



Flood Testing

Upon completion of a roof installation, many owners wish to verify the integrity of construction prior to “taking possession”. Some designers and consultants specify that a flood test of the roof be carried out as a means of assuring that the roof has been properly built. The CRCA National Technical Committee does not support this practice, believing that flood testing is not a reliable quality assurance method and that the risks associated with flood testing far outweigh any potential benefits.

Flood testing will not provide useful information about the quality of the roof design or installation, nor about the durability of the materials used. It may, if the depth of water is sufficient, indicate whether there is a breach in the membrane, but it will not confirm the overall ability of the roof to provide satisfactory service throughout its expected service life. The ability to resist wind and impact loads, to remain dimensionally stable, to resist temperature induced stress and numerous other attributes are as important for the long term performance of the roof.

Flood testing can cause irreparable damage to the roofing system, or even the supporting structure. Water weighs 1000 kg/m³ (62.4 lb/ft³). If a flood test calls for a depth of 50 mm (2 in), it would add 50 kg/m² (10 lb/ft²) to the dead load. However, most roofs, when properly constructed, are positively sloped to drains. CRCA together with many other industry organizations, recommend a minimum slope of 2%.

A simple example will demonstrate how this will significantly increase the load on the roof. Assume a roof is divided into basins of 15 m (50 ft) in length and width. Also assume that it is sloped at 2% to a drain in the centre of the basin. We know that the water, having a density of 1000 kg/m³ (62.4 lb/ft³), covering the roof with a uniform depth of 50 mm (2 in) weighs 50kg/m² (10 lb/ft²). Over the entire area of the roof basin (225 m², or 2500 ft²) the standing water at a uniform depth of 50 mm (2in) would weigh 11250 kg (25,000 lb). The additional volume of water in the basin resulting from the slope is 1/3 (15 m x 15 m x 0.15 m) = 11.25 m³ (400 ft³) which weighs a total of 11,250 kg (25,000 lb), or 50 kg/m² (10 lb/ft²) if divided uniformly over the roof. The total combined uniform weight of the water is, therefore, approximately 100 kg/m² (20 lb/ft²). The capacity of roofs constructed to near their design load limits may be exceeded by this weight of the water.

Properly constructed low-slope roofs are positively drained and are not designed to withstand large hydrostatic pressure loads. Fifty millimetres of water over the roof will exert a static fluid pressure of ≈ 72.5 kPa (10.5 psi). The pressure increases to over 215 kPa (31.25 psi) when the depth increases to 150 mm (6 in), as would occur over the drain sump as in the example of a sloped basin.

Although a membrane properly supported in the field of the roof should be able to resist these pressures, transitions and joints that rely on sealants, compression bars etc, may fail under such loads resulting in leakage. Should there be a weakness in the membrane, transitions, or edges of the roofing system, significant water ingress may occur, damaging the roof components, interior finishes and building contents. It should also be remembered that in the event of a leak occurring, it could not be stopped until all of the water is effectively drained from the roofs. By then the damage will have been done.

The safety of those individuals conducting the flood test must also be considered. A roof covered in water is difficult and hazardous to walk upon. When the drain plug is removed, the force of the draining water has sufficient force to suck a worker's arm into the drain causing serious injury. In addition, the force of the whirlpooling water may damage drain and pipe connections. Although flood testing is not recommended for roof applications, it may be a useful method for determining the integrity of waterproofing systems. Waterproofing systems are designed and constructed to resist substantial hydrostatic loads while in service. By example, the National Roofing Contractors Association

(NRCA) recommends a minimum of 5 plies of reinforcement in an asphalt built-up membrane where the anticipated hydrostatic pressure head that needs to be resisted is 7.9 to 15.2 m (26 to 50 ft). Due to the difficulty in uncovering a waterproofing membrane, it is prudent to conduct a flood test to verify that they will be leak free under such loads.

For roofing applications, however, where such pressures are not expected during service, flood testing will provide little useful information about the performance properties of the roof. There are many alternate non-destructive methods of evaluating the quality of the roof system that are far more reliable —Infrared Thermography, Electrical Capacitance (Impedance) Testing, Nuclear Moisture Testing and Electric Field Vector Mapping. The National Technical Committee of CRCA believes, however, that the most effective means of ensuring the satisfactory performance of the roof is by hiring a reputable roofing contractor and on-site monitoring of the installation by a knowledgeable roof observer.

Note: Much of the information contained in this Advisory Bulletin is taken from an article by J.P. Crowe, titled *Water, Water Everywhere* that appeared in the February 2006 issue of Professional Roofing. Information on how to acquire a copy of the entire article can be obtained at www.professionalroofing.net.

The opinions expressed herein are those of the CRCA National Technical Committee. These Technical Bulletins are circulated for the purpose of bringing roofing information to the attention of the reader. The data, commentary, opinions and conclusions, if any, are not intended to provide the reader with conclusive technical advice and the reader should not act only on the roofing information contained in these Technical Bulletins without seeking specific professional, engineering or architectural advice. Neither the CRCA nor any of its officers, directors, members or employees assumes any responsibility for any of the roofing information contained herein or the consequences of any interpretation which the reader may take from such information.