# Recommended Revisions for
# US Green Building Council
# Leadership in Energy and Environmental Design for Homes Version 3

## EQ PREREQUISITE: RODENTPROOFING

**Required**

This prerequisite applies to:

- Homes
- Mid-Rise

**Intent**

Assuring adequate provisions for rodent infestation resistance reduces the potential to use pesticides over the life of the building. The use of pesticides may have a negative impact on occupant comfort and health. Adequate rodentproofing will minimize the amount of energy and resources required over the life of the building if means other than pesticides are required to eliminate infestations. Adequate rodentproofing also reduces the amount of energy and resources required to repair, remove, dispose and replace materials when damage from rodents occurs.

**Requirements**

Buildings shall be provided with rodentproofing in accordance with Appendix F of the *International Building Code* or the Code of local jurisdiction, whichever is more stringent.

**Recommendations, suggestions, or other ideas for improvement**

The amount of energy and resources required for repair and replacement when rodent infestations occur can be significant. In addition, the use of pesticides and other measures to eradicate infestations can have a negative impact on human health and comfort. To provide for increased safety to occupants and minimize the negative impact on the built environment from rodents requires buildings to be designed and constructed in a manner that at least satisfies the minimum requirements of the Appendix F of the *International Building Code*. Currently, the use of Appendix F is optional and, thus it is not required in many jurisdictions. A green building should not be readily susceptible to rodent infestations and following these criteria should be a mandatory prerequisite for green buildings.


**Resources**

PCA HPBRS http://www.cement.org/codes/pdf/HPBRS%20&%20Commentary%20v2.0.pdf

International Code Council (ICC) *International Building Code* (IBC) Appendix F – *Rodentproofing*

## MR Prerequisite: Design of Storage and Collection Areas

**Required**

This prerequisite applies to:

- Homes (Low-Rise Multifamily)
- Mid-Rise

**Intent**

To assure adequate life safety and property protection in areas where large amounts of separated combustible materials are intended to be collected and stored.

**Requirements**

Design and construct areas intended for the storage and collection of recyclables to minimize the potential for jeopardizing life safety and to assure a minimum level of property protection for such storage and collection areas as they pose a larger hazard than traditional storage and collection areas within and around buildings.

1. Walls, floors and ceilings of interior collection or storage areas provided for recyclable materials shall be shall be completely separated from other parts of the building by noncombustible construction having a fire resistance rating of not less than 2-hours and constructed as fire walls or smoke partitions in accordance with the International Building Code.
2. These interior collections and storage areas shall also be equipped with automatic fire-extinguishing systems in accordance with NFPA 13
3. Exterior walls of buildings within 30 feet (measured horizontally and vertically) to exterior collection or storage areas provided for recyclable materials shall have a fire resistance rating of not less than 2-hours.

**Recommendations, suggestions, or other ideas for improvement**

Separated combustible materials pose much greater life safety and property protection risks than blended waste. The increased risk and danger to occupants and the potential for damage to structures when fires occur has not, as of yet, been addressed in the development of model building codes. To address this increased potential threat to occupants, the structure, and its contents, special criteria should be satisfied when providing collection or storage areas for separated combustibles in or adjacent to buildings. Areas for the collection and storage of recyclables must be designed and constructed in a manner are not to increase the danger occupants and service personnel and in a manner as not to increase the need for repair, removal, disposal and replacement of building materials and contents when a fire hazard occurs. No matter how idyllic we can envision recycle areas, they tend to become trash rooms.


Further consideration should be given to requiring smooth hard surfaces in these areas and attention should also be given to assuring these areas are rodentproof. Both are especially important for areas accepting liquid containers intended to be “empty”.

**Resources**

PCA HPBRS http://www.cement.org/codes/pdf/HPBRS%20&%20Commentary%20v2.0.pdf

International Code Council (ICC) *International Building Code* (IBC)

National Fire Protection Association (NFPA) NFPA 13, *Standard for the Installation of Sprinkler Systems*

## MR Prerequisite: Enhanced Resistance To Fire Damage – Internal Barriers

**Required**

This prerequisite applies to:

- Homes (Low-Rise Multifamily)
- Mid-Rise

**Intent**

To reduce construction, renovation, and demolition waste; divert debris from disposal in landfills and incineration facilities; and reduce energy and resources expended to reconstruct, repair or replace materials in buildings from fire damage

**Requirements**

Fire walls are used to create separate building areas for large buildings. They shall:

- Be constructed entirely of noncombustible materials
- Have fire resistance ratings of at least 2-hours
- Be constructed in accordance with the *International Building Code*.

To further reduce the risk of fire spread within the building, provide internal fire barriers (walls and horizontal floor systems) to establish multiple fire area compartments. Fire barrier assemblies shall have fire resistance ratings of at least 1-hour and constructed in accordance with the *International Building Code*.

**Recommendations, suggestions, or other ideas for improvement**

Enhanced property protection is a crucial component of green construction and thus requirements for enhanced performance of interior fire walls, fire barriers and fire partitions above the minimum requirements in the IBC are necessary. Such requirements reduce the amount of energy and resources required for repair, removal, disposal and replacement of building components and contents damaged from fire. This proposal requires fire walls, fire barriers and fire partitions to be more robust and enhances fire containment within the building thereby limiting the damage due to fire or fire suppression operations.

Additional benefits are enhanced life safety, security and occupant comfort; potentially less demand on community resources required for emergency response; and allowing facilities to be more readily adapted for re-use if there is a change of occupancy in the future.

Minimum building requirements whether through energy codes, plumbing codes, mechanical codes, zoning codes, or basic building codes, do not encourage truly sustainable buildings. The proposal is one of several that attempt to integrate the concepts of the *Whole Building Design Guide* (WBDG) into the minimum design and construction criteria for "green" buildings. The WBDG, developed in partnership between the National Institute of Building Sciences (NIBS) and the Sustainable Building Industries Council (SBIC), has as its key concepts: accessible, aesthetics, cost-effective, functional/operational, historic preservation, productive, secure/safe, and sustainable.

