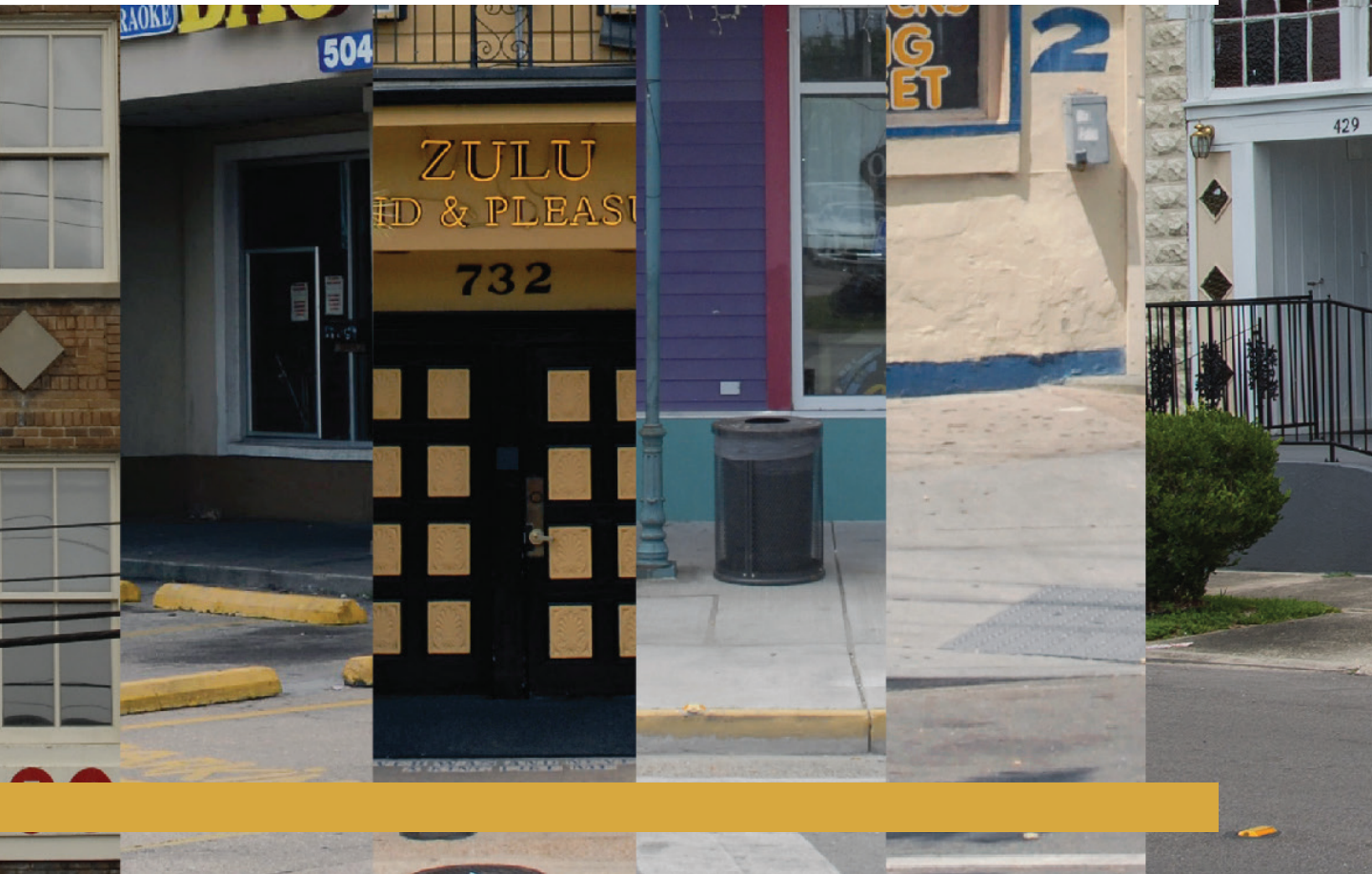




NEW ORLEANS BUILDING HARDENING GUIDE



CITY OF NEW ORLEANS



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CITY OF NEW ORLEANS



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1. What is Structural Hardening (Property Protection & Retrofitting)

THIS GUIDE IN CONTEXT

This guide will walk you through some ways to protect your business from high winds, flooding, fire, winter weather, and hail. These techniques range from very minor, inexpensive retrofits which you might do by yourself to far more complicated measures which require the assistance of a licensed professional.

Even if you do not own the building, you will still find ways to protect your inventory, equipment and other contents in this guide. You may also wish to share this information with your landlord, as many of the measures described here could help them to protect their investment.

Protecting the physical structure in which your businesses is located is only one part of reducing your risk. Preparedness, continuity planning and insurance are also critical. This guide will provide some minor discussion of these other components, as well as references to where to find more information.

This guide is intended to help you to take actions to reduce the risks to your business. Natural events such as hurricanes and thunderstorms will continue to take place in New Orleans, but their impacts will depend on individual actions, as well as on the measures taken by the City of New Orleans and other regional actors.



New Orleans Business Continuity Guide

“ We are building a New Orleans for the future — one that embraces change, prepares for the risks of the future, and honors our traditions.”

- Resilient New Orleans Strategy.
City of New Orleans. 2015

City and neighborhood-scale initiatives and policies are part of the broader risk reduction context. Corridor level solutions are discussed in the Main Street Resilience Plan developed by the New Orleans City Planning Commission. These measures might include drainage improvements, using green space, and street level interventions such as using Best Management Practices for stormwater.

The City of New Orleans also has several plans, policies, and regulations which are part of the broader risk reduction context. These include:

- Hazard Mitigation Plan
- Master Plan
- Comprehensive Zoning Ordinance
- Resilient New Orleans Strategy

1. What is Structural Hardening (Property Protection & Retrofitting)

WHAT IS PROPERTY PROTECTION AND RETROFITTING?

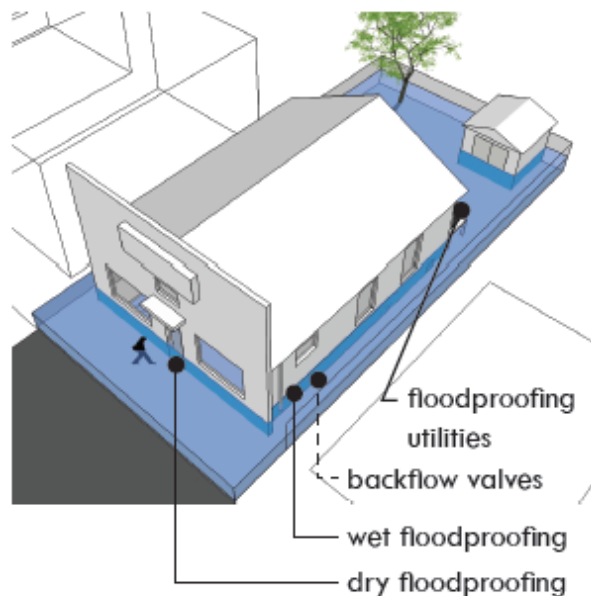
This technical guide provides information on a range of methods to protect your business from natural hazards. These methods include projects that impact the structure, impact contents and involve the surrounding site.

Property protection and hardening can be as simple as selecting materials that are better able to withstand a hazard such as flood or fire, and many of these measures are relatively low cost. This guide includes guidance on which measures might be most suited to your particular business, as well as whether you might need to utilize a licensed professional such as a landscape architect.

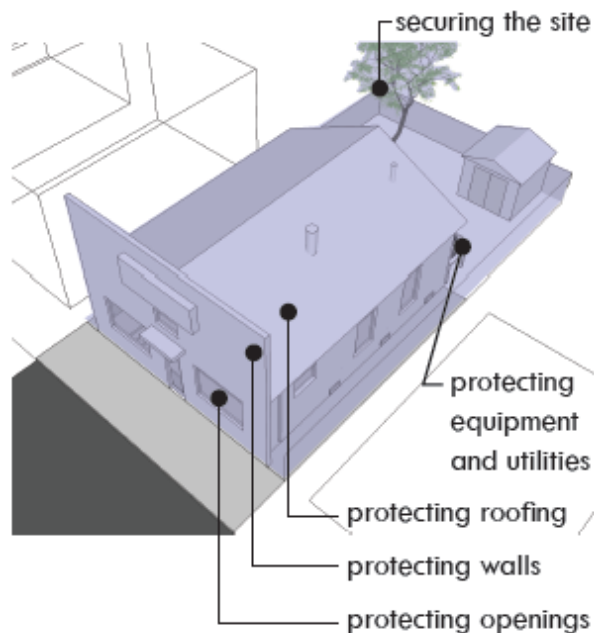
The following list illustrates the range of possible measures. Additional explanations, including easy to follow diagrams, are included in Sections 4 and 5 of this guide.

