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<td>Introduction Definitions</td>
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<td>D 01.01</td>
<td>Elements included in this section: Slabs, upper floors, columns, roofs (including safety equipment and plumbing etc.)</td>
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</table>
| Introduction Definitions     | Structure        |                     | D 01.02     | Structure is defined as:-  
- A Construction or framework of identifiable elements (components, entities, factors, members, parts, steps, etc.) which gives form and stability, and resists stresses and strains.  
- Structures that have defined boundaries within which (1) each element is physically or functionally connected to the other elements, and (2) the elements themselves and their interrelationships are taken to be either fixed (permanent) or changing only occasionally or slowly. |
| Introduction Definitions     | Sub-structure    |                     | D 01.03.01  | Sub-structure is defined as:-  
- A structure forming the foundation of a building or other construction, the foundations, columns, and abutments upon which the building rests.                                                 |
| Introduction Definitions     | Super-structure  |                     | D 01.03.02  | Super-structure is defined as:-  
- A structure built as a vertical extension of all of a building above the basement or ground floor slab/footings.                                                                                  |
| Construction Method          | Introduction     |                     | D 02.01     | Monash University wishes to explore the benefits and challenges of Design for Manufacturing Assembly (DfMA) for appropriate buildings, where benefits can be achieved and risks/challenges addressed. |
| Construction Method          | Building Types   |                     | D 02.02     | Research, Learning & Teaching, Office Accommodation, Residential (others where deemed appropriate).                                                                                                        |
| Construction Method          | Method of construction |               | D 02.03     | The Architect and Engineering (Services and Structural) Consultants must bring the initial concept design to a point, whereby a report must be written outlining which method of construction (or % of each method of construction - Traditional vs DFMA) may be considered for any of the new building types outlined above. |
| Construction Method          | Orientation, Floor shape and structural/planning grid(s) |                     | D 02.04     | Early planning studies must be developed, that align to the MDCS, such that the orientation, floor shape and structural grid, adaptability & flexibility of the building is clearly defined. |
| Construction Method          | Construction Report 1 |               | D 02.05.01  | Must clearly articulate and set out the targeted benefits, risks and challenges to be addressed in relation to: Programme (especially time on site), Costs, Adaptability and Flexibility, Quality, Sustainability, Liabilities & Compliance, Buildability (Ease of Construction), Aesthetics, Materials, End of life strategies, Safety, Procurement, Type of Contract, Competitive Advantage, the ‘Right Team’ Structure (roles and responsibilities), Transportation. |
| Construction Method          | Construction Report 2 |               | D 02.05.02  | Must clearly address and quantify the above-mentioned benefits, risks and challenges. If deemed appropriate the consultant team must recommend Early Contractor Intervention (ECI) to assist in the compilation of Construction Report 2: Where competitive tenders are sought from contractors, a performance brief must be prepared that clearly articulates the desired outcome(s)  
A tender period of 6-8 weeks must be accommodated within the overall programme for ECI, and the submission of competitive tenders, that are fully supported by Construction Report 2. |
| Excavation                   | Waste Management |                     | D 03        | All topsoil must be separated from the construction site and protected from degradation for reuse at the completion of the project. There must be no net change in the volume of topsoil on the site. |
| Material Use          | Concrete          | D 04.01 | Reduce the quantity of resource intensive Portland cement by substituting it with industrial waste products such as fly-ash (typically in the order of 10-20%), or oversized aggregate. At least 20% of all aggregates used for structural purposes must be recycled (Class 1 RCA in accordance with HB155-2002) or slag aggregate. Total proportions as follows:  
- 60% for in-situ concrete  
- 40% for precast concrete  
- 30% for stressed concrete  
Ensure 60-90% of all steel, by mass, in the project either has a post-consumer recycled content greater than 50% or is re-used. Refer to Green Star Design & As-Built: Materials - Credit 19 - Life Cycle Impacts; Materials - Credit 20 - Responsible Building Materials for guidance. |
| Material Use          | Steel             | D 04.02 | The following warranties on the following must be provided:  
- Basement waterproofing - 20 years  
- Other building waterproofing - 10 years  
- Termite treatment - 1 year  
Ensure roofs, walls and floors are constructed to minimise air leakage in accordance with Section J3.6 of the BCA - Construction of roofs, walls and floors.  
Ensure floor systems exceed the Total R-Value specified in Table J1.6 of the BCA. Floors with an in-slab heating or cooling system must be insulated around the vertical edge of their perimeter with insulation having an R value of not less than 1.0 as per Section J1.6 of the BCA - Floors.  
Floors must be sufficiently sealed and insulated to prevent heat loss or the transfer of water and air that might contribute to occupant discomfort.  
Inspection of reinforcement in place must be made by the Project Architect/Structural Engineer before concrete pouring is commenced.  
