish:	Tile + bedding + waterproof membrane. Semi-epoxy grout and water resistant adhesive for all tiling.

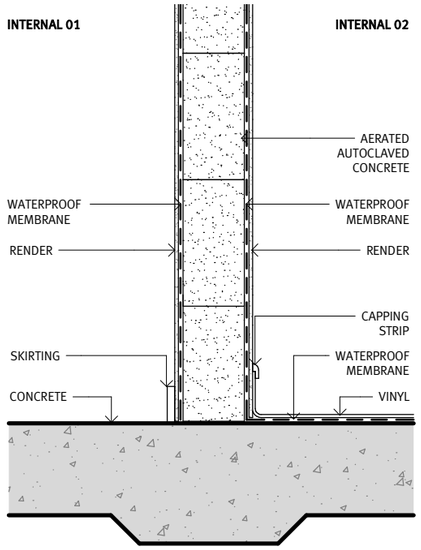
EXT-403
EXTERNAL | AAC BLOCK WALL
TILE FLOOR FINISH | WET AREA



TYPOLOGY:	MASONRY
WALL TYPE:	EXTERNAL | AAC BLOCK WALL
FLOOR FINISH:	VINYL
Structure:	AAC block wall.
Insulation:	N/A
External lining:	Render + waterproof membrane.
Internal lining:	Render + waterproof membrane.
Skirting:	Coved vinyl or other water resistant skirting.
Floor finish:	Vinyl + waterproof membrane.

EXT-404
EXTERNAL | AAC BLOCK WALL
VINYL FLOOR FINISH

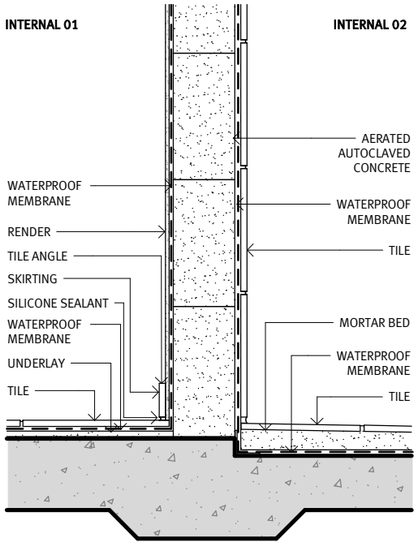
Masonry | External AAC Block + AAC Panel Wall



TYPOLOGY:	MASONRY
WALL TYPE:	INTERNAL | AAC BLOCK WALL
FLOOR FINISH:	CONCRETE / VINYL

Structure:	AAC block wall.
Insulation:	N/A
Internal lining 01:	Render + waterproof membrane.
Skirting 01:	Hardwood or other water resistant skirting.
Floor finish 01:	Existing concrete to be retained. Apply new non-slip penetrative sealant.
Internal lining 02:	Render + waterproof membrane
Skirting 02:	Coved vinyl or other water resistant skirting.
Floor finish 02:	Vinyl + waterproof membrane.

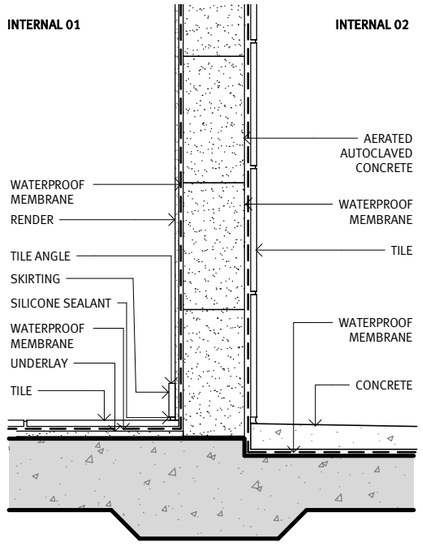
INT-301
INTERNAL | AAC BLOCK WALL
CONCRETE / VINYL FLOOR FINISH



TYPOLOGY:	MASONRY
WALL TYPE:	INTERNAL | AAC BLOCK WALL
FLOOR FINISH:	TILE / TILE | WET AREA

Structure:	AAC block wall.
Insulation:	N/A
Internal lining 01:	Render + waterproof membrane
Skirting 01:	Tile with tile angle or other water resistant skirting. Silicone sealant at junction to the floor finish. Semi-epoxy grout and water-resistant adhesive for all tiling.
Floor finish 01:	Tile + waterproof membrane + underlay (if required). Semi-epoxy grout and water-resistant adhesive for all tiling.
Internal lining 02:	Tile + waterproof membrane to above flood level. Semi-epoxy grout and water-resistant adhesive for all tiling. Silicone sealant at junction to the floor finish.
Skirting 02:	N/A
Floor finish 02:	Tile + bedding + waterproof membrane. Semi-epoxy grout and water resistant adhesive for all tiling.

INT-302
INTERNAL | AAC BLOCK WALL
TILE / TILE FLOOR FINISH | WET AREA

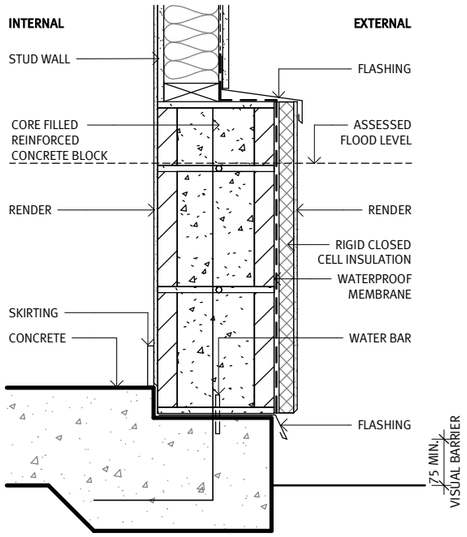


TYPOLOGY:	MASONRY
WALL TYPE:	INTERNAL | AAC BLOCK WALL
FLOOR FINISH:	TILE / CONCRETE | WET AREA

Structure:	AAC block wall.
Insulation:	N/A
Internal lining 01:	Render + waterproof membrane
Skirting 01:	Tile with tile angle or other water resistant skirting. Silicone sealant at junction to the floor finish. Semi-epoxy grout and water-resistant adhesive for all tiling.
Floor finish 01:	Tile + waterproof membrane + underlay (if required). Semi-epoxy grout and water-resistant adhesive for all tiling.
Internal lining 02:	Tile + waterproof membrane to above flood level. Semi-epoxy grout and water-resistant adhesive for all tiling. Silicone sealant at junction to the floor finish.
Skirting 02:	N/A
Floor finish 02:	Concrete + waterproof membrane.

INT-303
INTERNAL | AAC BLOCK WALL
TILE / CONCRETE FLOOR FINISH | WET AREA

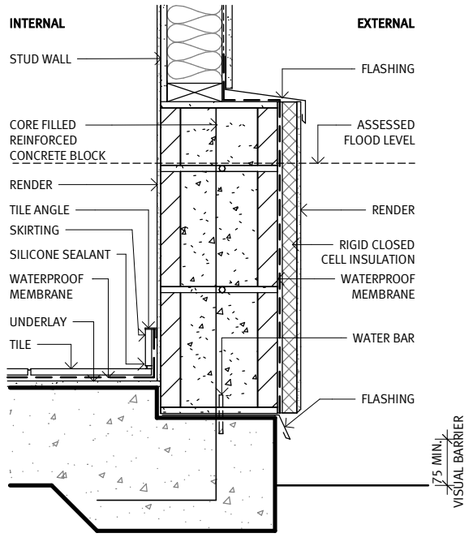
Masonry | Internal AAC Block + AAC Panel Wall



TYPOLOGY: COMPOSITE - LIGHTWEIGHT/MASONRY
WALL TYPE: EXTERNAL | CONCRETE BLOCK AND STUD WALL
FLOOR FINISH: CONCRETE FLOOR FINISH

Structure: Core filled reinforced concrete block to above flood level. Standard stud wall construction on top of blockwork.
Insulation: Rigid closed cell insulation.
External lining: Render.
Internal lining: Render.
Skirting: Hardwood or other water resistant skirting.
Floor finish: Concrete with non-slip penetrative sealant.