“Green infrastructure and low impact development allow individuals to actively help reduce localized flooding and pollution.”

- The Joy of Water,
Water Works LA. 2015



Flood protection measures

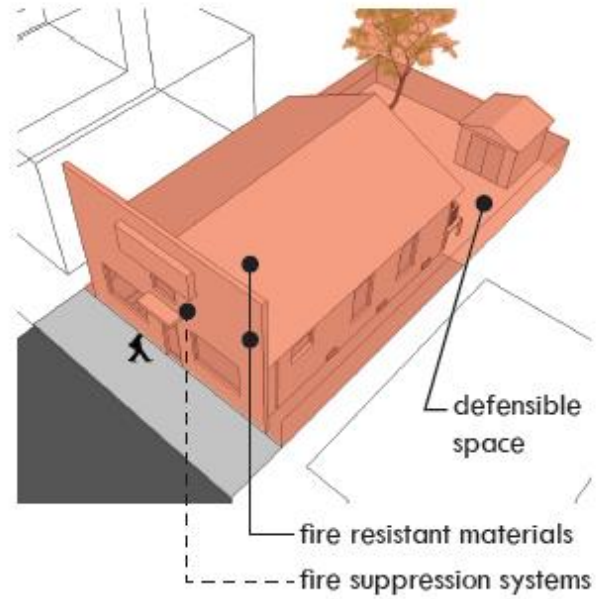


Wind protection measures

1. What is Structural Hardening (Property Protection & Retrofitting)



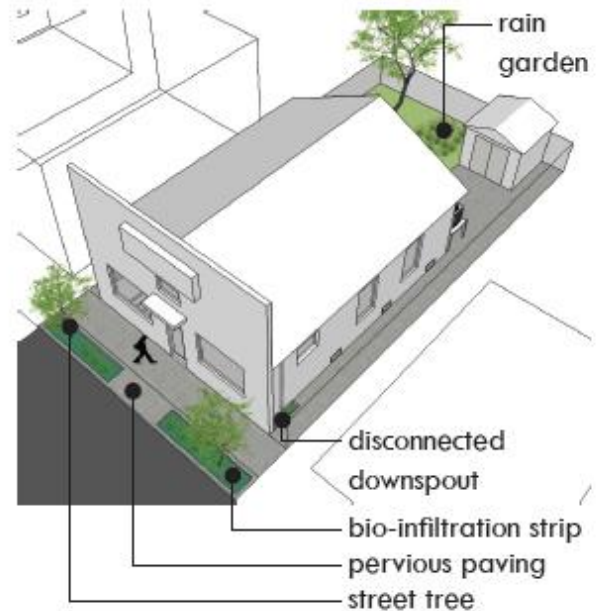
Hail protection measures



Fire protection measures



Winter weather protection measures



Site and street interventions:
green infrastructure

1. What is Structural Hardening (Property Protection & Retrofitting)

LEVEL OF PROTECTION

The measures described in this guide all provide varying levels of protection, and are most effective in the context of a broader risk reduction strategy. For example, wet floodproofing can significantly reduce the loss of equipment, inventory, and other contents at your building. However, it is most effective when coupled with site improvements that reduce localized flooding, as well as with planning for business interruption and insurance to reduce losses in the event of a more significant flood event.

It is also important to be aware that hazard events can occur at varying magnitudes. A brief rain shower will lead to a very different type of flooding than a hurricane might. Although events of a larger magnitude are certainly possible, the majority of impacts to businesses are from more frequent, smaller events. These measures provide a suitable level of protection for minor events, but do not necessarily prevent a catastrophic event.

Additional Measures to Consider

- Business Continuity Planning
- Insurance



Localized Flooding

Flooding in the St. Roch neighborhood, which is at a similar elevation to many of the corridors, following rainfall.

2. Assessing Your Structure and Level of Risk

ASSESSING YOUR STRUCTURE

Determining how to protect and retrofit your property begins with assessing your structure. In this section, we will cover how you can assess your structure, utilities, and site, determining your level of risk to a variety of hazards, including high winds, flooding, fire, winter weather, and hail. While the mitigation measures and hazard information presented in this guide have been tested and vetted, you must also understand that residual risk is an inherent part of living in New Orleans.

Assessing your structure begins with the simple question of what you are capable of doing to your building: do you own the property? If it is a rental property, you may need to check with the building owner to determine whether you can perform some retrofits recommended in this guide. However, remember that even if you do not own the building, you can still find ways to protect your inventory, equipment, and other contents. You may also wish to share this guide with your landlord, as many of the measures described could help them protect their investment.

“ Even if you do not own the building, you can still find ways to protect your inventory, equipment and other contents.”

Once you have determined that you are free to retrofit your structure, you should consider the construction, including such questions as:

- Is your foundation elevated or at ground level?
- Is your structure built of wood, masonry, steel, or concrete?
- Is the building façade made of wood siding, stucco, brick, concrete block, metal, vinyl siding, asbestos siding, or another material?
- How many openings, including doors and windows, are there on the ground level?
- How many openings are there on the upper level(s)?
- Are the windows made of impact resistant glass or are there shutters on the building?
- Are the doors impact resistant?
- Are there any building appendages, such as signs, awnings, etc.?
- What is the condition of the gutters?
- Are your downspouts disconnected?
- What is the general building condition?
- Is the roof made of shingles, slate, metal, or another material?
- Are there any items on the roof or building which might become airborne?

Evaluating your structure based on these questions will help you decide potential risks to your building and can help you determine where to begin hardening to protect the structure and contents.

2. Assessing Your Structure and level of Risk

ASSESSING YOUR UTILITIES

Once you have answered some basic questions about your building structure, you should examine your utilities. Utilities can form the lifeline of your business – nearly all businesses depend on electricity, sewer, water, and air conditioning in order to stay open, so it is critical to evaluate whether weaknesses in your utility connections could affect your business’s resilience. Start by evaluating your utilities, including such questions as:

- Are your utility connections above ground or underground?
- Do you have a generator or backup power?
- Do you have solar panels?
- Is your HVAC unit elevated or on the ground?

Some of these measures, such as whether your utility connections are above ground or underground, may be beyond your control as a business owner. Others, however, such as raising your HVAC unit, may be relatively easy to do and will help reduce risk to your building.



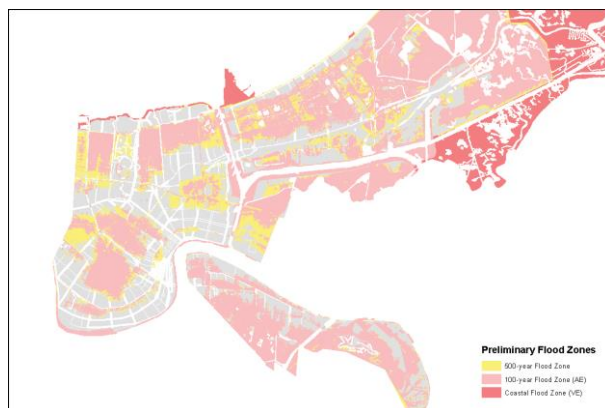
Elevated HVAC unit

The Zulu Social Aid and Pleasure Club reduced risk to its HVAC unit by elevating the unit significantly above ground level.

ASSESSING YOUR SITE AND LEVEL OF RISK

Once you have assessed your building and utilities, you should assess the site of your structure. This includes consideration of which types of hazards might affect your site. A helpful resource for determining this is your City’s Hazard Mitigation Plan, which provides detailed profiles for the hazards in your area.

You should also consult the Flood Insurance Rate Maps (FIRMs) to determine your site’s mapped flood risk.



Flood Insurance Rate Map

The Flood Insurance Rate Map is one means of estimating flood risk. They can be viewed at floodmaps.lsuagcenter.com

It is important to note that the FIRM is designed for the purposes of flood insurance and does not provide a definitive determination of whether your site might flood. It does not take into account minor flooding from drainage and street back-up, for example. Asking neighboring business about the history of flooding can also be a good idea.