All floor penetrations and associated service pipes (particularly in laboratory areas), are to be fully sealed with a flexible material. Any sealant used in an internal application – exposed or concealed - must meet Total Volatile Organic Compound (TVOC) Limits as outlined in Green Star Design & As-Built: Indoor Environment Quality- Credit 13 - Indoor Pollutants. All floor penetrations must include a sleeve, finished off approximately 25mm AFL. Install puddle flanges where appropriate. |
| General               | Warranty Periods  | D 05    | The following warranties on the following must be provided:  
- Basement waterproofing - 20 years  
- Other building waterproofing - 10 years  
- Termite treatment - 1 year  
Ensure roofs, walls and floors are constructed to minimise air leakage in accordance with Section J3.6 of the BCA - Construction of roofs, walls and floors.  
Ensure floor systems exceed the Total R-Value specified in Table J1.6 of the BCA. Floors with an in-slab heating or cooling system must be insulated around the vertical edge of their perimeter with insulation having an R value of not less than 1.0 as per Section J1.6 of the BCA - Floors.  
Floors must be sufficiently sealed and insulated to prevent heat loss or the transfer of water and air that might contribute to occupant discomfort.  
Inspection of reinforcement in place must be made by the Project Architect/Structural Engineer before concrete pouring is commenced. |
| Substructure          | Air Leakage       | D 06.01 | All floor penetrations and associated service pipes (particularly in laboratory areas), are to be fully sealed with a flexible material. Any sealant used in an internal application – exposed or concealed - must meet Total Volatile Organic Compound (TVOC) Limits as outlined in Green Star Design & As-Built: Indoor Environment Quality- Credit 13 - Indoor Pollutants. All floor penetrations must include a sleeve, finished off approximately 25mm AFL. Install puddle flanges where appropriate. |
| Substructure          | Floor Insulation  | D 06.02 | All floor penetrations and associated service pipes (particularly in laboratory areas), are to be fully sealed with a flexible material. Any sealant used in an internal application – exposed or concealed - must meet Total Volatile Organic Compound (TVOC) Limits as outlined in Green Star Design & As-Built: Indoor Environment Quality- Credit 13 - Indoor Pollutants. All floor penetrations must include a sleeve, finished off approximately 25mm AFL. Install puddle flanges where appropriate. |
| Substructure          | Floor Sealing     | D 06.03 | All floor penetrations and associated service pipes (particularly in laboratory areas), are to be fully sealed with a flexible material. Any sealant used in an internal application – exposed or concealed - must meet Total Volatile Organic Compound (TVOC) Limits as outlined in Green Star Design & As-Built: Indoor Environment Quality- Credit 13 - Indoor Pollutants. All floor penetrations must include a sleeve, finished off approximately 25mm AFL. Install puddle flanges where appropriate. |
| Substructure          | Reinforcement     | D 06.04 | All floor penetrations and associated service pipes (particularly in laboratory areas), are to be fully sealed with a flexible material. Any sealant used in an internal application – exposed or concealed - must meet Total Volatile Organic Compound (TVOC) Limits as outlined in Green Star Design & As-Built: Indoor Environment Quality- Credit 13 - Indoor Pollutants. All floor penetrations must include a sleeve, finished off approximately 25mm AFL. Install puddle flanges where appropriate. |
| Floor Slab            | Tolerances        | D 07    | All floor penetrations and associated service pipes (particularly in laboratory areas), are to be fully sealed with a flexible material. Any sealant used in an internal application – exposed or concealed - must meet Total Volatile Organic Compound (TVOC) Limits as outlined in Green Star Design & As-Built: Indoor Environment Quality- Credit 13 - Indoor Pollutants. All floor penetrations must include a sleeve, finished off approximately 25mm AFL. Install puddle flanges where appropriate. |
| Floor Penetrations    | Sizing            | D 08.01 | Ensure that adequate falls to floor wastes are specified and achieved. Locate floor wastes under the basin to limit ‘roll away’ for a person using a wheelchair. |
| Floor Penetrations    | Water             | D 08.02 | Ensure that adequate falls to floor wastes are specified and achieved. Locate floor wastes under the basin to limit ‘roll away’ for a person using a wheelchair. |
| Floor Penetrations    | Fire              | D 08.03 | Ensure that adequate falls to floor wastes are specified and achieved. Locate floor wastes under the basin to limit ‘roll away’ for a person using a wheelchair. |
| Slabs with Bitumen    | Membrane Surface  | D 09.01 | Ensure that adequate falls to floor wastes are specified and achieved. Locate floor wastes under the basin to limit ‘roll away’ for a person using a wheelchair. |
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| Floor Wastes          |                    | D 10.01 | Ensure that adequate falls to floor wastes are specified and achieved. Locate floor wastes under the basin to limit ‘roll away’ for a person using a wheelchair. |
| Floor Wastes          | Falls             | D 10.02 | Ensure that adequate falls to floor wastes are specified and achieved. Locate floor wastes under the basin to limit ‘roll away’ for a person using a wheelchair. |
| Floor Wastes          | Risers            | D 10.03 | Ensure that adequate falls to floor wastes are specified and achieved. Locate floor wastes under the basin to limit ‘roll away’ for a person using a wheelchair. |
| Floor Wastes          | Traps             | D 10.04 | Ensure that adequate falls to floor wastes are specified and achieved. Locate floor wastes under the basin to limit ‘roll away’ for a person using a wheelchair. |
| Expansion Joints      |                    | D 11.01 | Ensure that adequate falls to floor wastes are specified and achieved. Locate floor wastes under the basin to limit ‘roll away’ for a person using a wheelchair. |
| Expansion Joints      | Testing           | D 11.02 | Ensure that adequate falls to floor wastes are specified and achieved. Locate floor wastes under the basin to limit ‘roll away’ for a person using a wheelchair. |
### Sub-base Membrane

