

*(b) State, Territorial, Tribal, or Local Government Requirement*

FEMA may provide PA funding for additional State, Territorial, Tribal, or local government ADA requirements. These requirements must meet the eligibility criteria for standards, as described in Chapter 2:VII.C.1.

## **7. Seismic Safety for New Buildings**

*(a) Federal Requirement*

If a building is eligible for replacement, FEMA must ensure compliance with EO 12699, Seismic Safety of Federal and Federally Assisted or Regulated New Building Construction. This EO requires FEMA to ensure that the Applicant uses appropriate seismic design and construction standards and practices for new construction. Costs related to meeting required seismic standards are eligible regardless of the cause of damage.

Appropriate seismic standards vary by location based on the probability of a seismic incident occurring in a given area. The Interagency Committee on Seismic Safety in Construction recommends seismic design, construction standards, and practices appropriate for implementing this EO.

*(b) State, Territorial, Tribal, or Local Government Requirement*

If a community uses a standard other than those accepted by the Interagency Committee on Seismic Safety in Construction, FEMA evaluates the standard based on written justification from the community.

## **8. Permit Requirements**

If a Federal, State, Territorial, Tribal, or local government permitting agency requires additional work based on a standard that does not meet the eligibility criteria in Chapter 2:VII.C.1, the cost of the additional work is only eligible if the work:

- Does not change the pre-disaster size, capacity, or function of the facility;
- Applies to the type of repair or restoration required;
- Is reasonable based on the type and extent of damage; and
- Is an established, enforced, uniform practice that applies to all similar types of facilities within the Applicant's jurisdiction, regardless of the circumstance.

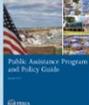
## **D. Hazard Mitigation**

Hazard mitigation is any sustained action taken to reduce or eliminate long-term risk to people and property from natural hazards and their effects. FEMA has authority to provide PA funding for cost-effective hazard mitigation measures for facilities damaged by the incident.<sup>240</sup>

In addition to providing funding for hazard mitigation under the PA Program, FEMA also provides hazard mitigation funding under its Hazard Mitigation Assistance (HMA) programs. FEMA's Federal Insurance and Mitigation Administration administers the HMA programs, which are briefly described in Figure 14. The eligibility criteria, procedures, and timelines for implementation of the hazard mitigation measures funded under the HMA programs differ from the hazard mitigation measures funded under the PA Program.

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<sup>240</sup> Stafford Act § 406(e), 42 U.S.C. 5172 (e), and 44 CFR 206.226(e).

Stafford Act Section <b>406</b>	Stafford Act Section <b>404</b>	National Flood Insurance Act of 1968 <b>NFIA</b>	Stafford Act Section <b>203</b>
<b>PA Programs</b>	<b>HMA Programs</b>		
<b>Disaster-related programs</b>  <b>PA:</b> Mitigation of incident-caused damage  Funding: Available for disaster-damaged facilities only*	<b>Disaster-related programs</b>  <b>HMGP:</b> Multi-hazard, statewide mitigation  Funding: Available for damaged and non-damaged facilities based on a percentage of dollars obligated to the PA and IA programs	<b>Non-disaster-related programs</b>  <b>FMA:</b> Flood mitigation for insured properties  <b>PDM:</b> Multi-hazard, project-specific	
NOTE: PA = Public Assistance HMA = Hazard Mitigation Assistance HMGP = Hazard Mitigation Grant Program		FMA = Flood Mitigation Assistance PDM = Pre-Disaster Mitigation IA = Individual Assistance	

\* See exception for Alternative Procedure Projects in Chapter 2, Section VII.G.4(c).

**Figure 14. FEMA Hazard Mitigation Programs**

FEMA commonly refers to PA-funded hazard mitigation as Section 406 hazard mitigation and mitigation funded under HMGP as Section 404 hazard mitigation. These references are based on the authorizing sections of the Stafford Act.

The Applicant may use both 406 and 404 mitigation funds to implement mitigation measures on the same facility, but not for the same work. The Applicant cannot use funds from one of these mitigation programs to meet the non-Federal cost share of work funded under the other mitigation program.

This document provides details regarding Section 406 hazard mitigation funding under PA. FEMA’s *Hazard Mitigation Assistance Guidance* provides further details on the HMA programs.<sup>240</sup>

### Section 406 Hazard Mitigation

FEMA evaluates proposed mitigation measures for cost-effectiveness, technical feasibility, and compliance with EHP laws, regulations, and EOs. In addition, FEMA ensures that the mitigation does not negatively impact the facility’s operation or surrounding areas, or create susceptibility to damage from another hazard.