2. Assessing Your Structure and Level of Risk

Additionally, consider the streetscape at your site, including such questions as:

- What is the sidewalk condition in front of your site?
- Are there trees or other vegetation, such as a planting strip?
- Is there outdoor furniture or other items that might need to be secured in the event?
- Is your site ADA accessible?
- What is the road condition in front of your site?
- Where are the catch basins in relation to your site?
- What is the condition of the catch basins nearest to your site? Are they clogged?

Once you've considered your streetscape, consider the parking at your site:

- Is there on-site parking?
- Is there stormwater mitigation, such as bioswales, curb cuts, or porous pavement in the parking area?
- Are there storm drains in the parking area?

Once you've considered these items, take another look at your building and site. Consider the following questions:

- Are there any accessory structures to your building?
- Are there any subsidence issues, such as visible cracks in the foundation?
- Are there any areas where water pools on the site during rain events?

Assessing the conditions of your building, utilities, and site helps you determine which measures are appropriate to harden your structure.



Clogged Catch Basin

This catch basin in St. Roch is clogged with leaves and other debris, not allowing proper drainage and increasing street flooding.



Bioswale Parking Lot

This bioswale is located off the OC Haley Blvd. Main Street at the Jack and Jake's parking lot.



Pooling Water

Water backs up on the street during a rain event. Photo by Bart Everson via Flickr/CC

3. Techniques for Structural Hardening & Property Protection

This section of the guide will walk you through the various options available to protect your property from the impacts of flooding, high wind, hail, fire and winter weather. Many of the measures described can be used to provide protection from multiple hazards. One example of this is elevating and securing utilities.

As you decide which measures to undertake, consider the opportunities to incorporate multiple measures and increase the level of protection. Also consider the opportunity to incorporate these measures as you do regular maintenance and upgrades. For example, you might look into defensible space when you improve landscaping.

Flood Protection Measures

- Dry Floodproofing
- Wet Floodproofing
- Backflow Valves
- Floodproofing Utilities

Wind Protection Measures

- Protecting the Building Envelope including: the roof, openings and walls
- Securing the site
- Protecting Equipment and Utilities

Hail Protection Measures

- Protecting Roofing
- Protecting Equipment

Fire Protection Measures

- Fire Resistant Materials
- Defensible Space

Winter Weather Protection Measures

- Protecting Roofing
- Protecting Utilities
- Insulation
- Fire Suppression Systems

“These measures will only work if they are practiced, well maintained and you have a plan in place for how to implement them in the event of a flood.”

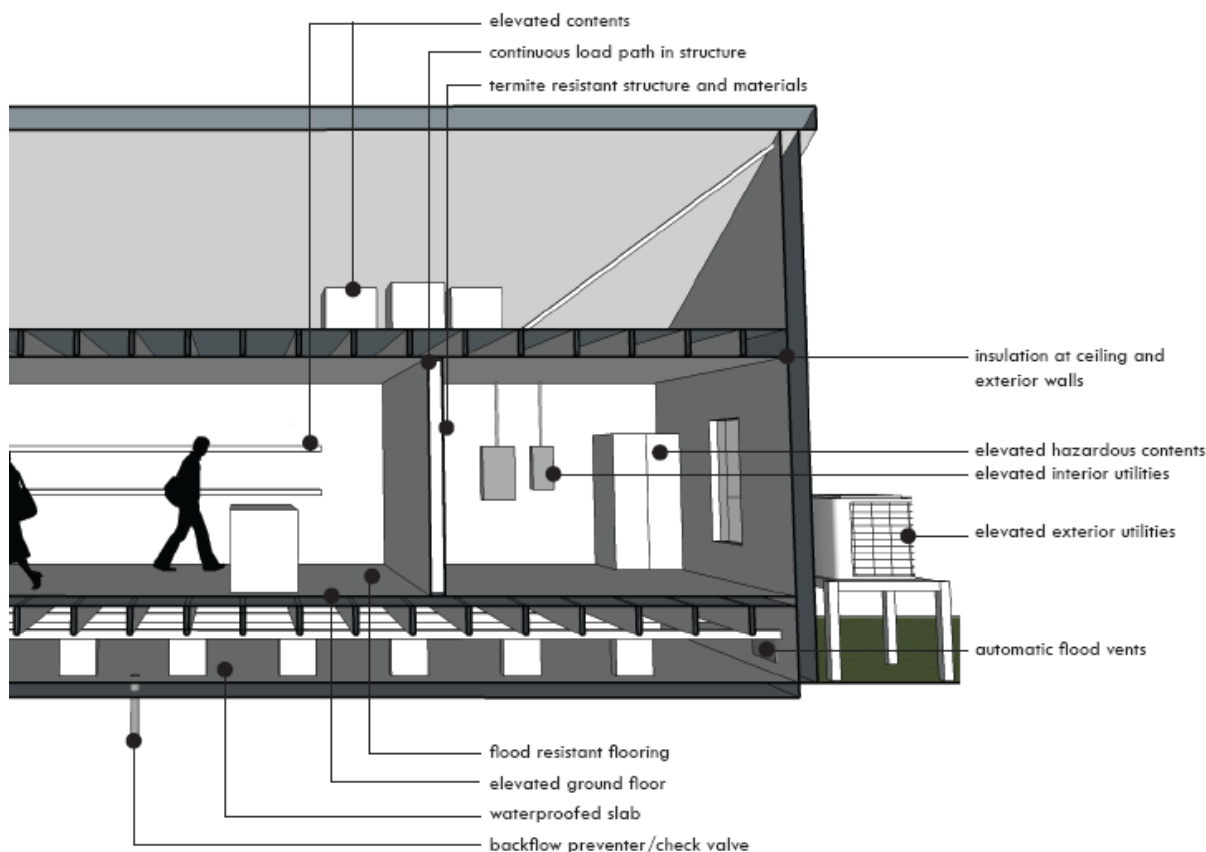


3. Techniques for Structural Hardening & Property Protection

FLOODING

There are many options to protect your building from flood damages. These include: dry floodproofing, wet floodproofing, backflow valves, and floodproofing utilities.

Some of these measures require a certain level of human intervention; for example, you might need to close a backflow valve or seal a door when flooding is expected. These measures will only work if they are practiced, well maintained and you have a plan in place for how to implement them in the event of a flood. All measures should be inspected periodically to ensure that they are still properly installed and that they have not been damaged, such as seals cracking from the heat.



3. Techniques for Structural Hardening & Property Protection

FLOODING

Dry Floodproofing

Dry floodproofing consists of a series of techniques that keep water out of a structure, including any utilities and equipment. Dry floodproofing can take many forms, with costs ranging from minimal to much higher. However, dry floodproofing is designed to provide protection only from low levels of flood water, and only when the structure is sound enough to withstand the flood load.

Examples of dry floodproofing measures include:

Impermeable walls

There are various types of impermeable wall products available commercially. Typically the process includes filling in openings, installing the waterproof layer, and sealing all cracks and penetrations

Shields for openings

There are both permanent and temporary shields that can be placed over openings. These shields prevent floodwaters from entering the structure. A permanent shield is a good option for an opening which does not require access, while a temporary shield is best for an opening such as a door which is used during normal operations.

If you do decide to utilize a temporary shield, you will need to ensure that there is a plan in place for how it will be deployed when flooding is expected. Be certain that this plan does not place you at any additional risk.



Application of Impermeable Coating

This image shows the application of an impermeable coating as part of a floodproofing strategy. Image courtesy Waggonner & Ball



Door Shield

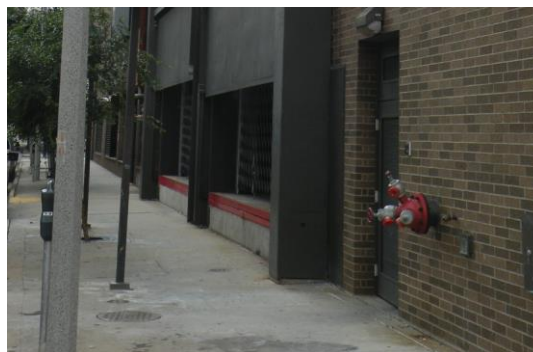
This image shows a temporary shield that can be installed on a doorway. Image courtesy of French Wetmore

3. Techniques for Structural Hardening & Property Protection

FLOODING

Internal drainage

Many of the flood protection measures require the incorporation of internal drainage, so that water is not trapped within the structure and/or behind the flood barrier. These measures include floor drains and sump pumps.



Internal Drainage

The floodproofing measures at Tulane University Hospital include drainage to allow water to exit the structure.

