Appendix B
Safe Room Assessment and Design Tools

Appendix B.1 Extreme-Wind Refuge Area Evaluation Checklists

Appendix B.2 Designer Checklists

B.1 Extreme-Wind Refuge Area Evaluation Checklists

Wind hazard evaluation checklists were developed by FEMA for the First Edition of FEMA 361 for use in assessing building's susceptibility to damage from high-wind events such as tornadoes and hurricanes. The checklist evaluation process will guide the user in identifying potential refuge areas at a site with one or more buildings. If the refuge area selected is to be considered for use as a "safe room," it must be structurally independent, easily accessible, and of sufficient size for the intended occupant load. Most importantly, the refuge area must be sufficiently resistant to wind forces or be made resistant with mitigation retrofits identified in FEMA 361. If it cannot meet the design criteria for near-absolute protection, the designated space should not be considered a safe room. Rather, it may be the best available space within the building, but use of this space during an extreme-wind event should only occur as a last resort.

An agency or individual can use the checklists to assess the ability of the refuge area to resist forces generated by a tornadic or hurricane event. The checklists consist of questions pertaining to structural and non-structural characteristics of a facility. The questions are designed to identify structural and non-structural vulnerabilities to wind-induced damage based on typical building failures. Structural or non-structural deficiencies may be remedied with retrofit designs but, depending on the type and degree of deficiency, the evaluation may indicate that the structure is unsuitable to serve as a safe room or even as a refuge area. The checklists are not a substitute for a detailed engineering analysis, but can assist the decision-makers involved in hazard mitigation and emergency management to make a preliminary selection of areas of a building that are best suited to serve as refuge areas, or are the best candidates for retrofitting to meet FEMA 361 safe room criteria.

The checklists can also be used to rank a group of facilities within a given geographic region. A scoring system was developed to be used in conjunction with the checklists. Each building deficiency is assigned penalty points according to the level of its vulnerability. Therefore, a high score reflects higher hazard vulnerability and a low score reflects higher hazard resistance, but only relative to other buildings considered in the scoring system. This evaluation process helps determine which building will perform best under natural hazard conditions in the least subjective manner possible. The checklists help identify the areas within buildings that are least vulnerable to damage from extreme winds and would likely require the least mitigation effort to achieve near-absolute protection. The scoring tool does not provide a "passing" or "acceptable" score. To determine the actual level of protection provided by the refuge area, a more detailed assessment is required.

The checklist has five sections: General Building Information, Wind Hazard Checklist, Flood Hazard Checklist, Structural Seismic Hazard Checklist, and Selecting the Refuge Area.

A summary score sheet has been provided with the evaluation checklists to compile the evaluation scores for each natural hazard when multiple sites or areas are being considered. A description of common building types and a glossary of terms are presented following the checklists.

Checklist Instructions

The checklists are designed to walk the user through a step-by-step process and should be filled out in sequence. This process is based on a rapid visual screening methodology and does not involve any destructive testing or detailed engineering calculations. A large portion of the checklists can be filled out using data obtained from design or construction plans. It is important to verify these data during a field inspection and note upgrades (i.e., expect roof replacements on older buildings). If building plans are not available for this evaluation, the accuracy of the checklist may be compromised; worst case scenarios should be assumed for information that cannot be verified. Additional information can be acquired from building specifications, site visits, and interviews with building personnel who can provide historical information on specific problems, repairs, upgrades, and procedures.

Low scores on the checklists indicate structural features that provide considerable levels of protection. Higher scores indicate that a refuge area is more vulnerable to wind damage and less able to provide adequate life-safety protection. The lowest possible cumulative score for Zone IV (region most vulnerable to tornado hazards) is 20 and a safe room or refuge area with this score would likely provide significant protection from an extreme-wind event; however, it is very unlikely that any building would have this score. A pilot study of 10 schools in Wichita (located in Zone IV) resulted in scores ranging from 56 to 161.

General Building Information: This section is for collecting information for reference purposes. All questions relate to the entire building or buildings at the site. The user may need to refer back to the General Building Information section to answer hazard related questions in other sections. This section is not scored.

Wind Hazard Checklist: This checklist applies only to the refuge area(s). If more than one area is selected, a separate checklist should be filled out for each area. A glossary is provided (starting on page 28) to help the user with unfamiliar terminology. Answer the questions and determine a score for this hazard.

Flood Hazard Checklist: This section applies to both the refuge area and to the entire building. A Flood Insurance Rate Map (FIRM) is required to answer most of the questions in this section. Answer the questions and determine a score for this hazard.

Structural Seismic Hazard Checklist: The checklist for the seismic threat pertains to the entire building. A Uniform Building Code (UBC) Seismic Zone Map is provided to help assess the seismic threat. Answer the questions and determine a score for this hazard.

Selecting the Refuge Area: The purpose of the evaluation is to select appropriate refuge areas that provide the best protection from tornado and hurricane events in the absence of a dedicated safe room. The criteria contained in this section will guide the user on how to select good refuge areas. Several refuge areas may be needed to provide enough usable space for the entire population that requires protection. A separate checklist should be filled out for each potential refuge area. This section is not scored.

Summary Score Sheet: After answering and scoring all of the questions in the checklists, the Summary Score Sheet should be filled out. The score sheet is used to compile all the scores for each refuge area for comparison. The total scores will then enable the user to rank each building and its potential as a suitable refuge area.

Transfer checklist scores to the Summary Score Sheet to include subscores from the wind section for each refuge area evaluated. The highest Area Total Wind Hazard Score should be placed in the Highest Wind Hazard Score block. The Total Score is the sum of the Highest Wind Hazard Score, Flood Hazard Score, and Seismic Hazard Score. The Total Scores will reflect the expected performance ranking of the buildings when placed in order from lowest to highest score (i.e., least vulnerable to most vulnerable structure).

GENERAL BUILDING INFORMATION

CONTACT INFORMATION

Site Name:_____

Street Address:_____

City, State, Zip:_____

Contact Person:_____

Contact Phone #:_____

Potential Refuge Population:_____

Typical hours the building is occupied:_____

Is the building locked at any time?_____

BUILDING DATA

Size/Square Footage: _____ Number of Stories:_____

Describe the building configuration:_____

General description of surrounding area:_____

_____

Are there any portable/temporary units: _____ How many:_____

Describe the condition of the building (are there cracks in the walls, signs of deterioration, rusting, peeling paint, or other repair needs):_____

_____

_____

What are the power or fuel sources for the following utilities (natural gas, oil, electric, LP, etc.)?

❑ Heating:_____ ❑ Cooling:_____ ❑ Cooking:_____

Is there a refuge area or safe room already identified within the building?_____

_____

From which hazard(s) is the refuge area supposed to protect?

❑ Tornado ❑ Hurricane ❑ Combined (Tornado and Hurricane)

If an existing safe room was designed for extreme winds, indicate the design professional and all relevant design parameters, specifically design wind speed:_____

_____

_____

Evaluator's Name:_____ Date of Evaluation_____

Site Name: _____

Provide a General Sketch of the Building:

Additional Comments:

Evaluator's Name:_____ Date of Evaluation_____

Site Name: _____

WIND HAZARD CHECKLIST

Address the following evaluation statements, giving the most appropriate answer for each question. After selecting the appropriate answer, take the score for that answer (# in the parentheses) and enter it into the score block for that question. Evaluation judgment is subject to limitations of visual examination. Questions have been grouped into sections based on structural issues, cladding and glazing, envelope protection, and non-structural issues. These questions apply only to the refuge area. **After all questions have been appropriately scored, sum the score column and determine the final wind hazard score for the refuge area.**

