APPENDIX B

Evaluation Guidance

This appendix provides information and guidance to home evaluators on the evaluation process that should be followed to initiate a wind retrofit project. The purpose is to set the framework for an evaluator to assess a home being considered for a wind retrofit project. This guidance is not intended to be used as a comprehensive "checklist" for evaluators, but rather to outline the type of information that should be obtained during the evaluation process and how it should be conveyed as findings and recommendations that can be used to identify and select appropriate wind mitigation activities. The evaluation process set forth in this appendix in Sections B.4 to B.6, when executed by a qualified evaluator, will enable a consistent and thorough evaluation that accurately assesses the condition of the home and its vulnerability to damage from wind and windborne debris. With this guidance, an evaluator can recommend the course of action moving forward.

B.1 Qualifications of an Evaluator

Evaluators must possess sufficient knowledge of the design and construction of residential buildings to perform these evaluations, but they need not be a registered engineer or architect. However, the evaluator should have knowledge of and familiarity with the wind retrofit Mitigation Packages and their intent as described in this Guide.

B.2 Evaluation Report

The evaluation process should result in a report that describes the building condition, building characteristics, and building vulnerability information to identify which Mitigation Package from this Guide should be implemented. This information will help homeowners determine whether they should proceed with a wind retrofit project, and specifically which Mitigation Package would be the most appropriate. The evaluation report must specifically address the proposed Mitigation Package(s) being considered. The level of protection associated with the different Mitigation Packages will reduce risk from wind hazards to some degree. It is important for the evaluation report to convey how much existing risk will be mitigated by the retrofit project and how much residual risk may remain; this is especially true if only the Basic Mitigation Package is being considered and the home is located in a well-defined wind hazard area. The report should also have a clearly marked "BCA Input" section that lists all data needed to perform a wind retrofit BCA, as described in Section B.4, Key Information to Collect for an Evaluation Report. Section B.6, Summary of Guidance for Evaluators, contains questions regarding each component of the building being evaluated to guide the evaluation process. These questions, in addition to the data described in Sections B.4 and B.5 should help the evaluator gather the necessary information for the evaluation report.

B.3 Benefit-Cost Considerations

The evaluation process should obtain all information necessary for a grant program manager, local official, homeowner, or other entity to perform a BCA using the FEMA BCA Tool (Version 4.5.5). This is important because the results of the BCA may be used to understand whether the proposed wind retrofit Mitigation Package is a cost-effective project for the home, and if the proposed wind retrofit Mitigation Package addresses risk adequately or leaves homeowners with residual risk after mitigation that they may find unacceptable.

B.4 Key Information to Collect for an Evaluation Report

The following information should be collected during the evaluation process and shown in the report:

- Owner information (name, contact information)
- Property information (building address, replacement cost, year of construction)
- Building dimensions (total square footage, mean roof height, number of stories)
- Design wind and flood hazard information (design wind speed based on ASCE 7, exposure category, flood zone for the property per the applicable Flood Insurance Rate Map, and Elevation Certificate)
- Photographs of the exterior of the home
- Design information of the home (construction and renovation plans, if available)
- Observations on the following components:
  a) Roof covering (age of covering, wind rating, if available)
  b) Roof structure
  c) Windows, skylights, entry doors, and garage doors
     - Opening protection devices or systems (design pressure and debris impact-resistance criteria, if applicable). This may be in the form of shutters, screens, or panels used to protect openings from debris impact. It may also be in the form of a laminated, polycarbonate, or other pressure-rated and debris-impact resistant glazing system.
  d) Exterior envelope components that will be affected by the proposed mitigation action
  e) Exterior envelope components that would reduce risk if mitigated, but are not part of any Mitigation Package (such as wall coverings)
  f) Exterior walls (both load-bearing and non-load-bearing)
  g) Attached structures
  h) Structural connections
  i) Foundation
- Information to support the development of cost estimates for Mitigation Packages (such as roof square footage, soffit area to be mitigated, number and sizes of openings to be protected, etc.)

In addition to collecting data on the construction type and condition of the building, the data required to evaluate the cost-effectiveness of a project using the FEMA BCA Tool should be collected and provided to the homeowners. This will allow a user to easily follow the guidance in Appendix C of this Guide; completing a BCA is a necessary step when applying for FEMA grant funding. The following should be provided in a clearly marked "BCA Input" section of the evaluation report:

- Wind hazard information for the area
- Building type (wood or masonry; note: for masonry structures, existing reinforcement should be documented)
- Number of stories
- Roof shape (hip or gable)
- Whether secondary water barrier exists on the roof
- Fastener size and spacing for roof deck attachments
- Attachment of the roof-to-wall connection
- Whether there are shutters on the home and if they are required by the current building code for new construction in this jurisdiction
- If a garage is present, the condition of the garage door

Regardless of whether the homeowner is considering applying for funding for the wind retrofit project, these BCA inputs should be provided on the report. The FEMA BCA Tool will help determine whether a project is cost effective (i.e., whether the benefits of the project outweigh the costs). More information on using the FEMA BCA Tool to analyze a wind retrofit project is provided in Appendix C of this Guide.