Floodwalls

There are many floodwalls available on the market, including permanent flood walls and temporary shields. Some of the products require a great deal of human intervention, such as inflating bladders or placing interlocking segments. Others require no intervention, such as walls that pop up from the ground when sufficient hydrostatic pressure is exerted upon them.



Flood Barrier

These interlocking panels provide protection from flooding. Photo: New York City Economic Development Corporation

Wet Floodproofing

Wet floodproofing consists of utilizing flood-damage-resistant materials and construction techniques to reduce or prevent damages to areas of a structure that are expected to flood. Wet floodproofing can be incorporated into the design of a building, or can be implemented on an existing structure. In some instances, the different materials and construction techniques do not add significant costs.

Wet floodproofing also includes protecting equipment and contents by ensuring that they are positioned above flood depths. In some instances this can be as simple as utilizing a platform to provide slight elevation.

3. Techniques for Structural Hardening & Property Protection

FLOODING

Flood Damage-Resistant Materials Utilizing materials that are resistant to flood damage is a practical and often simple method to reduce damages from flooding. This measure can be as easy as choosing stained concrete instead of carpeting when repairing or updating flooring. The materials utilized in the contents of your building can also be selected for their ability to resist flood damage.

Flood damage-resistant materials should be durable, able to be wetted, then dried and cleaned.

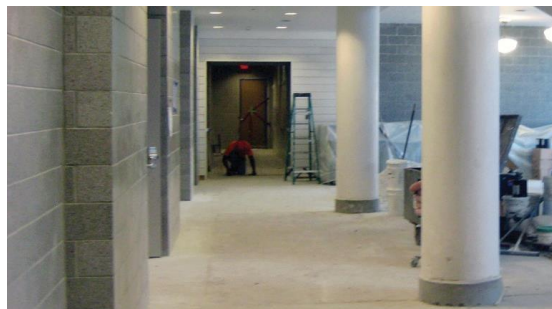
If you expect frequent flooding, wall vents and openings can be used to reduce hydrostatic pressure, reducing the possibility of structural damages from a flood.

Replace any rotten or termite damaged wood framing with termite treated wood. This can be done as part of repairs/upgrades, or following a flood. Masonry should also be repaired, particularly walls and foundation piers. Be certain to kill and remove any vegetation, as well as to repoint mortar joints.

After a flood you can use portable pumps to remove water and begin the cleaning process.

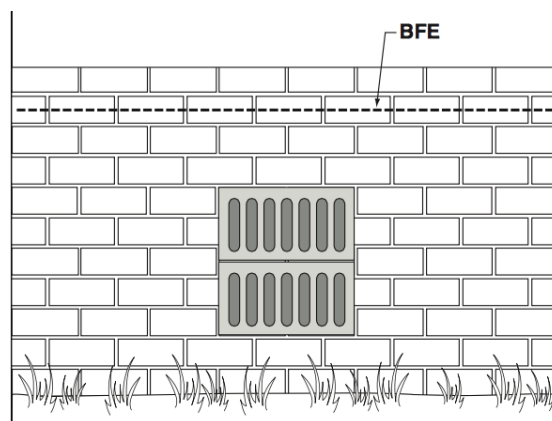
Flood Damage-Resistant Construction Techniques

These techniques focus on minimizing the extent of damages in the event of a flood. They include techniques such as:



Flood Damage-Resistant Materials

Colton School utilized flood-resistant materials for their flooring and walls.



Flood Vent

This graphic, taken from FEMA Technical Bulletin 1, illustrates the placement of flood vents.



Repair Masonry

Keeping masonry in good condition can protect your business from water damage

3. Techniques for Structural Hardening & Property Protection

FLOODING

- Installing electrical components above the expected flood level or utilizing a switch to shut off electricity in the event of flooding.
- Installing drywall parallel to the floor and leaving a gap between the bottom and top pieces of drywall to prevent excessive wicking.
- Utilizing flood resistant insulation materials.
- Utilizing wall board alternatives which are resistant to water damage.

Protecting Equipment

Many types of equipment and machinery can be protected by simply raising them above the expected flood levels. In many cases this can be done with basic platforms.

Backflow Valves

There are many different types of backflow valves available commercially and they can be placed at various points in a plumbing system. These valves prevent the flow of sewage into your business. Some valve types are automatic, while others require manual intervention.

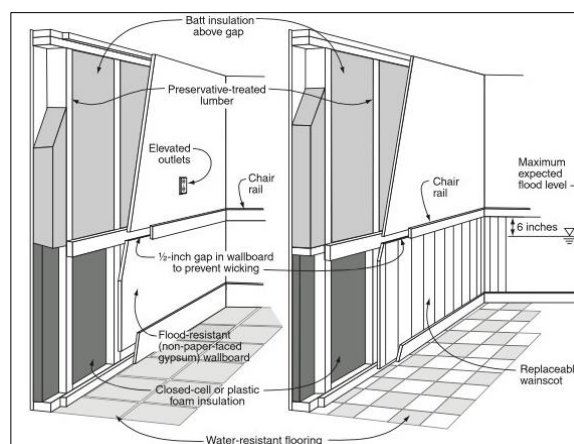
Floodproofing Utilities

Protecting utilities, such as HVAC systems, from flood damage can significantly reduce the cost of repairs following minor flooding and allow your business to resume operations much sooner. Methods include elevating utilities above expected flood heights or constructing small walls to prevent water from reaching the equipment.



Elevated electrical panels

Elevating electrical panels significantly helps reduce flood damages. Image courtesy Waggoner & Ball



Parallel drywall installation

This figure, taken from FEMA Technical Bulletin 2, illustrates common wet floodproofing techniques.



Elevated water heater

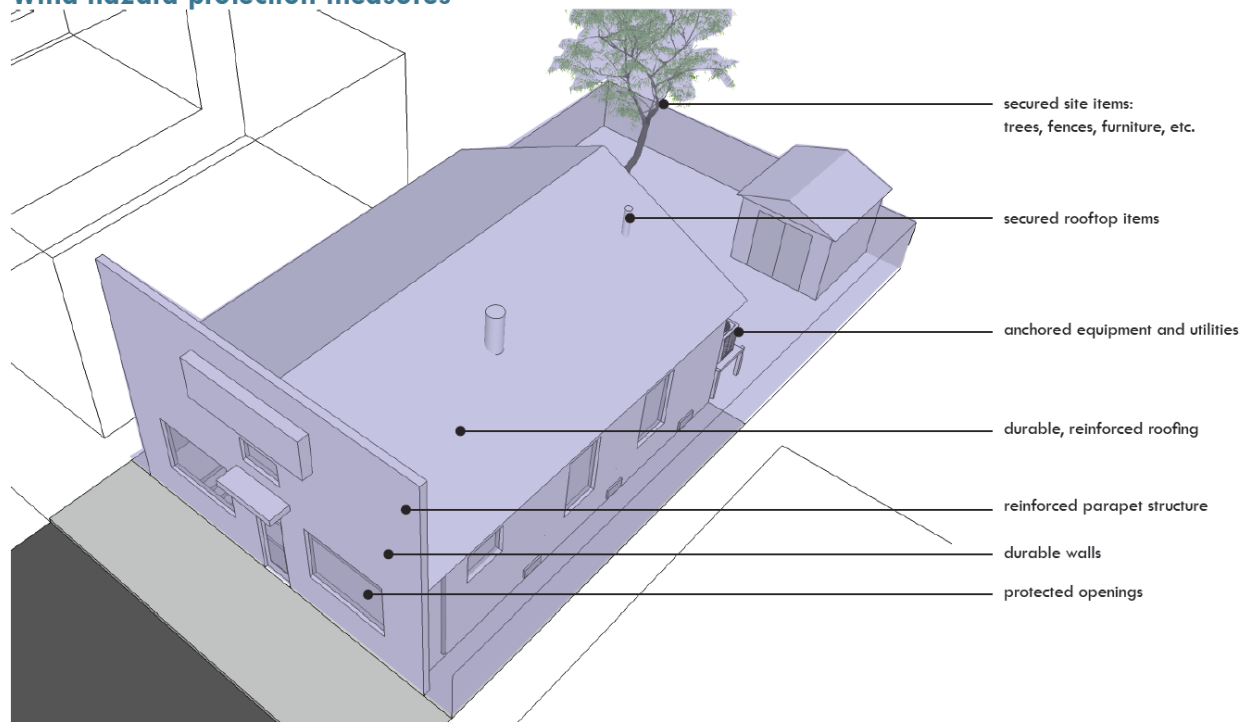
Utilities can also be suspended to prevent damage from water. Image courtesy Waggoner & Ball

3. Techniques for Structural Hardening & Property Protection

WIND

There are many options to protect your building from wind damages. These include: protecting the building envelope, site measures, equipment and utilities.