Question	Score
Structural Issues	
Refuge Area Size Length: Width: Height: Stories:	No Score
Usable square footage for this area (see FEMA 361, Section 3.3.1 or 3.4.1):	No Score
When was building constructed? Check box below. ❑ Post-2003 (0) ❑ 2003 – 1999 (0) ❑ 1998 – 1995 (0) ❑ 1994 – 1988 (2) ❑ 1987 – 1980 (4) ❑ 1979 – 1970 (6) ❑ 1969 – 1951 (8) ❑ Pre-1950 (10) Date on plans:	
The building was designed according to the following building code: ❑ Uniform Building Code, Year: ❑ International Building Code, Year: ❑ Standard Building Code, Year: ❑ International Residential Code, Year: ❑ National Building Code, Year: ❑ Other Code:	No Score
Were any of the following guidance documents or standards used in the construction of the refuge area or building? ❑ FEMA 361, year: ❑ ICC-600, year: ❑ SSTD 10, year: ❑ FEMA 320, year: ❑ ICC-500, year: ❑ ASCE 7, year: .	No Score
What is the structural construction material of the refuge area? ❑ Concrete (10) ❑ Pre-Cast Concrete (10) ❑ RM (10) ❑ Engineered/Heavy Steel Frame (12) ❑ Partially Reinforced Masonry (PRM) (15) ❑ Unreinforced Masonry (URM) (20) ❑ Wood or Metal Studs (20) ❑ Light Steel Building/Pre-engineered (20) ❑ Unknown (20)	

Evaluator's Name:_____ Date of Evaluation_____

Site Name: _____

What building plans are available for the inspection? ❑ As-built Plans (including full architectural and structural plans) (0) ❑ Design/Construction Plans (including full architectural and structural plans) (2) ❑ Structural Plans only (3) ❑ Architectural Plans only (5) ❑ Partial set of plans (8) ❑ No plans are available (12)	
Vertical and Lateral Load Resisting Systems (select the system that applies) ❑ Moment Resisting Frame or Braced Frame (identify infill wall below) (0) ❑ Concrete Beams/Columns ❑ Precast Concrete Beams/Columns ❑ Steel Beams/Columns (heavy) ❑ Wood Beams/Columns ❑ Steel Beams/Columns (light) ❑ Steel Bar Joist and Concrete or RM Columns	
Shear Wall of Braced Frame; bracing or support is provided by: ❑ Concrete Shear Wall (0) ❑ RM Shear Wall (0) ❑ PRM Shear Wall (2) ❑ URM Shear Wall (5) ❑ Plywood Shear Wall (5) ❑ Other: _____ (5)	
❑ Solid Load-Bearing Wall System ❑ Concrete Walls (0) ❑ RM Walls (0) ❑ PRM Walls (4) ❑ URM Walls (10) ❑ Framed Walls (wood or metal stud) (6) ❑ Other: _____ (6)	

Evaluator's Name:_____ Date of Evaluation_____

Site Name: _____

Elevated Floor or Roof Deck Systems (check all that apply)

❑ Concrete Beams and Slab ❑ Concrete Flat Slab ❑ Precast Concrete Deck

❑ Steel Deck with Concrete ❑ Steel Deck with Insulation Only

❑ Diagonal Sheathing ❑ Plywood Sheathing ❑ Wood Joists/Beams

❑ Wood Trusses ❑ Wood Plank ❑ Concrete Plank

❑ Concrete Waffle Slab ❑ Open Web Steel Joist ❑ Steel Beam

No Score

Do the connections in the structural systems provide a continuous load path for all loads (gravity, uplift, lateral)?

❑ Yes (0) ❑ No (10) ❑ Do not know (10)

If YES, identify the following connections:

Actual connectors of the roof structure and the spacing _____

_____

No Score

Actual connectors between the roof and wall and the spacing _____

_____

No Score

Connection Details for Refuge Area (check at least one item in each column)

	Roof to Roof Structure	Roof Structure to Wall Structure	Within Wall	Walls to Foundation
Reinforcing Steel	❑ (0)	❑ (0)	❑ (0)	❑ (0)
Welded (not tack)	❑ (0)	❑ (0)	❑ (0)	❑ (0)
Bolted	❑ (0)	❑ (0)	❑ (0)	❑ (0)
Metal Clips/Fasteners	❑ (1)	❑ (1)	❑ (1)	❑ (1)
Metal Hangers	❑ (1)	❑ (1)	❑ (1)	❑ (1)
Self Tapping Screws	❑ (1)	❑ (1)	❑ (1)	❑ (1)
Wire Fastener	❑ (2)	❑ (2)	❑ (2)	❑ (2)
Nailed	❑ (4)	❑ (4)	❑ (2)	❑ (4)
Other:_____ (possible tack weld)	❑ (5)	❑ (5)	❑ (5)	❑ (5)
Gravity Connection	❑ (6)	❑ (6)	❑ (6)	❑ (6)
Unknown	❑ (6)	❑ (6)	❑ (6)	❑ (6)

If walls are masonry units, are they grouted? Which cells are grouted (every cell, every 4th cell, etc.)? _____

No Score

Evaluator's Name:_____ Date of Evaluation_____

Site Name: _____

For all URM, both load-bearing and non-load-bearing, fill in the blanks and answer the following two questions. Maximum height: _____ Longest span: _____ Thickness: _____	No Score
Is the maximum wall height/wall thickness (h/t) ratios for URM in excess of those noted in AFM 32-1095, page G-63 (see chart below). ❑ Yes (5) ❑ No (0) ❑ Not applicable (0)	
Is the maximum wall length/wall thickness (l/t) ratios for URM in excess of those noted in AFM 32-1095, page G-63 (see chart below). (Measure longest span between column or pilaster supports or from end wall to wall opening). ❑ Yes (5) ❑ No (0) ❑ Not applicable (0)	

Allowable Value of Height-to-Thickness Ratio of URM Walls in High Wind Regions

Wall Types	Maximum l/t to h/t	
	Solid or Solid Grouted	All Other
Bearing Walls		
Walls of one-story buildings	16	13
First-story wall of multistory building	18	15
Walls in top story of multistory building	13	9
All other walls	16	13
Nonbearing Walls (Exterior and Interior[1])	15	13
Cantilever Walls	3	2
Parapets	2	1 1/2

[1] Interior wall ratio should be the same as the exterior wall ratio due to the risk of internal pressure through breached openings.

Chart from Air Force Manual (AFM) 32-1095: *Structural Evaluation of Existing Buildings for Seismic and Wind Loads*, page G-63.

Does the location of the refuge area require occupants to go outdoors to get to it? ❑ No (0) ❑ Yes (2)	
If the refuge area is a section of a building, are the wall systems separated from the remainder of the building structure with expansion joints? ❑ Yes (0) ❑ No (3)	
Does the refuge area have its own roof system (i.e., the roof does not extend over other sections of the building outside the refuge area or is separated by joints)? ❑ Yes (0) ❑ No (5)	

Evaluator's Name:_____ Date of Evaluation_____

Site Name: _____

Is the height of the refuge area roof less than 30 feet above ground level? ❑ Yes (0) ❑ No (2)	
Is there a roof span in the refuge area longer than 40 feet from support to support? ❑ Yes (10) ❑ No (0)	
Is the pitch of the roof less than 30° (less than 6/12 pitch)? ❑ Yes (4) ❑ No (0)	
If the building has parapet walls, are they taller than 3 feet (as compared to the adjacent roof level)? Check any of the following that apply. ❑ Structurally attached to the refuge area (2) ❑ Adjacent to egress routes (2) (if parapet walls collapse, egress routes to the refuge area may be blocked)	
Is there a roof overhang that is more than 2 feet wide? ❑ Yes (2) ❑ No (0)	
Structural Issues Subtotal =	

Evaluator's Name:_____ Date of Evaluation_____

Site Name: _____

Cladding and Glazing Issues	
What is the percentage of the exterior wall surface covered by windows and doors on the outer perimeter of the refuge area? ❑ No windows/protected doors (0) ❑ No windows/unprotected doors (1) ❑ 0% – 1% (1) ❑ 2% (2) ❑ 3% – 4% (4) ❑ 5% – 6% (6) ❑ 7% or more (10)	
Are the ALL windows, doors, and openings protected from impacts from windborne debris? If no, enter a score of 10 in the column to the right. If so, identify the level of protection offered by the system. The windows, doors, or openings of this space are protected from debris impact by systems that have been tested to resist the appropriate missile at the site as defined by: ❑ The FEMA 361 or ICC-500 Tornado Missile Criteria (15-lb 2x4 board @ at 100-80 mph) (0) ❑ The FEMA 361 Hurricane Missile Criteria (9-lb 2x4 board @ at 128-80 mph) (2) ❑ The ICC-500 Hurricane Missile Criteria (9-lb 2x4 board @ at 102-64 mph) (4) ❑ ASTM E 1996 for Critical Facilities Criteria (9-lb 2x4 board @ at 55 mph) (6) ❑ ASTM E 1996 for Critical Facilities Criteria (9-lb 2x4 board @ at 34 mph) (7) ❑ No criteria or a level of protection that does not meet any of the above criteria (10)	
Are doors to the refuge area secured at top and bottom with connections to resist suction effects that may pull the doors open (3-point latches)? ❑ Yes (0) ❑ No (10)	
Are there skylights or overhead atrium glass or plastic? ❑ Yes (5) ❑ No (0)	
What is the roof covering on the refuge area? NOTE: If more than one material type is used on the roof, choose the one with the highest penalty. ❑ Storm-resistant shingles (0) (greater than 100 mph rating) ❑ Wood shingles and shakes (2) ❑ Clay tile (2) ❑ Built-up roof, with stone ballast (2) ❑ Single-ply membrane with ballast (2) ❑ Built-up roof, without ballast (1) ❑ Single-ply membrane without ballast (1) ❑ Traditional metal roofing (1) ❑ Asphalt/metal shingles (1) ❑ Material other than those listed above (2) ❑ No roof covering (0)	
Cladding and Glazing Issues Subtotal =	

