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Abstract This paper is concerned with the preliminary application of a non-probabilistic tool, called an Info-Gap method (IGM), to the stability design under severe uncertainty for coping with the spalling property in the hard rock tunnel. Such a tool for the reliability-based design of tunnel stability having severe uncertainty is illustrated non-probabilistically on the basis of a deterministic mechanical model involving the slab-strip failure caused by the surrounding hard rock spalling. In the presented IGM, the non-probabilistic reliability analysis was explored, which elaborates how the Info-Gap modelling can be employed, and then how the reliability can be assessed non-probabilistically with the aid of the robustness function. On this basis, one type of reliability-based design chart relating the thickness of a single slab-strip to the spalling property of the chosen hard rock tunnel example was developed. This proposed non-probabilistic IGM can make the reliability-based design in the tunnel community have a possibility to be conducted when the probabilistic representation of uncertainty seems to be difficult due to extremely insufficient information.

Keywords Hard rock tunnel, Non-probabilistic reliability, Info-gap method (IGM).