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Loading on Flat Roofs

Flat roofs are an ideal location for plant and equipment. The type and location should be established at the earliest possible stage. Access requirements to plant, and weathering of access points should also be agreed.

This will allow informed decisions to be made on the most appropriate roof waterproofing system and selection of suitable components. Whilst late changes are often necessary to plant in terms of type and layout, if likely, selection of a suitable support arrangement will help reduce the risk of damage to the roof covering, or delays in the installation programme.

Loading types:

Dead loads: Dead loads, known as permanent or static loads, remain relatively constant, such as the structure's self-weight. Including the weight of any structural elements, permanent non-structural partitions, immovable fixtures such as plasterboard, built-in fixtures and so on.

Live loads: Live loads or imposed loads, are usually temporary, changeable and dynamic. These may vary and can derive from vehicle traffic, foot traffic from occupants, furniture and other equipment.

Snow load: Imposed by the accumulation of snow, these are more of a concern in geographic regions where snowfall can be heavy and frequent. Significant quantities of snow can accumulate, adding a sizeable load to the structure. The shape of a roof is a particularly important factor in the magnitude of the snow load. Snow falling on a flat roof is likely to accumulate, whereas snow is more likely to fall off a steeper roof pitch.

Ponding: There may be similar issues in areas of heavy rainfall or roofs with inadequate falls, where ponding can occur, affecting the load on the structure.

Wind load: Applied by the movement of air relative to a structure. Analysis draws upon an understanding of meteorology and aerodynamics as well as structures. The effects of wind load gain importance with height, the use of lighter materials and the use of shapes that my affect the flow of air, typically different roof forms. Where the dead weight of a structure is insufficient to resist wind loads, additional structure and fixation is necessary. For flat roofs they will normally be secured to the structure using adhesion or mechanical fixings, unless they are buried roofs, with suitable green or surface finishes, as used in balconies, terraces or amenity spaces. Where the surface finish provides sufficient ballast weight some elements of the roof system may be loose laid.

A building's design wind speed is usually determined from local standards and historical records to predict worst case wind speeds that may occur in the future.

Particular consideration is given to the increased wind pressures that occur around the corners and exposed edges of buildings.

It is common practice to carry out analysis using wind loading software to assess the specific wind loads on a project. In complex situations, it may be necessary to undertake wind tunnel testing of building forms to assess the change in air flows caused by the presence of a structure.

General Advice:
Seek advice from a Structural Engineer for structural strength and limitations on the structure of the roof and the allowable loadings on the roof decking.

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Compressive Strength:
Compressive strength of typical insulation materials is shown below;

- **Moy Paratherm PIR:** Typically exceeds 150 kPa at 10% compression. The maximum design load for a Moy PIR foam core board (e.g. Paratherm T, G or F) is @ 3,000 kg/m^2 (subject to the deck calculations also being able to withstand the additional loadings)

- **Moy Hardrock® Multi-Fix (DD) mineral wool:** Typically exceeds 70 kPa at 10% compression and must not exceed a loading of 500 kg/m^2.

- **Moy Foamglas® Cellular Glass:** T3+ typically exceeds 500 kPa, T4+ 600 kPa, S3 900 kPa and Foamglas F 1,600 kPa. However, Foamglas is tested according to EN826 Annex A, which specifically outlines the test method to define the uniform load bearing capabilities of insulations which do not compress before the load capability is recorded. Foamglas meets the EN826 Annex A requirement. All other insulation types achieve the basic EN 826 test criteria which allows for the insulation to compress and deform at between 10% - 15% compression.

- **Moy Aquapanel®:** Installed as an insulation coverboard, Aquapanel® cement board helps spread loadings on the roof waterproofing system from plant equipment, M&E or pedestrian foot traffic. Whilst this helps provide additional protection, the limiting factor will ultimately be the compressive strength of the insulation type specified below. Aquapanel® also provides increased resistance to impact and has the benefit of being a non-combustible RtF (Reaction to Fire) Class A1 roof board.

The compressive strengths shown above are the UDL worst case breakpoint. Use an appropriate safety factor when determining the working/allowable loads.

Protection against live loads:
It is critical that the distribution of any weight imposed on a roof is spread evenly. Contact areas should be free from debris. Check roof surface and live load surface for sharps or anything which may cause puncture. Use protective fleece and timber sheets in order to provide suitable protection against foot traffic during construction, or in areas of the roof that are used to store materials.

Removal of live loads:
Carefully remove protective timber sheeting and fleece. Inspect the waterproofing for punctures, scratches or stress. Damaged waterproofing must be rectified immediately by a qualified roofer authorised by Moy and installed to the specified standards.

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Proprietary plant support systems:
With Moy's RoofPro plant support system we recommend not exceeding 460 kg on a base of 457mm x 457mm. This equates to a pressure of 2,200 kg/m^2, including a factor of safety.

It is important to consider the design of the feet being used, as not all are the same. Some bases utilise a socket for accepting a Unistrut rail, so create an uneven pressure bulb that can result in deformation. Other bases do not allow the base to pivot with the roof slope and this creates a 'knife edge' load which may damage the membrane.

In the case of using any other system please seek guidance from Moy Technical Services.

Membrane Protection:
Moy always recommend an appropriate sacrificial membrane is placed under any plant support bases in order to help prevent damage to the waterproofing.