Evaluator's Name:_____ Date of Evaluation_____

Site Name: _____

Envelope Protection	
What are the debris hazards (choose all that apply): ❑ Large light towers (such as for an athletic field) and/or antennas within 300 feet of the structure? (2) ❑ Portable classrooms/trailers, small light frame buildings, HVAC units within 300 feet of the structure? (4) ❑ Unanchored fuel tanks within 300 feet of the structure? (5)	
❑ Are there buildings with roof gravel within 300 feet of the structure? (including the building site itself) (2) ❑ Are there debris generating sources (e.g., lumber yards, nurseries, and junk yards) within 300 feet of the structure? (4) ❑ Is the refuge area vulnerable to trees, telephone poles, light poles, and other potential missiles? (4)	
What is the material on the exterior walls of the refuge area (excluding window and door systems)? ❑ Concrete (0) ❑ RM (0) ❑ PRM (4) ❑ Brick and block composite wall with reinforcing steel @4 feet on center (o.c.) (6) ❑ 3-wythes of solid masonry brick (6) ❑ URM (8) ❑ Metal/vinyl siding (10) ❑ Metal panels (pre-engineered metal building) (10) ❑ Combination (other than EIFS) (12) ❑ EIFS (on substrate other than concrete or RM) (15)	
What is the material of the roof deck/elevated floor at the refuge area? ❑ Reinforced concrete at least 6 inches thick (0) ❑ Metal deck at least 14 gauge (0) ❑ Reinforced concrete at least 3-inches thick (2) ❑ Metal deck at least 20 gauge (4) ❑ Wood panels at least 1-inch thick (4) ❑ Cement fiber board/deck (tectum) (6) ❑ Metal deck 22 gauge or higher (8) ❑ Wood panels at least ½-inch thick (8) ❑ Other _____ (10)	

Evaluator's Name:_____ Date of Evaluation_____

Site Name: _____

Will the structure adjacent to the refuge area or surrounding it pose a threat if subject to collapse (structural components become debris that creates impact loads on the refuge area)? Specify: _____ ❑ Yes (5) ❑ No (0)	
Are there large, roll-down or garage type doors (metal, wood, plastic) on the exterior of the refuge area? ❑ Yes (5) ❑ No (0)	
For tornado and combined hazard safe rooms, identify what wind zone region the building is located in based on the Wind Zones Map provided in Figure 1. ❑ Zone I [130 mph] (4) ❑ Zone II [160 mph] (6) ❑ Zone III [200 mph] (8) ❑ Zone IV [250 mph] (10) Or For hurricane hazard safe rooms, identify the wind speed contour for the site (if the site is between contour lines, select the highest wind speed contour) provided in Figure 2. ❑ 160-170 (6) ❑ 180-190 (7) ❑ 200-225 (8) ❑ 225 + (10)	
Envelope Protection Subtotal =	

Evaluator's Name:_____ Date of Evaluation_____

Site Name: _____

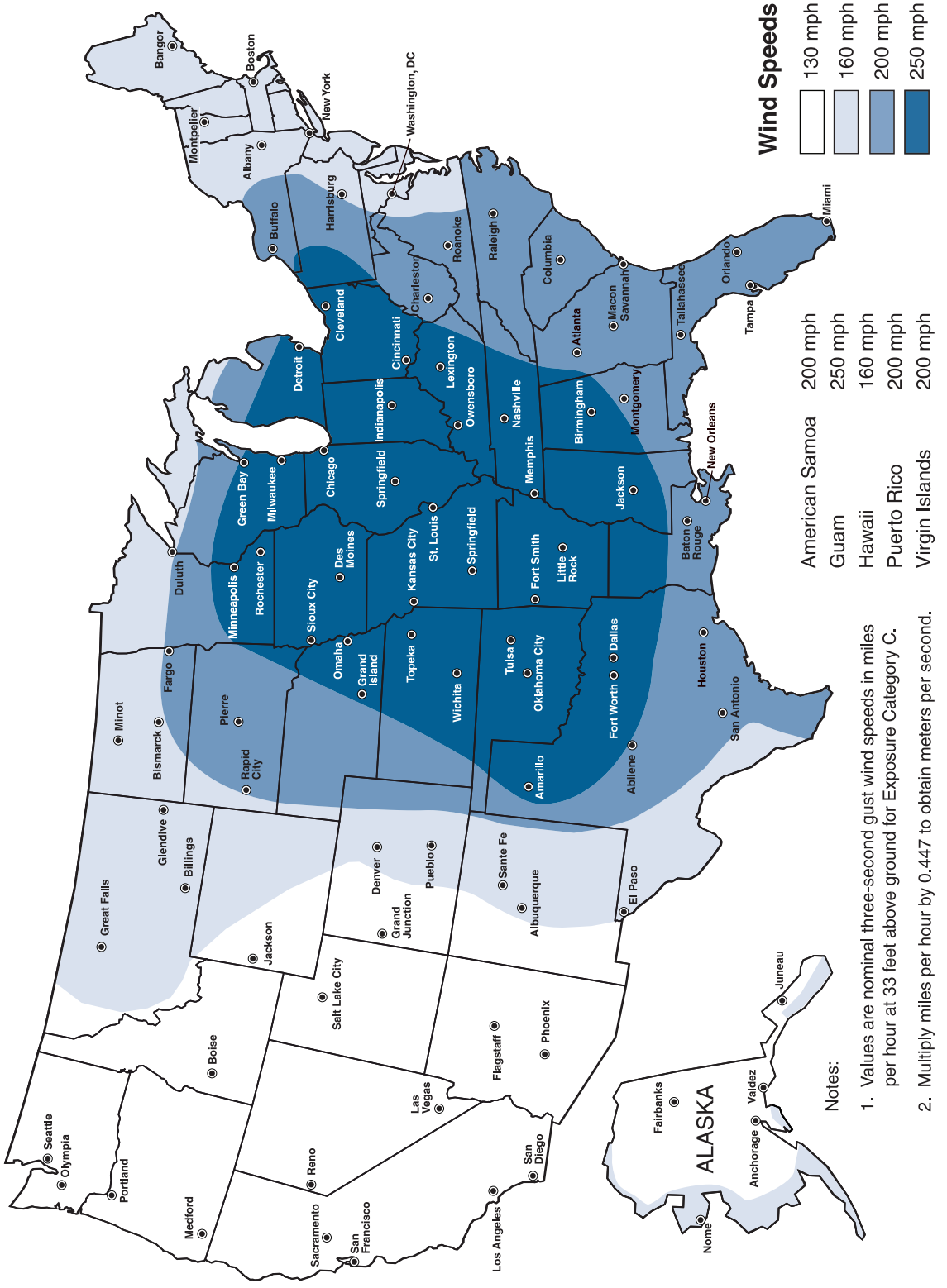


Figure 1: Wind Zones in the United States (Federal Emergency Management Agency) previously printed in FEMA 320, *Taking Shelter From the Storm.*