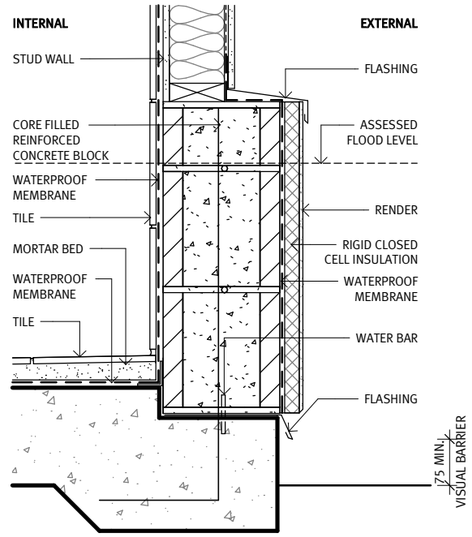
EXT-501
EXTERNAL | COMPOSITE WALL
CONCRETE FLOOR FINISH



TYPOLOGY: COMPOSITE - LIGHTWEIGHT/MASONRY
WALL TYPE: EXTERNAL | CONCRETE BLOCK AND STUD WALL
FLOOR FINISH: TILE

Structure: Core filled reinforced concrete block to above flood level. Standard stud wall construction on top of blockwork.
Insulation: Rigid closed cell insulation.
External lining: Render.
Internal lining: Render.
Skirting: Tile with tile angle or other water resistant skirting. Silicone sealant at junction to the floor finish.
Floor finish: Tile + waterproof membrane + underlay. Semi-epoxy grout and water-resistant adhesive for all tiling.

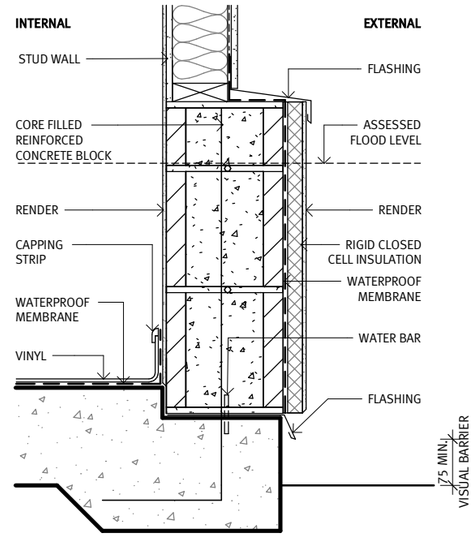
EXT-502
EXTERNAL | COMPOSITE WALL
TILE FLOOR FINISH



TYPOLOGY: COMPOSITE - LIGHTWEIGHT/MASONRY
WALL TYPE: EXTERNAL | CONCRETE BLOCK AND STUD WALL
FLOOR FINISH: TILE | WET AREA

Structure: Core filled reinforced concrete block to above flood level. Standard stud wall construction on top of blockwork.
Insulation: Rigid closed cell insulation.
External lining: Render.
Internal lining: Tile + waterproof membrane + 9mm water resistant lining to above flood level. Semi-epoxy grout and water-resistant adhesive for all tiling. Silicone sealant at junction to the floor finish.
Skirting: N/A
Floor finish: Tile + bedding + waterproof membrane. Semi-epoxy grout and water resistant adhesive for all tiling.

EXT-503
EXTERNAL | COMPOSITE WALL
TILE FLOOR FINISH | WET AREA

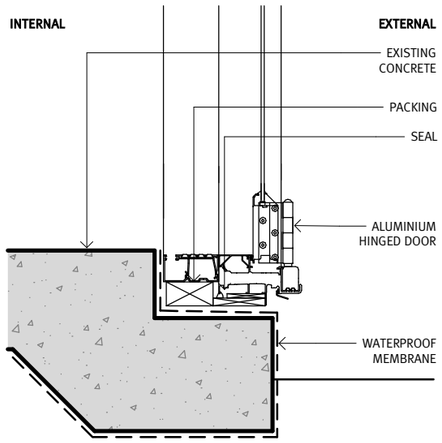


TYPOLOGY: COMPOSITE - LIGHTWEIGHT/MASONRY
WALL TYPE: EXTERNAL | CONCRETE BLOCK AND STUD WALL
FLOOR FINISH: VINYL

Structure: Core filled reinforced concrete block to above flood level. Standard stud wall construction on top of blockwork.
Insulation: Rigid closed cell insulation.
External lining: Render.
Internal lining: Render.
Skirting: Coved vinyl or other water resistant skirting.
Floor finish: Vinyl + waterproof membrane.

EXT-504
EXTERNAL | COMPOSITE WALL
VINYL FLOOR FINISH

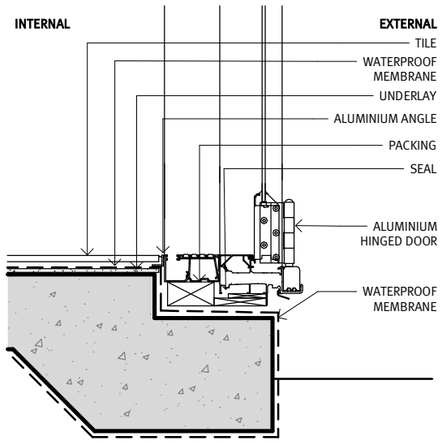
Lightweight + Masonry | Composite Wall



TYPOLOGY: THRESHOLD
WALL TYPE: N/A
FLOOR FINISH: CONCRETE | GROUND

Framing: Aluminium.
External cladding: N/A
Insulation: N/A
Internal lining: N/A
Skirting: N/A
Floor finish: Existing concrete to be retained. Apply new non-slip penetrative sealant.

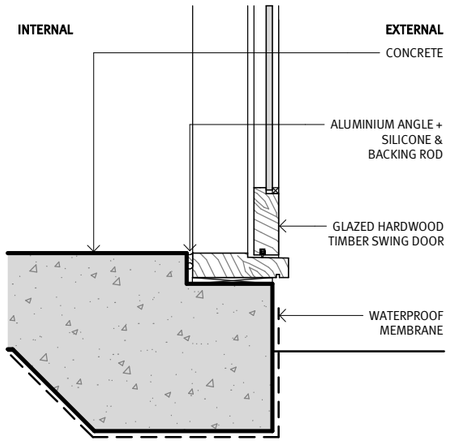
SILL-101
THRESHOLD | ALUMINIUM FRAME
CONCRETE FLOOR FINISH / GROUND



TYPOLOGY: THRESHOLD
WALL TYPE: N/A
FLOOR FINISH: TILE | CONCRETE

Framing: Aluminium.
External cladding: N/A
Insulation: N/A
Internal lining: N/A
Skirting: N/A
Floor finish: Tile + waterproof membrane + underlay (if required).

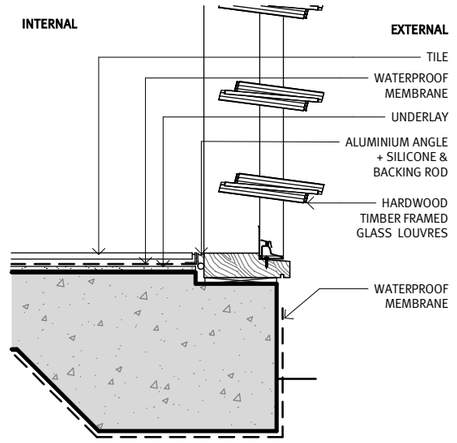
SILL-102
THRESHOLD | ALUMINIUM FRAME
TILE FLOOR FINISH / PAVING SLAB



TYPOLOGY: THRESHOLD
WALL TYPE: EXTERNAL | SINGLE SKIN
FLOOR FINISH: CONCRETE | GROUND

Framing: Hardwood timber.
External cladding: N/A
Insulation: N/A
Internal lining: N/A
Floor finish: Existing concrete to be retained. Apply new non-slip penetrative sealant.

SILL-103
THRESHOLD | TIMBER FRAME
CONCRETE FLOOR FINISH/ GROUND

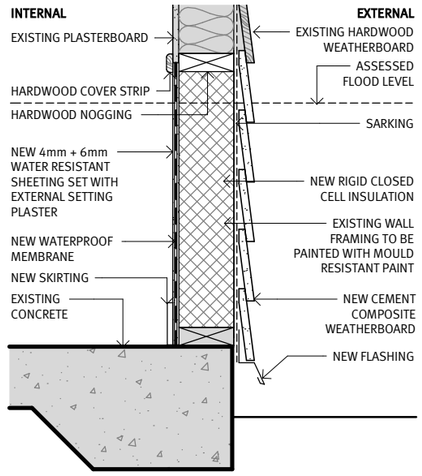


TYPOLOGY: THRESHOLD
WALL TYPE: N/A
FLOOR FINISH: TILE | GROUND

Framing: Hardwood timber.
External cladding: N/A
Insulation: N/A
Internal lining: N/A
Skirting: N/A
Floor finish: Tile + waterproof membrane + underlay (if required).

