

## Data Documentation Template and Checklist

### Tornado Mitigation FEMA Standard Analysis Methodology

This data documentation template is designed to assist Benefit-Cost (BC) analysts in recording the data and methodologies utilized in their Benefit-Cost Analysis (BCA). BC analysts should keep in mind that a well-documented BCA means that a knowledgeable BC analyst should be able to re-create the BCA from the supporting documentation provided (with a Mitigation application submitted for funding) without any additional explanation. BC analysts should provide an electronic or paper copy of the full BCA to compliment any template or summary submitted to FEMA for review. Check with your State Hazard Mitigation Officer or FEMA Regional office to find out if a completed Data Documentation Template (DDT) is required with your grant application.

Data Type	Value	Description	Documentation	Source
<b>State</b>	Text, name	<ul style="list-style-type: none"> <li>Name of State where project is located.</li> <li>Required for the software to use default probability and severity data.</li> </ul>	<ul style="list-style-type: none"> <li>None required.</li> </ul>	<ul style="list-style-type: none"> <li>Sub-applicant.</li> </ul>
<b>County</b>	Text, name.	<ul style="list-style-type: none"> <li>Name of County where project is located.</li> <li>Required for the software to use default probability and severity data.</li> </ul>	<ul style="list-style-type: none"> <li>None required.</li> </ul>	<ul style="list-style-type: none"> <li>Sub-applicant.</li> </ul>
<b>Building Longest Length</b>	Length in feet	<ul style="list-style-type: none"> <li>Length of longest side of building in feet.</li> <li>Software uses this information to determine the likelihood of the building being impacted by a tornado.</li> </ul>	<ul style="list-style-type: none"> <li>If estimated or measured, but include a description of estimate method.</li> <li>If determined by review of written materials, reference materials used, and date of the document[s].</li> </ul>	<ul style="list-style-type: none"> <li>May be determined by measurement, estimation, or review of architectural or engineering plans.</li> </ul>

<b>Data Type</b>	<b>Value</b>	<b>Description</b>	<b>Documentation</b>	<b>Source</b>
<b>Building Longest Width</b>	Width in feet	<ul style="list-style-type: none"> <li>• Width of building in feet.</li> <li>• Software uses this information to determine the likelihood of the building being impacted by a tornado</li> </ul>	<ul style="list-style-type: none"> <li>• If estimated or measured include a description of estimate method.</li> <li>• If determined by review of written materials, indicate materials used, and the date of the document[s].</li> </ul>	<ul style="list-style-type: none"> <li>• May be determined by measurement, estimation review of architectural or engineering plans.</li> </ul>
<b>Shelter Area</b>	Square feet	<ul style="list-style-type: none"> <li>• The area of the tornado shelter that is being constructed</li> </ul>	<ul style="list-style-type: none"> <li>• Include a description of estimate method.</li> <li>• If determined by review of written materials, indicate what materials were used, and the date of the document[s].</li> </ul>	<ul style="list-style-type: none"> <li>• Engineer, architect or contractor who is responsible for shelter specifications (Generally this should come from an engineering design estimate.).</li> <li>• Should conform to FEMA standards [see FEMA Publication No. 361]</li> </ul>
<b>Shelter Construction Type</b>	If using FEMA software, drop list default selection is provided.	<ul style="list-style-type: none"> <li>• Indicates construction type and materials that will be used in the shelter.</li> </ul>	<ul style="list-style-type: none"> <li>• Reference or provide copy of engineering or architectural specifications used.</li> </ul>	<ul style="list-style-type: none"> <li>• Engineer, architect or contractor who is responsible for shelter specifications.</li> </ul>
<b>Hurricane Shelter Occupancy</b>	Number of people	<ul style="list-style-type: none"> <li>• The occupancy for which the shelter is designed. Enter only in areas where there is hurricane risk in addition to tornado risk.</li> <li>• Can be calculated based on square footage of the shelter, dividing this figure by the FEMA standard for area per individual in a shelter. [see FEMA Pub. No. 361]</li> </ul>	<ul style="list-style-type: none"> <li>• Various forms are acceptable. The preferred documentation is a letter from a qualified source stating the occupancy.</li> <li>• The occupancy can also be estimated, if the method for doing so is clearly explained.</li> </ul>	<ul style="list-style-type: none"> <li>• Facility manager, building engineer, fire marshal, local building inspector.</li> <li>• The individual who provided the estimate.</li> </ul>