**D 12**

All internal ground slabs must have as a minimum, a plastic sheet membrane of 300 microns turned up at the perimeter with all joints taped. Floors and walls must be fully tanked where below grade or subject to hydrostatic pressure.

### Structural Grid

**D 13**

The Structural Grid must facilitate the operational functionality, both immediately and for the perceived life cycle of the building. The agreed operational functionality must determine the planning and sub-planning grid (300 mm).

Variance to grid dimensions below requires dispensation, and must be agreed in writing at early Concept Design Stage:
- Laboratories, 6.6 metres
- Flat floor Learning & Teaching, 8.4m or 12.6m
- Office Accommodation, 8.4m or 12.6m

### Flexibility in Space Planning

**D 14**

Load bearing elements (columns & structural walls) must, without compromising the structural integrity of the building, (including operational and equipment loading requirements), be kept to a minimum to provide flexibility in space planning.

### Protection to Finishes

**D 15**

Provide adequate protection to finishes on corners and exposed edges, particularly in areas susceptible to high volumes of people and damage from trolleys and the like.

### Disassembly

**D 16**

Structural framing, roofing and facade cladding systems: ensure at least 50% of new works are designed for disassembly. Refer to Green Star Design & As-Built: Materials - Credit 19 - Life Cycle Impacts for guidance.

### Structural Steel

**D 17.01**

In projects where at least 50% of the GFA is framed in structural steel, demonstrate that the building’s structural requirements and integrity have been achieved using 20% less steel (by mass) than conventional steel framing. Refer to Green Star Design & As-Built: Materials - Credit 19 - Life Cycle Impacts; Materials - Credit 20 - Responsible Building Materials for guidance.

**D 17.02**

Structural steel finish to be hot dipped galvanised (including all fixings). On erection of steelwork all damaged surfaces, identifying marks, bolts, and attachments are to be painted or treated with an applied finish. Prior to the application of a finish surfaces are to be cleaned.

### Columns and walls (load bearing)

**D 18**

- Where columns are exposed, treat/finish to minimise deterioration from the elements.
- Columns at the façade must not protrude into internal spaces
- Provide adequate protection to finishes on corners and exposed edges, particularly in areas susceptible to high volumes of people and damage from trolleys and the like.

**Note:** Mandatory in all delivery, loading docks and tenancy areas.

### Upper Floors

**D 19**

Tolerances must be maximum ± 3 mm in a 3,000 mm straight edge.

### Staircase

**D 20.01**

**Circulation:**
Stairs must be designed to meet or exceed the NCC and Disability (Access to Premises-Buildings) Standards, with both adult and child safety in mind.

