Hazard Mitigation Grant Program (HMGP)
FEMA 361 Tornado Safe Room

KAMM September 11, 2014

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A Team of Teams – With One Mission:
“Protecting Our Commonwealth”
Learning Objectives:

- Types of Safe Rooms
- Safe Room Protective Measures
- Safe Room Design Criteria
- Emergency Manager Considerations
- Application Development
Tornado Safe Rooms

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Tornado:

A violent rotating column of air, pendant or underneath a cumuliform cloud and often visible as a funnel.
What is a safe room?

• A space within a building or an entirely separate building that is designed and constructed to provide near absolute protection for its occupants during a natural hazard event.

What is the safe room protecting us from?

• Tornadoes and straight line winds up to 250 mph.
Tornado Safe Rooms

What types of safe rooms are there?

- Stand alone or internal
- Residential or Community
- Single use or multi-use
- Prefabricated or New construction

*Safe room use will affect the determination of which type of safe room best fits your community needs
Stand Alone Safe Room

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Stand-alone:
Structure separate from an existing building

Stand alone advantages:
• Does not need to be integrated into an existing building design
• Size can be determined according to needs rather than be limited by available space
• Will be structurally separated from building there for not vulnerable to being weakened if part of adjacent structure collapses
• May be located away from potential debris hazards
Internal Safe Rooms

Internal:
Inside a building but designed to be structurally independent

Internal Advantages:
• The safe room is being used mainly by the occupants of the building
• Access to the safe room can be reached more quickly
• Incorporating safe room into a planned renovation may reduce project cost
Residential Safe Room

Residential:

Small, specifically designed “hardened” room, such as a bathroom or closet OR External safe room either above or below ground.

- 16 people or less
- FEMA 320 guidance


- Difficult to prioritize under HMGP
Community:
Structure designed for 16 people or greater

- FEMA 361 guidance

Single Use Safe Room

Single Use:
Safe Room is being used **ONLY** during an event

**Single Use Advantages**
- Potentially simplified design that may be readily accepted by local officials
- Typically have simplified electrical/mechanical systems
- Always ready for occupants, will not be cluttered with furnishings and storage.

**Disadvantage:**
- In the absence of regular use, the safe room may acquire unintended functions that could impede its primary function—address this in O&M plan.

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Multi Use Safe Room

Multi Use:
Used for more than just protective measures

Multi Use Advantages:
• Allow immediate return on investment for owners/operators by optimizing space while providing near absolute protection

Disadvantage:
• Frequently require permanent fixtures and furnishings that reduce the effective area for safe room use.
• Cost could be higher
Whether your community chooses a stand alone, internal, single use or multi use, community or residential safe room. The safe room will either be built as a...

1. Prefabricated

2. New Construction
Safe Room
Protective Objectives

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Protective Objectives

• Intended to minimize the probability of injury or death during an extreme wind event by providing occupants with near absolute protection.

• Will provide protection against both wind forces and windborne debris.

• Level of threat is determined based off probability of occurrence of a hazard event of specific magnitude at a specific location.

• Although the level of exposure to wind hazards is not easy to quantify accurately, areas exposed to stronger or more frequent tornadoes have been identified and mapped.
Safe Room
Protective Objectives

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Protective Objectives

• The historical information on past wind storms is used to calculate their statistical frequency or probability of occurrence of certain magnitude.

• At present, it is not possible to directly measure wind speeds in a tornado b/c of its short life, however the measure used to identify wind speeds are an average time of a 3-second gust
Protective Objectives

• A vulnerability assessment is necessary in identifying these structures.
• It is necessary to evaluate the building stock of the community to identify their potential vulnerability to wind damage that can cause death.
• Inventory should be based on archeology & engineering reviews with building specific factors; structural integrity, age, condition, building material, design and quality.
Vulnerability Assessment

The 1st stage in a vulnerability assessment is a general survey that identifies the buildings that pose the greatest risk of damage/collapse;

- mobile homes, old wood frame homes, Unreinforced masonry, and high occupancy structures, daycare
Vulnerability Assessment

The 2\textsuperscript{nd} stage in the assessment is to identify ALL high occupancy buildings prone to wind damage and rank them according to level of potential harmful wind effects:

- Identify interior areas of buildings that can serve as the best SR
- Identify stand alone buildings, portions of buildings, interior areas that could be used as retrofit
- Combine physical vulnerability of the built environment to wind damage with level of exposure of building occupants to potential wind damage in order to calculate potential losses.
- Potential losses are estimated on basis of identified weakness in build or occupancy type.
- Example of Occupancy type; nursing home, schools, hospitals, daycare
Protective Objectives
Kentucky History

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Design Criteria for the construction of tornado safe rooms.

- FEMA P-320 Residential (2008)
- FEMA P-361 Community (2008) or
- International Code Council (ICC)-500 (2008)
- American Society of Civil Engineers [ASCE] 7-10, Minimum Design Loads for Buildings and Other Structures
- American Society of Civil Engineers ASCE 7-05, Design Wind Load/Speed Criteria
Safe Room
Design Criteria

At Risk Population

• Identifying the at risk population allows the community to consider location and optimum size of the safe room
• Occupants of a proposed safe room must be within a .5 mile radius of the safe room location and or less than a 5 minute walking distance
• How many structures and people are being protected by the safe room?
• Must indicate the % of occupants expected to utilize the safe room for 3 different sets of time. (12am-7, 7am-12pm, 12pm-12am)
• No obstructions to the access of the safe room such as two lane highways, fences, bridges, streams
• Per ADA compliance, you will need to identify if there are special needs occupants designated in the .5 mile radius to accommodate for any special needs
Safe Room Location:

