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Borehole geometry:
Gradient Elasticity vs. Finite Fracture Mechanics

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Two nonlocal approaches are applied to the borehole geometry, that is a circular hole under internal pressure. The former approach lays in the framework of Gradient Elasticity (GE), which is based on a nonlocal constitutive relationship [1]. Changing the stress field as the geometry (i.e., the radius of the hole) varies, the related stress concentration factor is considered as the controlling failure parameter. The latter approach is the so-called Finite Fracture Mechanics (FFM), well-consolidated in the framework of brittle fracture of notched structures [2]. The failure condition is no more singular at a point, but is achieved only when two average requirements on the stress and the energy ahead of the notch tip are fulfilled simultaneously. Both approaches are based on a material's characteristic length. When properly defined, GE and FFM predictions are in excellent agreement with each other and with experimental data on rock materials [3].

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