The Hills Development Control Plan (DCP) 2012

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THE HILLS Sydney's Garden Shire

Part C Section 6
Flood Controlled Land

C6

INDEX

1. INTRODUCTION

This Section of the DCP must be read in conjunction with Part A – Introduction of this DCP.

1.1. LAND TO WHICH THIS SECTION OF THE PLAN APPLIES

This Section of the DCP applies to all flood controlled land within The Hills Shire Local Government Area.

1.2. AIMS OF THIS SECTION OF THE DCP

The aim of this section of the DCP is to provide development controls to guide the management of flood risks associated with development by:

(i) Increasing public awareness of the hazard and extent of land affected by all potential floods, including floods greater than the 100 year average recurrence interval (ARI) flood and to ensure essential services and land uses are planned in recognition of all potential floods.

(ii) Informing the community of Council's policy for the use and development of flood controlled land.

(iii) Managing the risk to human life and damage to property caused by flooding through controlling development on land affected by potential floods.

(iv) Minimising the potential impact of development and other activity upon the amenity, aesthetic, recreational and ecological value of the waterway corridors and the surrounding environment.

1.3. HOW TO DETERMINE THE DEVELOPMENT CONTROLS THAT APPLY

The following steps should be taken to determine the relevant flood related development controls:

Step 1: Determine if the property is a Flood Control Lot or Flood Controlled Land. (This can be done through the purchase of a Section 149 Certificate from Council or via Council's website.)

Step 2: Determine which of the six land use categories the proposal falls under. (See **Schedule A).**

Step 3: Assess and document how the proposal will satisfy the applicable development controls and their objectives. (See **Sections 2 to 10**).

Step 4: Discuss your final application with Council staff before lodging it for determination.

Advice from a suitably qualified civil engineer may be required.

1.4. LAND USE CATEGORIES

Six major land use categories have been adopted. The specific uses, as defined by the applicable Environmental Planning Instruments, and other specially defined uses, have been grouped within each of these six categories, based on a similar level of potential vulnerability to flood hazards.

1.5. FLOOD COMPATIBLE BUILDING

Flood compatible building components and methods are a combination of measures incorporated in the design and/or construction and alteration of individual buildings or structures subject to flooding, or the use of flood compatible materials for the reduction or elimination of flood damage. Flood compatible materials include those materials used in building that are resistant to damage when inundated.

A list of flood compatible materials and methods is provided in **Schedule B**.

1.6. FLOOD PLANNING LEVELS

A range of flood planning levels (FPL) may apply depending on the type of land use and

the part of the development in consideration. In principle, a higher FPL will apply to land uses considered more sensitive to flood hazards or which may be critical to emergency management operations or the recovery of the community after a flood event.

Different FPLs are also considered appropriate for different parts of development. For example, the non-habitable floor levels of a dwelling can be at a lower level relative to the habitable floor level.

The following table outlines those FPLs to be applied within the development controls outlined later in this section of the DCP.

Table 1 – Flood Planning Levels

Reference	Flood Planning Level
FPL1	20 Year ARI
FPL2	100 Year ARI
FPL3	100 Year ARI + 0.5m Freeboard
FPL4	PMF

Notes:

1. FPL1, FPL2 and FPL 4 have zero freeboard.
2. The design flood levels and FPLs in **Table 1** may be obtained from Council if available or otherwise will be required to be determined by the proponent in accordance with Section 4. These levels will normally be 'rounded up' to the nearest 0.1m and referred to Australian Height Datum (AHD).
   FPL= Flood Planning Level.
   ARI = Average Recurrence Interval.
   PMF = Probable Maximum Flood.

2. OBJECTIVES AND DEVELOPMENT CONTROLS

Objectives and development controls for flood controlled land are set out in the following sections, with the following purpose:

The ***objectives*** represent the outcomes that the Council wishes to achieve from each control.

The ***development controls*** are those which when complied with would be expected to achieve the outcome intended in the majority of cases. While adherence to the prescriptive controls may be important, it is paramount that the objectives are clearly satisfied.