<b>Data Type</b>	<b>Value</b>	<b>Description</b>	<b>Documentation</b>	<b>Source</b>
<b>Tornado Shelter Occupancy</b>	Number of people, by hour of day	<ul style="list-style-type: none"> <li>In the FEMA software this is the same as the occupancy of the building, which is simply the number of people in the facility at various times of the day.</li> </ul>	<ul style="list-style-type: none"> <li>Various forms are acceptable. The preferred documentation is a letter from a qualified source stating the occupancy.</li> <li>The occupancy can also be estimated, if the method for doing so is clearly explained.</li> </ul>	<ul style="list-style-type: none"> <li>Facility manager, building engineer, fire marshal, local building inspector.</li> <li>The individual who provided the estimate.</li> </ul>
<b>Time Zone</b>	If using FEMA software, drop list default selection is provided.	<ul style="list-style-type: none"> <li>Time zone in which the facility is located.</li> </ul>	<ul style="list-style-type: none"> <li>No documentation required.</li> </ul>	<ul style="list-style-type: none"> <li>Not applicable.</li> </ul>
<b>Tornado Hazard Information</b>	Select Radius by counties or entire state.	<ul style="list-style-type: none"> <li>The software will indicate whether there has been sufficient number of tornados, in the counties selected, to compute hazard statistics.</li> </ul>	<ul style="list-style-type: none"> <li>Indicate method used.</li> <li>Unless there are site-specific conditions that justify modifying the software selected counties according to a specified radius, the User Selected Counties option is normally not used.</li> </ul>	<ul style="list-style-type: none"> <li>Software contains database of tornado hazard information for each county (collected by NOAA).</li> <li>Site specific hazard report, or individual who provided the estimate.</li> </ul>

<b>Data Type</b>	<b>Value</b>	<b>Description</b>	<b>Documentation</b>	<b>Source</b>
<b>Mitigation Project Cost (includes data inputs for net mitigation project cost and additional annual maintenance cost (\$/yr) for a project)</b>	Total dollar value	<ul style="list-style-type: none"> <li>Estimated total cost of the proposed mitigation action <b>(not just the Federal share)</b> and any maintenance activities that will be done to prolong effectiveness.</li> </ul>	<ul style="list-style-type: none"> <li>Narrative summary in the BCA module should state that this value comes from a potential or submitted project application.</li> <li>Sub-applicant should provide a detailed cost breakdown, rather than a lump sum value, from an engineering cost estimate.</li> <li>Must document source and reasoning in estimate of maintenance activity cost.</li> <li>Should support the value submitted with project application.</li> </ul>	<ul style="list-style-type: none"> <li>Should support the value submitted with the project application.</li> <li>Government representative or private professional with expertise relevant to the proposed project.</li> <li>For maintenance values, see Government representative or private professional with expertise relevant to the proposed project.</li> </ul>
<b>Mitigation Project Useful Lifetime</b>	Years	<ul style="list-style-type: none"> <li>Estimated amount of time that mitigation action will be effective.</li> <li>Includes any maintenance activities that will be done to prolong effectiveness).</li> </ul>	<ul style="list-style-type: none"> <li>Reference FEMA standard value if utilized.</li> <li>If FEMA standard value is not then include a justification of the value entered.</li> <li>May also attach a letter, e-mail, etc. from credible agency documenting this estimate (if resource other than FEMA standard value).</li> </ul>	<ul style="list-style-type: none"> <li>FEMA BCA Guidance, Page 27.</li> <li>BCA Checklist, Page 14.</li> <li>Government representative or private professional with expertise relevant to the proposed project.</li> </ul>

