Testing of a full-scale building under external blast

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ABSTRACT: Building structures should have sufficient robustness to resist progressive collapse that can result from localized failures (e.g. due to blast). However, current codes governing the design for robustness are rather generic and have limited provisions ensuring that structures withstand the exposure to such threat. Due to the complexity of the phenomenon (blast pressure, dynamic response, level of damage, residual capacity, propagation of collapse), the experimental validation of full-scale models may still be necessary for the development of numerical or analytical tools. An ongoing national research project, aiming to develop and validate numerical models for predicting the blast response of a steel framed building is under development. The building will be subjected to blasts (TNT or equivalent) with different charge sizes and locations, resulting in different scaled distances. As the scaled distance reduces, the peak overpressure increases, thus causing the shear failure of the elements located in the proximity. The potential for progressive collapse following local damage will be also investigated.
The paper presents the result of a numerical study that investigated the structural response of the building for different combinations of charge weights, standoff distances and levels of gravity load on the building floors. The preliminary validation of the numerical model is done using the results of blast tests, which were performed on similar steel frames within a previous research project.

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