The criteria for development applications for proposals on or adjacent to flood controlled land are structured in recognition that different controls are applicable to different land uses and levels of potential flood behaviours. Controls are provided for development based on the type of land use proposed, as well as specific controls for fencing, filling and to address environmental considerations.

Relevant development controls and submission requirements of other Sections of the DCP must also be complied with. For example, where alterations and additions are proposed to an existing dwelling further controls and information required to be submitted with a Development Application (DA) are listed in Part C Section 3 – Residential.

2.1. GENERAL OBJECTIVES

The following objectives apply to all land use categories:

OBJECTIVES

(i) To ensure the flood risk associated with development, comprising danger to life and damage to property, is minimised and not increased beyond the level acceptable to the community.

(ii) To ensure the proponents of development and the community in general are fully aware of the potential flood hazard and consequent risk associated with the use and development of land within the floodplain;

(iii) To ensure that proposed development does not exacerbate flooding on other properties;

(iv) To minimise the risk to life by ensuring the provision of appropriate evacuation measures are available;

(v) Where permitted, to maximise the potential for buildings to be returned to use as quickly and efficiently as practical, after being affected by flooding; and

(vi) To ensure that the design and siting controls and built form outcomes required to address the flood hazard do not result in unreasonable impacts on the:

- *amenity and character of an area;*
- *streetscape and the relationship of the building to the street; and*
- *the environment and ecology.*

2.2. GENERAL DEVELOPMENT CONTROLS

The following development controls apply to all land use categories:

(a) The flood impact of the development to be considered to ensure that the development will not increase flood effects elsewhere, having regard to:

- loss of flood storage;
- changes in flood levels and velocities caused by alterations to the flood conveyance, including the effects of fencing styles; and
- the cumulative impact of multiple potential developments in the floodplain.

An engineer's report may be required.

(b) If the application involves subdivision, the applicant to demonstrate that potential development as a consequence of a subdivision proposal can be undertaken in accordance with this Plan.

(c) The design materials and construction of the proposed development shall comply with the principles set out in the publication "Reducing Vulnerability of Buildings to Flood Damage – Guidance on Building in Flood Prone Areas", published by the NSW Government.

(http://www.ses.nsw.gov.au/multiversions/9022/FileName/Building_Guidelines.pdf)

For Development within the Hawkesbury River Floodplain

(e) All walls, up to FPL3, are to be constructed of flood resistant building materials, suitable for retaining structural integrity during and following long periods of continuous underwater immersion.

(f) All walls are to have additional strength to resist collapse. The number of engaged piers are to be increased from that typically required under the Building Code of Australia.

2.3. CRITICAL USES AND FACILITIES

(a) Critical uses and facilities are unsuitable land uses on any part of–flood controlled land affected by flooding up to FPL4.

2.4. SENSITIVE USES AND FACILITIES

(a) No development is to occur in or over a floodway area, a flowpath or a high hazard area (as defined in the Floodplain Development Manual (April 2005) (FDM)) generated by flooding up to FPL4.

(b) Habitable floor levels to be no lower than FPL4.

(c) Non-habitable floor levels to be no lower than FPL3 unless justified by a site specific assessment.

(d) All structures to have flood compatible building components below FPL4.

(e) Applicant to demonstrate that any structure can withstand the forces of floodwater, debris and buoyancy up to and including FPL4. An engineer's report may be required.

(f) The minimum surface level of open car parking spaces or carports shall be as high as practical, and not below FPL1.

(g) Garages or enclosed car parking must be protected from inundation by flood waters up to FPL2. Where 20 or more vehicles are potentially at risk, protection shall be provided to FPL3.

(h) Where the level of the driveway providing access between the road and parking space is lower than 0.3m below FPL2, the following condition must be satisfied - when the flood levels reach FPL2, the depth of inundation on the driveway shall not exceed:

- the depth at the road; or
- the depth at the car parking space.