- Must be located within a .5 miles radius of the vulnerable population
- Provide site location maps, address and decimal latitude and longitude for safe room site
- Identify who owns the property. Permanent easements may be necessary
- Identify what flood zone the project location is in
- Location will be heavily scrutinized by environmental review at state and federal levels
  - Provide Information if ground has been previously disturbed
  - Note how far down the slab and footers will be poured
  - Are there any historic structures near or around the proposed site
Safe Room Design Criteria

Safe Room Design Factors:

• The design criteria are based on a “minimum floor area per occupant approach.”
• Must allow 5 square feet per occupant and 10 square feet per handicap/disabled occupants for 200 or more.
• Identify the gross and usable sq ft of the safe room.
• To calculate usable sq ft you subtract the floor area of excluded spaces, partitions and walls, columns, fixed or movable objects, furniture, equipment, and other features that cannot be removed from the safe room during use.
Safe Room Design Criteria

Safe Room Design Factors:

• Must provide engineer design plans and site drawings
• Will require a registered professional engineer’s assurances that the design meets or exceed the FEMA 361 guidance, the appropriate codes, and construction standards
• A Peer review will need to be conducted for safe room occupancy of 50 or more. Design calculations and drawings should be thoroughly scrutinized for accuracy
• The design professional should prepare a quality assurance plan for the construction of the safe room. More detail can be found in CH. 3 of the FEMA 361 guidance
Safe Room Design Criteria

Safe Room Design Factors:

• FEMAs maximum time frame for duration in a safe room is 2 hours.

• Since the duration time is low the need for increased comfort of occupant is not recommended (HVAC, bathrooms)

• All safe rooms should have a sign inside or outside with the name of the manufacturer or builder of the safe room, its purpose and, design wind speeds

• Signage must be posted for the public to see identifying the structure as a tornado safe room.

• Occupancy signs should be posted on the inside of the structure
Safe Room
Design Criteria

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Engineering

Signage
Operations and Maintenance Plan

- Considered as a baseline plan

- An O&M statement is required during the application process and a final O&M plan is required at the close out of the safe room grant
Emergency Manager Considerations

Operations and Maintenance Plan

Establish a **Safe Room Coordinator**, whose responsibilities are to:

- Develop, plan, organize and coordinate the O&M plan. As well as maintenance of the safe room
- Ensure that personnel are assigned roles to facilitate all aspects of the safe room plan
- Develop educational and training programs relative to the community safe room O&M plan
- Coordinate practice drills and exercises to test the safe room O&M plan
- Conduct regular community meetings to discuss emergency planning
- Distribute phone #’s and key personnel to appropriate individuals and agencies
- Ensure that the SR O&M plan is periodically reviewed and updated as necessary
- Readiness and availability of the SR Management team is of special importance
  Must specify the duties and responsibilities of the team
Emergency Manager Considerations

Operations and Maintenance Plan

The Management team should include:

- Manager, building manager, shift supervisor, registration unit leader, health service unit leader, communications unit leader, food unit leader
- Each role has its own separate responsibilities outlined in more detail in the FEMA 361 guidance.
- Maintenance will help to ensure the community safe room equipment and supplies are fully functional during and after tornado events.
- Check in with your KYEM Grants manager for a full copy of an O&M Plan for reference
Scope of Work

Who, What, When, Where, Why, How

• Building type for at risk population?

• Population size?

• How many are coming from each structure?

• Determine size of safe room that will occupy maximum population within .5 mile radius?

• Who owns the property?

• What type of Safe room?
**Scope of Work / Budget**

Provide details of all costs of the project. This information is used in a Benefit-Cost Analysis so reasonable cost estimates, are essential. Do not include project administrative costs in the budget.

### A. Materials

<table>
<thead>
<tr>
<th>Item</th>
<th># of Units</th>
<th>Cost per Unit</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuous Footings</td>
<td>1</td>
<td>$4,000</td>
<td>$4,000</td>
</tr>
<tr>
<td>Slab on grade</td>
<td>1</td>
<td>$7,000</td>
<td>$7,000</td>
</tr>
<tr>
<td>Exterior Doors</td>
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<td>$1,750</td>
<td>$1,750</td>
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<tr>
<td>Reinforced Masonry Walls</td>
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<td>$14,500</td>
<td>$14,500</td>
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<tr>
<td>Hollow Core plank Roof</td>
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<tr>
<td>Roof Sheathing and coating</td>
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<tr>
<td>Electrical</td>
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<tr>
<td>HVAC</td>
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<td>Site work</td>
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<td>Sidewalks</td>
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<td>1st Aid/Fire Extinguisher</td>
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<td>Communications</td>
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<td>Signage</td>
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<tr>
<td>Storage for food/water</td>
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<tr>
<td><strong>Total Material Cost</strong></td>
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<td><strong>$68,000</strong></td>
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</table>

### Labor

(Include equipment costs -- please indicate all "soft" or in-kind matches)

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<th>Description</th>
<th># of Units</th>
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<tr>
<td>Labor</td>
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### Fees Paid

Include any other costs associated with the project

<table>
<thead>
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<th>Description of Task</th>
<th># of Units</th>
<th>Cost per Unit</th>
<th>Total Cost</th>
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<tbody>
<tr>
<td>Engineering Cost</td>
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</tbody>
</table>

(Budget Summary appreciated)

**Total Project Cost $134,000**
Milestones

• Assist in identifying task relationships

• Divide the activity into measurable tasks

Example Milestones

Master agreement 150 days
Engineering 60 days
Bidding/Award 60 days
Construction 150 days
Final inspection 30 days
Project close out 90 days

Total 540 days
KYEM has submitted 46 safe room grants totaling $9,949,022 in project costs in the commonwealth!

42 Awarded Grants  
$7,188,568

4 Pending Approval  
$2,760,454