CALCULATIONS OF THE RESPONSE OF A FLAT PLATE STRUCTURE TO A COLUMN REMOVAL

K. B. Morrill[1], C. S. Sheffield[2], A. M. Kersul[3], J. E. Crawford[1],
T. R. Brewer[1], S. Lan[1]

[1]Karagozian & Case, 700 N Brand Blvd., Suite 700, Glendale, CA, 91203, USA;
[2]Applied Research Associates, Inc.., 4300 San Mateo Blvd NE Suite A220, Albuquerque, NM, 87111, USA;
[3]Defense Threat Reduction Agency, 1680 Texas St. SE, Kirtland AFB, NM, 87117

ABSTRACT

The Defense Threat Reduction Agency (DTRA) performed a test series on a reinforced concrete flat plate structure in order to demonstrate the global response of the structure when a column was removed (i.e., missing column). The primary objectives of the tests were to determine the magnitude of the gravity load that would cause collapse of the structure and to generate a suite of response data to be used to develop and validate computational models for this type of event. Numerous high fidelity physics based (HFPB) finite element (FE) models were developed and used for scoping calculations to support test planning, instrumentation planning, and providing pre-test predictions and post-test analysis for the purposes of validating the sorts of analytic models that are appropriate for computing response for RC flat slab systems. Two tests were conducted; the first was done with no loads on the structure and the second was conducted with a 75 psf load applied to the structure. Calculations of the responses of these tests were conducted using the HFPB code, LS-DYNA. The K&C concrete model (KCCM) was used to represent the concrete in these calculations. This paper presents the results of the calculations supporting the development of the test plan and compares the test data to the calculations. Overall, the test results were used to update the model which provided calculations capable of adequately representing the test results.