Evaluator's Name:_____ Date of Evaluation_____

Site Name: _____

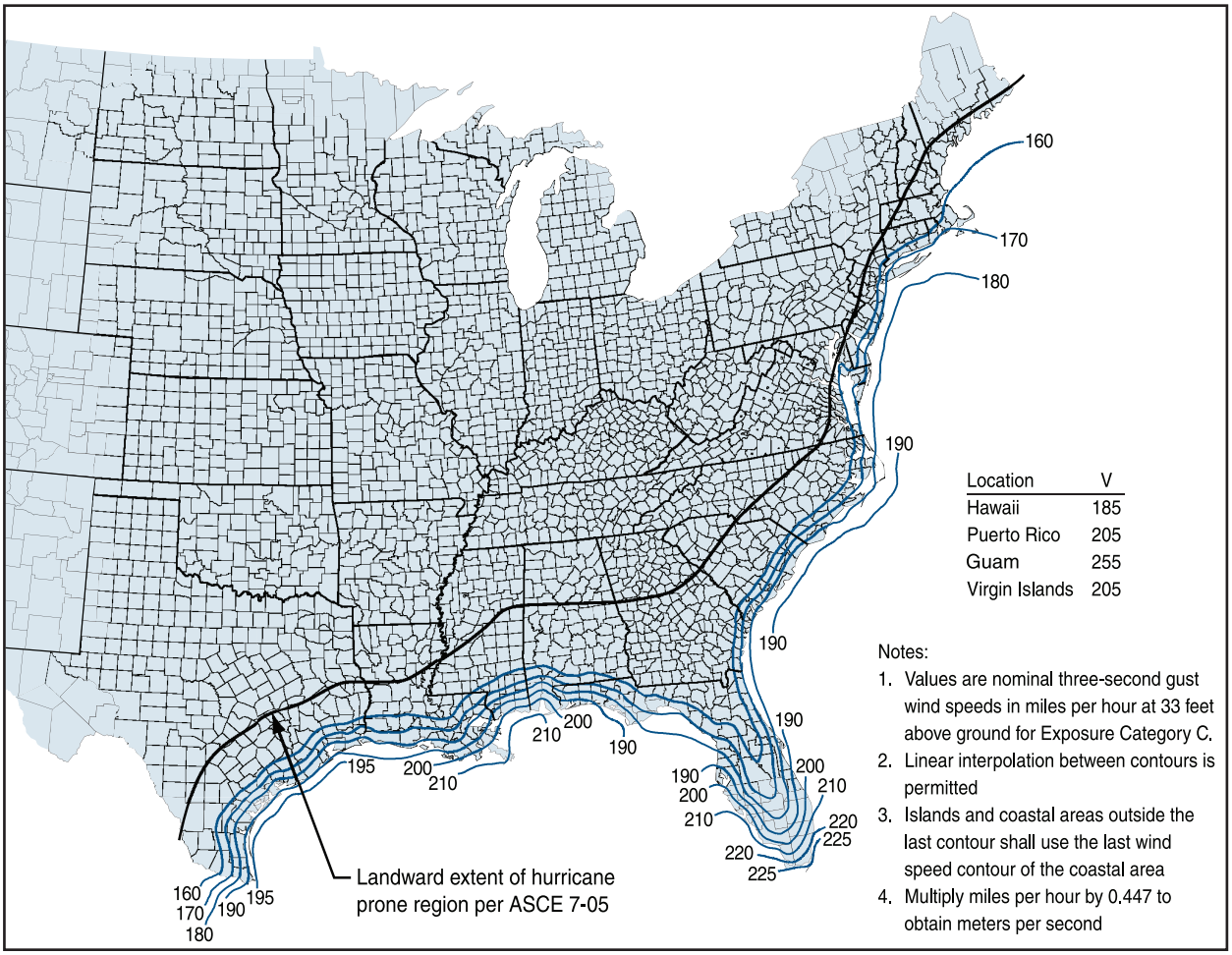


Figure 2: Hurricane Safe Room Design Wind Speed Map from the ICC-500

SOURCE: *ICC/NSSA STANDARD FOR THE DESIGN AND CONSTRUCTION OF STORM SHELTERS* (ICC-500). COPYRIGHT 2008, WASHINGTON, DC: INTERNATIONAL CODE COUNCIL. REPRODUCED WITH PERMISSION. ALL RIGHTS RESERVED. WWW.ICCSAFE.ORG < HTTP://WWW.ICCSAFE.ORG >.

Non-structural Issues	
Does a combustible gas line run through the refuge area? ❑ Yes (10) ❑ No (0) ❑ Unknown (10)	
Is there a stand-by power source/generator? ❑ Yes (0) ❑ No (8) If yes, what is the power source: ❑ Battery powered (0) ❑ Other power (indicate fuel type) _____(2) Is there an automatic transfer switch? ❑ Yes (0) ❑ No (2) What is the duration of lighting under the back-up power source? ❑ 0-2 hours (2) ❑ 3-6 hours (1) ❑ 7 or more hours (0)	
If the stand-by power supply is not within the refuge area, is it in a place where it will be protected during an extreme-wind event (in an interior room, or below grade)? ❑ Yes (0) ❑ No (5) ❑ Not Applicable (0)	
Is there a back-up communications system (if yes, list type)? ❑ Yes (0) ❑ No (2)	
Are bathrooms accessible within the refuge area? ❑ Yes (0) ❑ No (2)	
Is the refuge area ADA accessible? ❑ Yes (0) ❑ No (2)	

Evaluator's Name:_____ Date of Evaluation_____

Site Name: _____

Is an operations plan in place for evacuation to a refuge area during an extreme-wind event? ❑ Yes (0) ❑ No (8)	
If yes, answer the following questions: Does the evacuation plan include practice drills? ❑ Yes (0) ❑ No (2)	
What type of warning signal is used to indicate a tornado drill?:_____ Does it differ from a fire drill alarm? ❑ Yes (0) ❑ No (1)	
Can all occupants reach the candidate refuge area within 5 minutes? ❑ Yes (0) ❑ No (2) ❑ Unknown (2) List time: _____	
Non-structural Subtotal =	
Total Wind Hazard Score =	

Evaluator's Name:_____ Date of Evaluation_____

Site Name: _____

FLOOD HAZARD CHECKLIST

Address the following evaluation statements, giving the most appropriate answer for each question. After selecting the appropriate answer, take the score for that answer (# in the parentheses) and enter it into the score block for that question. Evaluation judgment is subject to limitations of visual examination. Elevations are only required if a flood hazard has been identified at the building site. If no flood hazard exists at the site, answer flood related questions with "not applicable." **After all questions have been appropriately scored, sum the score column and determine the final flood hazard score for the building/structure.**

Question	Score
Flood Hazard Issues	
Community Panel No.: _____ Date Revised:_____ Flood Hazard Zone: _____ What is the base flood elevation (BFE) at the building site?*_____ What is the 500-year flood elevation at the building site?**_____ ❑ Not applicable (Explain):_____	No Score
Is the site located in a mapped storm surge inundation zone? ❑ Yes ❑ No (0) If yes, what is the source used to verify this? _____ If the site is located in a storm surge inundation zone, which category is it in? ❑ Category 1-2 (6) ❑ Category 3 (8) ❑ Category 4-5 (10)	
Is the site located in any of the following areas? ❑ The Coastal High Hazard Area (VE zones) or other areas known to be subject to high-velocity wave action (10) ❑ Areas seaward of the Limit of Moderate Wave Action (LiMWA) where mapped, also referred to as the Coastal A Zone in ASCE 24-05 (10) ❑ Floodways (10) (Note: if the selected refuge area(s) is located in any of the areas listed above, serious consideration as to the use of the selected area(s) should be made. The areas listed above are locations that should not be used to provide protection to occupants.)	
Is there a history of floods at the building site? ❑ Yes (5) ❑ No (0) ❑ Unknown (5) ❑ Not applicable (0)	
Is there a history of drains (storm or sanitary) backing up due to flooding? ❑ Yes (2) ❑ No (0) ❑ Unknown (2) ❑ Not applicable (0)	

Evaluator's Name:_____ Date of Evaluation_____

Site Name: _____

Does the surrounding topography contribute to flooding in low-lying areas? Are there poor drainage patterns, basement stairwells, etc.? ❑ Yes (5) ❑ No (0)	
Are access roads to the building site sufficiently elevated and expected to be accessible during periods of high water (based on local flooding history and/or FIRM panel information)? ❑ Yes (0) ❑ No (2)	
If the building is within a 500-year floodplain or storm surge inundation zone, complete the following. If not, STOP HERE and skip to page 21 for THE STRUCTURAL SEISMIC HAZARD CHECKLIST.	