There are numerous references about the economic, societal, and environmental benefits that result when enhanced functional resilience is integrated into building design and construction. Six examples demonstrating the importance and supporting the concepts are:

1. ***Natural Hazard Mitigation Saves: An Independent Study to Assess the Future Savings from Mitigation Activities*** National Institute of Building Sciences Multi-Hazard Mitigation Council - 2005

   One of the findings in this report is "The analysis of the statistically representative sample of FEMA grants awarded during the study period indicates that a dollar spent on disaster mitigation saves society an average of $4." The programs studied often addressed issues and strategies other than enhanced disaster resistance of buildings and other structures. However, more disaster-resistant buildings enhance life safety; reduce costs and environmental impacts associated with repair, removal, disposal, and replacement; and reduce the time and resources required for community recovery.

2. ***Five Years Later – Are we better prepared?*** Institute for Business and Home Safety - 2010

   This IBHS report states: "When Hurricane Katrina made landfall on Aug. 29, 2005, it caused an estimated $41.1 billion in insured losses across six states, and took an incalculable economic and social toll on many communities. Five years later, the recovery continues and some residents in the most severely affected states of Alabama, Louisiana and Mississippi are still struggling. There is no question that no one wants a repeat performance of this devastating event that left at least 1,300 people dead. Yet, the steps taken to improve the quality of the building stock, whether through rebuilding or new construction, call into question the commitment of some key stakeholders to ensuring that past mistakes are not repeated." This report indicates that there is a need to implement provisions to make buildings more disaster-resistant. Clearly this suggests that functional resilience should at least be integrated into the design and construction of sustainable buildings.

3. **National Weather Service Office of Climate, Water and Weather Services** National Oceanic and Atmospheric Administration (NOAA) - 2010

   Data provided on the NOAA website [www.weather.gov/os/hazstats.shtml] indicates that the average annual direct property loss due to natural disasters in the United States exceeds of $35,000,000,000. This does not include indirect costs associated with loss of residences, business closures, and resources expended for emergency response and management. These direct property losses also do not reflect the direct environmental impact due to reconstruction after the disasters. Functional resilience will help alleviate the environmental impact and minimize both direct and indirect losses from natural disasters.

4. ***Global Climate Change Impacts in the United States*** U.S. Global Change Research Program - 2009

   The USGCRP includes the departments of Agriculture, Commerce, Defense, Energy, Health and Human Services, Interior, State and Transportation; National Aeronautic and Space Administration; Environmental Protection Agency, USA International Development, National Science Foundation and Smithsonian Institution

   The report identifies that: "Climate changes are underway in the United States and are projected to grow. Climate-related changes are already observed in the United States and its coastal waters. These include increases in heavy downpours, rising temperature and sea level, rapidly retreating glaciers, thawing permafrost, lengthening growing seasons, lengthening ice-free seasons in the ocean and on lakes and rivers, earlier snowmelt, and alterations in river flows. These changes are projected to grow." The report further identifies that the: "Threats to human health will increase. Health impacts of climate change are related to heat stress, waterborne diseases, poor air quality, extreme weather events, and diseases transmitted by insects and rodents. Robust public health infrastructure can reduce the potential for negative impacts." Key messages in the report on societal impacts include:

   - "City residents and city infrastructure have unique vulnerabilities to climate change. "
   - "Climate change affects communities through changes in climate-sensitive resources that occur both locally and at great distances."
   - "Insurance is one of the industries particularly vulnerable to increasing extreme weather events such as severe storms, but it can also help society manage the risks."

   Sustainable building design and construction cannot be about protecting the natural environment without consideration of the projected growth in severe weather. Minimum codes primarily based on past natural

events are not appropriate for truly sustainable buildings. Buildings expected to have long term positive impacts on the environment must be protected from these extreme changes in the natural environment. The provisions for improved property protections are necessary to reduce the amount of energy and resources associated with repair, removal, disposal, and replacement due to routine maintenance and damage from disasters. Further such provisions reduce the time and resources required for community disaster recovery.

5. ***Sustainable Stewardship - Historic preservation plays an essential role in fighting climate change,*** *Traditional Building,* National Trust for Historic Preservation - 2008

   In the article *Richard Moe summarizes the results of a study by the* Brookings Institution which projects that by 2030 we will have demolished and replaced 82 billion square feet of our current building stock, or nearly 1/3 of our existing buildings, largely because the vast majority of them weren't designed and built to last any longer. Durability, as a component of functional resilience, can reduce these losses.

6. **Opportunities for Integrating Disaster Mitigation and Energy Retrofit Programs**

   Senate Environment and Public Works Committee Room, Dirksen Senate Office Building, Wash, D.C. - 2010

   During this panel discussion a representative of the National Conference of State Historic Preservation Officers noted that more robust buildings erected prior to 1950 tend to be more adaptable for reuse and renovation. Prior to the mid-1950s most local jurisdictions developed their own building code requirements that uniquely addressed the community's needs, issues and concerns. Pre-1950 building codes typically resulted in more durable and robust construction that lasts longer.

The total environmental impact of insulation, high efficiency equipment, components, and appliances, low-flow plumbing fixtures, and other building materials and contents are relatively insignificant when rendered irreparable or contaminated and must be disposed of in landfills after disasters. The US Army Corps of Engineers estimated that after Hurricane Katrina nearly 1.2 billion cubic feet of building materials and contents ended up in landfills. This is analogous to stacking enough refrigerators a fifth of the way to the moon or placing them end to end around the equator of the Earth twice.