(i) Reliable access for pedestrians or vehicles is required from the building, commencing at a minimum level equal to the lowest habitable floor level to a refuge area above FPL4. In the case of alterations or additions to an existing development, this may require retro-fitting the existing structures if required to support a refuge area above FPL4.

(j) Applicant to demonstrate that area is available to store goods above FPL4.

(k) Materials which may cause pollution or are potentially hazardous during any flood must not be stored externally below FPL4.

(l) A Site Flood Emergency Response Plan is required when elements of the development, including vehicular and pedestrian access are below FPL4.

The Site Flood Emergency Response Plan should relate to the landuse and site conditions in conjunction with flood behaviour up to FPL4 expected to be experienced at the site. The plan should consider the following specific actions:

- Preparing for a flood;
- Responding when a flood is likely;
- Responding during a flood; and
- Recovery after a flood.

The flood plan should be consistent with the relevant NSW SES “FloodSafe” Guide.

2.5. RESIDENTIAL

(a) No development is to occur in a floodway area, a flowpath or a high hazard area (as defined in the FDM) generated by flooding up to FPL2, unless justified by a site specific assessment.

(b) Habitable floor levels to be no lower than FPL3.

(c) Non-habitable floor levels to be equal to or greater than FPL3 where possible, or otherwise no lower than FPL1 unless justified by a site specific assessment.

(d) A restriction is to be placed on the title of the land, pursuant to S.88B of the Conveyancing Act, where the lowest habitable floor area is elevated above finished ground level, confirming that the under croft area is not to be enclosed, where Council considers this may potentially occur.

(e) All structures to have flood compatible building components below FPL3.

(f) Applicant to demonstrate that the structure can withstand the forces of floodwater, debris and buoyancy up to and including FPL3, or FPL4 if required to satisfy evacuation criteria (i.e. use as a refuge area). An engineer's report may be required.

(g) The flood impact of the development to be considered to ensure that the development will not increase flood effects elsewhere, having regard to:

- loss of flood storage;

- changes in flood levels and velocities caused by alterations to the flood conveyance, including the effects of fencing styles; and
- the cumulative impact of multiple potential developments in the floodplain.

An engineer's report may be required.

(h) The minimum surface level of open car parking spaces or carports shall be as high as practical, and not below FPL1.

(i) Garages or enclosed car parking must be protected from inundation by flood waters up to FPL2. Where 20 or more vehicles are potentially at risk, protection shall be provided to FPL3.

(j) Where the level of the driveway providing access between the road and parking space is lower than 0.3m below FPL2, the following condition must be satisfied - when the flood levels reach FPL2, the depth of inundation on the driveway shall not exceed:

- the depth at the road; or
- the depth at the car parking space.

A lesser standard may be accepted for single detached dwelling houses where it can be demonstrated that risk to human life would not be compromised.

(k) All service conduits located below FPL3 are to be made fully flood compatible and suitable for continuous underwater immersion. Conduits are to be self-draining if subject to flooding.

(l) A Site Flood Emergency Response Plan is required when elements of the development, including vehicular and pedestrian access are below FPL3.

The Site Flood Emergency Response Plan should relate to the landuse and site conditions in conjunction with flood behaviour up to FPL2 expected to be experienced at the site. The plan should consider the following specific actions:

- Preparing for a flood;
- Responding when a flood is likely;
- Responding during a flood; and
- Recovery after a flood.

The flood plan should be consistent with the relevant NSW SES “FloodSafe” Guide.

2.6. COMMERCIAL AND INDUSTRIAL

(a) No development is to occur in or over a floodway area, a flowpath or a high hazard area (as defined in the FDM) generated by flooding up to FPL2, unless justified by a site specific assessment.

(b) Habitable floor levels are to be at FPL3 or higher.

(c) Non-habitable floor levels to be equal to or greater than FPL3 where possible, or otherwise no lower than FPL1 unless justified by a site specific assessment.

(d) All structures to have flood compatible building components below FPL3.

(e) Applicant to demonstrate that the structure can withstand the forces of floodwater, debris and buoyancy up to and including FPL3, or FPL4 if required to satisfy evacuation criteria (i.e. use as a refuge area). An engineer's report may be required.