Wind hazard protection measures



Wind Protection Building Envelope

Protecting the building envelope is critical to preventing the complete failure of a structure as a result of high winds. One of the primary means for providing this protection is by making certain that there is a continuous load path through the structure, from the foundation on up to the roof, as well as ensuring that the roof is made from durable materials. There are various ties and connectors available which can be used to ensure that the walls are properly anchored to the rafters and floor, as well as connecting multiple stories.



Continuous load path

A continuous load path transfers wind loads through the structure down to the foundation, protecting the building envelope.

Image courtesy Waggoner & Ball

3. Techniques for Structural Hardening & Property Protection

WIND

Depending upon your structure, it may be possible to incorporate additional connections without incurring high costs and without making significant alterations to the structure. However, if you do not have easy access to the rafters or slab, then strengthening the building envelope will be more difficult. Any time that you make alterations to your structure, particularly involving the walls, flooring or ceiling – you can seek opportunities to strengthen the connections.

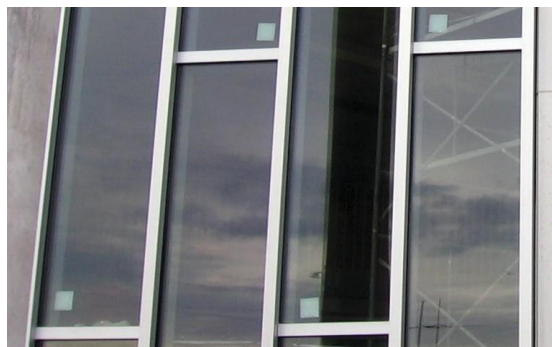
Site

Many of the damages from wind events occur when debris, or other objects, are picked up by the high winds and flung into structures. One way to reduce the probability of this occurring is to ensure that any exterior items on your site, such as outdoor furniture or small outbuildings, are properly anchored.

Sheds, for example, can be anchored to a poured concrete slab. Outdoor furniture can be brought inside when high wind conditions are expected, or can be chained to anchors drilled into concrete.

Equipment and Utilities

Outdoor equipment and utilities can be protected in much the same way. Rooftop equipment and utilities, in particular, can be placed upon wind-rated platforms which, when properly attached, can withstand winds of up to 140mph. Protecting rooftop equipment from being removed by the wind also helps to ensure that the building envelope is not broken in a wind event.



Impact resistant glazing

New windows installed that resist high wind pressure and damage from wind-borne debris. Image courtesy Waggonner & Ball



Restaurant Sign Reinforced

An existing restaurant sign and overhang structure is reinforced with new bracing to protect it against high winds. Image courtesy Waggonner & Ball



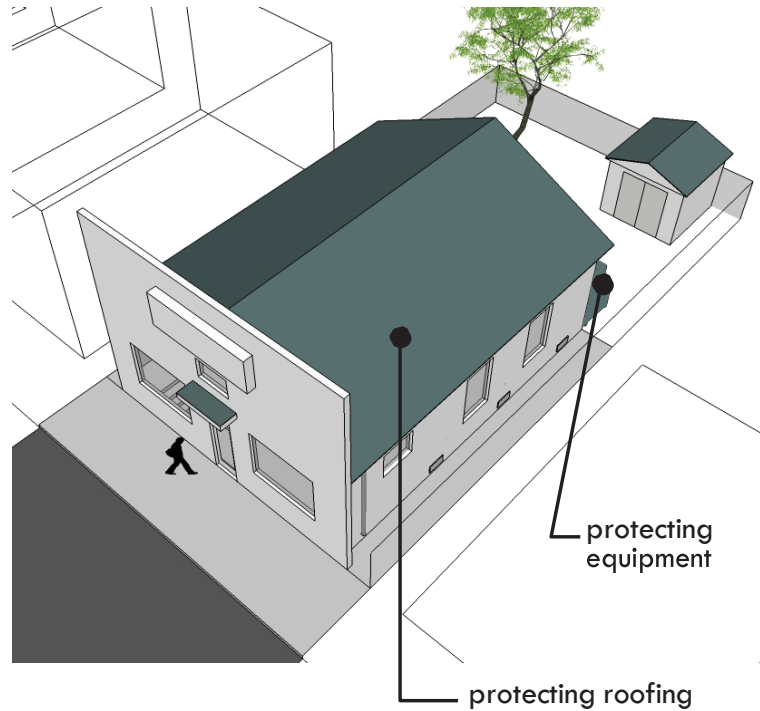
Utilities Protected from Wind

Placing the utilities within a protected section of the roof minimizes wind damages. Image courtesy Waggonner & Ball

3. Techniques for Structural Hardening & Property Protection

HAIL

Hail stones can damage roofing, utilities, equipment and vehicles. Most hail events cause only minor, cosmetic damage, but taking hail damage can have a significant impact.



Roofing

There are impact resistant roofing materials commercially available that minimize the damages from hail and other impacts. These types of shingles also provide protection against some of the impacts from high winds. In the event that you do need to replace a roof, consider utilizing impact resistant shingles as well as moisture resistant underlayment.



Durable Shingled Roof

Roofs must be maintained to replace any loose, missing, or damaged shingles. Image courtesy Waggoner & Ball

Protect Equipment

Equipment and vehicles can be stored under coverings to minimize the potential damages from a hail storm, as well as providing some protection from other damages and theft.



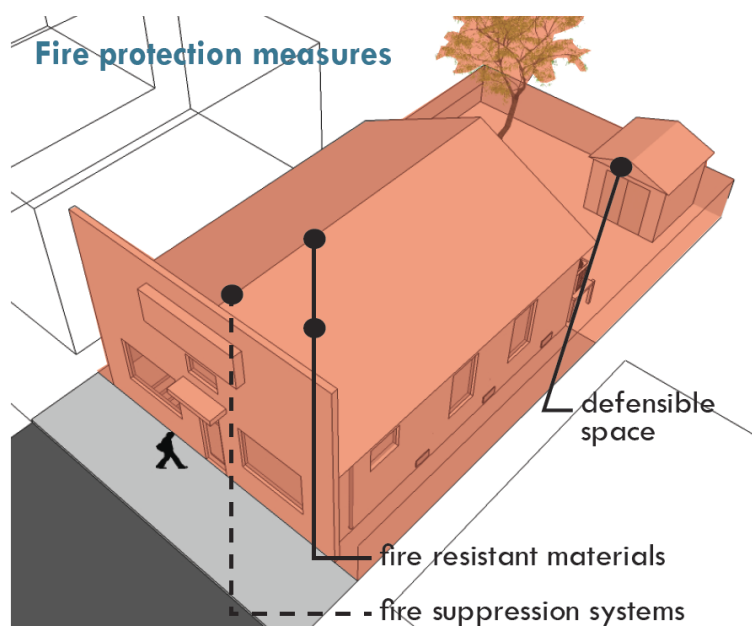
Durable Metal Roof

A metal roof is resistant to hail. Image courtesy Waggoner & Ball

3. Techniques for Structural Hardening & Property Protection

FIRE

There are various measures that you can take to reduce your risk of fire, as well as to reduce the damages in the event that a fire does impact your business. These include utilizing fire resistant materials, practicing defensible space, and incorporating fire suppression systems.



Fire Resistant Materials

Fire resistant materials can be utilized as part of construction for both new construction and renovations. Techniques include utilizing building materials such as Autoclaved Aerated Concrete, and paints which have a higher flash point and prevent the ignition of wallboard for several hours – allowing more time for firefighters to arrive and thereby reducing the spread of a fire.

Fire resistant materials can also be utilized for the contents of the structure, including to protect critical documents. For example, there are various small safes and fireproof filing boxes which can protect critical documents in the event of a structural fire.

Although some of these measures do increase costs, some can lead to reduced insurance costs and many can be incorporated into needed repairs and renovations as they are undertaken.

Defensible Space

Landscaping can be a key component in reducing fire risk, primarily from a fire that spreads from a neighboring structure. This measure involves limiting the flammable materials and vegetation that immediately surround a structure, reducing potential fuel for a fire. Specific techniques include utilizing plants with higher moisture contents and maintaining an adequate distance between landscaping and the structure.