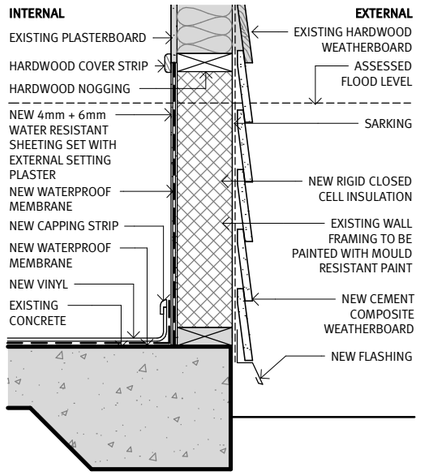
SILL-104
THRESHOLD | TIMBER FRAME
TILE FLOOR FINISH/ PAVING SLAB

Lightweight + Masonry | Threshold Details



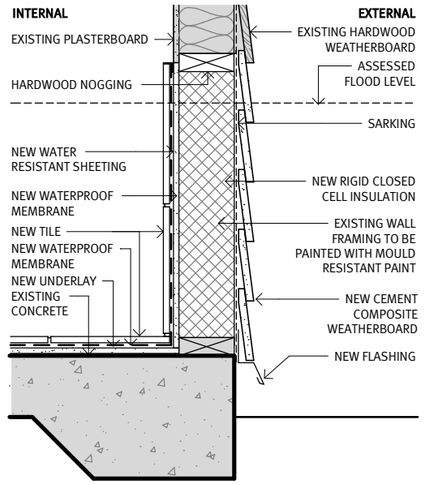
TYPOLOGY:	RETROFIT LIGHTWEIGHT
WALL TYPE:	EXTERNAL | EXISTING STUD WALL
FLOOR TYPE:	EXISTING CONCRETE SLAB
Framing:	Existing pine or hardwood framing to be retained and painted with mould resistant paint.
External lining:	Existing hardwood weatherboard to above flood level to be replaced with new cement composite weatherboard
Insulation:	Existing batt insulation to be replaced with new rigid closed cell insulation. Thickness of insulation to match depth of stud frame. Seal edges of insulation to frame.
Internal lining:	Existing internal lining to be replaced with new 6mm water resistant sheeting set with external setting plaster to above flood level + waterproof membrane + 4mm water resistant sheeting.
Skirting:	Hardwood or other water resistant skirting.
Floor finish:	Existing concrete to be retained. Apply new non-slip penetrative sealant.

EXT-601
EXTERNAL | EXISTING STUD WALL



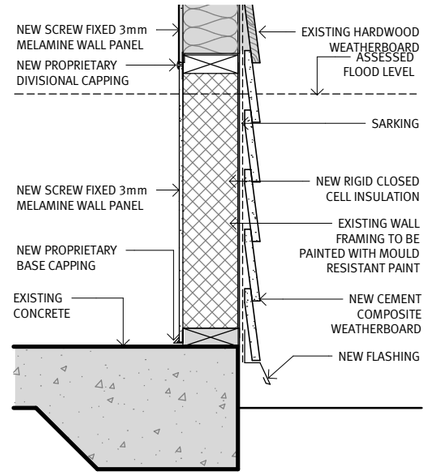
TYPOLOGY:	RETROFIT LIGHTWEIGHT
WALL TYPE:	EXTERNAL | EXISTING STUD WALL
FLOOR TYPE:	EXISTING NON WATER RESISTANT FLOOR FINISH ON CONCRETE SLAB
Framing:	Existing pine or hardwood framing to be retained and painted with mould resistant paint.
External lining:	Existing hardwood weatherboard to above flood level to be replaced with new cement composite weatherboard
Insulation:	Existing batt insulation to be replaced with new rigid closed cell insulation. Thickness of insulation to match depth of stud frame. Seal edges of insulation to frame.
Internal lining:	Existing internal lining to be replaced with new 6mm water resistant sheeting set with external setting plaster to above flood level + waterproof membrane + 4mm water resistant sheeting.
Skirting:	Coved vinyl or other water resistant skirting.
Floor finish:	Vinyl + waterproof membrane.

EXT-602
EXTERNAL | EXISTING STUD WALL



TYPOLOGY:	RETROFIT LIGHTWEIGHT
WALL TYPE:	EXTERNAL | EXISTING STUD WALL
FLOOR TYPE:	EXISTING NON WATER RESISTANT FLOOR FINISH ON CONCRETE SLAB
Framing:	Existing pine or hardwood framing to be retained and painted with mould resistant paint.
External lining:	Existing hardwood weatherboard to above flood level to be replaced with new cement composite weatherboard
Insulation:	Existing batt insulation to be replaced with new rigid closed cell insulation. Thickness of insulation to match depth of stud frame. Seal edges of insulation to frame.
Internal lining:	Existing internal lining to be replaced with new water resistant sheeting set with external setting plaster to above flood level + waterproof membrane + tile with tile angle. Silicone sealant at junction to the floor finish. Semi-epoxy grout and water-resistant adhesive for all tiling.
Skirting:	N/A
Floor finish:	Existing non water resistant floor finish to be replaced with new tile + waterproof membrane + underlay. Semi-epoxy grout and water-resistant adhesive for all tiling.

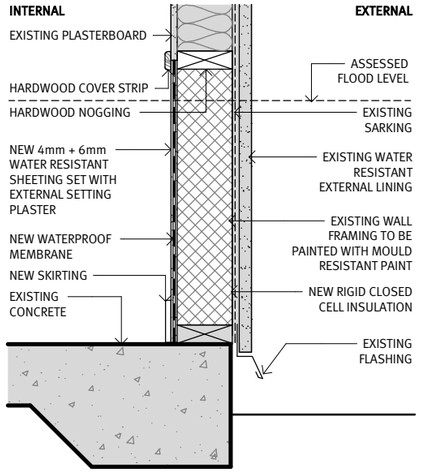
EXT-603
EXTERNAL | EXISTING STUD WALL



TYPOLOGY:	LIGHTWEIGHT
WALL TYPE:	EXTERNAL | EXISTING STUD WALL
FLOOR FINISH:	EXISTING CONCRETE SLAB
Framing:	Existing pine or hardwood framing to be retained and painted with mould resistant paint.
External lining:	Existing hardwood weatherboard to above flood level to be replaced with new cement composite weatherboard.
Insulation:	Rigid closed cell insulation. Thickness of insulation to match depth of stud frame. Seal edges of insulation to frame.
Internal lining:	Existing internal lining to be replaced with new 3mm melamine wall panel system that is screw fixed for easy removal.
Skirting:	N/A
Floor finish:	Existing concrete to be retained. Apply new non-slip penetrative sealant.

EXT-604
EXTERNAL | EXISTING STUD WALL

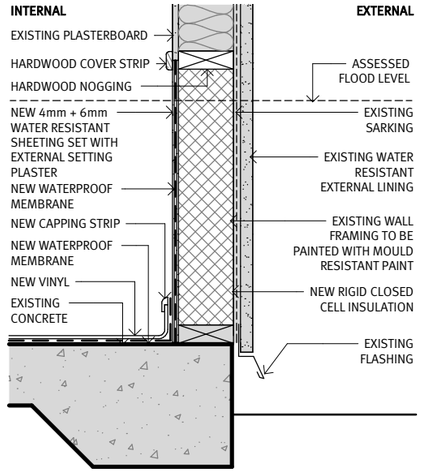
Lightweight | External Wall



TYPOLOGY: RETROFIT LIGHTWEIGHT
WALL TYPE: EXTERNAL | EXISTING STUD WALL
FLOOR TYPE: EXISTING CONCRETE SLAB

Framing: Existing pine or hardwood framing to be retained and painted with mould resistant paint.
External lining: Existing water resistant external lining to be retained.
Insulation: Existing batt insulation to be replaced with new rigid closed cell insulation. Thickness of insulation to match depth of stud frame. Seal edges of insulation to frame.
Internal lining: Existing internal lining to be replaced with new 6mm water resistant sheeting set with external setting plaster to above flood level + waterproof membrane + 4mm water resistant sheeting.
Skirting: Hardwood or other water resistant skirting.
Floor finish: Existing concrete to be retained. Apply new non-slip penetrative sealant.

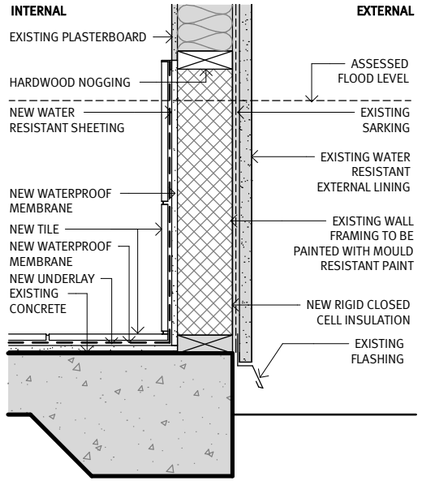
EXT-701
EXTERNAL | EXISTING STUD WALL



TYPOLOGY: RETROFIT LIGHTWEIGHT
WALL TYPE: EXTERNAL | EXISTING STUD WALL
FLOOR TYPE: EXISTING NON WATER RESISTANT FLOOR FINISH ON CONCRETE SLAB

Framing: Existing pine or hardwood framing to be retained and painted with mould resistant paint.
External lining: Existing water resistant external lining to be retained.
Insulation: Existing batt insulation to be replaced with new rigid closed cell insulation. Thickness of insulation to match depth of stud frame. Seal edges of insulation to frame.
Internal lining: Existing internal lining to be replaced with new 6mm water resistant sheeting set with external setting plaster to above flood level + waterproof membrane + 4mm water resistant sheeting.
Skirting: Coved vinyl or other water resistant skirting.
Floor finish: Vinyl + waterproof membrane.