* BFEs are shown on the Flood Insurance Rate Map (FIRM) for the community.

** 500-year flood elevations are not shown on the FIRM; they are provided in the Flood Insurance Study (FIS) report for the community

Structural Issues* **	
What is the building/structure type? ❑ Concrete (0) ❑ RM (2) ❑ Steel (2) ❑ PRM (5) ❑ URM (8) ❑ Wood (10) ❑ Unknown (10)	
What is the elevation of the lowest floor/level of the building being used for refuge? _____	
Is this elevation: ❑ Above the 100-year flood elevation + 2 feet (0) ❑ Less than 2 feet above the BFE (4) ❑ Below the BFE or unknown (8) ❑ Not applicable (0)	
Is this elevation: ❑ Above the 500-year stillwater flood elevation (0) ❑ Less than the 500-year stillwater flood elevation (10) ❑ Not applicable (0)	
Is this elevation: ❑ Above the lowest floor elevation required by the community's floodplain ordinance (0) ❑ Below the lowest floor elevation required by the community's floodplain ordinance (10) ❑ Not applicable (0)	
If the site is in a mapped Zone D (or has not been evaluated as part of a NFIP flood study), is this elevation: ❑ Above the highest recorded flood elevation in the area + 2 feet (0) ❑ Below the highest recorded flood elevation in the area + 2 feet (10) ❑ Not applicable (0)	

Evaluator's Name:_____ Date of Evaluation_____

Site Name: _____

If the site is in a mapped coastal storm surge inundation zone, is this elevation: ❑ Above the maximum stillwater elevation associated with a Category 5 hurricane and/or above the wave crest elevation having a 0.2 percent annual chance of being equaled or exceeded (0) ❑ Below the the maximum stillwater elevation associated with a Category 5 hurricane and/or below the wave crest elevation having a 0.2 percent annual chance of being equaled or exceeded (10) ❑ Not applicable (0)	
Is the elevation above the highest of the applicable requirements listed in the last 5 questions? ❑ Yes (0) ❑ No (10) ❑ Not applicable (0)	
If the lowest floor of the building is susceptible to flooding, are there openings in the walls to allow water to pass through the wall, thus avoiding pressure buildup on the foundation and first floor walls? ❑ Yes (0) ❑ No (5) ❑ Not applicable (0)	
Is any space below the applicable flood criteria used for classroom or office space? (If this area is used for storage, access, and parking only answer "No"). ❑ Yes (2) ❑ No (0) ❑ Not applicable (0)	
Is the building material located at the susceptible parts of the base of the structure constructed of entirely flood-resistant material? ❑ Yes (0) ❑ No (2) ❑ Not applicable (0)	
Facility and Utility Issues	
Are the heating, electrical, and other utilities located in a basement or on a slab area that is below the BFE? ❑ Yes (4) ❑ No (0) ❑ Not applicable (0)	
Is there a method of removing floodwaters from the building (e.g., sump pump)? What is the size and capacity of the pump? _____ ❑ Yes (0) ❑ No (4) ❑ Not applicable (0)	
Total Flood Hazard Score =	

*** Ensure that all elevations that are compared to base flood elevations (BFEs) are defined on the vertical datum that is stated on the FIRM panel. (Do not compare local benchmarks to mean sea level (MSL), National Geodetic Vertical Datum of 1929 (NGVD '29), etc.)

Evaluator's Name:_____ Date of Evaluation_____

Site Name: _____

STRUCTURAL SEISMIC HAZARD CHECKLIST

Address the following evaluation statements, giving the most appropriate answer for each question. After selecting the appropriate answer, take the score for that answer (# in the parentheses) and enter it into the score block for that question. Evaluation judgment is subject to limitations of visual examination and availability of plans. (NOTE: This checklist is based upon the guidelines set forth in the FEMA 154 publication, *Rapid Visual Screening of Buildings for Potential Seismic Hazards: A Handbook* (2nd Edition, March 2002). One significant difference is the scoring procedure used herein. Do not compare a building scored on this checklist system with a building scored from FEMA 154. The comparison will not be valid.) After all questions have been appropriately scored, sum the structural seismic hazard score column and determine the final score for the building/structure.

For additional guidance on the design and construction of buildings subject to seismic hazards see FEMA 454, *Designing for Earthquakes: A Manual for Architects* (December 2006), and FEMA 232, *Homebuilder's Guide to Earthquake-Resistant Design and Construction* (June 2006).

Question	Score
See the Seismic Zone Map of the United States (Figure 3 on page B-23) to determine the region of seismicity (low, medium, or high) of the building locale.	
Is the building located in a low region of seismicity and was it designed by a design professional? ❑ Yes (0) If yes, further inspection within the seismic checklist is not necessary. STOP HERE. Is the building located in a medium or high region of seismicity? ❑ Yes (0) If yes, complete all remaining questions on this checklist.	
What is the building/structure type? ❑ Wood (10) ❑ RM and PRM (12) ❑ Steel (12) ❑ Concrete (14) ❑ Pre-cast " Tilt-up" Concrete (15) ❑ URM (17) ❑ Unknown (20)	

Evaluator's Name:_____ Date of Evaluation_____

Site Name: _____

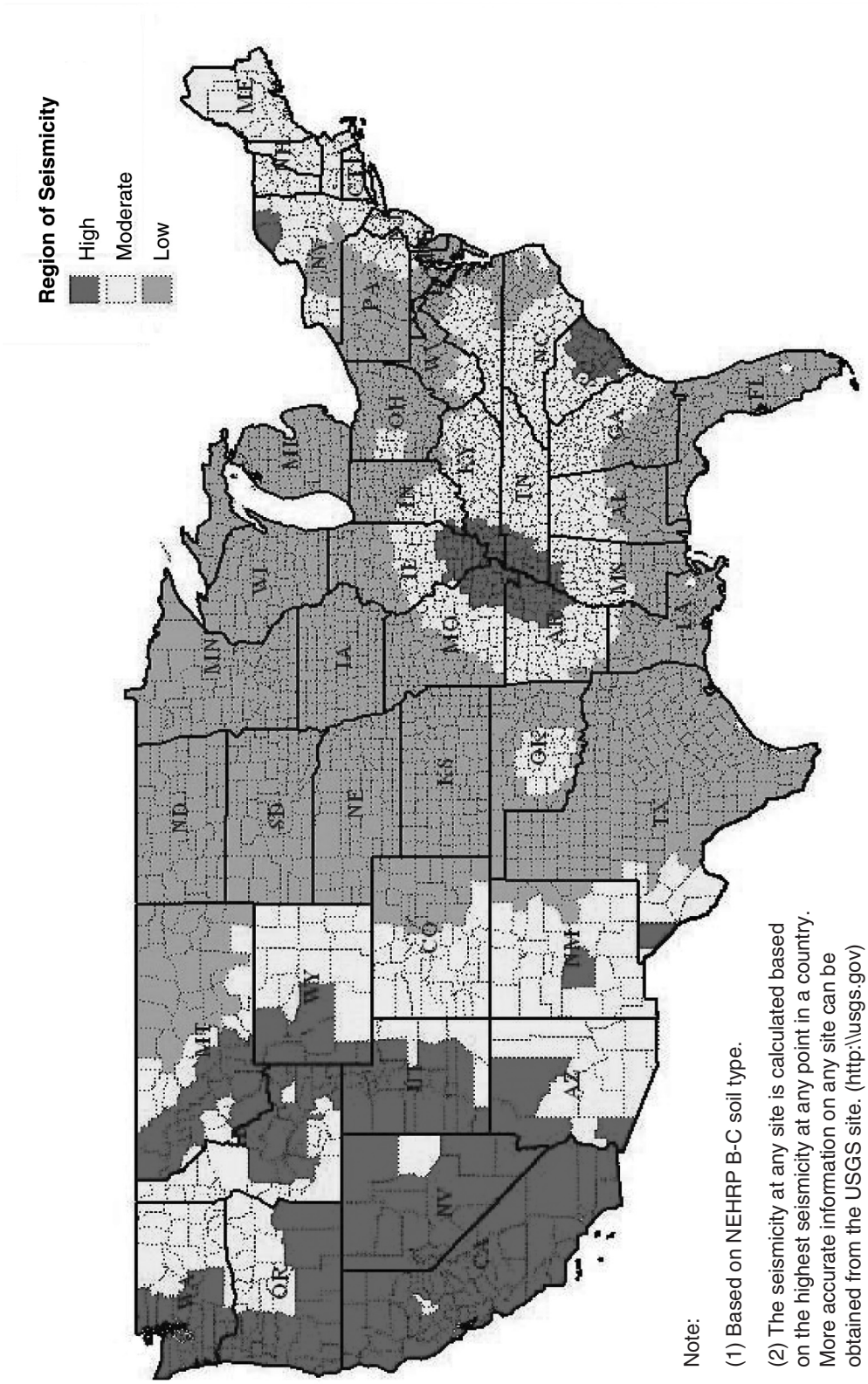
Add penalty points for deficiencies as noted during the inspection. Select one column based on the building type determined in the previous question. Under each column, circle the penalty points if they apply for the criteria listed. (Use descriptions provided on the following page when filling out the matrix below.) When complete, sum the penalties that have been circled and place that total in the score box at right.