**Resources**

PCA HPBRS http://www.cement.org/codes/pdf/HPBRS%20&%20Commentary%20v2.0.pdf

International Code Council (ICC) *International Building Code* (IBC)

## MR PREREQUISITE: ENHANCED RESISTANCE TO FIRE DAMAGE – CONTAINMENT

**Required**

This prerequisite applies to:

- Homes (Low-Rise Multifamily)
- Mid-Rise

**Intent**

To reduce construction, renovation, and demolition waste; divert debris from disposal in landfills and incineration facilities; and reduce energy and resources expended to reconstruct, repair or replace materials in buildings damaged from fire events

**Requirements**

Building shall be designed to the heights in feet, heights in stories and floor areas in square feet based on the following:

1) All structural load-bearing elements (i.e. walls, columns, beams, girders, floors and roofs) shall satisfy the criteria of the *International Building* Code but shall not have a fire resistance rating of less than 1-hour.
2) No increases in allowable floor area, according to *International Building Code*, are permitted for open space around the perimeter of the building.
3) No increases in height in feet or number of stories, according to *International Building Code*, are permitted for the presence of automatic sprinkler systems.

**Recommendations, suggestions, or other ideas for improvement**

Requiring increased fire resistance for building elements, as buildings increase in size, reduces the amount of damage to the building and its contents. This enhances sustainability by minimizing how much building materials will be required to restore the building. This also reduces the amount of materials entering landfills, positively impacts the demand on community resources required for emergency response, and allows facilities to be more readily adapted for re-use if there is a change of occupancy in the future.

Minimum building requirements whether through energy codes, plumbing codes, mechanical codes, zoning codes, or basic building codes, do not encourage truly sustainable buildings. The proposal is one of several that attempt to integrate the concepts of the *Whole Building Design Guide* (WBDG) into the minimum design and construction criteria for "green" buildings. The WBDG, developed in partnership between the National Institute of Building Sciences (NIBS) and the Sustainable Building Industries Council (SBIC), has as its key concepts: accessible, aesthetics, cost-effective, functional/operational, historic preservation, productive, secure/safe, and sustainable.

There are numerous references about the economic, societal, and environmental benefits that result when enhanced functional resilience is integrated into building design and construction. Six examples demonstrating the importance and supporting the concepts have been previously mentioned. See discussion on the following topics starting on page 7.

1. ***Natural Hazard Mitigation Saves: An Independent Study to Assess the Future Savings from Mitigation Activities***
2. ***Five Years Later – Are we better prepared?***
3. **National Weather Service Office of Climate, Water and Weather Services**
4. ***Global Climate Change Impacts in the United States***
5. ***Sustainable Stewardship - Historic preservation plays an essential role in fighting climate change ,***
6. **Opportunities for Integrating Disaster Mitigation and Energy Retrofit Programs**

**Resources**

PCA HPBRS http://www.cement.org/codes/pdf/HPBRS%20&%20Commentary%20v2.0.pdf

International Code Council (ICC) *International Building Code* (IBC)

## MR PREREQUISITE: ENHANCED STRUCTURAL RESISTANCE TO FIRE DAMAGE

**Required**

This prerequisite applies to:

- Homes (Low-Rise Multifamily)
- Mid-Rise

**Intent**

To reduce construction, renovation, and demolition waste; divert debris from disposal in landfills and incineration facilities; and reduce energy and resources expended to reconstruct, repair or replace materials in buildings damaged from fire events.

**Requirements**

Building shall be designed so that all structural load-bearing elements (i.e. walls, columns, beams, girders, floors and roofs) shall satisfy the criteria of the *International Building* Code but shall not have a fire resistance rating of less than 1-hour.

**Recommendations, suggestions, or other ideas for improvement**

*Fire Losses in the United States During 2009* by the National Fire Protection Association, August 2010 shows that property loss due to structure fires in buildings other than one and two family dwellings was approximately 4.5 billion dollars. Increased fire resistance of building elements reduces the amount of damage to the building and its contents. This enhances sustainability by minimizing how much building materials will be required to restore the building and reduces the amount of materials entering landfills. Additional benefits are enhanced life safety, potentially less demand on community resources required for emergency response, and allowing facilities to be more readily adapted for re-use if there is a change of occupancy in the future.

Minimum building requirements whether through energy codes, plumbing codes, mechanical codes, zoning codes, or basic building codes, do not encourage truly sustainable buildings. The proposal is one of several that attempt to integrate the concepts of the *Whole Building Design Guide* (WBDG) into the minimum design and construction criteria for "green" buildings. The WBDG, developed in partnership between the National Institute of Building Sciences (NIBS) and the Sustainable Building Industries Council (SBIC), has as its key concepts: accessible, aesthetics, cost-effective, functional/operational, historic preservation, productive, secure/safe, and sustainable.

There are numerous references about the economic, societal, and environmental benefits that result when enhanced functional resilience is integrated into building design and construction. Six examples demonstrating the importance and supporting the concepts have been previously mentioned. See discussion on the following topics starting on page 7.

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International Code Council (ICC) *International Building Code* (IBC)

## MR PREREQUISITE: ENHANCED RESISTANCE TO EXTERIOR FIRE DAMAGE

**Required**

This prerequisite applies to:

- Homes
- Mid-Rise

**Intent**

To reduce construction, renovation, and demolition waste; divert debris from disposal in landfills and incineration facilities; and reduce energy and resources expended to reconstruct, repair or replace materials in buildings damaged from fire events

**Requirements**

Building shall be designed so the exterior of buildings are less susceptible to exposure to fire by the following measures:

1) Exterior wall coverings of vinyl siding conforming to the requirements of the *International Building Code* and Exterior insulation and finish systems (EIFS) conforming to the requirements of the *International Building Code* shall only be permitted to be installed on exterior walls of buildings with a minimum separation distance of 30 feet to other buildings or to property lines.
2) Combustible exterior wall coverings shall not be installed on exterior walls of buildings with a separation distance of 5 feet or less to other buildings or to property lines.
3) Limiting openings in the exterior walls in accordance with Table 1
4) Unclassified roof coverings shall not be permitted.