Mitigation measures must be cost-effective. FEMA considers mitigation measures to be cost-effective if any of the following criteria are met:

- The cost for the mitigation measure does not exceed 15 percent of the total eligible repair cost (prior to any insurance reductions) of the facility or facilities for which the mitigation measure applies.
- The mitigation measure is specifically listed in Appendix J: Cost-Effective Hazard Mitigation Measures, AND the cost of the mitigation measure does not exceed 100

<sup>240</sup> FEMA’s HMA Guidance is available at <http://www.fema.gov/media-library/assets/documents/103279>.

percent of the eligible repair cost (prior to any insurance reductions) of the facility or facilities for which the mitigation measure applies.

- The Recipient or Applicant demonstrates through an acceptable benefit-cost analysis (BCA) methodology that the measure is cost-effective. FEMA's BCA software<sup>241</sup> provides appropriate BCA methodologies.

Many mitigation measures that do not meet the first two requirements above prove to be cost-effective based on a BCA. If the mitigation measure is not cost-effective based on the first two criteria, FEMA, the Recipient, and the Applicant will work together to develop a BCA to determine whether it is cost-effective.

A BCA is based on a comparison of the total eligible cost for the mitigation measure to the total value of expected benefits. Benefits include reductions in:

- Damage to the facility and its contents
- The need for emergency protective measures
- The need for temporary facilities
- Loss of function
- Casualties (typically included only for earthquake, tornado, and wildfire mitigation)

To be eligible, the mitigation measures must directly reduce the potential of future, similar damage to the facility. Generally, eligible mitigation measures are those the Applicant performs on the damaged portion(s) of the facility. If the Applicant proposes mitigation measures that are distinct and separate from the damaged portion(s) of the facility, FEMA evaluates the proposal and determines eligibility on a case-by-case basis considering how the mitigation measure protects the damaged portion(s) of the facility and whether the mitigation measure is reasonable based on the extent of damage. Some examples of such measures include:

- Constructing floodwalls around damaged facilities
- Installing new drainage facilities (including culverts) along a damaged road
- Dry floodproofing both damaged and undamaged buildings that contain components of a system that are functionally interdependent (i.e., cases where the entire system is jeopardized if any one component of the system fails)

If FEMA determines mitigation measures to undamaged portions ineligible as 406 hazard mitigation, the Applicant may request HMGP (Section 404) funding from the State or Territory



#### Section 404 Hazard Mitigation Grant Program

The Recipient manages HMGP and is responsible for soliciting applications from State, Tribal, and local government agencies. Projects submitted to the Recipient must be in accordance with the Recipient's Hazard Mitigation Plan, address severe detrimental impacts, and have the greatest potential to reduce future losses. Eligible projects include acquisition of hazard-prone property, retrofitting existing buildings and facilities, elevation of flood-prone structures, infrastructure protection measures, and hazard mitigation planning. State, Tribal, and local government agencies should direct questions regarding HMGP to the State Hazard Mitigation Officer: <http://www.fema.gov/state-hazard-mitigation-officers>.

<sup>241</sup> FEMA's BCA software is available at <https://www.fema.gov/benefit-cost-analysis>.

to provide protection to undamaged portions, while utilizing PA Program (Section 406) mitigation funds to provide protection to damaged portions.

Section 406 hazard mitigation opportunities usually present themselves during facility repair. However, in cases where the Applicant must repair a facility in an expedited manner, it may miss an opportunity to implement mitigation measures during repair. If the Applicant implements mitigation measures after the PA-funded repair is complete, the mitigation work may be eligible; however, FEMA will not provide PA funding for any duplicative work as a result of the subsequent mitigation.

In some instances, the Applicant may implement mitigation measures after the incident occurs but before the incident is declared or before FEMA has the opportunity to evaluate the measure for eligibility. In these cases, the mitigation work may still be eligible if it is cost-effective and FEMA confirms compliance with applicable EHP laws, regulations, and EOs.

If FEMA approves mitigation funding and the Applicant does not complete the mitigation work, FEMA will deobligate the mitigation funds.

### E. Repair vs. Replacement

When evaluating whether a damaged facility is eligible for replacement, FEMA compares the repair cost with the replacement cost and evaluates the feasibility of repairing the facility.<sup>243</sup>

A facility is considered repairable when:

- The cost to repair the disaster-related damage does not exceed 50 percent of the cost to replace the facility based on its pre-disaster size, capacity, and function; and
- It is feasible to repair the facility so that it can perform the pre-disaster function as well as it did prior to the incident.<sup>244</sup>

The comparison of the repair cost to the replacement cost results in a fraction that expresses repair as a percentage of replacement. The percentage is calculated with the repair cost as the numerator and the replacement costs as the denominator. FEMA refers to this calculation as the “50% Rule.”