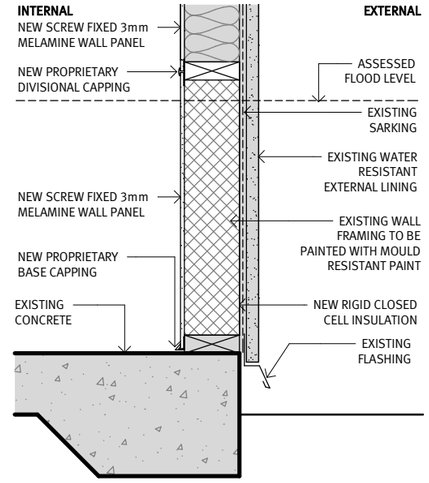
EXT-702
EXTERNAL | EXISTING STUD WALL



TYPOLOGY: RETROFIT LIGHTWEIGHT
WALL TYPE: EXTERNAL | EXISTING STUD WALL
FLOOR TYPE: EXISTING NON WATER RESISTANT FLOOR FINISH ON CONCRETE SLAB

Framing: Existing pine or hardwood framing to be retained and painted with mould resistant paint.
External lining: Existing water resistant external lining to be retained.
Insulation: Existing batt insulation to be replaced with new rigid closed cell insulation. Thickness of insulation to match depth of stud frame. Seal edges of insulation to frame.
Internal lining: Existing internal lining to be replaced with new water resistant sheeting set with external setting plaster to above flood level + waterproof membrane + tile with tile angle. Silicone sealant at junction to the floor finish. Semi-epoxy grout and water-resistant adhesive for all tiling.
Skirting: N/A
Floor finish: Existing non water-resistant floor finish to be replaced with new tile + waterproof membrane + underlay (if required). Semi-epoxy grout and water-resistant adhesive for all tiling.

EXT-703
EXTERNAL | EXISTING STUD WALL

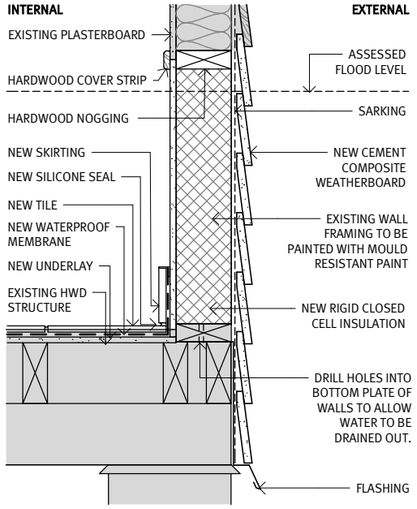


TYPOLOGY: LIGHTWEIGHT
WALL TYPE: EXTERNAL | EXISTING STUD WALL
FLOOR FINISH: EXISTING CONCRETE SLAB

Framing: Existing pine or hardwood framing to be retained and painted with mould resistant paint.
External lining: Water resistant external lining
Insulation: Rigid closed cell insulation. Thickness of insulation to match depth of stud frame. Seal edges of insulation to frame.
Internal lining: Existing internal lining to be replaced with new 3mm melamine wall panel system that is screw fixed for easy removal.
Skirting: N/A
Floor finish: Existing concrete to be retained. Apply new non-slip penetrative sealant.

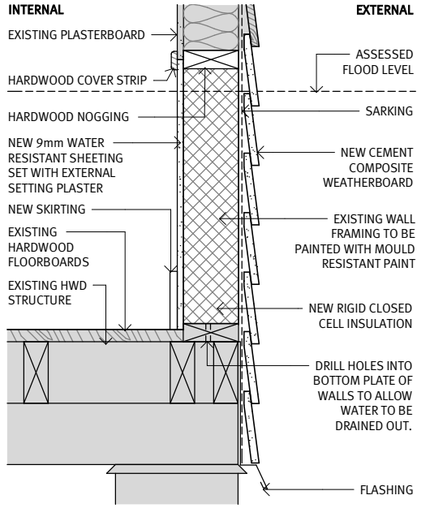
EXT-704
EXTERNAL | EXISTING STUD WALL

Lightweight | External Wall



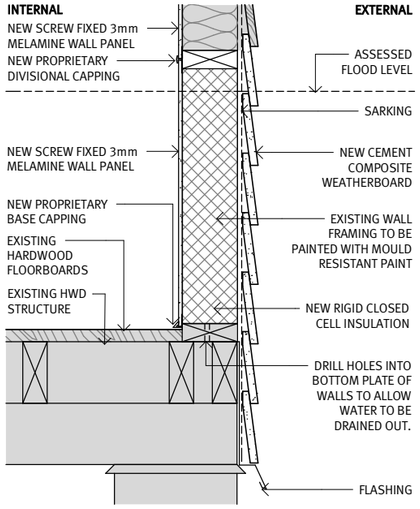
TYPOLOGY:	RETROFIT LIGHTWEIGHT
WALL TYPE:	EXTERNAL | EXISTING STUD WALL
FLOOR TYPE:	EXISTING NON WATER RESISTANT FLOOR FINISH ON TIMBER STRUCTURE
Framing:	Existing pine or hardwood framing to be retained and painted with mould resistant paint. Drill holes into the bottom plate to allow water to be drained out.
External lining:	Existing weatherboard to above flood level to be replaced with new cement composite weatherboard.
Insulation:	Existing batt insulation to be replaced with new rigid closed cell insulation. Thickness of insulation to match depth of stud frame. Seal edges of insulation to frame.
Internal lining:	Existing internal lining to be replaced with new 9mm water resistant sheeting set with external setting plaster to above flood level.
Skirting:	Tile with tile angle or other water resistant skirting. Silicone sealant at junction to the floor finish. Semi-epoxy grout and water-resistant adhesive for all tiling.
Floor finish:	Existing non water resistant floor finish to be replaced with new tile + waterproof membrane + underlay. Semi-epoxy grout and water-resistant adhesive for all tiling.
NOTE:	Check existing floor framing can withstand the additional flooring load. Consult structural engineer.

EXT-801
EXTERNAL | EXISTING STUD WALL



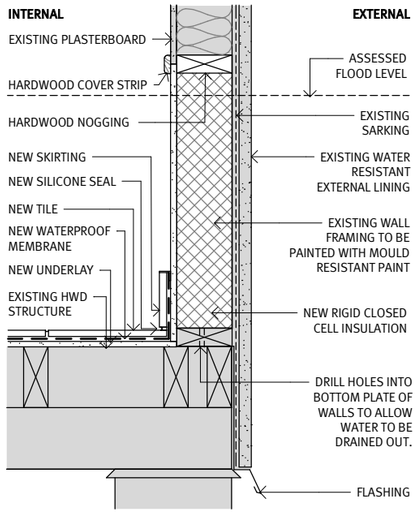
TYPOLOGY:	RETROFIT LIGHTWEIGHT
WALL TYPE:	EXTERNAL | EXISTING STUD WALL
FLOOR TYPE:	EXISTING WATER RESISTANT FLOOR FINISH ON TIMBER STRUCTURE
Framing:	Existing pine or hardwood framing to be retained and painted with mould resistant paint. Drill holes into the bottom plate to allow water to be drained out.
External lining:	Existing hardwood weatherboard to above flood level to be replaced with new cement composite weatherboard.
Insulation:	Existing batt insulation to be replaced with new rigid closed cell insulation. Thickness of insulation to match depth of stud frame. Seal edges of insulation to frame.
Internal lining:	Existing internal lining to be replaced with new 9mm water resistant sheeting set with external setting plaster to above flood level.
Skirting:	Hardwood or other water resistant skirting.
Floor finish:	Sand and polish the existing hardwood floors if required.
NOTE:	Check existing floor framing can withstand the additional flooring load. Consult structural engineer.

EXT-802
EXTERNAL | EXISTING STUD WALL



TYPOLOGY:	RETROFIT LIGHTWEIGHT
WALL TYPE:	EXTERNAL | EXISTING STUD WALL
FLOOR TYPE:	EXISTING WATER RESISTANT FLOOR FINISH ON TIMBER STRUCTURE
Framing:	Existing pine or hardwood framing to be retained and painted with mould resistant paint. Drill holes into the bottom plate to allow water to be drained out.
External lining:	Existing hardwood weatherboard to above flood level to be replaced with new cement composite weatherboard.
Insulation:	Existing batt insulation to be replaced with new rigid closed cell insulation. Thickness of insulation to match depth of stud frame. Seal edges of insulation to frame.
Internal lining:	Existing internal lining to be replaced with new 3mm melamine wall panel system that is screw fixed for easy removal.
Skirting:	N/A
Floor finish:	Sand and polish the existing hardwood floors if required.
NOTE:	Check existing floor framing can withstand the additional flooring load. Consult structural engineer.