(f) The flood impact of the development to be considered to ensure that the development will not increase flood effects elsewhere, having regard to:

- loss of flood storage;
- changes in flood levels and velocities caused by alterations to the flood conveyance, including the effects of fencing styles; and

- the cumulative impact of multiple potential developments in the floodplain.

An engineer's report may be required.

(g) The minimum surface level of open car parking spaces or carports shall be as high as practical, and not below FPL1.

(h) Garages or enclosed car parking must be protected from inundation by flood waters up to FPL2. Where 20 or more vehicles are potentially at risk, protection shall be provided to FPL3.

(i) Where the level of the driveway providing access between the road and parking space is lower than 0.3m below FPL2, the following condition must be satisfied - when the flood levels reach FPL2, the depth of inundation on the driveway shall not exceed:

- the depth at the road; or
- the depth at the car parking space.

(j) All service conduits located below FPL3 are to be made fully flood compatible and suitable for continuous underwater immersion. Conduits are to be self-draining if subject to flooding.

(k) Applicant to demonstrate that area is available to store goods above FPL3.

(l) No external storage of materials below FPL3 which may cause pollution or be potentially hazardous during any flood.

(m) A Site Flood Emergency Response Plan is required when elements of the development, including vehicular and pedestrian access are below FPL3.

The Site Flood Emergency Response Plan should relate to the landuse and site conditions in conjunction with flood behaviour up to FPL2 expected to be experienced at the site. The plan should consider the following specific actions:

- Preparing for a flood;
- Responding when a flood is likely;
- Responding during a flood; and
- Recovery after a flood.

The flood plan should be consistent with the relevant NSW SES "FloodSafe" Guide.

2.7. RECREATION AND NON-URBAN

(a) No development is to occur in a floodway area, a flowpath or a high hazard area (as defined in the FDM) generated by flooding up to FPL2, unless justified by a site specific assessment.

(b) All floor levels to be no lower than FPL1 unless justified by a site specific assessment.

(c) All structures to have flood compatible building components below FPL3.

(d) Applicant to demonstrate that the structure can withstand the forces of floodwater, debris and buoyancy up to and including FPL3, or FPL4 if required to satisfy evacuation criteria (i.e. use as a refuge area). An engineer's report may be required.

(e) The flood impact of the development to be considered to ensure that the development will not increase flood effects elsewhere, having regard to:

- loss of flood storage;
- changes in flood levels and velocities caused by alterations to the flood conveyance, including the effects of fencing styles; and
- the cumulative impact of multiple potential developments in the floodplain.

An engineer's report may be required.

(f) The minimum surface level of open car parking spaces, carports or garages, shall be as high as practical.

(g) The driveway providing access between the road and parking space shall be as high as practical and generally rising in the egress direction.

(h) All service conduits located below FPL3 are to be made fully flood compatible and suitable for continuous underwater immersion. Conduits are to be self-draining if subject to flooding.

(i) A Site Flood Emergency Response Plan is required when elements of the development, including vehicular and pedestrian access are below FPL3.

The Site Flood Emergency Response Plan should relate to the landuse and site conditions in conjunction with flood behaviour up to FPL2 expected to be experienced at the site. The plan should consider the following specific actions:

- Preparing for a flood;
- Responding when a flood is likely;
- Responding during a flood; and
- Recovery after a flood.

The flood plan should be consistent with the relevant NSW SES "FloodSafe" Guide.

2.8. CONCESSIONAL DEVELOPMENT

(a) No development is to occur in a floodway area, a flowpath or a high hazard area (as defined in the FDM) generated by flooding up to FPL2, unless justified by a site specific assessment.

(b) New habitable floor levels to be no lower than FPL3. Where this is not practical due to compatibility with the height of adjacent buildings, or compatibility with the floor level of existing buildings, or the need for access for persons with disabilities, a lower floor level may be considered. In these circumstances, the floor level is to be as high as practical, and, when undertaking alterations or additions no lower than the existing floor level.