Fire Suppression Systems

Fire suppression systems are required in certain types of commercial structures, but can prove beneficial even in instances in which they are not required. Automatic fire suppression systems include sprinkler systems and other systems that detect a fire and extinguish it without human intervention.

3. Techniques for Structural Hardening & Property Protection

WINTER WEATHER

Although winter weather conditions are not common in New Orleans, businesses can see significant impacts when these conditions are present. There are some small measures that can be taken at low cost and can reduce these impacts.

Roofing

There are various roof underlayments which provide a moisture barrier and prevent water intrusion in the event that ice were to be present on the roof for a prolonged period. Additionally, these underlayments provide protection from water intrusion in the event that a small number of shingles are blown off during a wind event.

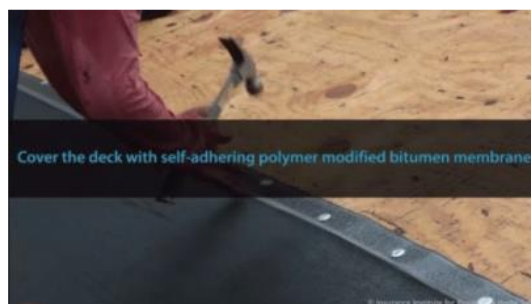
Utilities and Exterior Items

Water pipes can rupture during a freeze, so it is advisable to ensure that any outdoor hose connections are turned off and well drained. Additionally, insulating any exterior pipes, including those beneath a building elevated on piers, can also help to prevent freezing.

Insulation

Insulation in an attic and behind walls can reduce the impacts of extreme temperatures and also serve to reduce heating and cooling bills.

Winter weather protection measures



Underlayment

Applying an underlayment to your roof protects it from water intrusion.

4. Site and Street Interventions

Site and Street Interventions



This section of the guide includes site and street interventions. In addition to the measures outlined in the previous section to protect your structure and property, it is useful to take a larger look at your property site and street for opportunities to improve resiliency.

SECURING YOUR SITE AND STREET

Remember that one of the ways to protect your structure during wind events is to secure debris or other objects that may cause damage. Take the time to evaluate items on your site, such as outdoor furniture, trashcans, and small buildings, and make sure they are properly anchored or brought inside during high wind events.

Evaluate your street for items that might become airborne and damage your property. If necessary, speak with neighbors or the City if you see debris or objects that could cause damage in the event of high wind. Securing trash and other debris also keeps these items from washing away and clogging nearby storm drains during rain events.

STORM DRAINS

Storm drains allow water from your street to enter the City's drainage system; however, if the drains are clogged water can back up and cause localized flooding. A quick survey of your street will help you locate the nearest storm drains and evaluate whether they are draining properly. If the storm drain is clogged with trash or other debris, you can clear it by carefully using a rake or shovel. A best practice is to make sure your storm drains are clear prior to a rain event. You can also mark storm drains with a

4. Site and Street Interventions

pre-printed marker, reading “No Dumping, Drains to Waterway,” to remind passersby to keep the storm drains clear; these markers can be requested through the Sewerage and Water Board of New Orleans. If the storm drain is clear of trash and debris, but is still not draining properly, you can report it to the City by calling 311 or to the Sewerage and Water Board by calling 52-WATER.

GREEN INFRASTRUCTURE

Site and street interventions of green infrastructure work together to reduce localized flooding, improve environmental quality, and enhance quality of life along business corridors. Green infrastructure represents an approach to water management that mimics the natural water cycle in urban environments, which can help reduce localized flooding and have the added benefits of reducing pollution, improving air quality, and providing more space for recreation and natural habitats.

Green infrastructure slows water down, holds it temporarily, allows plants to filter out pollutants, and infiltrates water back into the soil. Such measures reduce the amount of stormwater entering a city’s system of pipes until after the peak rains have passed, which reduces the frequency of street flooding during small-scale rain events and improves water quality in surrounding water bodies.

Green infrastructure includes a variety of different measures that can be implemented at the site or street level. Using plants, measures



Green infrastructure on OC Haley Blvd.

These rain gardens on OC Haley Blvd. are an example of green infrastructure measures that collect and filter rainwater. Image courtesy Waggonner & Ball

such as rain gardens or bioswales slow water down and allow it to filter back into the ground, reducing localized flooding and the subsidence that occurs when soils dry out and compact. Other measures use gravel or permeable concrete to allow water to infiltrate. Rain barrels and cisterns catch and store rainwater, which can then be used to water plants.

“ Green infrastructure helps reduce localized flooding by slowing water down and reducing the amount of stormwater entering a city’s system of pipes”

4. Site and Street Interventions

Determining which green infrastructure measures are appropriate for a particular location begins by assessing the site and street. This assessment can be done by a licensed professional or individual, depending on the scale and type of green infrastructure measures. The critical component is to determine where water enters and leaves the property, including such considerations as:

- Location of structures (including the building footprint, garage, and awnings) and other hard surfaces, such as driveways and pavement
- Location of downspouts and storm drains
- Location of high and low points on the property: does water run off certain areas and/or collect in others?

Once an initial site assessment has been completed, it is possible to begin determining which green infrastructure measures will work for the site or street. This requires additional considerations, such as:

- Space: consider the size of the property and proximity to structures, including neighboring stores and houses. Do not install measures that collect and detain stormwater runoff too close to structures.
- Existing structures: consideration of how the existing structure can be retrofitted to include green infrastructure measures.
- Slope/elevation: slope and elevation changes on the site will affect how water travels and may limit the use of some types of green infrastructure.

- Soils: poorly draining soils, such as clay or silt, limit the amount of water that can infiltrate. This can affect the types of green infrastructure measures that might be appropriate and may require that the soil be remediated to include a more sandy or gravel soil mixture to allow for better infiltration.

Once the area has been evaluated for these considerations, it is possible to determine what types of green infrastructure measures can be implemented on the property site and street.

Common green infrastructure measures are described here and on the following page.

4. Site and Street Interventions



Bioswale Around Existing Tree
A bioswale is a landscaped feature with sloped sides that conveys water and allows it to infiltrate into the ground.



French Drain Installation
A french drain is long, narrow, gravel-filled ditch that catches and treats stormwater runoff.



Green Roofs
A vegetated roof, planted over a waterproofing membrane, which can help reduce stormwater runoff, lower cooling costs, and provide habitat for wildlife.
Photo by Arlington County VA on Flickr/CC



Green Walls
A green wall is a vegetated wall, which can provide shade and lower cooling costs.



Permeable Paving
Permeable paving is any system of pavers or porous material that allows for water to infiltrate into the ground. Pervious concrete allows water to pass through into the ground, reducing runoff.



Rain Barrel and Cistern
Rain barrels collect and store rainwater for non-potable usage, including landscape irrigation.



Rain Garden
A rain garden is a landscaped feature designed to collect, retain, and infiltrate stormwater runoff. Rain gardens on OC Haley Blvd. are maintained by local businesses, such as Casa Borrega.



Subsurface Storage
Subsurface storage helps detain and store water below ground using vaults, pipe chambers, or plastic structures, to reduce the amount of stormwater entering the drainage system.



Street Trees
Trees help reduce runoff by holding rainwater on leaves and bark during a rain event, allowing for it to evaporate back into the air or soaking into the ground, where tree roots hold soil in place and absorb water.

Green infrastructure measures can be implemented on site or within the street, depending on the type of measure and conditions. Business owners should consider the condition of their building and determine which measures are suited for their site. On site measures help slow water down before it hits the street and drainage system. Street interventions can include creating curb cuts that allow water to filter through rain gardens in an existing planting strip or on the street. Green

infrastructure site and street interventions work together to reduce localized flooding, improve environmental quality, and enhance quality of life along business corridors.

5. Deciding Whether to Do it Yourself

KEY CONSIDERATIONS

The decision of whether or not to hire a professional to design and/or install resilient improvements depends on many factors, including the specific measures selected; your comfort and experience related to the implementation of the measure; whether you have access to the necessary equipment; and the characteristics of your building and/or site. Factors such as the age and condition of the building and site access can significantly affect the ease or difficulty of applying certain measures. The scope of work itself is another major consideration.

With relatively few exceptions, most construction work will require a building permit from the City of New Orleans. Additionally, measures that involve design of a system, such as drainage, utilities, or the building envelope, will likely require a licensed professional, such as an architect, engineer, or landscape architect. Building and site improvements are also subject to review by the recently adopted Comprehensive Zoning Ordinance (CZO), and properties in historic districts are subject to review by the Historic Districts Landmarks Commission (HDLC).