| Table 1<br>Maximum Area of Exterior Wall Opening Based on Distance to Property Lines or Other Buildings and Degree of Opening Protection | | |
|---|---|---|
| **Distance to Property Lines or Other Buildings (feet)** | **Degree of Opening Protection** | **Allowable Areas** |
| 0 to less than 3 | Unprotected (UP) | Not Permitted |
| | Protected (P) | Not Permitted |
| | | |
| 3 to less than 5 | Unprotected (UP) | Not Permitted |
| | Protected (P) | 15% |
| | | |
| 5 to less than 10 | Unprotected (UP) | 10% |
| | Protected (P) | 25% |
| | | |
| 10 to less than 15 | Unprotected (UP) | 15% |
| | Protected (P) | 45% |
| | | |
| 15 to less than 20 | Unprotected (UP) | 25% |
| | Protected (P) | 75% |
| | | |
| 20 to less than 25 | Unprotected (UP) | 45% |
| | Protected (P) | No Limit |
| | | |
| 25 to less than 30 | Unprotected (UP) | 70% |
| | Protected (P) | No Limit |
| | | |
| 30 or greater | Unprotected (UP) | No Limit |
| | Protected (P) | Not Required |
| For SI: 1 foot = 304.8 mm<br>UP = Unprotected openings in buildings<br>P = Openings protected with an opening protective assembly in accordance with the ICC *International Building Code* | | |

**Recommendations, suggestions, or other ideas for improvement**

Enhanced property protection is a crucial component of green construction and thus requirements for enhanced performance of exterior walls and roofs above the minimum requirements in the International Building Code are necessary. Such requirements reduce the amount of energy and resources required for repair, removal, disposal and replacement of building components and contents damaged from fire. This proposal requires exterior walls to be more robust and limits openings when located in close proximity to other buildings.

Also strengthening roof coverings to resist the affect of fire reduces the amount of damage to the building and its contents. *Fire Losses in the United States During 2009* by the National Fire Protection Association, August 2010 shows that property loss due to structure fires in buildings other than one and two family dwellings was approximately 4.5 billion dollars.

Additional benefits are enhanced life safety, security and occupant comfort; potentially less demand on community resources required for emergency response; and allowing facilities to be more readily adapted for re-use if there is a change of occupancy in the future.

Minimum building requirements whether through energy codes, plumbing codes, mechanical codes, zoning codes, or basic building codes, do not encourage truly sustainable buildings. The proposal is one of several that attempt to integrate the concepts of the *Whole Building Design Guide* (WBDG) into the minimum design and construction criteria for "green" buildings. The WBDG, developed in partnership between the National Institute of Building Sciences (NIBS) and the Sustainable Building Industries Council (SBIC), has as its key concepts: accessible, aesthetics, cost-effective, functional/operational, historic preservation, productive, secure/safe, and sustainable.

There are numerous references about the economic, societal, and environmental benefits that result when enhanced functional resilience is integrated into building design and construction. Six examples demonstrating the importance and supporting the concepts have been previously mentioned. See discussion on the following topics starting on page 7.

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PCA HPBRS http://www.cement.org/codes/pdf/HPBRS%20&%20Commentary%20v2.0.pdf

International Code Council (ICC) *International Building Code* (IBC)

## MR PREREQUISITE: ENHANCED RESISTANCE TO FIRE DAMAGE – AUTOMATIC SPRINKLER PROTECTION Required

This prerequisite applies to:

- Homes (Low-Rise Multifamily)
- Mid-Rise

**Intent**

Significant losses due to fire in low-rise and mid-rise multifamily buildings are frequently the result of fire spread through areas not required to be protected with automatic sprinkler systems conforming to NFPA 13R, such as attics. To reduce construction, renovation, and demolition waste; divert debris from disposal in landfills and incineration facilities; and reduce energy and resources expended to reconstruct, repair or replace materials in buildings damaged from fire events sprinkler systems conforming to NFPA 13 are required.

**Requirements**

Buildings shall be provided with automatic sprinkler protection in accordance with the NFPA 13. Standpipe and fire alarm system features shall not be reduced or modified based on the presence of automatic sprinkler protection.

**Recommendations, suggestions, or other ideas for improvement**

Robustness of the building is enhanced by requiring most buildings to be provided with sprinkler protection. Sprinkler protection combined with established fire compartments can reduce damage to the building and its contents from a fire event which in turn enhances sustainability by minimizing how much building materials will be required to restore the building and reduces the amount of materials entering landfills. Appropriate levels of combined containment with automatic fire sprinkler systems minimize damage from fire, smoke, steam and water used for suppression and control, Further, the combination reduces that amount of toxic smoke that may be generated by some building materials and building contents when fires occur. Additional benefits are enhanced life safety, potentially less demand on community resources required for emergency response and allowing facilities to be more readily adapted for re-use if there is a change of occupancy in the future.

Additional benefits are enhanced life safety, security and occupant comfort; potentially less demand on community resources required for emergency response; and allowing facilities to be more readily adapted for re-use if there is a change of occupancy in the future.

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PCA HPBRS http://www.cement.org/codes/pdf/HPBRS%20&%20Commentary%20v2.0.pdf

International Code Council (ICC) *International Building Code* (IBC)

## MR Prerequisite X.X: Design for Enhanced Resistance to Wind Damage

**Required**

This prerequisite applies to:

- Homes
- Mid-Rise

**Intent**

To assure enhanced life safety and to minimize property damage the minimum design wind loads are increased. The significant environmental impact that results is reduced energy and resources for repair, removal, disposal and replacement of materials damaged during high wind events.

**Requirements**

Wind loads shall be determined in accordance with ASCE 7 or the *International Building Code* (IBC). The design wind pressure, *p*, and design wind force, *F*, determined in accordance with ASCE 7 or IBC shall be based on a design wind speed equal to the basic wind speed (or locally adopted basic wind speed in special wind zones, if higher) plus 20-mph. Component and cladding loads shall be determined for the design wind speed defined assuming terrain Exposure C, regardless of the actual local exposure. Wind shall be assumed to come from any horizontal direction and wind pressures shall be assumed to act normal to the surface considered.

**Recommendations, suggestions, or other ideas for improvement**

The last significant hurricane season in the United States was in 2005. The American Society of Civil Engineers reported in *Normalized Hurricane Damage in the United States*, *1900 – 2005,* National Hazard Review, ASCE 2008, that property damage from hurricanes was 81 billion dollars in 2005. Increasing the stringency of the design criteria of buildings for wind hazards results in more robust buildings. The sustainability benefit from reduced damage minimizes how much building materials will be required to restore the building. A further benefit is a reduction in the amount of damaged building materials and content entering landfills.

