FEMA'S BENEFIT COST-ANALYSIS TOOL FOR SEISMIC NON-STRUCTURAL PROJECTS

General Guidance

The purpose of this document is to provide potential subapplicants with general guidance on FEMA's Hazard Mitigation Assistance (HMA) benefit-cost analysis (BCA) tool. The BCA is a required subapplication component. This guidance is not intended to provide complete information, but rather to outline basic requirements and considerations as subapplicants begin the analysis process. Cal OES is available to answer technical questions about BCAs and can be contacted by emailing HMA@caloes.ca.gov.

Seismic Non-Structural Projects Benefit-Cost Analysis

Seismic non-structural projects anchor or brace non-structural elements of a building including ceilings, electrical cabinets, elevators, fire sprinkler systems, HVAC equipment and ducts, racks and shelves, parapets and chimneys, raised floors for data centers, computers and information technology equipment. Non-structural elements are building contents and elements that are not structural elements of the building.

BCA Software and Methodology

FEMA requires the use of its BCA software (version 6 for all BCAs). Subapplicants can get the software by visiting FEMA's Benefit-Cost Analysis Guidance and Tools website: https://www.fema.gov/media-library/assets/documents/179903.

Analysts should select *Seismic* as the hazard type, and *Non-Structural* as the mitigation action type. The software includes three approaches, only two of which generally apply to seismic projects. The first is *modeled damages,* in which the analyst selects various input parameters and enters data related to loss of function and occupancy, and the software calculates the benefits of the project. The second is *expected damages,* in which the analyst must establish a series of relationships between earthquake frequencies and likely damages. The third is *historic damages,* which seldom applies to earthquake projects, but is based on the same approach as *expected damages.*

Seismic Non-Structural Projects

Data used in the Analysis

This subsection is intended as a general summary of data requirements for seismic structural BCAs. In order to complete a non-structural seismic retrofit BCA, you must have the following information (this is not intended as a comprehensive list):

1. Address or latitude and longitude.
2. Project scope and description.
3. Structure type (drop list).
4. Hazard type (drop list; seismic).
5. Mitigation action type (drop list).
6. Project useful life. Refer to the Help menu in FEMA's BCA software that provides additional information on project useful life values. The information may also be found in the 2009 FEMA BCA Reference Guide.
7. Project cost and annual maintenance cost.
8. Soil type (for the modelled damages path only).
9. Details about the building and components included in the project (for the modelled damages path only).
10. Facility occupancy (for the modelled damages path only).
11. Frequency/damage relationships for at least two potential earthquake events (for both before- and after-mitigation scenarios; for the expected damages path only).

Benefits

Benefit categories included in non-structural seismic retrofits typically include the repair or replacement costs for each element and the economic loss of service of the building. If the *modeled damages* path is used, the software also incorporates death and injury values, though these are typically negligible for non-structural projects.

Project Effectiveness

Project effectiveness is the extent to which a mitigation activity reduces future damages. The *modeled damages* path provides post-mitigation damage functions (which indicate the project's effectiveness), whereas in the *expected damages* path, the analyst must enter values for post-project damages, lost function and deaths/injuries (as applicable).

Documentation

Cal OES and FEMA require subapplicants to provide documentation for all data that is used in a BCA. This must be included with the materials that are submitted as part of the application package.

Best Practices

Cal OES strongly recommends that each subapplicant BCA be supplemented by a brief technical report that summarizes the approach to the analysis, the data that was used, the sources of the data, and the results of the analysis.

Ideally, every data point entered into the software will be explained in a technical report and backed up with written documentation.

Seismic Non-Structural Projects