

Building Access for Maintainable Plant and Roof safety systems (G190)

Introduction

Working on and maintaining serviceable Plant and Equipment on a structure or building or on its roof is a hazardous task, where engineered access solutions, along with adequate access, egress and fall prevention measures to ensure safe accessibility to any maintainable item is to be provided. Additionally, all roof and/or in ceiling access systems shall be designed and installed to mitigate all risks around unauthorised access. Designers are encouraged to consult with The Department for Infrastructure and Transport (DIT) Construction Advice Group to inform their designs.

General Requirement

DIT's primary design intent is for all Serviceable Plant (typically, but not limited to: Electrical, Fire, Hydraulic and Mechanical plant), to be located in dedicated plant rooms within the building envelope, and/or be housed at ground level, in secured enclosures and/or fenced yard(s).

Where this cannot practically be achieved, the Serviceable Plant and Equipment (or their sub-components) may be located on a roof, on a Certified Engineered Structural Plant Platform, in a manner that allows the roofing to be replaced without the need for the Plant Platform, nor any of the Plant and equipment installed on it, to be removed/replaced/reinstated.

Plant Platform(s) shall not sit in, on, nor be supported in any way directly by the roof sheeting/membrane/tiles etc.

Where major plant platforms exist on roof(s) permanent stairs is recommended at all Plant platform entry points. Where access to roofs via a ladder is required, a permanent solid base/ platform shall be provided. Distances to all egress points shall not exceed 20 metres or where access is hindered due to any other risks shorter distances may be required. All plant platforms greater than 100m² shall have minimum two exit points.

NOTE: Gaining access to higher roofs from lower roofs by persons bringing their own ladders up to the lower roof, to hook onto the upper roof(s) is considered a WHS hazard, and not permissible. Permanent ladders shall be appropriately provided for such purposes/use.

AS2293 Exit/Emergency Lighting, along with suitable access and maintenance illumination, will be required for all plant areas >100m.

No maintainable items of Plant shall be located closer than 5000mm from any roof edge, where not provided with guardrailing. See section 3 for PV solar panel installations.

Where a roof pitch is $>20^\circ$, alternative access measures need to be developed by the Project and Design Team.

All design documentation and drawings are to articulate details of above for clarity to the construction contractor(s). Contractors shop drawings shall also reflect these requirements.

DIT Amended Natspec Requirement

The DIT amended Natspec establishes the Construction Requirements for the design and installation of Plant and Equipment on SA Government construction and refurbishment projects. The LPSC and their Design Team are responsible that '0193 Building Access and Safety Systems' is referenced in all Specifications for Government Projects.

Definitions

1. Plant – The word 'Plant' includes, but is not limited to:
 - a. Mechanical Plant, such as Air-Conditioning Condensers', Evaporative Coolers, Boilers, HHW Plant, Packaged AHU's, Exhaust and Pressurisation fans, along with any associated Ductwork, Dampers, Pipework connections, and valves (inclusive of all inspection points) etc.,
 - b. Hydraulic Plant, such as Fire, Hot Water Services, Solar collectors, Pipework connections and valves, etc.,
 - c. Electrical Plant, such as Solar Panels and/or Inverters, Electrical Controls, Control cubicles/boxes, Generators, Switchboards, Cabling, and/or (c) allied equipment (including any Electronics) within a facility.
 - d. All terminations and Isolation points, of serviceable components (including their electrical connections).
2. Fire Detection Equipment, includes in-ceiling fire and smoke detectors, shall be installed accessible for servicing
3. LAP – Ladder Access Point (a propriety item).
4. Plant Platform - A Plant Platform shall be an Engineered Structural steel platform mounted from Structural RHS or SHS steel sub-frames through the roof decking, to purposely designed and built structure below the roof to take the proposed loads of the Platform and associated Plant and Equipment (plus 20% spare capacity).

The Structural Platform shall be rated to the same AS1170.4, importance level as the building(s) it serves. The Safe Working Load (SWL) limit of the Plant Platform shall be clearly labelled on the platform.

NB: The Plant Platform shall also be designed and installed to have a minimum clearance gap of 600mm between the roof decking and the underside of the platform structure (to allow for access for maintenance, and a full roof replacement).

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The Platform shall be sized to adequately house all the Plant required for the project inclusive of a walkway around all serviceable areas, plus an additional 20% of physical space to allow for future Plant and Equipment. Where switchboards are mounted on roof platforms a roof over the switchboard(S) to DIT requirements shall be provided.