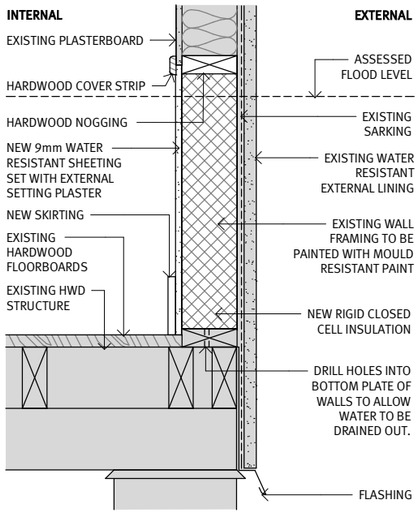
EXT-803
EXTERNAL | EXISTING STUD WALL



TYPOLOGY: RETROFIT LIGHTWEIGHT
WALL TYPE: EXTERNAL | EXISTING STUD WALL
FLOOR TYPE: EXISTING NON WATER RESISTANT FLOOR FINISH ON TIMBER STRUCTURE

Framing:	Existing pine or hardwood framing to be retained and painted with mould resistant paint. Drill holes into the bottom plate to allow water to be drained out.
External lining:	Existing water resistant external lining to be retained.
Insulation:	Existing batt insulation to be replaced with new rigid closed cell insulation. Thickness of insulation to match depth of stud frame. Seal edges of insulation to frame.
Internal lining:	Existing internal lining to be replaced with new 9mm water resistant sheeting set with external setting plaster to above flood level.
Skirting:	Tile with tile angle or other water resistant skirting. Silicone sealant at junction to the floor finish. Semi-epoxy grout and water-resistant adhesive for all tiling.
Floor finish:	Existing non water resistant floor finish to be replaced with new tile + waterproof membrane + underlay. Semi-epoxy grout and water-resistant adhesive for all tiling.
NOTE:	Check existing floor framing can withstand the additional flooring load. Consult structural engineer.

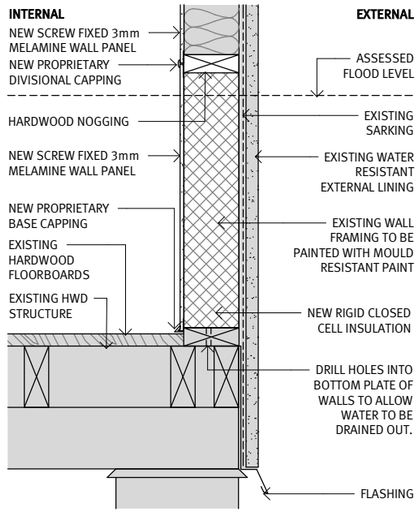
EXT-901
EXTERNAL | EXISTING STUD WALL



TYPOLOGY: RETROFIT LIGHTWEIGHT
WALL TYPE: EXTERNAL | EXISTING STUD WALL
FLOOR TYPE: EXISTING WATER RESISTANT FLOOR FINISH ON TIMBER STRUCTURE

Framing:	Existing pine or hardwood framing to be retained and painted with mould resistant paint. Drill holes into the bottom plate to allow water to be drained out.
External lining:	Existing water resistant external lining to be retained.
Insulation:	Existing batt insulation to be replaced with new rigid closed cell insulation. Thickness of insulation to match depth of stud frame. Seal edges of insulation to frame.
Internal lining:	Existing internal lining to be replaced with new 9mm water resistant sheeting set with external setting plaster to above flood level.
Skirting:	Hardwood or other water resistant skirting.
Floor finish:	Sand and polish the existing hardwood floors if required.
NOTE:	Check existing floor framing can withstand the additional flooring load. Consult structural engineer.

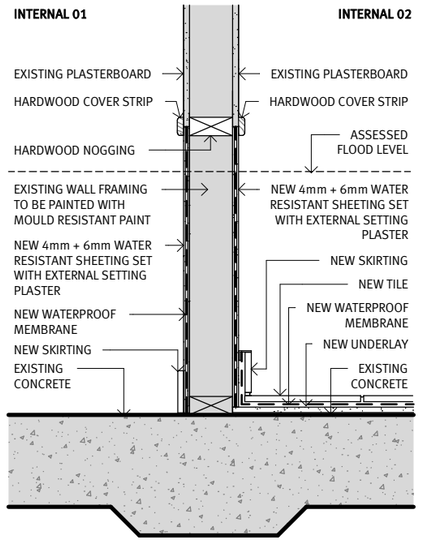
EXT-902
EXTERNAL | EXISTING STUD WALL



TYPOLOGY: RETROFIT LIGHTWEIGHT
WALL TYPE: EXTERNAL | EXISTING STUD WALL
FLOOR TYPE: EXISTING WATER RESISTANT FLOOR FINISH ON TIMBER STRUCTURE

Framing:	Existing pine or hardwood framing to be retained and painted with mould resistant paint. Drill holes into the bottom plate to allow water to be drained out.
External lining:	Existing water resistant external lining to be retained.
Insulation:	Existing batt insulation to be replaced with new rigid closed cell insulation. Thickness of insulation to match depth of stud frame. Seal edges of insulation to frame.
Internal lining:	Existing internal lining to be replaced with new 3mm melamine wall panel system that is screw fixed for easy removal.
Skirting:	N/A
Floor finish:	Sand and polish the existing hardwood floors if required.
NOTE:	Check existing floor framing can withstand the additional flooring load. Consult structural engineer.

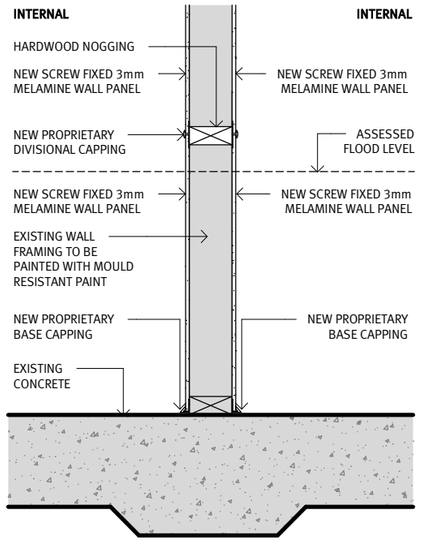
EXT-903
EXTERNAL | EXISTING STUD WALL



TYPOLOGY: RETROFIT LIGHTWEIGHT
WALL TYPE: INTERNAL | EXISTING STUD WALL
FLOOR TYPE: EXISTING NON WATER RESISTANT FLOOR FINISH ON CONCRETE SLAB
CODE: RL-301

Framing: Existing pine or hardwood framing to be retained and painted with mould resistant paint.
Internal lining: Existing internal lining to be replaced with new 6mm water resistant sheeting set with external setting plaster to above flood level + waterproof membrane + 4mm water resistant sheeting.
Skirting 01: Hardwood or other water resistant skirting
Floor finish 01: Existing concrete to be retained. Apply new non-slip penetrative sealant.
Skirting 02: Tile with tile angle or other water resistant skirting. Silicone sealant at junction to the floor finish. Semi-epoxy grout and water-resistant adhesive for all tiling.
Floor finish 02: Existing non water resistant floor finish to be replaced with new tile + waterproof membrane + underlay. Semi-epoxy grout and water-resistant adhesive for all tiling.

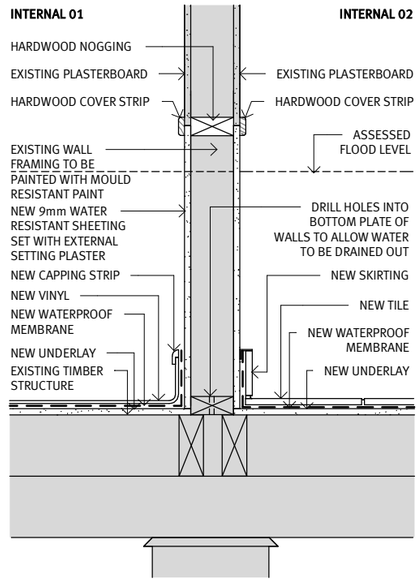
INT-401
INTERNAL | EXISTING STUD WALL



TYPOLOGY: RETROFIT LIGHTWEIGHT
WALL TYPE: INTERNAL | EXISTING STUD WALL
FLOOR TYPE: EXISTING NON WATER RESISTANT FLOOR FINISH ON CONCRETE SLAB
CODE: RL-302

Framing: Existing pine or hardwood framing to be retained and painted with mould resistant paint.
Internal lining: Existing internal lining to be replaced with new 3mm melamine wall panel system that is screw fixed for easy removal.
Skirting: N/A
Floor finish: Existing concrete to be retained. Apply new non-slip penetrative sealant.