Additional benefits are enhanced life safety, security and occupant comfort; potentially less demand on community resources required for emergency response; and allowing facilities to be more readily adapted for re-use if there is a change of occupancy in the future.


Above photographs are of Greensburg, KS (left) and after Hurricane Katrina (right)

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**Resources**

PCA HPBRS http://www.cement.org/codes/pdf/HPBRS%20&%20Commentary%20v2.0.pdf

American Society of Civil Engineers/Structural Engineering Institute (ASCE/SEI) 7 *Minimum Design Loads for Buildings and Other Structures*

International Code Council (ICC) *International Building Code* (IBC)

## MR PREREQUISITE: STORM SHELTERS

**Required**

This prerequisite applies to:

- Homes
- Mid-Rise

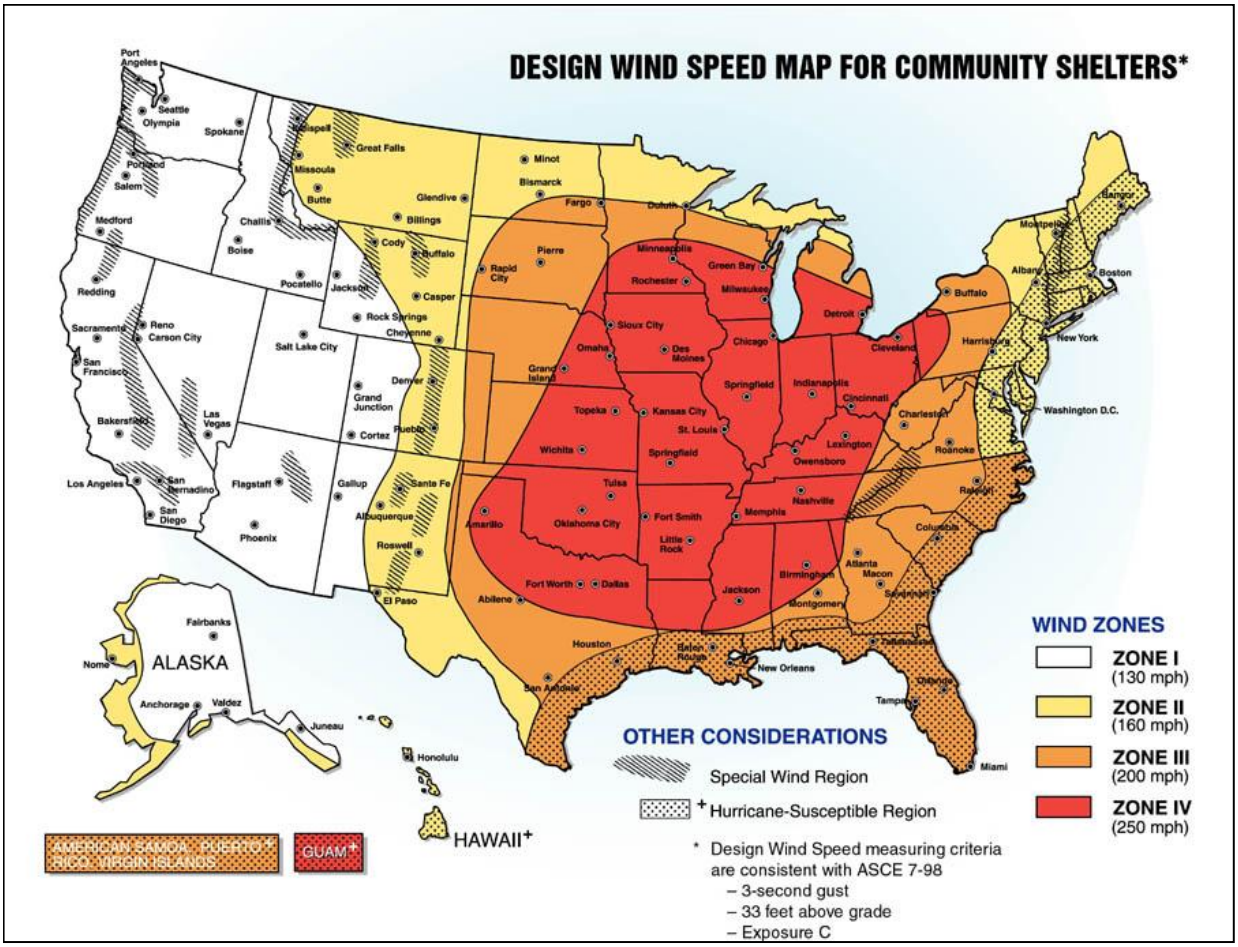
**Intent**

To require storm shelters for enhanced life safety of building occupants and permit more rapid recovery after disasters by minimizing injuries and preserving the human component of the community.

**Requirements**

Storm shelters complying with the requirements of ICC/NSSA 500 shall be provided for occupants of buildings according to the following:

1. **Hurricane-Prone Regions** – In hurricane-prone regions hurricane shelters shall be provided for occupants of buildings.
2. **Tornado-Prone Regions** – In areas where the shelter design wind speed for tornadoes is 160 mph or greater, tornado shelters shall be provided for occupants of buildings.
3. **Combined hurricane and tornado shelters –** Combined hurricane and tornado shelters shall comply with the more stringent requirements of ICC/NSSA-500 for both types of shelters.




**Recommendations, suggestions, or other ideas for improvement**

Incorporating storm shelters and community shelters into the design of buildings located in high wind regions enhances the living environment for the occupants. These shelters become havens for protecting people from injury or death due to structural collapse and windborne debris. Additional benefits are enhanced life safety, security and occupant comfort; potentially less demand on community resources required for emergency response and healthcare; and allowing facilities to be more readily adapted for re-use if there is a change of occupancy in the future.