Walkways on the Plant Platform shall be a minimum of 1200mm wide to allow for new Plant and Equipment to be safely moved around the Plant Platform. There shall be no floor hatches, under or through a Plant Platform walkway.

Dependant on the requirements of the Plant being serviced, a minimum of 600mm clear unobstructed access space shall be provided around each of the items of Serviceable Plant, as well as a suitable access space around all serviceable items.

The Platform shall have a complete fall protection guard railing to all sides of the Platform. The plant platform shall have Steps/Stairs to provide safe access/egress to the platform (typically) from the adjacent roof walkway below/leading to the platform (or at the platform' access point). Stairs greater than 2 steps shall have a handrail.

The Plant Platform shall be designed and constructed in a manner that will allow the roof decking, to be replaced without the need for the Plant Platform, nor any of the Plant installed upon it, to be removed/replaced. The Plant Platform shall not sit on, nor be supported directly on the roof sheeting.

On Existing Buildings, further support columns/structure may need to be designed/engineered and installed within the existing structure, to facilitate the Plant Platform to be installed above the roof decking/membrane.

5. Roof Walkways - AS 1657 compliant walkway systems shall be provided across all roofing, from the roof access point, through to all serviceable plant locations.

Walkways shall not be located within 3000mm of a roof edge, if not provided with a guardrail.

Dissimilar metal protection products shall cover the entire mating surface, of the Walkway system to the roof sheeting.

6. Fixings - Where the roof profile permits, all roof mounted Plant, including walkways shall be installed via propriety Non-Penetrative Clamps to the roof sheeting.

Where the roof profile does not allow for clamps and penetrative fixings are used, they shall be installed to the crest of the roof profile, and not through the pan. Robust sealing of the roof membrane at fixing points, shall be provided.

All fixings and connection points shall be engineered and fit for purpose for the intended use.

7. Roof Hatch and the Internal ladder systems - Suitable allowance for access through any building fabric to the roof access point shall be provided from internally to the building, via a suitably sized and insulated roof access hatch.

The minimum requirement for access to a roof, shall be via an internal 60° fixed step-type ladder system, from the floor level, up to the roof sheeting. Any roof Hatch shall be compliant to AS1657, with Gas Struts provided to facilitate easy opening, and be securely pad-lockable from within the building envelope.

8. Proprietary certification plaques shall be installed at the principal entry point to any access point, noting, testing dates, manufacturers details and load ratings.
9. 'SiD' – Safety in Design, information for the Plant Platform and roof access system, shall be added into the Projects SiD documentation and manual.
10. Illumination requirements for Plant areas, shall comply to Australian Standards, however, be no less than '40 Lux' for trafficable walkways and access areas, and '160 Lux' for general work areas, typically where each of the Plants' Electrical Panels, valves, and maintainable/replaceable components, are located etc.
11. A 'shall' requirement is considered critical for the effective building operation, and/or is required under other Departmental policies (for instance, concerning safety, operations, maintainability or environmental requirements. Any deviation of this clause in the Design or Tender phases of the project must have written approval from the DIT Manager, Professional and Advisory Services. Further deviations in the Construction phase may not be considered. A request to vary a 'shall' requirement must be submitted for endorsement to the DIT Manager, Professional and Advisory Services, with a costed, Design Team justification for the variation, based on safety and design, operational and maintenance considerations.

Design Principles

On SA Government projects, the minimum requirements for the Installation of, and Safe Access to Plant and Equipment, shall be designed and provided in accordance with the following requirements:

1. Plant, internal to the building.
 - a. DIT's first preference is for all serviceable Plant and Equipment to be located in dedicated plant rooms/areas within the Building envelope.
 - b. Suitably designed Plant areas shall be spatially allowed for and designed/documentated, to cater for adequate maintenance clearance(s) whilst maintaining any required airflows for all Plant.
 - c. The design shall allow for a minimum additional 20% future physical Plant capacity, along with its access requirements etc.
 - d. All Plant shall be installed in a manner to not hinder safe maintenance access or breach manufacturers installation requirements or Standards.
 - e. Dependant on the requirements of the Plant being serviced, a minimum of 600mm clear unobstructed walkway, shall be provided around each of the items of Serviceable Plant.

2. Plant, external to the Building and to be ground mounted.
 - a. DIT's second preference, is for serviceable Plant and Equipment to be ground mounted on suitable Plinths and located in ground mounted dedicated (Plant) enclosures and/or fenced yard(s) designed and constructed to mitigate unauthorised access
 - b. The enclosures and/or fenced yard(s) shall be suitably designed to allow for required maintenance clearance(s), safe operation, and the required airflows for all Plant.
 - c. All enclosures, fences, and acoustic treatments provided, shall be non-combustible, and installed to not hinder maintenance access or breach manufacturers installation requirements or Standards.
 - d. The design shall allow for a minimal additional 20% future physical Plant capacity, along with its access requirements etc.
 - e. Informative: AS/NZS1680 compliant lighting should be provided.