<b>Data Type</b>	<b>Value</b>	<b>Description</b>	<b>Documentation</b>	<b>Source</b>
<b>Discount Rate</b>	<b>The OMB-mandated discount rate of 7% must be used for all BCAs.</b>	<ul style="list-style-type: none"> <li>• The discount rate determines the time-value of money</li> <li>• In a FEMA benefit-cost analysis, a discount rate is used to calculate a value today (the Net Present Value) of future benefits so that they can be compared to the costs of a mitigation project.</li> </ul>	<ul style="list-style-type: none"> <li>• Electronic or paper copy of the BCA.</li> <li>• <b>The OMB-mandated discount rate of 7% must be used for all BCAs.</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>The OMB-mandated discount rate of 7% must be used for all BCAs.</b></li> </ul>
<b>Dollar value for Minor/Major Injuries</b>	<p><b>2006 Dollars</b> (present year value per person)</p> <p>Major injury = \$18,085</p> <p>Minor injury = \$1,808</p>	<ul style="list-style-type: none"> <li>• Average of the estimated values for the treatment of major and minor injuries per person.</li> <li>• Use the Inflation Calculator found in the BCA Tools Folder to inflate the FEMA standard values from 2001 to present day value.</li> <li>• 2001 Major injury = \$15,600</li> <li>• 2001 Minor injury = \$1,560</li> </ul>	<ul style="list-style-type: none"> <li>• If standard values in FEMA software are used then provide print out of software.</li> <li>• Use the Inflation Calculator found in the BCA Tools Folder to inflate the FEMA standard values from 2001 to present day value.</li> </ul>	<ul style="list-style-type: none"> <li>• FEMA “What is a Benefit?” guidance, Section 2.3.</li> </ul>
<b>Dollar Value of a Casualty</b>	<p><b>2006 Dollars</b> (present year value per person)</p> <p>Casualty = \$3,141,633</p>	<ul style="list-style-type: none"> <li>• Estimated value of the loss of one person.</li> <li>• Use the Inflation Calculator found in the BCA Tools Folder to inflate the FEMA standard values from 2001 to present day value.</li> <li>• 2001 Casualty = \$2,710,000</li> </ul>	<ul style="list-style-type: none"> <li>• If standard values in FEMA software are used then provide print out of software.</li> <li>• Use the Inflation Calculator found in the BCA Tools Folder to inflate the FEMA standard values from 2001 to present day value.</li> </ul>	<ul style="list-style-type: none"> <li>• FEMA “What is a Benefit?” guidance, Section 2.3.</li> </ul>

<b>Data Type</b>	<b>Value</b>	<b>Description</b>	<b>Documentation</b>	<b>Source</b>
<b>Design Wind Speed</b>	Number in MPH	<ul style="list-style-type: none"> <li>The wind speed to which the shelter should be designed.</li> </ul>	<ul style="list-style-type: none"> <li>If utilized reference FEMA Publication 361, figure 2-2; or ASCE-7-98.</li> <li>Exception to standard resources requires detailed explanation of source used and method applied.</li> </ul>	<ul style="list-style-type: none"> <li>FEMA or ASCE publication.</li> </ul>
<b>Injuries at Various Wind Speeds, Pre-mitigation</b>	Number from 0 to 100	<ul style="list-style-type: none"> <li>Percent of individuals in the subject facility who will be injured in various wind speed ranges before the mitigation project is in place.</li> <li>Speeds ranges vary from 0-44 MPH to 263+ MPH. FEMA software includes default figures based on previous data inputs [primarily construction type]</li> </ul>	<ul style="list-style-type: none"> <li>None required if FEMA software defaults are used.</li> <li>If defaults are over-ridden, written documentation must indicate why defaults were not used, and the derivation or source of the over-ride data.</li> </ul>	<ul style="list-style-type: none"> <li>Engineer, architect, professional publications, studies or reports.</li> </ul>

<b>Data Type</b>	<b>Value</b>	<b>Description</b>	<b>Documentation</b>	<b>Source</b>
<b>Mitigation Effectiveness [injuries]</b>	Number from 0 to 100	<ul style="list-style-type: none"> <li>• The effectiveness of the proposed mitigation project, expressed as a percentage of the pre-mitigation injuries avoided.</li> <li>• For example, if there are 42 injuries expected in a given wind speed range before the mitigation measure is implemented, and it is 50% effective, then 21 injuries are prevented.</li> <li>• When multiplied by the 'value' of injuries [see above], this is a key determinant of the benefits of a tornado shelter project.</li> </ul>	<ul style="list-style-type: none"> <li>• There are no software defaults for this data.</li> <li>• Documentation must fully explain the derivation and source of the data.</li> <li>• Provide detailed citations for any publication references. If individuals are consulted for this figure, provide copies of reports, letters, etc. indicating the means by which the effectiveness figures were determined.</li> </ul>	<ul style="list-style-type: none"> <li>• Engineer, architect, professional publications, studies or reports.</li> </ul>
<b>Deaths at Various wind Speeds, Pre-mitigation</b>	Number from 0 to 100	<ul style="list-style-type: none"> <li>• Percent of individuals in the subject facility who will be killed in various wind speed ranges before the mitigation project is in place.</li> <li>• Speeds ranges vary from 0-44 MPH to 263+ MPH. FEMA software includes default figures based on previous data inputs [primarily construction type]</li> </ul>	<ul style="list-style-type: none"> <li>• None required if FEMA software defaults are used.</li> <li>• If defaults are over-ridden, written documentation must indicate why defaults were not used, and the derivation or source of the over-ride data.</li> </ul>	<ul style="list-style-type: none"> <li>• Engineer, architect, professional publications, studies or reports.</li> </ul>