**The design must:**
- meet the requirements of the Monash University Accessibility Aspiration Design Factors (AAD) Paige please add link
- take into account heavy use and adopt materials, finishes and components which are durable and provide economy of maintenance
- have non-slip finish to treads,
- adopt a non-scratching material for handrails
- locate light fittings such that they can be reached without the need for an elevated work platform or scaffold.

**Fire Escape:**
In addition to the above, finishes must be non-combustible.

**D 20.02**

Do not specify:
- open risers
- tensioned multi-strand metal cabling as balustrade
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| **Ramps**                  | Ramps must be designed as an integral element of the main building entrance, the overall façade, and the existing and finished levels of the surrounding area (Accessway). Ramps must:  
- Be compliant to current BCA & Disability (Access to Premises-Buildings) Standards.  
- Be compliant to current the Monash University Accessibility Aspiration Design Factors (AAD)  
- provide a minimum (clear and unimpeded) width of 1200 mm  
- provide compliant handrails and edging kerbs |
| **Roof General**            | D 21  
Roof design must be in accordance with:  
- BCA Section J1.3 Roof and Ceiling Construction  
- BCA Section J3.6 Construction of Roofs, Walls and Floors  
- SAA HB39 -1997 Installation code for metal roofing  
- SAA/SNZ HB114:1998 Guidelines for the design of eaves and box gutters |
| **Roof Types**              | D 22.01  
Pitched or curved roofs must be used in preference to flat roof systems. |
| **Roof Current & Future Roof Mounted Equipment** | D 22.02  
Consider current and future installation of addional plant, solar panels, rainwater tanks, roof gardens, etc. Consolidate new or existing plant and machinery where possible. |
| **Roof Access and Safety**  | D 22.03  
Roof design must minimise the need for ongoing roof maintenance whilst enabling building services and external features to be safely accessed, maintained and cleaned. |
| **Roof Materials**          | D 22.05.01  
Must be:  
- Readily available, Australian made  
- Self-coloured (factory applied finish)  
- Light in colour (avoid reflectance to adjoining buildings)  
- Decking must be 0.53 mm TMT Zincalume, profile must accommodate fixing clips for PV Panels without the need for drillings. |
| **Roof Materials Restrictions** | D 22.05.02  
Must not be:  
- A membrane roofing system (sheet or seamless) (Unless matching existing)  
- Tiled roofs (Unless matching existing)  
- Cause a chemical reaction from aluminium in contact with other materials |
| **Roof Colour and Design**  | D 22.06  
Roof to be light in colour to minimise heat gain. Design roof to enhance enhance internal spaces and assist in naturally ventilated or mixed mode systems. |
| **Roof Warranty Periods**   | D 22.07  
The following warranties must be provided:  
- Roofing Membranes – 20 years  
- Sheet metal – 15 years  
- Workmanship – 7 years |
| **Roof Rain and Storm Protection** | D 22.08  
The design and specification of all roofing components must be capable of withstanding a 250mm/hr IFD (Intensity Frequency Duration). This is equivalent to a 1% Annual Exceedance Probability (AEP) or a 1 in 100 year rainfall event. |
| **Roof Skylights**          | D 22.09  
Must be:  
- of a trafficable material or,  
- protected by a guardrail or,  
- protected by a galvanised wire mesh 300 x 150 spacing of 2mm strands  
- protected by a galvanized wire mesh 50 x 50 x 3.5mm strand, fixed below translucent sheeting when fixed to covered walkways or similar |
| **Roof Insulation**         | D 22.10  
Roofs must be sufficiently insulated and comply with the minimum total R value as specified in BCA Section J1.3 Roof and Ceiling Construction. Fibreglass of minimum R3.0 rating fixed so that contact is maintained with underside of roof deck. Avoid, noting health and safety issues of fibreglass insulation include cancer risk from exposure to glass fibres, formaldehyde off-gassing from the backing/resin, use of petrochemicals in resin, and environmental health aspects of production. Refer to Green Star Design & As-Built: Indoor Environment Quality - Credit 13 - Indoor Pollutants for guidance. |
| **Roof Drainage system - Siphonic** | D 22.11.01  
A Siphonic drainage system is not the preferred option. Where a siphonic system is proposed a full description and justification report must accompany any design, and dispensation sought. The design and installation must comply with the following requirements: |
# Roof Drainage System - Siphonic Design

- The system must:
  - Ensure guttering, downpipes and overflow pipes are adequately sized to deal with high rainfall events.
  - Ensure over flow pipes are separate and run independently from the primary downpipe system.
  - Test various types of systems failure and blockages to determine the impact on gutters, overflows and systems redundancy.
  - Include guards to protect inlets against intrusion of debris e.g. leaf matter or birds entering system
  - Ensure acoustic levels, measurements taken during normal and surcharged conditions require minimal attenuation measures inside the building.
  - Conserve and reuse water and be connected to a water harvesting system where required.