Design and Installation Requirements

Where:

- i. a roof needs to be accessed for maintenance, or
- ii. the installed/proposed Plant and Equipment cannot be reasonably located in dedicated plant rooms within the building envelope, and/or installed at ground level in secured enclosures and/or fenced yard(s),

the following typical roof access and plant installation scenarios shall apply:

1. **Single storey building, where NO plant exists on a roof (and where level and permanent unobstructed access around the perimeter of the building is not available):**
 - a. Access to a roof for cleaning of gutters etc., shall be via a propriety Ladder Access Point (LAP), located in a safe area. The maximum permissible LAP height is 3500mm (nominal) above finished ground level.
 - i. Where this is not achievable, an internal stair/ladder system shall be provided.
 1. Where this is not achievable, a permanent external 70⁰-75⁰ cage ladder compliant with AS 1657 and with robust security provisions to mitigate any unauthorised access shall be provided.
 - b. A fixed proprietary roof mounted guardrail system following an AS 1657 compliant walkway shall be installed from the roof edge at the LAP, leading away from the live edge, for a minimum distance of 3000mm.
 - c. A Static Line Access System shall be provided to allow persons to safely access the areas, within 3000mm from the live edge to all of the roof gutters where a fall risk exists.

- i. A Draft fall rescue plan shall also be developed by the installing Contractor and be included in the SiD documentation.

d. Where a roof pitch is $>20^\circ$, alternative measures need to be developed.

2. All Buildings/Structures, where Plant is proposed, (or exists) on a Roof.

- a. With the exception of a Solar Panel installation, a roof level engineered Plant Platform shall be provided for all maintainable Plant to be installed upon.

No Plant is permitted to sit on the roof sheeting/fabric.

- (a) An exemption is permitted, for applications where a single item of Plant ($<200\text{kg}$) is proposed to be mounted on a roof, on an engineered HVAC type of platform. The platform is to be mounted across the crest of the roof profile, and not in the pan.

For further guidance, refer DIT Design Guideline DG-41

Note: Where multiple items are proposed, a request to vary this exemption must be submitted for endorsement to the DIT Manager Professional & Advisory Services for approval.

- b. Roof access shall be provided via an internally located AS1657 compliant access roof hatch system and a permanent stair/ladder system.
 - (a) Where this cannot be achieved, a permanent (lockable) external stair, or 70° - 75° cage ladder compliant with AS 1657 and with robust security provisions to mitigate any unauthorised access shall be provided.
- c. A fixed proprietary roof mounted guardrail system shall be installed around the roof access point. Such a system would continue leading away from a live edge, for a minimum distance of 3000mm from the live edge(s).
- d. A walkway system shall be provided from the roof access point and continue through to all Maintainable items of Plant.
- e. The items of plant must not be located within 5000mm from a roof edge if not provided with a guardrail, refer *General Requirements*.
- f. A Static Line Access System shall be provided to allow persons to safely access the areas, within 3000mm from the live edge to safely access all of the roof gutters.

3. PV Solar installations:

The distance to edge for plant without providing guard railing may be reduced to 3000mm for PV solar panels only, providing the maintenance walkway is at least 3000mm from the roof edge. Walkways may need to be located on the inner side of panels to also achieve their 3000mm edge clearance.

- a. Safe roof access shall be provided via an internally located AS1657 compliant access roof hatch system and a permanent stair/ladder system.
 - (a) Where this cannot be achieved, a permanent (lockable) external stair, or 70⁰-75⁰ cage ladder compliant with AS 1657 and with robust security provisions to mitigate any unauthorised access shall be provided.
- b. A fixed proprietary roof mounted guardrail system shall be installed around the roof access point. Such a system would continue leading away from a live edge, for a minimum distance of 3000mm from the live edge(s).
- c. A walkway system shall be provided from the roof access point and continue through to all Maintainable items of Plant. The walkway system shall be designed so that no more than 2 panels can be safely accessed for cleaning (thus 4 solar panels can be placed between each 2 rows of walkway, to allow cleaning 2 panels up the roof, and 2 panels below, from the walkway).
- d. A Static Line Access System shall be provided to allow persons to safely access the areas, within 3000mm from the live edge to safely access all of the roof gutters.