Data Type	Value	Description	Documentation	Source
<b>Mitigation Effectiveness [deaths]</b>	Number from 0 to 100	<ul style="list-style-type: none"> <li>• The effectiveness of the proposed mitigation project, expressed as a percentage of the pre-mitigation injuries avoided.</li> <li>• For example, if there are 8 deaths are expected in a given wind speed range before the mitigation measure is implemented, and it is 75% effective, then 6 deaths are prevented.</li> <li>• When multiplied by the ‘value’ of deaths [see above], this is a key determinant of the benefits of a tornado shelter project.</li> </ul>	<ul style="list-style-type: none"> <li>• There are no software defaults for this data.</li> <li>• Documentation must fully explain the derivation and source of the data. Provide detailed citations for any publication references. If individuals are consulted for this figure, provide copies of reports, letters, etc. indicating the means by which the effectiveness figures were determined.</li> </ul>	<ul style="list-style-type: none"> <li>• Engineer, architect, professional publications, studies or reports.</li> </ul>

## *FEMA BCA Checklist*

### *Appendix II*

#### **FEMA BCA Checklist**

*Last Updated June 28, 2006*

**For the entire BCA Checklist, refer to the BCA\_Checklist.doc located on the BCA Mitigation Toolkit (BCA Mitigation Toolkit\4 – BCA TOOLS\CHECKLIST AND DATA DOCUMENTATION TEMPLATES).**

### **3.6 Tornado Mitigation Project**

3.6.1 Verify that the Tornado module has been installed properly (complete installation instructions are on the *FEMA Mitigation BCA Toolkit* CD).

- (a) For Windows 95 and 98, follow the directions that appear on the screen for installation.
- (b) For Windows 2000, ME, XP, and XT, follow the instructions until a prompt states that there is a “version conflict.” Then follow the instructions on the *FEMA Mitigation BCA Toolkit* CD to finish the installation.

3.6.2 The Building Information, Tornado Hazard Information, and Mitigation Project Information sections of the module are extremely important to developing a good BCA based on appropriate and defensible data. The data must be complete in each section to develop an accurate BCA.

3.6.3 Tornado Building Information section:

- (a) The project state and county are necessary for running the Tornado module properly.
- (b) The longest structure length and width are keys for determining the likelihood of the structure being affected by a tornado.
- (c) The proposed shelter area within the building (in square feet), shelter construction type, and shelter occupancy are important in determining the performance effectiveness and cost-effectiveness of the mitigation measure.

3.6.4 Tornado Hazard Information section:

The module database must have a sufficient number of past tornadoes to determine the probability of tornado occurrence in a selected county. Because it is unlikely that a single county will have a sufficient number of tornadoes for meaningful statistics, the sample area of counties must be large enough to be representative of the hazard. The module contains a database with data for all counties.

Note: Some states that have an insufficient history of tornadoes may need to expand the sample area beyond the state to include counties from neighboring states.

### 3.6.5 Mitigation Project Information section:

- (a) Mitigation projects using the Tornado BCA module MUST also include:
  - longest length of the building
  - longest width of the building
  - square footage of the proposed shelter area within the building
  - shelter construction type (i.e., construction materials)
  - site location referenced by county and state
- (b) For design wind speeds other than those found in FEMA 361, *Design and Construction Guidance for Community Shelters* Figure 2-2 or American Society of Civil Engineers (ASCE) 7-98, *Minimum Design Loads for Buildings and Other Structures*, the application will need to include documentation on the source of the data and justification of why the design wind speeds used are more appropriate than the standard sources.
- (c) For FEMA statistical values for injuries and deaths, use the Inflation Calculator (located in the BCA Tools main folder) to inflate values from the 2001 values listed in Section 2.3 of the *FEMA "What is a Benefit?"* document (\$2,710,000 for a death, \$15,600 for major injury, and \$1,560 for minor injury) to the current year. If the FEMA standard values are over-ridden, the application will need to include documentation on the source of the data and justification of why the data is more appropriate than the standard data. However, if the default values for injuries and deaths are only adjusted to the current year values, no documentation is required.