Building Characteristic	RM and PRM	URM	Steel	Wood	Concrete	Pre-cast	Unknown
High Rise	1.0	0.5	1.0	N/A	1.0	0.5	1.0
Poor Condition	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Vertical Irregularity	0.5	0.5	0.5	0.5	1.0	1.0	1.0
Soft Story	2.0	2.0	2.0	1.0	2.0	2.0	2.0
Plan Irregularity	2.0	2.0	1.5	2.0	1.5	2.0	2.0
Pounding	N/A	N/A	0.5	N/A	0.5	0.5	0.5
Large (and Heavy) Cladding	N/A	N/A	N/A	N/A	1.0	1.0	1.0
Post Benchmark	2.0	N/A	2.0	2.0	2.0	2.0	2.0

Total Structural Seismic Hazard Score =

Evaluator's Name:_____ Date of Evaluation_____

Site Name: _____



Note:

(1) Based on NEHRP B-C soil type.

(2) The seismicity at any site is calculated based on the highest seismicity at any point in a country. More accurate information on any site can be obtained from the USGS site. (http:\\usgs.gov)

Figure 3: Seismic Zone Map of the United States (FEMA 154, March 2002)

Explanation of Building Characteristics

High-Rise:

For the purposes of this checklist, a wood-frame structure will not be considered a high-rise building. For buildings constructed of masonry units (i.e., brick, block, etc.), if the building is five stories and taller, it is considered a high-rise. For all remaining building types, the building must be eight stories or taller to be considered a high-rise building. If the building is determined to be a high-rise, assess penalty.

Poor Condition:

A building will be considered to be in poor condition if the building condition for the appropriate building type has been observed. Assess penalty if:

- **Masonry Joints:** The mortar can be easily scraped away from the joints by hand with a metal tool, and/or there are significant areas of eroded mortar.
- **Masonry Units:** There is visible deterioration of large areas of masonry units (i.e., significant cracking in the mortar joints, cracks through the masonry blocks themselves, voids or missing blocks or units, etc.).
- **Deterioration of Steel:** Significant visible rusting, corrosion, tearing, or other deterioration in any of the steel elements in the vertical or lateral force-resisting system.
- **Deterioration of Wood:** Wood members show signs of decay, shrinkage, splitting, fire damage, or sagging, or the metal accessories are deteriorated, broken, or loose. Wood members also showing signs or “tracks” from insect infestation.
- **Deterioration of Concrete:** Visible deterioration of concrete (i.e., cracking, spalling, crumbling, etc.) or significant exposure of reinforcing steel in any of the frame elements.
- **Concrete Wall Cracks:** Diagonal cracks in the wall element that are ¼ inch or greater in width are found in numerous locations, and/or form an X pattern.
- **Cracks in Boundary Columns:** Diagonal cracks wider than 1/8 inch in concrete columns on any level of the structure.

Vertical Irregularity:

Are there “steps” in elevation of the building? Are some floors set-back or do they extend outward from the footprint of the building? Are all of the walls of the building vertical or are there walls that slope inward or outward as viewed from the base of the building? Is the building located atop a small hill? If so, there are vertical irregularities; assess penalty.

Soft Story:

Does one story in a building have substantially less shear resistance (resistance to lateral deformation or story drift) than other stories above or bellow it? This condition usually occurs on the ground-floor level between a rigid foundation system and a stiff upper level system. Tall open ground floors are common architectural features in many large buildings. If the presence of a soft story is suspected (open floor plan, extensive glazing, taller ceilings, etc.) check whether

that story has sufficient peripheral bracing (larger number or stiffer columns, moment frames or similar) or a rigid braced interior core. Assess penalty points according to the level and adequacy of story shear resistance (bracing).

Plan Irregularity:

Does the building have a highly irregular floorplan? Is the floorplan of the building an "L," "E," "H," "+," "T," or other such irregular configuration? Is the building long and narrow; length/width ratio greater than 2:1? If so, there are plan irregularities; assess penalty.

Pounding:

How close is the next adjacent building? Are the floors of two adjacent buildings at different elevations? An adjacent building presents a threat of pounding if the lateral distance between the two buildings is less than 4 feet times the number of stories of the smallest building. For example, if a ten-story building and a four-story building are adjacent to one another, there is a potential pounding problem if the buildings are not more than 16 inches apart. (4" x 4 stories = 16" of separation required); assess penalty.

Large (and Heavy) Cladding:

Is the exterior of the building covered in large concrete, or stone panels? If large panels exist, were the connections that secure these panels designed for seismic requirements? If it cannot be positively determined that the connections were designed for seismic requirements, assume that they were not. If large panels are present and they have been determined to be connected with non-seismic connectors, cladding deficiencies exist; assess penalty.

Post Benchmark:

A building is considered to be "post benchmark" if it was designed after modern seismic provisions were accepted by the local building code or the code that has been specified by the local jurisdiction. If the building was not designed for seismic requirements or it is not known if the building was designed for seismic requirements, it is not post benchmark; assess penalty.

Selecting the Refuge Area

Identify potential refuge areas and answer the following questions for each one.

On basis of this information, select the best potential refuge areas (interior spaces that provide the best protection). Explain the selection and rank the refuge areas from most desirable to least desirable.

The recommended square footage (RSF) used for refuge must be calculated depending on the hazard type.

(For Tornado Use, RSF = Total Population x 5 square feet)
(For Hurricane Use, RSF = Total Population x 20 square feet)

Does the potential refuge area have excessive glazing (greater than 6% of exterior wall surface covered by windows) or long unsupported walls and roof spans (greater than 40 feet)?

Is the potential refuge area susceptible to damage from collapsing nearby heavy structures or other objects (e.g., concrete towers, telephone or power poles, antenna towers, chimneys, trees, etc.)?

Is the potential refuge area accessible to all building occupants, including the disabled?

If a potential refuge area is cluttered, can materials be easily moved to create additional usable space?

How much usable space exists (see Part o of FEMA 361, Sections 3.3.1 and 3.4.1)?

recommended square footage (RSF, calculated above) =

available square footage (ASF) =

usable square footage (USF) =

Is USF ≥ to RSF? _____

The USF is determined by subtracting the floor area of excluded spaces, partitions and walls, columns, fixed or movable objects, furniture, equipment or other features that cannot be removed, or stored, during use as a safe room from the ASF.

[Note: as an alternate method, the following values can be used to calculate USF – for safe room areas with concentrated furnishings or fixed seating, reduce by a minimum of 50%; for safe room areas with unconcentrated furnishings (removable tables, etc.) and without fixed seating, reduce by a minimum of 35%; for safe room areas with open space, reduce by a minimum of 15%.]

Evaluator's Name:_____ Date of Evaluation_____

Site Name: _____

Sketch refuge areas within building layout and show access routes (an existing floorplan may be marked up and attached in lieu of the sketch):

Additional Comments:

Evaluator's Name:_____ Date of Evaluation_____

Site Name: _____

Common Building Types and Glossary of Terms

The following is a guide for selecting the type of building/type of construction of the building evaluated. The primary designations that the building types are divided into are Wood, Steel, Concrete, Pre-Cast Concrete, Reinforced Masonry, Partially Reinforced Masonry, and Unreinforced Masonry.