4. Plantrooms - Including 'On Grade' Level, and/or Roof level Plantrooms on a building:

- a. On a building where a new Roof level Plantroom is proposed/provided, which houses multiple items and/or components of Plant, the minimum requirement for access to the roof level Plantroom shall be via Grade level access to a floor of the Building, and/or via an internal (National Construction Code approved) 45° (minimum) stairway, leading persons to the roof level.
- b. On a building where an existing Roof level Plantroom is considered suitable to be reused, the existing access system may be considered acceptable for reuse, if provided with existing fixed access system(s) from existing/proposed floor level(s), and additional fall protection as per Clause 3.7 is provided.
- c. Informative: AS/NZS1680 compliant lighting should be provided.

5. SA HEALTH Projects:

Plantrooms (including Roof level Plant rooms) on a large (>500m²) SA Health facility, where a new Roof level or other Plantroom(s) are proposed to be provided to house multiple items and components of Plant.

The minimum requirements for access to plant room/platform shall be:

- a. Via an internal (National Construction Code approved) 45° stairway.
- b. And also, via a Lift if available (and ideally a dedicated Goods Lift).

6. Correctional Facilities:

Plantrooms (including Roof level Plantrooms) on a building greater than 500m² and/or a Multistorey building, where a new Roof level Plantroom(s) or other Platforms are to be proposed, to house multiple items and components of Plant, the minimum requirements for access to plant area shall only be via a secure and internally accessed (National Construction Code approved) 45° stairway.

On a building where an existing Roof level Plantroom is considered suitable to be reused, the existing access system may be considered acceptable for reuse, if provided with a Standards compliant fixed access system from an existing floor level(s), and for Serviceability purposes, that additional fall protection as detailed in dot points 3 and 4 of this Guidenote shall apply.

- a. Furthermore, the Lead Agency and Facility Manager shall be consulted on their ongoing operational requirements on a case-by-case basis.
- b. Informative: AS/NZS1680 compliant lighting should be provided.

7. Department for Education (DfE):

- a. Refer to DfE Design Guidelines for additional requirements.

8. Voids, skylights, and other fragile roofing:

- a. Consideration shall be given to the installation of a proprietary guardrail system to the edges of any internal void areas, to prevent inadvertent access to these areas. The consideration shall be the result of a formal and documented Risk Assessment (to be included in the SiD documentation)
- b. All skylights and fragile roofing shall be provided with Standards compliant fall protection systems. This includes propriety skylight systems (as *Velux™*, etc.).
 - a. Glazed skylights will not be accepted without an inherent, Standards Compliant fall protection medium being provided. Preference is for the fall protection medium to be by the same manufacturer as the skylight.
 - b. Design Teams should consider the aesthetics, along with any NCC Section-J requirements, and Site Security Risks, in the final selection of skylights along with any proposed fall protection solution. Final selections shall be undertaken and documented in the design phase of the project.
- c. Prominent signage shall be provided along the edges of all skylights, polycarbonate sheeting, and/or any other form of fragile roof areas, to prevent inadvertent access to these areas. A formal Risk Assessment shall be conducted to determine the final spacing/locations of such signage.
- d. For new projects, or where new plant and/or equipment is proposed, in locations where fragile roof sheeting is proposed or exists, suitable access propriety walkways shall be provided over the fragile sheeting to allow persons to safely transverse the roof.

Notes

- a) The installation of external ground mounted Air-Conditioning Condensers is still permitted in propriety/custom galvanised metal vandal resistant condenser cages on concrete plinths. Each cage is to service a single piece of plant alone. DIT wish to avoid situations, where such installations are requiring cages around multiple condensers, to satisfy these requirements.

The Designer/Installer of such Condenser cages shall consider the weight of the removable sections/cage gates along with the Projects' LPSC and Facility Manager(s) (FM) regarding how maintenance staff will ongoingly need to remove or open these portions of the cage assembly. Any removable section/door shall be no heavier than 10kg's. Removable sections/doors heavier than 10kg's, shall be hinged. Additionally, all such design details and decisions shall formally be recorded and included in the Projects' SiD documentation.

In addition, the location of the plant and cages shall not create a climbing point that allows fortuitous entry to roof areas or fenced/secure areas.

Refer to DPTI Design Guides: DG23, DG24, and DG25.

- b) Where multiple plant exists, the inclusion of a secure and serviceable plant enclosure shall be provided.
- c) Caution needs to be factored that cage access hatches are serviceable by one technician, do not hinder or breach manufacturers requirements and do not provide a climbing risk and access to roofs.

Contact

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