You should also consider just how much time you have available to devote to the measures, and whether the cost of your time outweighs the savings of obtaining a building permit and doing the work on your own instead of hiring a contractor. Additionally, consider grouping projects together and incorporate these measures when you are having other work done on your structure, such as replacing aging windows or upgrading equipment and utilities.

As you decide whether or not to do the work yourself, begin by reviewing the categories of the measures shown on these pages. Measures are divided into those which you are most likely to be able to do on your own, those which

“ Factors such as the age of the building can play a significant role in the ease or difficulty of applying certain measures.”

likely require assistance depending upon their specific application, and those which require a professional. Remember that hiring a professional for design, installation, or both is always an option for any measure.

Measures which you are most likely to be able to do on your own

- Wet Floodproofing
- Securing the site and street
- Defensible Space
- Business Continuity Planning
- Insulation
- Storm drains
- Rain barrel or cistern

Measures which may require professional assistance

- Dry Floodproofing
- Fire Resistant Materials
- Green Infrastructure (depending on measure and scope)
- Protecting Equipment and Utilities
- Backflow Valves
- Floodproofing Utilities
- Protecting the Building Envelope including: the roof, openings and walls

Measures which always require a licensed professional

- Fire Suppression Systems
- Protecting Equipment and Utilities

REGULATORY REQUIREMENTS

After you have decided whether or not to undertake the property protection actions on your own, you should identify any regulatory requirements that might impact your project.

5. Deciding Whether to Do it Yourself

Some measures identified in this guide will not trigger any regulatory requirements; however, factors such as the historic nature and location of a structure may impact certain projects.



Elevated HVAC unit
Elevating HVAC units high allows access underneath.

Regulatory Considerations

- Building Codes and Permitting, including whether or not a design professional is required
- Zoning and Historic Districts
- Flood Ordinance and National Flood Insurance Program Requirements

Building Codes and Permitting

The City of New Orleans requires a building permit for most construction work. See Section 105.2 for work that is exempt from a building permit here: https://www.municode.com/library/la/new_orleans/codes/code_of_ordinances?nodetd=PTII-CO_CH26BUBUREHOST_ARTIINGE_S26-15SAME



City of New Orleans One Stop
Building permit website

Unless these measures are undertaken as part of a much larger project, this threshold is unlikely to be met as a result of the projects outlined in this guide.

Electrical and mechanical permits are likely required for some of the equipment and utilities protection related measures.

The City of New Orleans requires an electrical permit for the alteration of any electrical apparatus or equipment, and a mechanical permit for the alteration of any mechanical or gas-fired apparatus or equipment, such as air conditioning systems. Visit the City's building permit application, called One Stop App, here: <http://www.nola.gov/onestop/>

Zoning and Historic Districts

Measures which affect the site or exterior of a building are subject to requirements in the CZO, here: <http://czo.nola.gov>. The Historic District Landmarks Commission (HDLC) provides guidelines for new construction, exterior alterations, and additions to buildings which are located within the city's historic districts, listed here: <http://www.nola.gov/hdlc/>. These guidelines impact alterations to the exterior of the structure, such as the façade and windows. Several of the measures identified within this guide do impact the exterior of the structure.



Historic Districts
HDLC designated historic districts

5. Deciding Whether to Do it Yourself

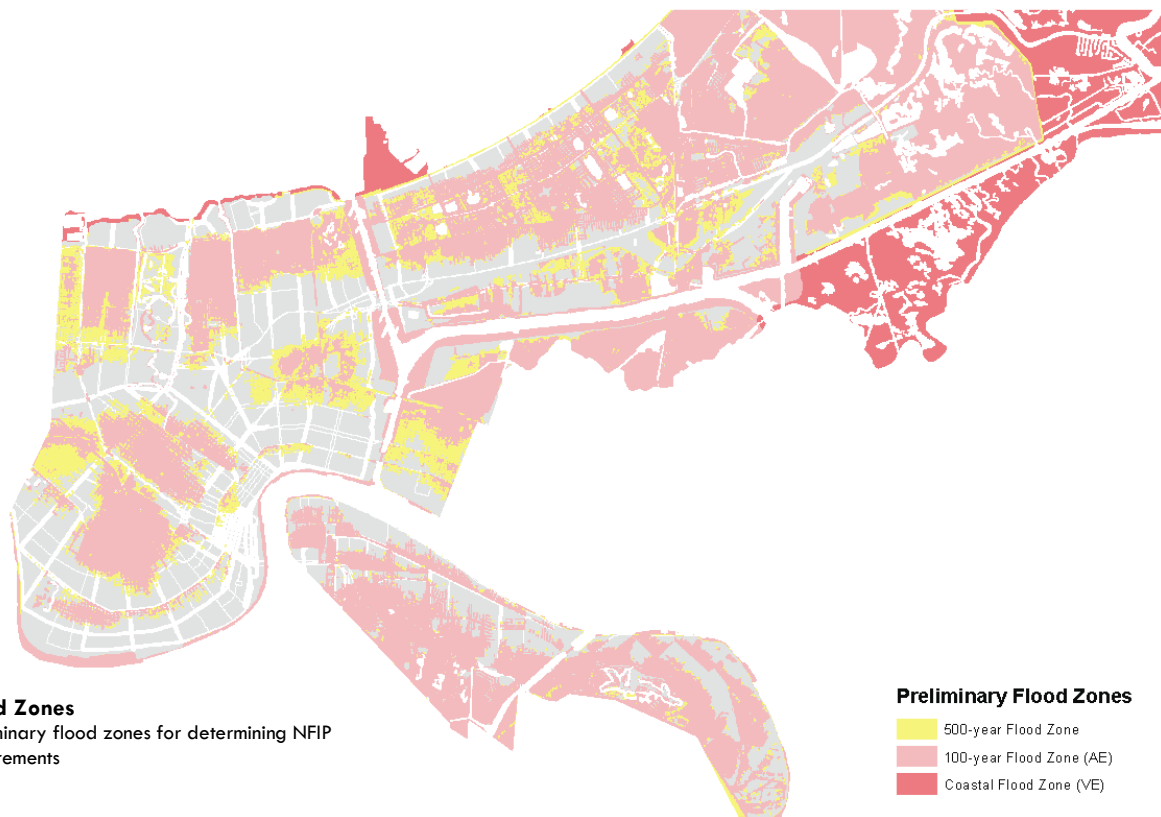
Flood Ordinance and National Flood Insurance Program Requirements

If your project meets the requirements for a permit, then you will also need to ensure compliance with the National Flood Insurance Program (NFIP) requirements, including elevation requirements.

You should consult the Flood Insurance Rate Maps when determining how high to elevate utilities and/or what level to utilize for floodproofing. Going above the minimum elevation requirements is a best practice and results in cost savings under the NFIP.

“ If your property is located within a historic district, be certain to consult the HDLC guidelines and consider utilizing a licensed professional for any exterior alterations. ”

Visit Floodmaps.LSUAgCenter.com to view Flood Insurance Rate Maps. The Louisiana Flood Maps Portal allows searches by address to help determine how flood risk affects insurance, loans, and construction.



5. Deciding Whether to Do it Yourself

EVALUATION OF OPTIONS

The chart below provides an overview of options, discussed in detail in the Section 3 and 4, and the level of effort required for each. The potential cost is relative, and gives a general idea of which measures might be more expensive. Zero indicates that this measure could be implemented at no cost.