Braced Frame

A building frame system in which all vertical and lateral forces are resisted by shear and flexure in the members, joints of the frame itself, and walls or bracing systems between the beams and columns. A braced frame is dependent on bracing, infill walls between the columns, or shear walls between the columns to resist lateral loads.

Concrete

These buildings have walls and/or frames constructed of reinforced concrete columns and beams. Walls will be seen as smooth surfaces of finished concrete. If this is a concrete frame, concrete masonry units (CMUs) are often used as shear (internal) walls placed between the columns and the beams.

Engineered Steel (Heavy)

These buildings are constructed of steel beams and columns and use either moment or braced frame systems. These buildings are designed specifically for that site and are not a "pre-engineered" or "pre-fabricated" building.

Load-Bearing Wall System

A building structural system in which all vertical and lateral forces are resisted by the walls of the building. The roof structure will be attached to the walls of the building and any forces in the roof system will be transferred to the walls through this roof/wall connection.

Moment Frame

A building frame system in which all vertical and lateral forces are resisted by shear and flexure in members and joints of the frame itself. A moment frame will not utilize bracing, infill walls between the columns, or shear walls between the columns to resist lateral loads.

Partially Reinforced Masonry (PRM)

These buildings have perimeter, bearing walls of reinforced brick or CMU and the vertical wall reinforcement is spaced at more than 8 inches apart and a maximum spacing of 72 inches apart. Reinforcing for these walls will not be evident when viewing the walls; this information may be attained by using reinforcement locating devices or from reviewing project plans. Roof systems will typically be constructed of wood members, steel frames and trusses, or concrete. They may also have roofs and floors composed of precast concrete.

Pre-cast (Including Tilt-up Construction) Concrete

These buildings typically have pre-cast and tilt-up concrete that will run vertically from floor to ceiling/roof. These buildings often have pre-cast or cast-in-place concrete roof systems, but may have very large wood or metal deck roof systems. These buildings could also be pre-cast concrete frames with concrete shear walls, containing floor and roof diaphragms typically composed of pre-cast concrete.

Reinforced Masonry (RM)

These buildings have perimeter bearing walls of reinforced brick or CMU and the vertical wall reinforcement is spaced at a maximum spacing of 8 inches apart; if the reinforcement is in CMU walls, every cell must contain reinforcing steel and grout. Reinforcing for these walls will not be evident when viewing the walls; this information may be attained by using reinforcement locating devices or from reviewing project plans. Roof systems will typically be constructed of wood members, steel frames and trusses, or concrete. They may also have roofs and floors composed of pre-cast concrete.

Steel (Light/Pre-engineered)

These buildings, at a minimum, will have a frame of steel columns and beams. These buildings may be constructed with braced frames. These buildings may be "pre-engineered" and/or "prefabricated" with transverse rigid frames. Interior shear walls may exist between the columns and beams of the frame. In addition, exterior walls may be offset from the exterior frame members, wrap around them, and present a smooth masonry exterior with no indication of the steel frame.

Unreinforced Masonry (URM)

These buildings have perimeter bearing walls of unreinforced brick or concrete-block masonry. Roof systems will typically be constructed of wood members, steel frames and trusses, or concrete. They may also have roofs and floors composed of pre-cast concrete. Most masonry wall systems that were constructed prior to the 1970s are unreinforced masonry.

Wood

These buildings are typically single or multiple family dwellings of one or more stories. Wood structures may also be commercial or industrial buildings with a large floor area and with few, if any, interior walls. Typically, all walls and roof systems are constructed of timber frames.

The following is a glossary of terms that has been provided to ensure clarity and provide definitions for terminology used in these checklists.

Base Flood

The flood having a 1-percent probability of being equaled or exceeded in any given year; also referred to as the 100-year flood.

Base Flood Elevation (BFE)

This height of the base flood in relation to the National Geodetic Vertical Datum of 1929 (or other vertical datum as specified). These elevations can be found on a Flood Insurance Rate Map (FIRM). The elevation of the lowest floor of a structure must be above the BFE to qualify for most forms of federal flood insurance.

Continuous Load Path

A continuous load path can be thought of as a "chain" running through a building. The "links" of the chain are structural members, connections between members, and any fasteners used in the connections (such as nails, screws, bolts, welds, etc.). To be effective, each "link" in the continuous load path must be strong enough to transfer loads without breaking. Because all applied loads (gravity, dead, live, uplift, lateral, etc.) must be transferred to the foundation, the load path must connect to the foundation.

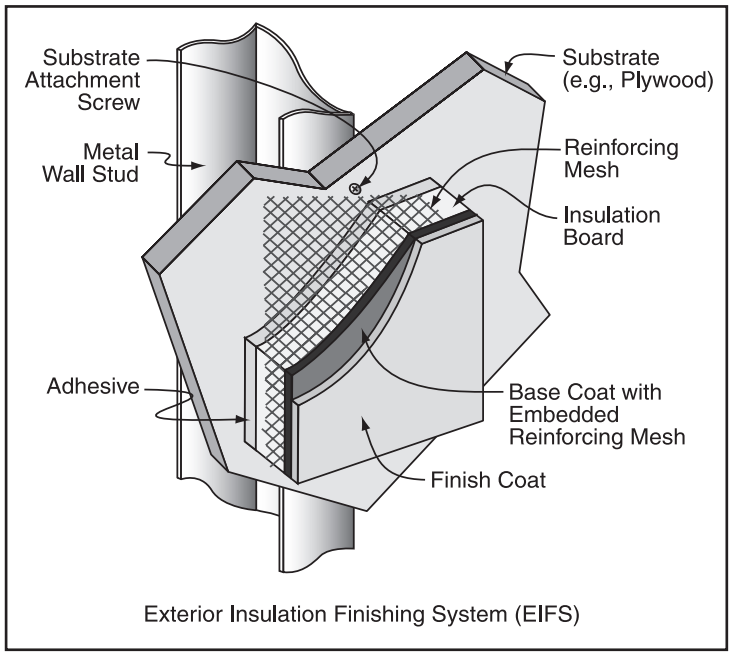


Figure 4. EIFS wall construction

An exterior insulation finishing system (EIFS) is a multi-layered exterior wall system used on both commercial buildings and homes (see Figure 4). It comprises an insulation board mounted to a substrate. The insulation is protected by a plastic finish coat. Mesh reinforcing may be used to strengthen the system. Mesh reinforcing is located in a base coat that is between the insulation board and the finish coat.

Flood Insurance Rate Map (FIRM)

An insurance and floodplain management map issued by FEMA that identifies areas of a 100-year flood hazard in a community. In areas studied by detailed analyses, the FIRM also shows BFEs and 500-year floodplain boundaries and, occasionally, floodway boundaries.

Flood-Resistant Material

Any building material capable of withstanding direct and prolonged contact with floodwaters without sustaining significant damage. The term "prolonged contact" means at least 72 hours, and the term "significant damage" means any damage requiring more than low-cost cosmetic repair (such as painting).

Masonry Wall: Height to Thickness Ratio (H/T)

Height to thickness refers to the height of a masonry wall compared to the thickness of the wall. The height of the wall should be measured from the foundation up to the point at which the wall is laterally supported. In a one-story building, the maximum height will typically be found at the point at which a wall extends to the highest roof support. In a multi-story building, the tallest floor height will indicate the height of the wall. Inspection of a doorway section in a masonry wall will allow an evaluator to determine the thickness of the wall. The largest ratio that is found is the most critical.

Masonry Wall: Length to Thickness Ratio (L/T)

Length to thickness refers to the length of a masonry wall compared to the thickness of the wall. The length of the wall is typically measured from a wall corner to the next adjacent wall corner. Wall spans, however, can be quite long. If there are any vertical columns in a wall, the length will then be measured from column to column or from vertical support to vertical support. Inspection of a doorway section in a masonry wall will allow an evaluator to determine the thickness of the wall. The largest ratio that is found is the most critical.

Parapet

A parapet is a small wall located atop a building that extends above the roof level. Parapets are typically located along a wall face at the top of the roof. They are most commonly seen on flat roofs and are usually a few feet tall and will be a minimum of 8 inches thick. They are often constructed of unreinforced masonry and are susceptible to damage by lateral forces caused by wind and seismic forces.