B.5 Identifying Damage and Deficiencies

The evaluation process should identify if any significant deficiencies or conditions exist that must be addressed for the proposed solutions of the Mitigation Packages to be effective mitigation. Construction conditions, older techniques, or poor condition of building materials are just a few of the items that may need to be addressed or corrected, in addition to the actual retrofit action, to ensure the home meets the basic performance assumptions of this Guide. However, the corrective work may or may not be an eligible cost under the wind retrofit project type. Building elements that require corrective work may include, but are not limited to, the following:

- Foundations that are inadequate or do not provide safe and stable support for a residential building in a hurricane-prone region (such as dry-stacked concrete masonry units, foundations with no load path from the floor or wall connection to the ground, or damaged/undermined foundations)
- Building elements weakened by insect damage or infestation
- Rot or deterioration of the structure or envelope systems that would prevent the home from carrying the loads it was designed to withstand

- Elevation of the home if located in a Zone V and not properly elevated on an open foundation per the NFIP or local flood plain ordinance

If any such deficiency exists for an element in the home being evaluated, an estimate of the degree of repair required should be provided, if possible. In some situations, a design professional may need to be involved to effectively assess the magnitude of the condition and the work required to repair it. If the conditions are difficult to repair and have high associated costs, it is possible that the home is not a candidate for wind mitigation retrofitting using the Mitigation Packages in this Guide. Information regarding a home's deficiencies and overall condition can greatly aid homeowners, both for the purpose of executing the wind retrofit project and to understand the condition of their home.

B.6 Summary of Guidance for Evaluators

The following guidance can help evaluators collect the data necessary to produce the evaluation report.

Envelope Assessment

Goals:

- Identify weaknesses in the home's envelope where wind or wind-driven rain can enter the home
- Identify ways to mitigate those weaknesses
- Determine what Mitigation Package is appropriate

Roof Covering:

- What is the existing roof covering type? (e.g., asphalt shingles, clay or concrete tile, etc.)
- What is the existing roof covering age? (in years)
- What is the expected remaining useful life of the roof covering? (in years)
- What is the roofing design wind speed? (in mph)
  ("Unknown" if roof covering has a design wind speed that is not documented)
  a) Is the design wind speed in fastest mile or 3-second gust?
- Is a secondary water barrier present beneath the roof deck and roof covering? If so, provide details.

Roof Sheathing and Connections:

- What is the roof sheathing type? (e.g., wood boards, wood structural panels)
- What is the roof sheathing thickness? (in inches)
- How is the roof sheathing secured to the roof framing:
  a) Within 4 feet of eaves hips, ridges, and gable ends?

b) In other areas of the roof deck?

- Are there any observable shattered or broken sheathing panels in the attic?
- Are sheathing or truss shiners visible from inside the attic? If so, how many?

Attic Ventilation Systems:

- What attic ventilation system is in place? (soffits, ridge vents, gable vents, etc.)
- Are soffit vents braced or otherwise protected to resist wind pressures and prevent wind-driven rain entry?
- Are gable vents braced or otherwise protected to resist wind pressures and prevent wind-driven rain entry?
- Are off-ridge vents braced or otherwise protected to resist wind pressures and prevent wind-driven rain entry?
- What are the lengths of overhangs at gables (if applicable) and eaves?
- Are there other overhangs? (e.g., carports, porches, breezeways)

Openings:

- Windows
  a) What are the sizes and quantities of all windows?
  b) For each window, is glazing protection present?
  c) For each window, is there a provided differential pressure rating and/or impact rating of the window or protection? If so, provide details.
  d) Are skylights present on the home? If so, are they protected?
- Doors
  a) What are the sizes and quantities of all entry doors?
  b) For each entry door, is a differential pressure rating and/or impact rating of the door or protection provided? If so, provide details.
  c) What are the sizes and quantities of all garage doors?
  d) For each garage door, is a differential pressure rating provided?
  e) For each garage door with glazing, is the impact rating for the glazing provided?

Attached Structures:

- Are there any attached structures present? (e.g., porches, carports)
  a) If so, is there a continuous load path in the attached structures?
  b) How are the structures attached to the home?

Structural Assessment

Goals:

- Identify weaknesses in the home's structural system that can fail when exposed to wind loads
- Identify ways to mitigate those weaknesses
- Determine what level of mitigation is achievable

Roof Framing:

- For homes with engineered wood trusses:
  a) Are truss members and connector plates damaged or deteriorated?
  b) Have alterations or repairs of any truss member been made? If so, do the repairs ensure that members can safely carry the appropriate gravity and uplift loads?
- For homes with wood roof rafter and ceiling joist framing:
  a) Are any roof framing members damaged or deteriorated?

Wall Construction:

- What are the wall heights for each story?
- Do any exterior walls have significant window and/or door area?
- For exterior bearing walls:
  a) Is the wall framing system capable of supporting vertical and lateral wind loads?
  b) Are connections between walls and structural framing members at the top and bottom of the wall capable of adequately transferring vertical and lateral wind loads?
  c) For homes with multiple stories, are wall framing systems capable of supporting cumulative wind loads?
- For interior bearing walls:
  a) Is the interior wall framing system capable of supporting the gravity load and vertical and lateral wind loads?
  b) Are connections at the top and bottom of interior wall framing systems capable of transferring the gravity load and vertical and lateral wind loads?
  c. Is the foundation, floor framing, or bearing wall capable of supporting the wall framing system?

Gable End Walls (if applicable):

- What are the heights of all gable end walls?
- Do gable end walls have structural sheathing? If not, identify sheathing type (e.g., foam sheathing, no sheathing).

Floor Framing:

- Is the floor framing system capable of supporting the gravity load and vertical and lateral wind loads?
- Is the floor framing system adequately supported?

Foundation:

- Is the foundation support system capable of resisting uplift and shear forces and transmitting them to the ground?
- Is the foundation in good condition? Are there signs of failure or duress in the foundation?

Chimney (if applicable):

- Was the chimney designed for high wind loads?
- Are there anchors, straps, or other elements that provide a means for the structure to resist wind loads?

Continuous Load Path:

- Is there a continuous and adequate load path from the roof to the foundation of the home?
- Are roof-to-wall connections capable of resisting uplift loads?
- For multi-story homes, are wall-to-wall connections capable of resisting accumulated uplift and shear forces?
- Are wall-to-foundation connections capable of resisting accumulated uplift and shear forces?