(c) A restriction is to be placed on the title of the land, pursuant to S.88B of the Conveyancing Act, where the lowest habitable floor area is elevated above finished ground level, confirming that the under croft area is not to be enclosed, where Council considers this may potentially occur.

(d) All new structures to have flood compatible building components below FPL3.

(e) Applicant to demonstrate that the new structure can withstand the forces of floodwater, debris and buoyancy up to and including FPL3, or FPL4 if required to satisfy evacuation criteria (i.e. use as a refuge area). An engineer's report may be required.

(f) The flood impact of the development to be considered to ensure that the development will not increase flood effects elsewhere, having regard to:

- loss of flood storage;
- changes in flood levels and velocities caused by alterations to the flood conveyance, including the effects of fencing styles; and
- the cumulative impact of multiple potential developments in the floodplain.

An engineer's report may be required.

(g) Driveway and parking space levels to be no lower than the design floor level or ground level. Where this is not practical, a lower level may be considered. In these circumstances, the level is to be as high as practical, and, when undertaking alterations or additions no lower than the existing level.

(h) All service conduits located below FPL3 are to be made fully flood compatible and suitable for continuous underwater immersion. Conduits are to be self-draining if subject to flooding.

(i) Applicant to demonstrate that area is available to store goods above FPL3.

(j) No external storage of materials below FPL3 which may cause pollution or be potentially hazardous during any flood.

(k) A Site Flood Emergency Response Plan is required when elements of the development, including vehicular and pedestrian access are below FPL3.

The Site Flood Emergency Response Plan should relate to the landuse and site conditions in conjunction with flood behaviour up to FPL2 expected to be experienced at the site. The plan should consider the following specific actions:

- Preparing for a flood;
- Responding when a flood is likely;
- Responding during a flood; and
- Recovery after a flood.

The flood plan should be consistent with the relevant NSW SES "FloodSafe" Guide.

3. OTHER DEVELOPMENT

3.1. FENCING

OBJECTIVES

(i) To ensure that fencing does not result in the obstruction of the free flow of floodwaters;

(ii) To ensure that fencing does not become unsafe during floods and potentially become moving debris which threatens the integrity of structures or the safety of people.

DEVELOPMENT CONTROLS

(a) Fencing within a floodway or a flowpath must be of an open style that that will not impede the flow of floodwaters.

3.2. FILLING

OBJECTIVES

(i) To ensure that proposed filling does not exacerbate flooding on other properties.

DEVELOPMENT CONTROLS

(a) Filling on flood controlled land is not permitted unless a report from a suitably qualified civil engineer is submitted to Council that certifies that the development will not increase flood affectation elsewhere, or Council otherwise determines that a report is not required.

(b) Filling of floodway areas or land that conveys an existing overland flowpath is not permitted.

(c) Filling of individual sites in isolation, without consideration of the cumulative effects is not permitted. A case by case decision making approach cannot take into account the cumulative impact of flooding behaviour, and associated risks, caused by individual developments. Any proposal to fill a site must be accompanied by an analysis of the effect on flood levels of similar filling of developable sites in the area.

This analysis would form part of a flood study prepared in accordance with Council's requirements as outlined at Section 5 of this section of the DCP.

4. INFORMATION REQUIREMENTS

(a) Applications must include information that addresses all relevant controls, in addition to the following matters, as applicable.

(b) Applications for Concessional Development (see Schedule A) to an existing dwelling shall be accompanied by documentation from a registered surveyor confirming existing floor levels to AHD.

(c) Other Applications shall be accompanied by a survey plan showing:

- The position of the existing building(s) and proposed building(s);

- The existing ground levels to AHD around the perimeter of the building and contours of the site; and
- The existing or proposed floor levels to AHD.

(d) Applications for earthworks, filling of land and subdivision shall be accompanied by a survey plan (with a contour interval of 0.5m or similar) showing relative levels to AHD.