INT-402
INTERNAL | EXISTING STUD WALL

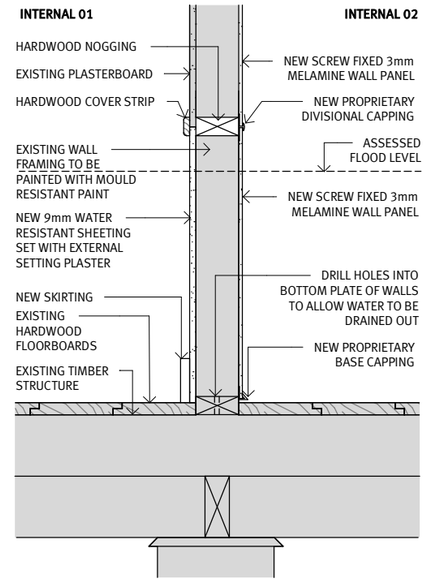


TYPOLOGY: RETROFIT LIGHTWEIGHT
WALL TYPE: INTERNAL | EXISTING STUD WALL
FLOOR TYPE: EXISTING NON WATER RESISTANT FLOOR FINISH ON TIMBER STRUCTURE
CODE: RL-303

Framing: Existing pine or hardwood framing to be retained and painted with mould resistant paint. Drill holes into the bottom plate to allow water to be drained out.
Internal lining: Existing internal lining to be replaced with new 9mm water resistant sheeting set with external setting plaster to above flood level.
Skirting 01: Coved vinyl or other water resistant skirting.
Floor finish 01: Existing non water resistant floor finishes such as carpet to be replaced with new vinyl + waterproof membrane + underlay.
Skirting 02: Tile with tile angle or other water resistant skirting. Silicone sealant at junction to the floor finish. Semi-epoxy grout and water-resistant adhesive for all tiling.
Floor finish 02: Existing non water resistant floor finish to be replaced with new tile + waterproof membrane + underlay. Semi-epoxy grout and water-resistant adhesive for all tiling.

NOTE: Check existing floor framing can withstand the additional flooring load. Consult structural engineer.

INT-403
INTERNAL | EXISTING STUD WALL

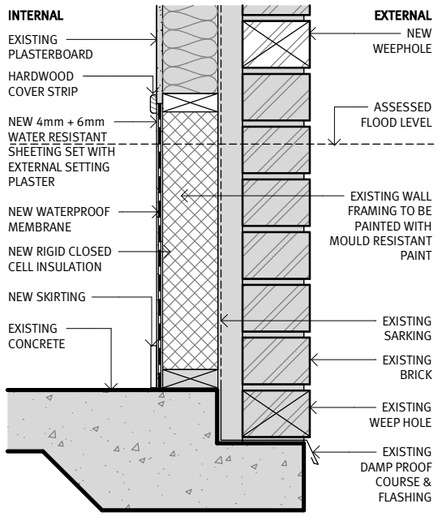


TYPOLOGY: RETROFIT LIGHTWEIGHT
WALL TYPE: INTERNAL | EXISTING STUD WALL
FLOOR TYPE: EXISTING HARDWOOD TIMBER FLOORBOARDS ON TIMBER STRUCTURE
CODE: RL-304

Framing: Existing pine or hardwood framing to be retained and painted with mould resistant paint. Drill holes into the bottom plate to allow water to be drained out.
Internal lining 01: Existing internal lining to be replaced with new 9mm water resistant sheeting set with external setting plaster to above flood level.
Skirting 01: Hardwood or other water resistant skirting
Internal lining 02: Existing internal lining to be replaced with new 3mm melamine wall panel system that is screw fixed for easy removal.
Skirting 02: N/A
Floor finish: Sand and polish the existing hardwood floors if required.

INT-404
INTERNAL | EXISTING STUD WALL

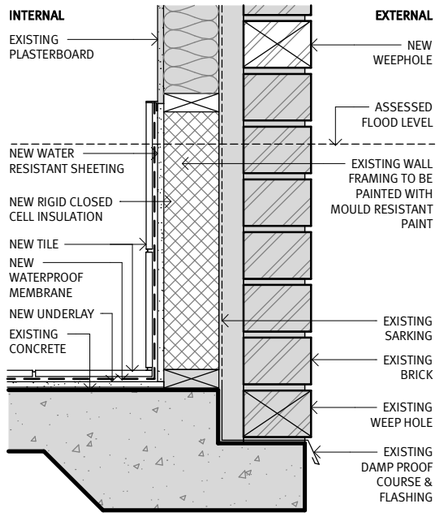
Lightweight | Internal Wall



TYPOLOGY: MASONRY
WALL TYPE: EXTERNAL | EXISTING BRICK VENEER
FLOOR TYPE: EXISTING CONCRETE SLAB

Framing:	Existing pine or hardwood framing to be retained and painted with mould resistant paint.
External lining:	Existing brick veneer to be retained. Additional weep holes and brick vents to be added where possible.
Insulation:	Existing batt insulation to be replaced with new rigid closed cell insulation. Thickness of insulation to match depth of stud frame. Seal edges of insulation to frame.
Internal lining:	Existing internal lining to be replaced with new 6mm water resistant sheeting set with external setting plaster to above flood level + waterproof membrane + 4mm water resistant sheeting.
Skirting:	Hardwood or other water resistant skirting.
Floor finish:	Existing concrete to be retained. Apply new non-slip penetrative sealant.

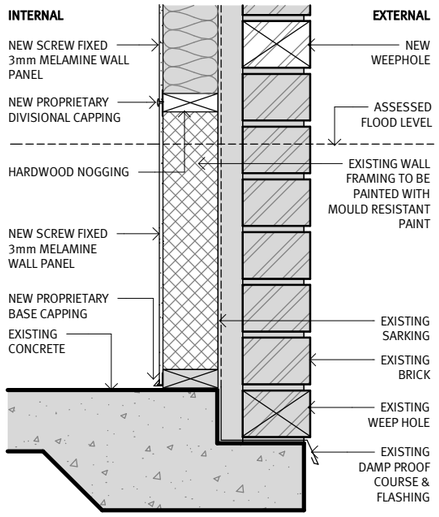
EXT-911
EXTERNAL | EXISTING BRICK VENEER



TYPOLOGY: MASONRY
WALL TYPE: EXTERNAL | EXISTING BRICK VENEER
FLOOR TYPE: EXISTING NON WATER RESISTANT FLOOR FINISH ON CONCRETE SLAB

Framing:	Existing pine or hardwood framing to be retained and painted with mould resistant paint.
External lining:	Existing brick veneer to be retained. Additional weep holes and brick vents to be added where possible.
Insulation:	Existing batt insulation to be replaced with new rigid closed cell insulation. Thickness of insulation to match depth of stud frame. Seal edges of insulation to frame.
Internal lining:	Existing internal lining to be replaced with new water resistant sheeting set with external setting plaster to above flood level + waterproof membrane + tile with tile angle. Silicone sealant at junction to the floor finish. Semi-epoxy grout and water-resistant adhesive for all tiling.
Skirting:	N/A
Floor finish:	Existing non water resistant floor finish to be replaced with new tile + waterproof membrane + underlay. Semi-epoxy grout and water-resistant adhesive for all tiling.

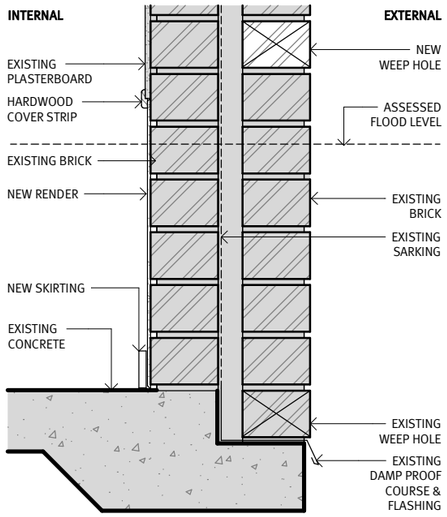
EXT-912
EXTERNAL | EXISTING BRICK VENEER



TYPOLOGY: MASONRY
WALL TYPE: EXTERNAL | EXISTING BRICK VENEER
FLOOR TYPE: EXISTING CONCRETE SLAB

Framing:	Existing pine or hardwood framing to be retained and painted with mould resistant paint.
External lining:	Existing brick veneer to be retained. Additional weep holes and brick vents to be added where possible.
Insulation:	Existing batt insulation to be replaced with new rigid closed cell insulation. Thickness of insulation to match depth of stud frame. Seal edges of insulation to frame.
Internal lining:	Existing internal lining to be replaced with new 3mm melamine wall panel system that is screw fixed for easy removal.
Skirting:	N/A
Floor finish:	Existing concrete to be retained. Apply new non-slip penetrative sealant.

