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SAFETY OF ROOF STRUCTURES

When an engineer begins to design a structure that is expected to be placed under stress he looks first of all to the stress-strain relationship characteristic of the structural material. That characteristic describes first of all the reversible elastic deformation followed by the irreversible components: plastic deformation and eventually ductile or brittle fracture. In designing to the limit, the engineer will often prescribe a stress that produces about one-half of the allowable elastic deformation. In the case of roof beams, for example, this will lead to look-up tables of beam materials, cross-sections, and length, coupled with recommended elastic deflections and hence permissible loads

The building permits will typically boil all this down to a specification of permissible roof loading. So in practice today when a roof load comes under scrutiny, e.g. after a heavy snow-fall, a technician will climb onto the roof and take load samples from place to place across the roof. This practice has at least two significant drawbacks: (i) not all of the roof can be examined in this way, (ii) unsuspected weakness stemming from age or construction defects will not be revealed. Furthermore "load" per se is not the primary factor; permissible load is based on the permissible deflection upon which the initial building design was based. So ***deflection*** should be considered a "reference standard", and a key part of an overall assessment. Deflection monitoring looks at real performance of the roof in response to applied loads (snow, ice, water, etc.) so any system that can monitor deflection will enable the owner to ensure that the roof is operating within its safe limit.

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