(e) For large scale developments, or developments in critical situations, including where an existing catchment based flood study is not available, a flood study using a fully dynamic one or two dimensional computer model may be required. For smaller developments consideration may be given to the use of an existing flood study if available and suitable (e.g. it contains sufficient local detail), or otherwise a flood study prepared in a manner consistent with the latest edition of the publication "Australian Rainfall and Runoff" and the FDM, will be required. From this study, the following information shall be submitted in plan form for the pre-developed and post-developed scenarios:

- Water surface contours;
- Velocity vectors;
- Velocity and depth product contours;
- Delineation of FPLs that may apply to the development; and
- Flood profiles for the full range of events for full development including all structures and works (including revegetation).

(f) Where the controls for a particular development proposal require an assessment of structural soundness during potential floods, the following impacts must be addressed having regard to the likely depths and velocities of flood waters:

- Hydrostatic pressure;
- Hydrodynamic pressure;
- Impact of debris;
- Buoyancy forces;
- Saturated ground conditions;
- Shear stress and scour forces around and downstream of the structure.

Note that foundations need to be included in the structural analysis.

5. SCHEDULES

SCHEDULE A - LAND USE CATEGORIES

Critical Uses and Facilities	Sensitive Uses and Facilities	Residential
Emergency services facilities; public administration building that may provide an important contribution to the notification or evacuation of the community during flood events (e.g. SES Headquarters and Police Stations); hospitals.	Community facility; educational establishments; public utility undertaking (including electricity generating works; sewerage system; telecommunications facility and water treatment facility) which are essential to evacuation during periods of flood or if affected would unreasonably affect the ability of the community to return to normal activities after flood events; heavy industrial storage establishment, residential care facility; school and seniors housing.	Additions or alterations to existing dwellings greater than 40m^2 to the habitable floor area which existed at the date of commencement of this Plan; affordable housing; attached dwelling; backpackers accommodation; bed and breakfast accommodation; boarding house; canal estate development; caravan park (with permanent occupants i.e. other than short term sites)(see Note 1); child care centre; dual occupancy; dwelling house; exhibition home; farm stay accommodation, Garages or outbuildings with a floor area exceeding 40m², group homes; home based child care centre; home business; home industry; home occupancy; home occupation (sex services); hostel; hotel or motel accommodation; moveable dwelling; multi dwelling housing; neighbourhood shop; residential flat building; rural worker's dwelling; secondary dwelling; semi-detached dwelling and serviced apartments.

SCHEDULE A - LAND USE CATEGORIES

Commercial or Industrial	Recreation or Non-urban Uses	Concessional Development
Agricultural produce industry; air transport facility; amusement centre; brothel; bulky goods premises; business premises; car park; cellar door premises; community facility (other than sensitive uses and facilities); correctional centre; crematorium; depot; entertainment facility; exhibition village; feed lot, food and drink premises; freight transport facility; function centre; funeral home; general industry; hazardous industry; hardware and building supplies, health care professional; health consulting rooms; heavy industry; high technology industry; highway service centre; industrial retail outlet; light industry; livestock processing industry; market; medical centre; mixed use development; mortuary; office premises; passenger transport facility; place of public worship; pub; public administration building (other than critical uses and facilities); recreation facility (major); registered club; restaurant; restricted dairy; restricted premises; rural supplies; sawmill or log processing works; self-storage units; service station; sex services premises; shop; shop top housing; storage premises; take away food or drink premises; transport depot; truck depot; vehicle body repair workshop; turf farming; vehicle repair station; vehicle sales or hire premises; veterinary hospital; warehouse or distribution centre; waste disposal facility; waste or resource transfer stations; and wholesale supplies.	Agriculture; airstrip; animal boarding or training establishment; aquaculture; boat launching ramp; boat repair facility; boat shed; Camp site and caravan site – short term sites (see Note 1); caravan park (with non-permanent occupants); cemetery; charter and tourism boating facility; environmental facility; environmental protection works; extensive agriculture; extractive industry; farm building; garden centre; horticulture; helipad (other than those associated with a critical use facility); information and education facility; intensive livestock agriculture; intensive plant agriculture; kiosk; jetty; landscape and material supplies; marina; mining; natural water-based aquaculture; plant nursery; port facilities; recreation area; recreation facility (indoor); recreational facility (outdoor); research station; resource recovery facility; restriction facilities; roadside stall; stock and sale yard; viticulture; water recreation structure; water recycling facility; and water storage facility.	(i) Additions or alterations to an existing dwelling up to 40m^2 to the habitable floor area which existed at the date of commencement of this Plan; or (ii) Garages or outbuildings with a maximum floor area of 40m^2; or (iii) Redevelopment for the purposes of substantially reducing the extent of flood affectation to the existing building.