## Roof Drainage System - Siphonic Installation

- The system must be:
  - A proven proprietary prefabricated piping system, fully developed for the Australian climate.
  - Installed by an experienced specialist contractor, familiar with siphonic systems.
  - Installed in accordance with the approved design drawings and specification.

## Roof Drainage System - Siphonic Testing

- The system must include:
  - A test report/documentation must be submitted to provide evidence that:
    - The system has been pressure tested for extreme conditions
    - Acoustic levels, measurements taken during normal and surcharged conditions require minimal attenuation measures inside building.
    - A Leak test report/completion of installation certificate has been completed to show the system has been tested using AIR showing results from:
      - Test duration minimum of 3 minutes
      - Test pressure minimum 30 kpa pressure
      - Pressure drop over testing time
      - The system has been tested by means of a static head water test, in which no leaks were detected
      - Test duration 5 minutes - no leaks
      - The system is free of debris, defects, damage or misalignment.

### Roof Gutters & Sumps Restrictions

- Must not be:
  - Internal box gutters
- Must be:
  - 6 TMT Grade 304 stainless steel, with riveted and soft soldered joints.
  - Provided with removable mesh type leaf guard across the full area of all box gutter sumps. Guards must be made from materials that are compatible with adjacent elements.

### Roof Downpipes Restrictions

- Must not be:
  - Cast within concrete columns. (Encase in riser duct within building envelope, with access for rodding).
- Must be:
  - U.P.V.C. heavy duty (S.W. grade) or copper (“Class D”) as specified, where concealed.
  - External downpipes connected to stormwater drain by discharging over a grated pit. The pit may be of P.V.C. with an aluminium grate sized to suit downpipe min 225 x 225 square, with a dished concrete apron 150mm wide each side on consolidated F.C.R. fill. In garden areas the grate level must be at least 75mm above mulch.

### Roof Downpipes Materials

- Must be:
  - U.P.V.C. heavy duty (S.W. grade) or copper (“Class D”) as specified, where concealed.
  - External downpipes connected to stormwater drain by discharging over a grated pit. The pit may be of P.V.C. with an aluminium grate sized to suit downpipe min 225 x 225 square, with a dished concrete apron 150mm wide each side on consolidated F.C.R. fill. In garden areas the grate level must be at least 75mm above mulch.

### Roof Access Standards and Policies

- Must:
  - Meet MU OH&S policy
  - Be via stairs
  - Hatches must be sliding type
  - Locking must be in accordance with MU Keying Policy.

### Roof Access Restrictions

- Must not be:
  - Via ladders
| Roof | Fall Prevention | D 22.17.01 | All projects where the roof safety equipment is either new or reconfigured (if existing), must be approved by the University’s appointed Inspector and Certifier. Specialist Fees for the review must be borne within Project cost. Safety equipment must:
- conform with the Code of Practice: Prevention of Falls - Working on Roofs
- conform with hierarchy of controls (MU order of preference)
- Parapet
- Guardrail (fold down or static)
- Rail system
- Where required by legislation all roof safety equipment must bear compliance plates - installing contractor must provide.
- Walkways
- Design must be compatible with roofing system. Provide handrails where walkway is mounted more than 600 mm above roof, with a clear width between handrails of at least 900 mm.
- Platforms
- Allow sufficient area such that plant may be serviced without causing undue danger, stress or discomfort to technician. |
| Roof | Fall Prevention Restrictions | D 22.17.02 | Safety equipment must not include:
- anchor points
- static lines |
| Roof | Plant & Equipment Installation | D 23 | Consider current and future installation of additional plant, solar panels, rainwater tanks and the like. Consolidate new or existing plant and machinery where possible. Locate plant ‘out of line of site’ when viewed from Ground Level |
| Roof | Plant & Equipment Maintenance | D 24 | Access: Provide adequate access for routine servicing such that plant mechanic, is able to access all items safely and without undue stress or discomfort. Allow sufficient space such that work may be undertaken around each item. Where access for an operative is required under plant or platform a minimum gap of 600 mm must be left for cleaning of leaf and other debris. |
| Roof | Plant Rooms & Enclosures Locking | D 25 | Access for authorised maintenance staff only must be in accordance with MU Keying Policy. (Do not use building’s keying system) |