**They work!!**

Photo provided by Oklahoma Department of Emergency Management

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**Resources**

PCA HPBRS http://www.cement.org/codes/pdf/HPBRS%20&%20Commentary%20v2.0.pdf

International Code Council (ICC)/National Storm Shelter Association (NSSA) ICC/NSSA 500 *Standard on the Design and Construction of Storm Shelters*

## MR Prerequisite: DESIGN OF EXTERIORS FOR ENHANCED WIND DAMAGE RESISTANCE

**Required**

This prerequisite applies to:

- Homes
- Mid-Rise

**Intent**

To minimize property damage during high wind events. The significant environmental impact that results is reduced energy and resources for repair, removal, disposal and replacement of materials damaged during high wind events.

**Requirements**

Vinyl siding conforming to the requirements of the *International Building Code* (IBC) and exterior insulation and finish systems (EIFS) conforming to the requirements of the IBC shall only be permitted to be installed on exterior walls of buildings located outside hurricane-prone regions as defined in the IBC

**Recommendations, suggestions, or other ideas for improvement**

Enhanced property protection is a crucial component of green construction and thus requirements for enhanced performance of exterior walls above the minimum requirements in the IBC are necessary. Such requirements reduce the amount of energy and resources required for repair, removal, disposal and replacement of exterior wall coverings damaged from wind. Property damage from wind was reported to be almost 2 billion dollars in 2009 according to the National Weather Service. This proposal requires exterior wall coverings most susceptible to wind damage be limited to non-hurricane prone regions.


Minimum building requirements whether through energy codes, plumbing codes, mechanical codes, zoning codes, or basic building codes, do not encourage truly sustainable buildings. The proposal is one of several that attempt to integrate the concepts of the *Whole Building Design Guide* (WBDG) into the minimum design and construction criteria for "green" buildings. The WBDG, developed in partnership between the National Institute of Building Sciences (NIBS) and the Sustainable Building Industries Council (SBIC), has as its key concepts: accessible, aesthetics, cost-effective, functional/operational, historic preservation, productive, secure/safe, and sustainable.

There are numerous references about the economic, societal, and environmental benefits that result when enhanced functional resilience is integrated into building design and construction. Six examples demonstrating the importance and supporting the concepts have been previously mentioned. See discussion on the following topics starting on page 7.

1. ***Natural Hazard Mitigation Saves: An Independent Study to Assess the Future Savings from Mitigation Activities***
2. ***Five Years Later – Are we better prepared?***
3. **National Weather Service Office of Climate, Water and Weather Services**
4. ***Global Climate Change Impacts in the United States***
5. ***Sustainable Stewardship - Historic preservation plays an essential role in fighting climate change ,***
6. **Opportunities for Integrating Disaster Mitigation and Energy Retrofit Programs**

**Resources**

PCA HPBRS http://www.cement.org/codes/pdf/HPBRS%20&%20Commentary%20v2.0.pdf
International Code Council (ICC) *International Building Code* (IBC)

## MR Prerequisite: Design of Exteriors for Enhanced Hail Damage Resistance

**Required**

This prerequisite applies to:

- Homes
- Mid-Rise

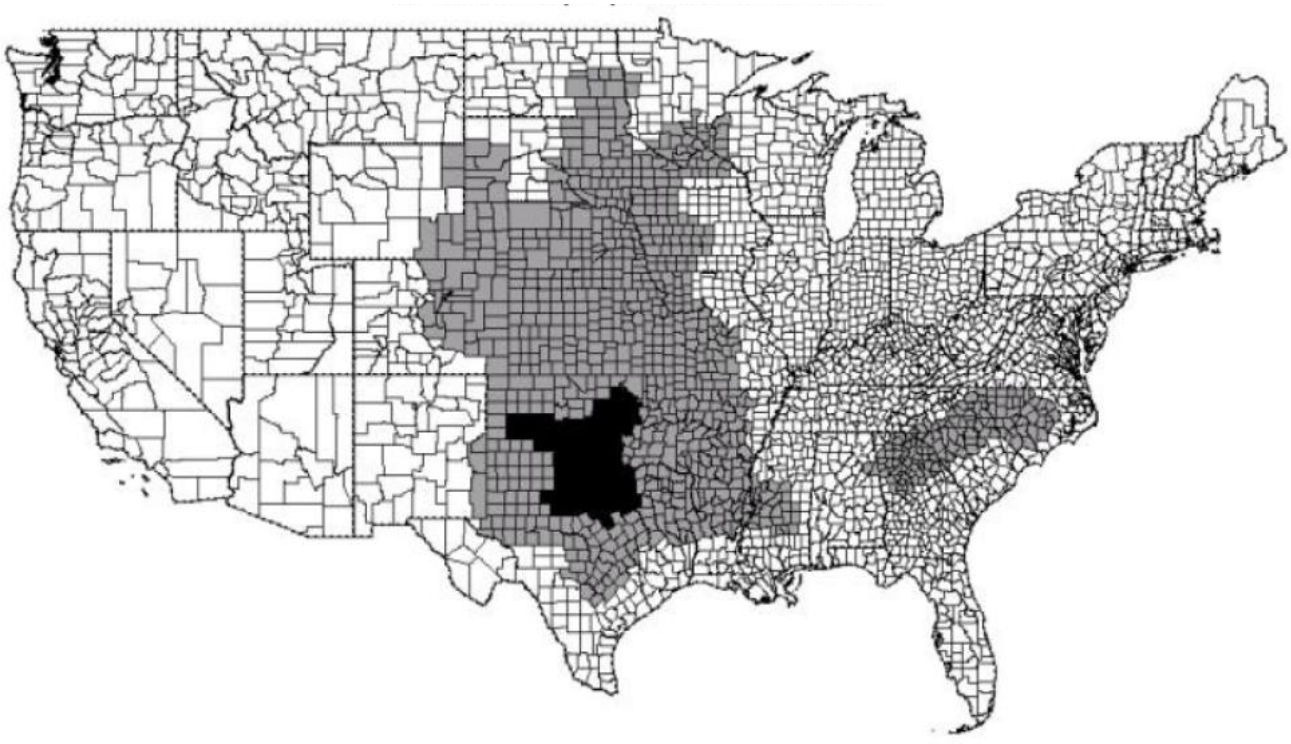
**Intent**

To minimize property damage during hail storms. The significant environmental impact that results is reduced energy and resources for repair, removal, disposal and replacement of materials damaged during high wind events.