(1) As defined by the Local Government (Manufactured Home Estates, Caravan Parks, Camping Grounds and Moveable Dwellings) Regulation 2005

Note: Terms provided in Schedule A have the same meaning as The Hills Local Environmental Plan 2012.

SCHEDULE B – FLOOD COMPATIBLE MATERIALS AND METHODS

BUILDING COMPONENT	FLOOD COMPATIBLE MATERIAL
Flooring and Sub-floor Structure	Concrete slab-on-ground monolith construction. Suspended reinforced concrete slab.
Floor Covering	Clay tiles. Concrete, precast or in situ. Concrete tiles. Epoxy, formed-in-place. Mastic flooring, formed-in-place. Rubber sheets or tiles with chemical-set adhesives. Silicone floors formed-in-place. Vinyl sheets or tiles with chemical-set adhesive. Ceramic tiles, fixed with mortar or chemical-set adhesive. Asphalt tiles, fixed with water resistant adhesive.
Wall Structure	Solid brickwork, blockwork, reinforced, concrete or mass concrete.
Roofing Structure (for situations where the relevant flood level is above the ceiling)	Reinforced concrete construction. Galvanised metal construction.
Doors	Solid panel with water proof adhesives. Flush door with marine ply filled with closed cell foam. Painted metal construction. Aluminium or galvanised steel frame.
Wall and Ceiling Linings	Fibro-cement board. Brick, face or glazed. Clay tile glazed in waterproof mortar. Concrete. Concrete block. Steel with waterproof applications. Stone, natural solid or veneer, waterproof grout. Glass blocks. Glass. Plastic sheeting or wall with waterproof adhesive.
Insulation	Foam (closed cell types).
Windows	Aluminium frame with stainless steel rollers or similar corrosion and water resistant material.
Nails, Bolts, Hinges and Fittings	Brass, nylon or stainless steel. Removable pin hinges. Hot dipped galvanised steel wire nails or similar.

Heating and Air Conditioning Systems

Heating and air conditioning systems should, to the maximum extent possible, be installed in areas and spaces of the house above the relevant FPL. When this is not feasible every precaution should be taken to minimise the damage caused by submersion according to the following guidelines.

- Fuel

Heating systems using gas or oil as a fuel should have a manually operated valve located in the fuel supply line to enable fuel cut-off.

- Installation

The heating equipment and fuel storage tanks should be mounted on and securely anchored to a foundation pad of sufficient mass to overcome buoyancy and prevent movement that could damage the fuel supply line. All storage tanks should be vented to an elevation of 600 millimetres above the relevant FPL.

- Ducting

All ductwork located below the relevant FPL should be provided with openings for drainage and cleaning. Self-draining may be achieved by constructing the ductwork on a suitable grade. Where ductwork must pass through a water-tight wall or floor below the relevant FPL, the ductwork should be protected by a closure assembly operated from above relevant FPL.

Flood Compatible Building Methods

In addition to conforming to the BCA and other relevant standards, Council may require builders to utilise best practice building methods to minimise the susceptibility of structures to damage when inundated by floodwaters. Details of these methods are documented in the following document:

Reducing Vulnerability of Buildings to Flood Damage – Guidance on Building in Flood Prone Areas. Hawkesbury-Nepean Floodplain Management Steering Committee (HNFMSC), June 2006. (Copies available from the NSW Office of Environment and Heritage); and within other supplementary information available from Council.