	DIY	Potential Cost	City Code Review + Permitting	Contractor	Design Professional
Business continuity planning	yes	0 - \$			
Flooding					
Impermeable walls		\$ - \$\$			
Shields for openings		\$ - \$\$			
Internal drainage		\$\$			
Floodwalls	may	\$ - \$\$			
Damage resistant materials		\$ - \$\$			
Damage resistant construction		\$ - \$\$			
Protecting equipment		\$ - \$\$			
Backflow valves		\$\$			
Floodproofing utilities		\$\$ - \$\$\$			
Wind					
Building envelope		\$\$ - \$\$\$			
Securing the site	yes	0 - \$			
Equipment and utilities		\$\$ - \$\$\$			
Hail					
Roofing		\$\$ - \$\$\$			
Protecting equipment		\$ - \$\$			
Fire					
Fire resistant materials		\$\$ - \$\$\$			
Defensible space	yes	0 - \$			
Winter Weather					
Roofing		\$\$ - \$\$\$			
Utilities and exterior items	may	\$			
Insulation	may	\$ - \$\$			
Site and street interventions					
Securing site and street	yes	0			
Storm drains	yes	0			
Bioswale	may	\$ - \$\$\$			
French drain		\$\$ - \$\$\$			
Green roof		\$\$ - \$\$\$			
Green wall	may	\$ - \$\$			
Permeable paving		\$ - \$\$			
Rain barrel or cistern	yes	\$ - \$\$			
Rain garden	may	\$ - \$\$			
Subsurface storage		\$\$ - \$\$\$			
Street trees	may	\$ - \$\$			

LEGEND

	likely required
	may be required

6. Business Continuity

PRINCIPLES OF BUSINESS CONTINUITY

Business continuity planning helps businesses prepare for disruptive events – ranging from a power outage to a major hurricane – to minimize the impacts these events will have on their operations. Planning for these events can help small businesses stay in business when faced with unexpected disruptions that can affect their income and may come with additional costs.

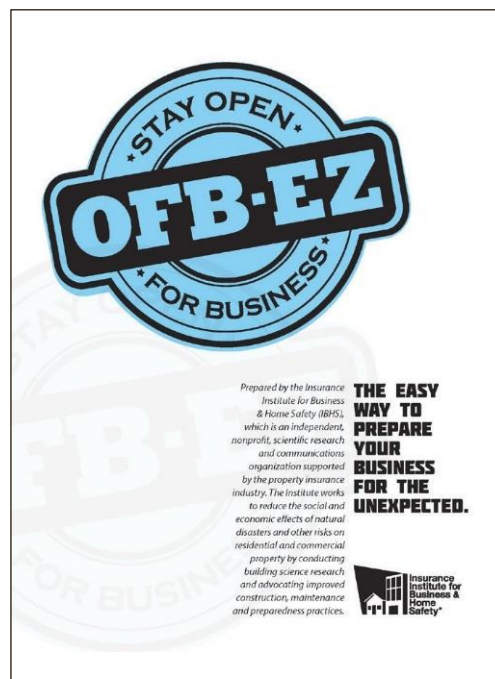
A business continuity plan can help businesses with:

- Avoiding Market Share Loss
- Brand Protection
- Communications

For additional information on business continuity planning, there are several resources including:

- OFB-EZ (Open For Business-EZ) by Insurance Institute for Business and Home Safety (IBHS)
- New Orleans Business Continuity Guide
- Small Business Guide to Disaster Planning & Recovery by the Urban League of New Orleans

Please see the Main Streets Business Continuity Guide.



Resources for business continuity planning.



7. Business Hardening Case Studies

CASE STUDIES OF BUSINESS Hardening

A selection of the case studies relating to property protection and retrofitting is included in this guide. The full ten case studies are included in the New Orleans Business Continuity Guide.

Brottworks

Hardening for High Winds

Kellie and Andrew Brott of Brottworks Design Studio on Freret Street, had just purchased and renovated their workshop space in early 2005. Hurricane Katrina caused extensive wind damage to the structure and highlighted the need to rebuild with stronger materials in order to minimize future impacts from high wind events. The owners conducted extensive research into the possible materials they could utilize and settled on Insulated Concrete Forms (ICF).

Utilizing ICF did not increase their costs over traditional wood construction and actually increased their speed of construction. However, Kelly and Andrew did face some challenges in identifying the appropriate contractor who was familiar with the material. Their project was successful, but required their daily supervision.



Andrew Brott of Brottworks
Hardening for High Winds

Pagoda Café

Heading for High Ground

When selecting the site for their business, owners Dan Etheridge and Shana Sassoon considered flood risk along with building design and neighborhood. The location they had their eye on was on relatively high ground and they knew that the building did not take on any water during Katrina.

When renovating the building they elevated the building and poured a new concrete slab foundation. They selected concrete flooring both for the aesthetic and because they knew it would be easier to clean up in the event of flooding. By doing so, they managed to preserve a historic building while updating it for their businesses' needs and reducing its vulnerability to future flood events.



Pagoda Café
Heading for high ground

7. Business Hardening Case Studies

Massey's Professional Outfitters

Outfitted for Survival

When Mike Massey was considering a new location for his Massey's sporting goods store, he used his experience from Katrina, in which their store in Metairie, LA flooded. He considered the physical structure and how resilient it would be to short and longer-term hazards.

Their new location had concrete flooring and concrete walls, which facilitates cleanup in the event of a flood event. Mike also changed how they dealt with their merchandise inside the store: instead of using wall applications, they chose to use racks, which could be easily moved in the event of an oncoming storm to protect their inventory. The store building is over 100 years old, but new thinking about their structural hardening based on their business experience has helped Massey's remain resilient.

These examples of how local business owners have addressed building hardening to promote business continuity demonstrate how small steps can greatly reduce future losses and improve their resilience. For additional case studies, please see the Main Streets Business Continuity Guide.



Massey's Professional Outfitters
Heading for high ground

8. Funding a Hardening Project

FUNDING A HARDENING PROJECT

Many of the projects described in this guide are inexpensive and might be things that you could undertake as part of yearly maintenance. For example, some of the measures that reduce the risk of wind damages, such as securing outdoor items, can be done for less than \$200. Although even this amount of expense can be daunting for a small business, saving a small amount of money each month towards the measures might yield a significant return in terms of reduced future impacts.

Other measures can be undertaken through the course of normal purchases and repairs. For example, making the decision to purchase furniture made from materials that are less prone to flood damages, or incorporating a small platform when installing equipment.

Larger scale measures might require loans, or in some cases might be eligible for grant funding at the corridor level.

Grants

There are some federal grants which local governments are eligible to apply for which could be utilized towards corridor-wide or city-wide risk reduction efforts. These include grants from the Federal Emergency Management Agency (FEMA), as well as other federal agencies, which can be utilized for various types of retrofits and education.

Federal Emergency Management Agency (FEMA)

FEMA provides funding for mitigation activities following a disaster declaration and through its annual grant programs.

Grant programs include:

- Unified Hazard Mitigation Assistance
- Public Assistance

The Unified Hazard Mitigation Assistance (HMA) programs include both post-disaster grant funding, and yearly programs, depending upon congressional allocations. The State is the applicant for all HMA programs, with local governments serving as the sub-applicants.

Grant programs include:

- Hazard Mitigation Grant Program (HMGP) – Available after a presidentially declared disaster.
- Pre-Disaster Mitigation (PDM) – Available yearly depending upon congressional appropriations.
- Flood Mitigation Assistance – Available yearly depending upon appropriations.

Eligible activities under HMGP, PDM and FMA include: Structure Elevation, Dry Floodproofing of Historic Structures or Non-residential Structures, Generators, and Localized or Non-localized Flood Risk Reduction Projects.

FEMA also provides technical assistance, and occasionally resources and/or funding through the following:

1. Risk Mapping, Assessment, and Planning
2. Building Science Branch

Environmental Protection Agency (EPA)

The EPA provides funding for water quality, environmental education, and estuary protection, all of which might be useful for components of hazard mitigation projects. These programs can be used to support certain types of green infrastructure, which often has a water quality co-benefit, as well as used for the protection or restoration of natural resources.

8. Funding a Hardening Project

Grant programs include:

- Healthy Watersheds Consortium Grant Program
- Urban Waters Grant Program

U.S. Housing and Urban Development (HUD)

HUD provides a range of disaster recovery resources working in partnership with agencies such as FEMA and the Small Business Administration (SBA). More recently, HUD has partnered with the Rockefeller Foundation to host the National Disaster Resilience Competition.

HUD programs can be utilized towards hazard mitigation by local jurisdictions, and in some cases by individuals.

In addition to the federal grants, some cities have chosen to create their own grant or rebate programs. These may be part of capital improvement programs, or funded by fees, typically an earmarked portion of existing permit and fee structures or establishing requirements for developer contributions. The use of these funds is typically tied to specific project types, such as risk reduction measures.

Loans

There are various types of construction and improvement loans that can be utilized for the larger measures. In some instances, banks have been able to loan against the expected reductions in insurance costs. The Small Business Administration is one source for low interest loans for small businesses.

Low Cost Measures

Many of the measures identified in this guide can be completed at very little expense. This is particularly the case for those measures that can be undertaken without the need for a licensed professional.

In addition to these low cost measures, planning can often be taken on without a cost.