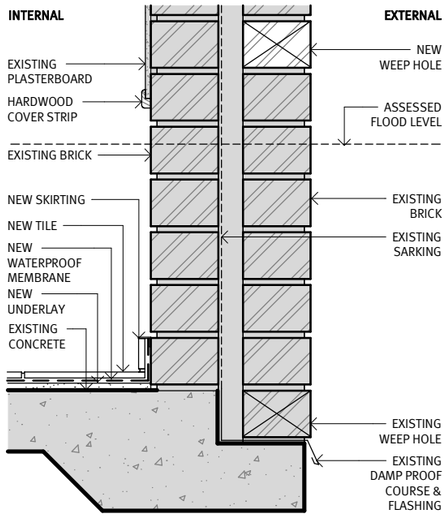
EXT-913
EXTERNAL | EXISTING BRICK VENEER



TYPOLOGY: MASONRY
WALL TYPE: EXTERNAL | EXISTING DOUBLE BRICK
FLOOR TYPE: EXISTING CONCRETE SLAB

Structure:	Existing brick to be retained.
Framing:	Existing pine or hardwood framing to be retained and sprayed with new waterproof membrane.
External lining:	Existing brick veneer to be retained. Additional weep holes and brick vents to be added where possible.
Insulation:	N/A
Internal lining:	New render to above the flood line.
Skirting:	Hardwood or other water resistant skirting.
Floor finish:	Existing concrete to be retained. Apply new non-slip penetrative sealant.

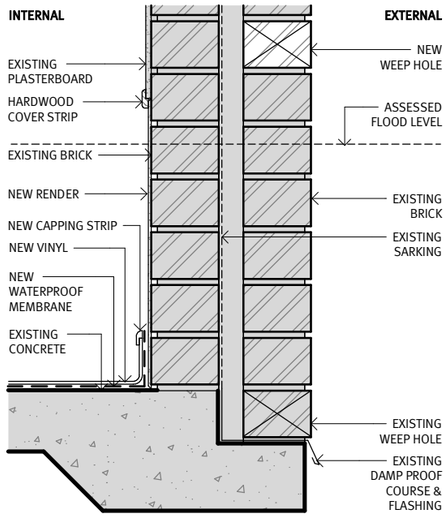
EXT-921
EXTERNAL | EXISTING DOUBLE BRICK



TYPOLOGY: MASONRY
WALL TYPE: EXTERNAL | EXISTING DOUBLE BRICK
FLOOR TYPE: EXISTING NON WATER RESISTANT FLOOR FINISH ON CONCRETE SLAB

Structure:	Existing brick to be retained.
Framing:	Existing pine or hardwood framing to be retained and sprayed with new waterproof membrane.
External lining:	Existing brick veneer to be retained. Additional weep holes and brick vents to be added where possible.
Insulation:	N/A
Internal lining:	Existing internal lining to be removed and the brick left exposed with a paint finish.
Skirting:	Tile with tile angle or other water resistant skirting. Silicone sealant at junction to the floor finish. Semi-epoxy grout and water-resistant adhesive for all tiling.
Floor finish:	Existing non water resistant floor finish to be replaced with new tile + waterproof membrane + underlay. Semi-epoxy grout and water-resistant adhesive for all tiling.

EXT-922
EXTERNAL | EXISTING DOUBLE BRICK



TYPOLOGY: MASONRY
WALL TYPE: EXTERNAL | EXISTING DOUBLE BRICK
FLOOR TYPE: EXISTING NON WATER RESISTANT FLOOR FINISH ON CONCRETE SLAB

Structure:	Existing brick to be retained.
Framing:	Existing pine or hardwood framing to be retained and sprayed with new waterproof membrane.
External lining:	Existing brick veneer to be retained. Additional weep holes and brick vents to be added where possible.
Insulation:	N/A
Internal lining:	New render to above the flood line.
Skirting:	Coved vinyl or other water resistant skirting.
Floor finish:	Existing non water resistant floor finish to be replaced with new vinyl + waterproof membrane + underlay.

EXT-923
EXTERNAL | EXISTING DOUBLE BRICK

Flood resilient materials

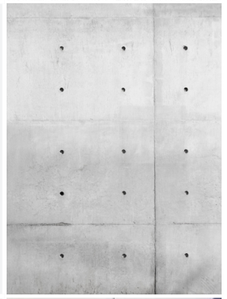
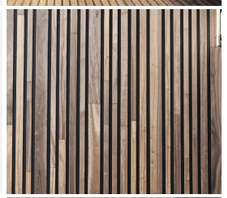
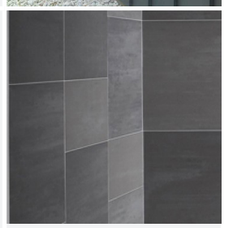
This section details the advantages and disadvantages of different materials and systems referred to throughout this guidance.

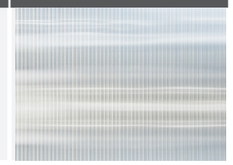
Flood resilient materials table

The following materials in the *Flood Resilient Materials Table* have been systematised according to building element type. Building element types include the following:

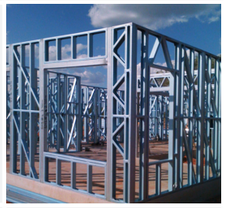
1 External services
2 External cladding & structure
3 Wall framing
4 Insulation
5 Internal structural members
6 Internal floors & ceilings
7 Internal walls
8 Wet areas
9 Internal stairs
10 Doors & windows
11 Internal services - electrical
12 Cabinetry

Flood Resilient Materials	Advantages	Disadvantages	Image
1. External services			
Rainwater tank anchor / tie-down	• Avoid added damage due to the movement of heavy rainwater tanks		 TTB-2500
2. External cladding & structure			
Double Brick & Brick Veneer*	• Durable and water-resistant • Minimal clean-up and repair • Extra weight helps to cancel uplift forces • Skirtings and architraves not required for double brick walls • Face or glazed brick is more durable than common (clay) brick • Waterproof cement render finish provides a durable external barrier • Structural glazed clay tile also provides a durable	• Not recommended for new construction as double brick and brick veneer walls will take considerable time to dry after a flood • To retrofit this construction type extensive use of waterproofing spray may be necessary to protect any timber framing	
Concrete block	• Durable, water and fire resilient • Minimal maintenance • No cavity to hold moisture and/or silt when core-filled • Minimal clean-up and repair • Extra weight helps to cancel uplift forces • Can be constructed relatively quickly • Can be reinforced for additional strength	• Can be less aesthetically pleasing unless rendered and painted	
Rendered Autoclaved aerated concrete block or panel (AAC)	• Durable and water-resistant (only with waterproof render) • Minimal maintenance • No cavity to hold moisture and/or silt • Minimal clean-up • Can be constructed relatively quickly	• Only recommended if waterproof rendered	

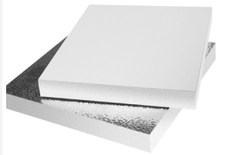
Flood Resilient Materials	Advantages	Disadvantages	Image
Waterproof render	• Durable and water-resistant • Unaffected by water immersion • Not prone to impact damage • Easy to clean or repaint	• Slightly higher cost compared to alternative finishes	
Off-form concrete	• No cavity to hold moisture and/or silt • Very strong • Immune to water damage • Minimal clean-up and repair • Extra weight helps to cancel uplift forces • Skirtings and architraves commonly not used • Low maintenance	• Specialised construction needed for in-situ and concrete panel • Unfinished concrete may not be acceptable for appearance reasons	
Fibre cement	• Water-resistant • Affordable • Easily repaired and replaced • Variety of colours and textures	• Requires some maintenance	
Hardwood	• Water-resistant • Easily repaired and replaced • Renewable resource	• Requires regular maintenance	
Composite timber	• Durable, water, mould and termite resilient • Recyclable • Low maintenance	• More difficult to repair and replace	
Metal	• Water-resistant • Low maintenance	• More difficult to repair and replace	
Tile	• Durable, water-resistant • Minimal maintenance • Can be temperature, chemical and impact resistant • Impervious to mould and termites • Low maintenance	• More difficult to repair and replace	

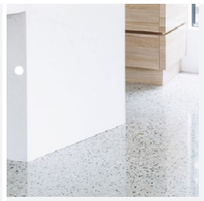
Flood Resilient Materials	Advantages	Disadvantages	Image
Translucent sheeting	• Water-resistant • Minimal maintenance • Allows light in	• Only for walls adjacent to non-habitable rooms • No insulation if translucency is to be maintained	