#### 1. Calculation

The repair cost (numerator) is the cost of repairing disaster-related damage only and includes costs related to compliance with standards that apply to the repair of the damaged elements only. The numerator does not include costs associated with:



#### Substantial Damage Determination

A floodplain manager’s Substantial Damage determination (which is part of the NFIP eligibility process and described in Chapter 2:VII.C.5) is separate and distinct from FEMA’s 50% Rule.

FEMA’s eligibility determination for funding replacement is based on the 50% Rule regardless of a Substantial Damage determination.



#### Terminology

**Soft costs** are those not considered as direct construction costs, including:

- Architectural costs
- Engineering costs
- Project management costs
- Financing
- Legal fees
- Other pre-/post-construction expenses

<sup>243</sup> 44 CFR § 206.226(f).

<sup>244</sup> 44 CFR § 206.226(f)(1).

## APPENDIX J: COST-EFFECTIVE HAZARD MITIGATION MEASURES

FEMA considers the following potential mitigation measures to be cost-effective if the measures:

- Do not exceed 100 percent of project cost;
- Are appropriate to the disaster damage;
- Will prevent future similar damage;
- Are directly related to the eligible damaged elements;
- Do not increase risks or cause adverse effects to the property or elsewhere; and
- Are technically feasible for the hazard and location.

### **General**

#### *1. Drainage/Crossings*

- **Drainage Structures:** When drainage structures are destroyed, replace the structure with multiple structures or a larger structure. The Applicant may use existing State, Territorial, Tribal, or local drainage criteria for sizing replacement culverts. The Applicant must consider replacement structures with regard to a total drainage system and cannot upgrade structures without a watershed hydrology study with an emphasis on downstream effects and National Flood Insurance Program regulations.
- **Culverts:** Where the alignment of a culvert is inconsistent with existing water flow, realign the culvert vertically or horizontally or relocate the culvert to improve hydraulics and minimize erosion and scour. The Applicant must consider realignment of structures with regard to a total drainage system and cannot replace structures without a watershed hydrology study with an emphasis on downstream erosion effects.
- **Low-Water Crossings:** When bridges are destroyed and where traffic counts are low, replace bridges with carefully placed low-water crossings.
- **Erosion Control:** Add properly designed entrance and exit structures, such as a headwall, wingwalls, flared aprons, or energy dissipation measures to increase efficiency and help to minimize scour and erosion. Depending on the severity of erosion, line drainage ditches and armor embankments with gabion baskets, rip rap, cast-in-place concrete, crushed stone or rock, grouted rip rap, sheet-piling, and/or geotextile fabric to control erosion.
- **Roadways and Railways:** Where shoulders are damaged by overflow from adjacent water courses, stabilize shoulders and embankments with geotextile fabric.
- **Restraining Cables on Bridges:** Install cables to restrain a bridge from being knocked off piers or abutments during floods or earthquakes. Also, where bridges have been damaged or destroyed when girders, beams, and decking system are displaced by storm surges or earthquakes, install girder and deck uplift tie-downs to prevent their displacement from the substructure.

## 2. Sanitary and Storm Sewer Systems

- Access Covers: When feasible, access covers can be elevated to the hydraulic grade line. There are a number of devices that prevent infiltration into access holes.
- Sewer Lines: Repair lining or encasement of damaged sections to prevent infiltration or structural collapse.
- Pump Stations:
  - Elevate equipment or controls in a pump station that are subject to flood damage. Dry floodproof pump station buildings.
  - Install camlocks, transfer switches, and electrical panels to facilitate the connection of portable emergency generators.
  - If pumps and their attached motors are damaged by stormwater inundation, replace them with submersible or inline pumps as appropriate.
  - If pump station equipment is damaged as a result of power failure, install switches, circuit isolation and/or quick connect capability to facilitate rapid connection of backup power.

## 3. Water and Wastewater Treatment Plants

- Elevate equipment and controls that can be elevated easily.
- Dry or wet floodproof buildings.

## 4. Potable Water

- Well Systems:
  - Seal exposed portions of well casing or raise the elevation of the well head to prevent infiltration of flood waters.
  - Elevate controls, mechanical equipment, or electrical service associated with use of the well to protect them from flood damage.
  - Raw water intakes – Install buttressing to prevent damage from erosion, scour, and flood debris.