**Requirements**

Vinyl siding conforming to the requirements of the *International Building Code* and exterior insulation and finish systems (EIFS) conforming to the requirements of the *International Building Code* shall only be permitted to be installed on exterior walls of buildings located outside moderate and severe hail exposure regions.

Roof coverings and exterior wall coverings of vinyl siding and EIFS used in regions where hail exposure is Moderate or Severe shall be tested, classified, and labeled in accordance with UL 2218 or FM 4473.



Moderate exposure - one or more days with hail diameter greater than 1.5 in. (38 mm) in a twenty (20) year period

Severe exposure - one or more days with hail diameter greater than 2.0 in. (50 mm) in a twenty (20) year period

**Figure 1. Hail Exposure Map**

**Recommendations, suggestions, or other ideas for improvement**

Enhanced property protection is a crucial component of green construction and thus requirements for enhanced performance of exterior walls above the minimum requirements in the IBC are necessary. Such requirements reduce the amount of energy and resources required for repair, removal, disposal and replacement of exterior wall coverings damaged from hail. Property damage from hail was reported to be approximately 1.3 billion dollars in 2009 according to the National Weather Service. This proposal requires exterior wall coverings most susceptible to damage from hail be tested, classified, and labeled in accordance with UL 2218 or FM 4473 to be more robust and limited in hail exposure areas.

Minimum building requirements whether through energy codes, plumbing codes, mechanical codes, zoning codes, or basic building codes, do not encourage truly sustainable buildings. The proposal is one of several that attempt to integrate the concepts of the *Whole Building Design Guide* (WBDG) into the minimum design and construction criteria for "green" buildings. The WBDG, developed in partnership between the National Institute of Building Sciences (NIBS) and the Sustainable Building Industries Council (SBIC), has as its key concepts: accessible, aesthetics, cost-effective, functional/operational, historic preservation, productive, secure/safe, and sustainable.

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5. ***Sustainable Stewardship - Historic preservation plays an essential role in fighting climate change ,***
6. **Opportunities for Integrating Disaster Mitigation and Energy Retrofit Programs**

**Resources**

PCA HPBRS http://www.cement.org/codes/pdf/HPBRS%20&%20Commentary%20v2.0.pdf

International Code Council (ICC) *International Building Code* (IBC)

Underwriters Laboratories (UL) UL 2218, *Impact Resistance of Prepared Roof Covering Materials. UL 2218, Impact Resistance of Prepared Roof Covering Materials*.

Factory Mutual (FM) FM 4473, *Specification Test Standard for Impact Resistance Testing of Rigid Roof Materials by Impacting With Freezer Ice Balls.*

## MR Prerequisite: Design for Enhanced Resistance to Damage from Snow Loads

**Required**

This prerequisite applies to:

- Homes
- Mid-Rise

**Intent**

To reduce construction, renovation, and demolition waste; divert debris from disposal in landfills and incineration facilities; and reduce energy and resources expended to reconstruct, repair or replace materials in buildings damaged from excessive snow loads

**Requirements**

The ground snowloads to be used in determining the design snow loads for roofs shall be equal to 1.2 times the ground snowloads determined in accordance with ASCE 7 or the *International Building Code*.

**Recommendations, suggestions, or other ideas for improvement**

The National Weather Service reports that U.S. property damage due to winter storms and ice exceeded 1.5 billion dollars in 2009. Increasing the stringency of the design criteria for snow hazards results in more robust buildings with less risk of damage to the building and its contents. Enhanced sustainability is achieved by minimizing the amount of both replacement materials required to restore the building and damaged materials entering landfills

Minimum building requirements whether through energy codes, plumbing codes, mechanical codes, zoning codes, or basic building codes, do not encourage truly sustainable buildings. The proposal is one of several that attempt to integrate the concepts of the *Whole Building Design Guide* (WBDG) into the minimum design and construction criteria for "green" buildings. The WBDG, developed in partnership between the National Institute of Building Sciences (NIBS) and the Sustainable Building Industries Council (SBIC), has as its key concepts: accessible, aesthetics, cost-effective, functional/operational, historic preservation, productive, secure/safe, and sustainable.

There are numerous references about the economic, societal, and environmental benefits that result when enhanced functional resilience is integrated into building design and construction. Six examples demonstrating the importance and supporting the concepts have been previously mentioned. See discussion on the following topics starting on page 7.

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**Resources**

PCA HPBRS http://www.cement.org/codes/pdf/HPBRS%20&%20Commentary%20v2.0.pdf

American Society of Civil Engineers/Structural Engineering Institute (ASCE/SEI) 7 *Minimum Design Loads for Buildings and Other Structures*

International Code Council (ICC) *International Building Code* (IBC)

## MR PREREQUISITE: DESIGN FOR ENHANCED RESISTANCE TO SEISMIC DAMAGE

**Required**

This prerequisite applies to:

- Home
- Mid-Rise

**Intent**

To reduce construction, renovation, and demolition waste; divert debris from disposal in landfills and incineration facilities; and reduce energy and resources expended to reconstruct, repair or replace materials in buildings damaged from seismic events

**Requirements**

Building in high seismic risk areas shall be designed by a registered design professional and the seismic load applied to the building design, determined in accordance with International Building Code, shall be increased by a factor of 1.2 when located where the 0.2 sec spectral response acceleration parameter is equal to or greater than 0.4g. In addition, for high seismic risk buildings a site specific geotechnical report complying with the provisions of ASCE 7 is required.