Tack Weld

A small weld intended only to secure a building element (i.e., roof deck) in place during construction. If the type of weld cannot be determined, it should be considered no better than a tack weld and “Other” should be selected.

SUMMARY SCORE SHEET

	WIND HAZARD SCORE	**Area 1 Total**	Structural	Cladding/Glazing	Envelope	Non-structural	**Area 2 Total**	Structural	Cladding/Glazing	Envelope	Non-structural	**Area 3 Total**	Structural	Cladding/Glazing	Envelope	Non-structural	**Area 4 Total**	Structural	Cladding/Glazing	Envelope	Non-structural	**Area 5 Total**	Structural	Cladding/Glazing	Envelope	Non-structural	Highest Wind Hazard Score	Flood Hazard Score	Seismic Hazard Score	**TOTAL SCORE**
Site 1																														
Site 2																														
Site 3																														
Site 4																														
Site 5																														
Site 6																														
Site 7																														
Site 8																														
Site 9																														
Site 10																														

B.2 Designer Checklists

FEMA

Checklist
for
Design and Construction Guidance for Community Safe Rooms
using FEMA 361, Edition 2 (2008)

Blue - User Input	Gray - Program generate		Date:		
Project Name:					
Location:					
Designer/Lead Authority:			Completed by:		
1	General Design and Drawings				
2	Type of [community] safe room	Tornado/ Hurricane/ Both			
3	Do the structural drawings include a statement that the safe room was designed to FEMA 361?	Yes/No			
4	Is the design wind speed stated on the drawings?	Yes/No			Wind speed should be obtained from Sections 3.3 or 3.4 of FEMA 361
5	Are other structural and envelope design parameters identified on the drawings?	Yes/No			See Section 3.9 of FEMA 361
6	Has the safe room (s) to be incorporated been identified on the drawings?	Yes/No			See Section 3.9 of FEMA 361
7	Is space provided for safe room supplies within each safe room area?	Yes/No			
8	Wind Loading - Identify Appropriate Safe Room Hazard Criteria				
9	**Tornado Safe Room** - Go to Line 16 if this is not a Tornado Safe Room				
10	What wind zone is the safe room located in?	I, II, III, IV			
11	What is the design wind speed for the tornado safe room?			mph	Wind speed should be obtained from Figure 3-1 of FEMA 361
12	What is the state's site exposure category?	ASCE 7-05			See Section 3.3.1 of FEMA 361
13	Building enclosure classification - how was Atmospheric Pressure Change (APC) considered? - Designed at a partially enclosed building - Designed as an enclosed building with APC value added	FEMA 361/ ICC-500/ ASCE 7-05/ Other			
14	What standard was used in calculating wind pressures?	ASCE 7-05/ ICC-500/ Other/ None			
15	Go to Line 31 (Walls / Openings / Door Assemblies / Window and Window Assemblies)				
16	**Hurricane Safe Room** - Go to Line 23 if this is a Tornado/Hurricane (Combined Hazard) Safe Room				
17	What is the design wind speed for the hurricane safe room?			mph	
18	How is this design wind speed determined? From FEMA 361 Chapter 3?	Yes/No			Wind speed should be obtained from Figure 3-2 of FEMA 361
19	What is the State's site exposure category?	ASCE 7-05			
20	Building enclosure classification? - Designed at a partially enclosed building - Designed as an enclosed building	FEMA 361/ ICC-500/ ASCE 7-05 /Other			

21	What standard was used in calculating wind pressures?	ASCE 7-05/ ICC-500/ Other/ None			
22	Go to Line 31 (Walls / Openings / Door Assemblies / Window and Window Assemblies)				
23	**Tornado/Hurricane (Combined Hazard) Safe Room**				
24	What wind zone is the safe room located in?	I, II, III, IV			
25	What is the design wind speed if designed as a tornado safe room?			mph	
26	What is the design wind speed if designed as a hurricane safe room?			mph	
27	How was this hurricane design wind speed determined from FEMA 361 Chapter 3?	Yes/No			Wind speed should be obtained from Figure 3-2 of FEMA 361
28	What is the state's site exposure category?	ASCE 7-05			
29	Building enclosure classification - how was Atmospheric Pressure Change (APC) considered? - Designed at a partially enclosed building - Designed as an enclosed building with APC value added	FEMA 361/ ICC-500/ ASCE 7-05/ Other			
30	What standard was used in calculating wind pressures?	ASCE 7-05/ ICC-500/ Other/ None			
31	Walls / Openings / Door Assemblies / Window and Window Assemblies				
32	Have the walls of the safe room area been successfully tested for the identified hazard criteria for tornadoes, hurricanes, or both? Identify hazard and criteria.	Yes/No			
33	Have the roof deck systems of the safe room area been successfully tested for the identified hazard criteria for tornadoes, hurricanes, or both? Identify hazard and criteria.	Yes/No			
34	Have any openings or opening protection systems of the safe room area been successfully tested for the identified hazard criteria for tornadoes, hurricanes, or both? Identify hazard and criteria.	Yes/No			
35	Have any glazing or glazing systems of the safe room area been successfully tested for the identified hazard criteria for tornadoes, hurricanes, or both? Identify hazard and criteria.	Yes/No			
36	Have any door or door systems of the safe room area been successfully tested for the identified hazard criteria for tornadoes, hurricanes, or both? Identify hazard and criteria.	Yes/No			
37	Are windows or openings protected by shutter systems? If yes, and for tornado safe rooms, are these shutter systems readily available?	Yes/No			Openings should be protected to resist wind pressures and debris impacts
38	Flood Hazards (FEMA 361)				
39	Is the safe room located on a FIRM in a mapped A, B, or shaded X zone?	Yes/No			
40	Is the safe room located on a FIRM in a mapped V or VE zone?	Yes/No			
41	Is the safe room located in a mapped floodway?				
42	Is the safe room located behind a non-certified levee?				
43	Is the safe room located in an area subject to Category 5 storm surge inundation?	Yes/No			
44	What is the mapped BFE (100-year flood elevation) at the site, if applicable?				

45	What is the mapped 500-year flood elevation at the site, if applicable?				
46	What is the (proposed) elevation of the top of the safe room floor?				
47	Was Section 3.6 of FEMA 361 used to select this elevation?				
48	If the surrounding area is flooded, is access to the safe room possible?	Yes/No			
49	Other Hazards (FEMA 361)				
50	Is the safe room designed to resist damage from the collapse of adjoining or adjacent structures?	Yes/No			
51	If non-safe room portions of adjoining structures are attached to the safe room, would collapse cause damage to the safe room?	Yes/No			
52	Is the safe room designed in accordance with the latest National Earthquake Hazards Reduction Program (NEHRP) seismic recommendations?	Yes/No			
53	Ventilation (FEMA 361)				
54	Is ventilation provided by passive (P) or mechanical (M) methods?	(P/M)			
55	Are ventilation openings protected?	Yes/No			
56	Is the ventilation equipment protected from wind forces and debris impacts?	Yes/No			
57	Air exchanges per hour provided				
58	Square Footage/Occupancy Criteria (FEMA 361)				
59	Maximum expected occupancy (number of people)				
60	Net available square footage (ASF) - Open areas			sf	Refer to FEMA 361 Chapter 3 on how to calculate usable floor areas.
61	Net available square footage (ASF) - Restrooms, kitchens, storage areas, etc.			sf	Refer to FEMA 361 Chapter 3 on how to calculate usable floor areas.
62	Total usable square footage			sf	
63	Recommended Square Footage (RSF) Calculations				
64	Expected number of standing or seated occupants				
65	Expected number of wheelchair-bound occupants				
66	Expected number of bedridden occupants				
67	Total number of occupants described for the safe room				
68	Total number of recommended square footage (RSF) based on number of occupants listed above			sf	
69	ADA Requirements (FEMA 361)				
70	Is the safe room accessible to individuals with disabilities? (Assume a power-off condition, where the elevator is not functioning, unless a protected generator or standby power source is present.)	Yes/No			
71	Toilets				
72	Number of toilets provided				
73	Are appropriate toilets available in each separate safe room area?	Yes/No			
74	Special Inspection				
75	Has or will a Special Inspection Program and a QA/QC plan been/be developed?	Yes/No			See Section 3.10, FEMA 361