## 5. Electric Power Distribution

- Pad-Mounted Transformers: Elevate the transformer above the Base Flood Elevation.
- Pole-Mounted Equipment:
  - Anchor or otherwise protect fuel tanks from movement.
  - Support transformers with multiple poles.
  - Replace damaged poles with higher-rated poles of the same or different material, such as replacing wood poles with precast concrete or steel.
- Add guy-wires or additional support to power lines.
- Remove large diameter lines from poles.
- Provide looped distribution service or other redundancies in the electrical service to critical facilities, such as hospitals and fire stations.

## 6. Above-Ground Storage Tanks

- Strengthen or stiffen base connections.
- Install self-initiating disconnects and shut-off valves between tanks and distribution lines to minimize damage and leaks.

## 7. Underground Pipelines

- Install shut-off valves so that damaged sections of pipeline can be isolated.

## **Buildings**

### 1. General Effects of Flood Damage

- Buildings without a Substantial Damage Determination based on the community's floodplain management ordinance: If technically feasible, elevate or dry floodproof components or building systems vulnerable to flood damage, including electrical panels; heating, ventilation, and air conditioning/machinery rooms; emergency generators; and fuel tanks. If elevating or dry floodproofing is not feasible, wet floodproof buildings.

### 2. Roofs

Because the failure of a roof covering can lead to extensive damage to contents and operation, the Applicant should evaluate damaged roofing to determine cause of failure.

- Low Slope Roofs: Replace entire roof with a roof covering with a secondary membrane and a fully adhered roof covering, such as modified bitumen. Mechanically fastened insulation or membranes are not acceptable.
- Roof-Mounted Equipment: Secure to roof top via a continuous load path, using tie-downs, straps, or other anchoring systems.
- Hurricane Clips: Install clips in locations subject to high winds. Clips, fasteners, anchors, straps, and connectors should be compatible with the roof system and resistant to corrosion in coastal areas.
- High Wind Pressure Areas (e.g., corner zones, roof soffits, overhangs): When roof damages are due to wind pressure, strengthen the high-wind pressure areas.
- Roof Openings: When there is roof system damage or water intrusion due to damage to roof openings, such as hatches and skylights, strengthen the openings or windows.
- Gable Roofs: For gable roofs damaged by wind, replace the gable-end framing with hipped roof framing to reduce wind forces (lower edge pressure; reduced projected wind area) and strengthen the roof framing.

### 3. Shutters

In areas subject to hurricane winds, shutters are appropriate in the following areas:

- All damaged windows on critical facilities, such as hospitals.
- The lower floors of non-critical facilities with damaged windows most likely to be struck by debris.

- Damaged windows of buildings with very high-value contents that can be damaged by water (such as libraries and document centers).
- Damaged windows of buildings if it appears that failure of roofing materials or other portions of nearby structures could create impact hazards.

#### 4. Anchoring

- Anchor mechanical and electrical equipment in critical facilities.
- For small support buildings subject to uplift or rollover from high winds, securely anchor the buildings to foundations to prevent toppling or becoming missile hazards.

#### 5. Flexible Piping

- Install flexible piping at pipe/conduit connections to equipment to accommodate expected movement in an earthquake.

#### 6. Bracing

- Brace large diameter pipes and electrical lines to meet seismic loads.
- Brace non-structural interior walls and partitions.
- Brace parapets, anchor veneer or cladding, and brace other non-structural elements that could collapse and cause injury or block safe exit of a building during an earthquake or high-wind event.

#### 7. Replacement of Glass

- Replace glass with impact-resistant material.

#### 10. General Buildings

- Buildings: Where spread footings have been undercut by scour, underpin footings.
- Siding: If siding has been damaged by wind, replace with a stronger siding with stronger attachments to the wall sheathing and structure.
- Venting: Where there has been water damage caused by water intrusion through venting systems, replace the vents with rain and water-resistant vents.

#### 11. Doors and Windows

- Where damage has resulted from wind and water intrusion around weather stripping on doors or windows, upgrade the weather stripping to prevent water infiltration.
- Where damage has been caused by wind-induced failure of entry and garage doors, replace doors, door frames, hinges, and hardware with wind-resistant units.

#### **Miscellaneous Structures**

- Marine Piers: If marine piers ramps that attach to decking have been damaged by storm-surge uplift and buoyancy, install open decking or floating decking with uplift-resistant tie-downs and fasteners.

- Signage: If sign panels and their supports have failed, replace with a stronger type of system of supports and panels. Consider using multiple support posts and stronger panels and fasteners.
- Gutters and Downspouts: If damaged by wind or water, upgrade the gutter and downspout system to direct water away from the structure to prevent interior or basement water damage.