**Recommendations, suggestions, or other ideas for improvement**

Increasing the stringency of the design criteria of high performance buildings for earthquakes enhances a buildings ability to respond to a ground motion event. This results in more durable buildings which reduces damage to the building and its contents from seismic events which in turn enhances sustainability by minimizing how much building materials will be required to restore the building and reducing the amount of materials entering landfills. Additional benefits are enhanced life safety, potentially less demand on community resources required for emergency response and allowing facilities to be more readily adapted for re-use if there is a change of occupancy in the future.

This proposal is consistent with the criteria of the Fortified Buildings program of the Institute for Business and Home Safety (IBHS)

Minimum building requirements whether through energy codes, plumbing codes, mechanical codes, zoning codes, or basic building codes, do not encourage truly sustainable buildings. The proposal is one of several that attempt to integrate the concepts of the *Whole Building Design Guide* (WBDG) into the minimum design and construction criteria for "green" buildings. The WBDG, developed in partnership between the National Institute of Building Sciences (NIBS) and the Sustainable Building Industries Council (SBIC), has as its key concepts: accessible, aesthetics, cost-effective, functional/operational, historic preservation, productive, secure/safe, and sustainable.

There are numerous references about the economic, societal, and environmental benefits that result when enhanced functional resilience is integrated into building design and construction. Six examples

demonstrating the importance and supporting the concepts have been previously mentioned. See discussion on the following topics starting on page 7.

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American Society of Civil Engineers/Structural Engineering Institute (ASCE/SEI) 7 *Minimum Design Loads for Buildings and Other Structures*

International Code Council (ICC) *International Building Code* (IBC)

## MR Prerequisite: Design for Enhanced Flood Damage Resistance

**Required**

This prerequisite applies to:

- Homes
- Mid-Rise

**Intent**

To minimize the amount of building materials and contents that become contaminated by flood water and must be disposed in landfills and to minimize the amount of energy and resources required to repair, remove, dispose and replace flood damaged and contaminated materials. Flood resistant buildings place less demand for material and natural resources for individual and community disaster recovery. Further, flood-resistant construction is less likely to generate debris and contaminants that pollute the environment when floods occur.

**Requirements**

The design and construction of buildings in flood hazard areas including flood hazard areas subject to high velocity wave action shall be designed and constructed in accordance with ASCE 7 and ASCE 24 and the following:

1. Floors required by ASCE 24 to be built above the base elevations shall have the floor and their lowest horizontal supporting members not less than the higher of:
   a. Design flood elevation
   b. Base flood elevation plus 3 feet (1 m)
   c. Advisory base flood elevation plus 3 feet (1 m) or
   d. 500-year flood if known
2. Levees and flood walls shall not be considered as providing flood protection.

**Recommendations, suggestions, or other ideas for improvement**

Flood resistant construction minimizes the amount of building materials and contents that become contaminated by flood water and must be disposed in landfills and to minimize the amount of energy and resources required to repair, remove, dispose and replace flood damaged and contaminated materials. Flood resistant buildings place less demand for material and natural resources for individual and community disaster recovery. Further, flood-resistant construction is less likely to generate debris and contaminants that pollute the environment when floods occur.

Minimum building requirements whether through energy codes, plumbing codes, mechanical codes, zoning codes, or basic building codes, do not encourage truly sustainable buildings. The proposal is one of several that attempt to integrate the concepts of the *Whole Building Design Guide* (WBDG) into the minimum design and construction criteria for "green" buildings. The WBDG, developed in partnership between the National Institute of Building Sciences (NIBS) and the Sustainable Building Industries Council (SBIC), has as its key concepts: accessible, aesthetics, cost-effective, functional/operational, historic preservation, productive, secure/safe, and sustainable.

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**Resources**

PCA HPBRS http://www.cement.org/codes/pdf/HPBRS%20&%20Commentary%20v2.0.pdf

American Society of Civil Engineers/Structural Engineering Institute (ASCE/SEI) 7 *Minimum Design Loads for Buildings and Other Structures*

American Society of Civil Engineers (ASCE) ASCE 24 *Flood Resistant Design and Construction*

## MR Prerequisite: Enhanced Resistance To Fire Damage – Wildfires

**Required**

This prerequisite applies to:

- Homes
- Mid-Rise

**Intent**

To reduce construction, renovation, and demolition waste; divert debris from disposal in landfills and incineration facilities; and reduce energy and resources expended to reconstruct, repair or replace materials in buildings damaged from wildland fire events.

**Requirements**

The construction, alteration, movement, repair, maintenance and use of any building, structure or premises within the wildland interface areas shall follow the provisions of the *International Wildland-Urban Interface Code*. The design and construction of exterior walls shall be based on the fire hazard severity value determined for the site.

**Recommendations, suggestions, or other ideas for improvement**

When buildings are built in areas subject to wildfires they are at risk to damage that may occur. According to the National Weather Service the property damage from wildland fires was 110 million in 2009. To reduce the likelihood of damage, this proposal requires sites for buildings to be reviewed for characteristics of the surrounding environment to see if they may contribute to wildfires. If found, the building design will incorporate features to enhance the robustness of the building to reduce risk of fire damage and production of toxic emissions. In turn this enhances sustainability by minimizing how much building materials will be required to restore the building and reduce the amount of materials entering landfills. Additional benefits are enhanced life safety, security and occupant comfort and potentially less demand on community resources required for emergency response.

Minimum building requirements whether through energy codes, plumbing codes, mechanical codes, zoning codes, or basic building codes, do not encourage truly sustainable buildings. The proposal is one of several that attempt to integrate the concepts of the *Whole Building Design Guide* (WBDG) into the minimum design and construction criteria for "green" buildings. The WBDG, developed in partnership between the National Institute of Building Sciences (NIBS) and the Sustainable Building Industries Council (SBIC), has as its key concepts: accessible, aesthetics, cost-effective, functional/operational, historic preservation, productive, secure/safe, and sustainable.

There are numerous references about the economic, societal, and environmental benefits that result when enhanced functional resilience is integrated into building design and construction. Six examples demonstrating the importance and supporting the concepts have been previously mentioned. See discussion on the following topics starting on page 7.

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**Resources**

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International Code Council (ICC) *International Wildland-Urban Interface Code (*IWUIC)