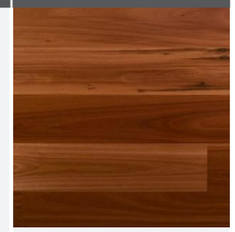
3. Wall framing

Hardwood framing	• Durable, water-resistant and has thermally insulating properties • Flexibility of design, allows for modification on site • Timber is a humidity regulator • For raised wall, consider drilling holes in bottom plate for drainage	• Can be host to mould and termites (although poses less risk than softwood)	
Steel framing	• Durable and water-resistant • Impervious to mould and termites • Can include a recycled material component	• Factory pre-fabricated and pre-cut steel frames do not allow much flexibility for modification on-site • Higher cost than hardwood framing	
Pine framing painted with mould resistant paint (Retrofitting)	• Water-resistant and resistant to mould and termites • Cost effective solution for existing pine framing. • For raised walls, consider drilling holes in bottom plate for drainage	• Not as water resistant as hardwood or steel framing	

4. Insulation

XPS rigid thermal insulation	• Durable and water-resistant • Higher R-values compared to loose-fill or open cell insulation	• Increased labor and material costs due to sealing, taping and fitting to eliminate cavities • Susceptible to sunlight • XPS uses HCFCs in its production	
Closed cell flexible sheet insulation	• Durable and water-resistant • Higher R-values compared to loose-fill or open cell insulation	• Susceptible to sunlight	
Sprayed Polyurethane foam (SPUF) or closed-cell plastic foams	• Durable and water-resistant • Higher R-values compared to loose-fill or open cell insulation	• Denser than open-cell foam, requiring more material • More expensive than open-cell	

Flood Resilient Materials	Advantages	Disadvantages	Image
5. Internal structural members			
Hardwood	• Durable, water-resistant and has thermally insulating properties • Flexibility of design, allows for modification on site	• Can be host to mould and termites (although poses less risk than softwood) • Timber components more prone to damage and may need repairing and maintenance	
Steel	• Durable and water-resistant • Impervious to mould and termites • Can include a recycled material component	• Less on-site flexibility	
Consult a registered (RPEQ) Structural Engineer for recommendations on any damaged internal structural members.			
6. Internal floors & ceilings			
Slab on ground	• Generally undamaged by immersion for any period • The additional weight and strength helps to resist buoyancy forces • Slab on ground floors tend to be the least expensive option • Allows for easier post-flood cleaning / hose down	• For a given ground level, slab on ground floors will normally be only slightly higher and more vulnerable to inundation including local overland flooding. • Potentially suffers from scouring undermining effects	
Raised Concrete Slab	• All the advantages of slab on ground construction • Raised floor (on fill, waffle pod, suspended slabs) minimises risk of water entering house when surrounding ground is flooded • Suitable for uneven ground / sloping site - avoids need for cut and fill and reduces costs of retaining walls and drainage • Can also utilise a range of proprietary precast flooring systems where fill is not employed	• Steps may be required	

Flood Resilient Materials	Advantages	Disadvantages	Image
Suspended hardwood timber floor direct fixed to joists	• Likely extra elevation reduces the flood risk • The house can be designed so that minor flooding and overland flow can pass under the floor • Quick and economic construction	• Timber components more prone to damage and may need replacing or repairing • Timber strip flooring should not suffer any significant loss in strength but may swell or cup (moisture resistant flooring, bearers and joists could be used as substitute for natural timbers) • House could be more prone to uplift (especially sheet clad houses) • Suspended floors are more expensive	
Tile	• Durable and water-resistant • Minimal maintenance • Can be temperature, chemical and impact resistant • Impervious to mould and termites • Low maintenance	• More difficult to repair and replace • Must be used with semi-epoxy or epoxy grout and water resistant adhesive to be flood resilient	
Rubber / Vinyl / Marmoleum	• Durable and water-resistant • Easily and quickly installed • Minimal maintenance • Variety of colours and textures • Rubber flooring can have a very high recycled component	• More difficult to repair and replace • Can be discoloured or damaged by some chemical cleaners • Must be purposefully installed and sealed to be flood resilient using a water-resistant substrate • Vinyl is not biodegradable or commonly recycled • Comes in many forms and products and can be difficult to determine if flood resilient	
7. Internal walls			
Rendered Autoclaved aerated concrete block or panel (AAC)	• Durable and water-resistant (only with waterproof render) • Minimal maintenance • No cavity to hold moisture and/or silt • Minimal clean-up • Can be constructed relatively quickly	• Only recommended if waterproof rendered	

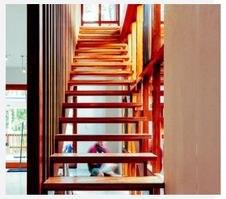
Flood Resilient Materials	Advantages	Disadvantages	Image
Moisture resistant internal wall cladding	• Durable, fire and water-resistant • Resistant to mould and termites		
Fibre cement cladding	• Water-resistant • Affordable • Easily repaired and replaced • Variety of colours and textures	• Requires some maintenance	
Marine grade and Moisture Resistant Plywood	• Water and impact resilient • Highly pliable for design flexibility • Can be stained or painted	• Increased cost compared to other internal wall finishes • Requires some maintenance • Not suitable for long duration flood events • Edges must be purposefully covered and sealed to be flood resilient	
Single skin hardwood timber framed	• Timber frame construction is traditional and economic • Least expensive construction	• Frame can warp or swell in flood event • Frame may suffer decay or mould can grow if not dried • Exterior cladding or brick veneer can be damaged with movement of the wall frame • Some internal linings may need extensive replacement • Some types of bulk insulation retain moisture and may need to be removed to aid drying – replacement would only follow adequate drying of structure. • Some bracing types may need replacing	

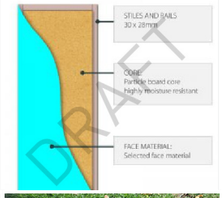
Flood Resilient Materials	Advantages	Disadvantages	Image
Paint - Polyester-epoxy	• Water and stain resistant	• Limited ability to repair because does not bond to previous coating • Can cause health issues if inhaled • Limitations depending on surface type • Highly flammable	
Paint - Alkyd (oil-based)	• Water and stain resistant • Easily washable and more chemically resistant than latex • Better when repainting than other paint options	• Longer drying time • Not mould resilient • Releases VOC's • Does not breath., therefore will peel if exposed to moisture	
Paint - Latex	• Water, mould, fire and fade resistant • More easily applied than other paint options • Quicker drying time than alkyd paints	• Adheres badly to pre-painted, dirty or chalky walls • Can shrink and cause surface stress • Does not perform as well as alkyd paint in areas of high humidity	

8. Wet areas

Refer to sections *6. Internal Floors & Ceilings* and *7. Internal Walls* as these are also applicable to wet areas.

9. Internal stairs

Hardwood treads with steel or hardwood stringers (open risers)	• Water-resistant • Easily repaired and replaced • Prevents flood water and debris from being trapped under stair Use Kwila or greater grain density hardwood.	• Open risers can be a trip hazard* *Closed riser stairs with a removable bottom riser is also an option	
Concrete	• Generally undamaged by immersion for any period • Allows for easier post-flood cleaning / hose down	• Typically economical for a few steps only	

Flood Resilient Materials	Advantages	Disadvantages	Image
10. Doors & windows			
Solid core door	• Water and fire resilient and durable • Low maintenance • Noise mitigating and thermal insulating	• More expensive • Heavy • May need periodic maintenance due to expansion and contraction	
Flush threshold	• Water may be easily flushed out of the building	• More expensive due to labor cost of recessing the door sill • Not weatherproof as the door has nothing to seal against - may require brush or rubber seals to be fixed to the bottom of the door	
11. Internal services - electrical			
Flood resilient material options are not applicable for internal electrical services.			
12. Cabinetry			
Compact laminate	• Durable, water, mould, fire and termite resilient • Low maintenance, long lasting • Resistant to chemical cleaners • Various colours, patterns and textures	• More difficult to repair and replace if colours / patterns become discontinued	
Acrylic solid surface	• Durable, water, mould, fire and termite resilient • Low maintenance, long lasting • Resistant to chemical cleaners • Various colours, patterns and textures	• More expensive • Not heat resistant • Not as environmentally friendly as other resilient cabinetry options	
Marine grade plywood	• Water and impact resilient • Highly pliable for design flexibility • Can be stained or painted	• Increased cost compared to other internal wall finishes • Requires some maintenance • Not suitable for long duration flood events • Edges must be purposefully covered and sealed to be flood resilient	

Flood Resilient Materials	Advantages	Disadvantages	Image
Composite timber panel (with 2 pack paint to all edges)	• Durable, water, mould and termite resilient • Recyclable • Low maintenance	• More difficult to repair and replace • Edges must be sealed	
Stainless steel frame (open)	• Durable, water, mould and termite resilient • Low maintenance • Recyclable • Easily washable	• More expensive • Difficult to repair	

For enquiries about the Resilient Homes Fund:

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