



Public Assistance- 406 Hazard
Mitigation

*Refresher Course for PA
Field Personnel*

Course Goal

- To educate Public Assistance staff about the proper use of mitigation assistance provided under Section 406 of the Stafford Act.

Course Objectives

- Differentiate between 404 and 406 Mitigation
- Understand FEMA regulations and policies regarding 406 mitigation
- Identify Mitigation Opportunities
- Define Cost-Effectiveness
- Discuss PW and HMP preparation

404 vs. 406 Mitigation

404	406
State Managed	PA Managed
Applied Statewide	Site Specific
Cost-effective funding	Cost-effective funding
Capped at 7.5/20%	Not Capped
Multi-Hazard/Area wide (competitive)	Incident specific
Non-damaged Facility	Damaged Element of Facility Only

*R*egulations and Policies

- Stafford Act- Section 406
- 44 CFR 206.201(f) and 206.226(c)
- PA Guide (pages 98 – 101)
- Policy #9526.1 – Hazard Mitigation Funding Under Section 406

Floodplain Management Requirements

- Avoid adverse impacts to the floodplain (Executive Order 11988 – Floodplain Management)
- FEMA may require mitigation of the hazard or relocation of a critical facility up to and including the 500-year floodplain before approving funding
- Identify mitigation project locations on the Flood Insurance Rate Map (FIRM)

Critical Actions/Facilities

- Critical Actions
 - Defined as an action for which even a light chance of flooding is too great. So the 500-year floodplain becomes the critical action floodplain.
 - Critical actions include extending the useful life of structures or facilities such as:
 - ✓ Production, use, or storage of toxic materials
 - ✓ Hospitals, nursing homes, and housing for the elderly
 - ✓ Emergency Operations Centers and data storage centers
 - ✓ Generating plants and utilities

Critical Actions/Facilities - Continued

- Mitigation for Critical Facilities may include:
 - Elevation
 - Relocation
 - Floodproofing

Environmental Considerations

- For any action taken by FEMA in a floodplain or wetland the provisions of 44 CFR Part 10 Environmental Considerations are supplemental to the provisions of Executive Order 11988 Floodplain Management and EO 11990 Protection of Wetlands
- A Mitigation measure that affects facility location, footprint, function, size will potentially require NEPA compliance including such other environmental considerations as Endangered Species, Clean Air Act, or Clean Water Act.

Historic Preservation Issues

- A Mitigation Measure that affects historic districts, buildings, structures, etc. or facilities 45 years or older require the review of a Historic Specialist prior to any alteration of the structure or facility.
- The Historic Specialist will coordinate mitigation projects for historic compliance with the State Historic Preservation Officer (SHPO)

Keeper's Quarters

Built: Circa 1936

Relocation area for
replacement electrical panel
IF approved by the State
Historic Preservation Officer

This HMP was NOT
approved by the SHPO –
therefore not eligible for
FEMA funding

406 Mitigation Eligibility

- Permanent Work
- Related to damaged element
- Reduce or eliminate the threat of future damage to the facility
- Be cost effective

Not applicable for alternate projects and most improved projects

Repair and Mitigation

- Benefits of a combined approach
 - Lowers mitigation project costs
 - Increases mitigation cost-effectiveness
 - Reduces design and construction time
- Completed Work
- Multiple Sites

Potential Impacts of Mitigation Proposals

- Adverse effects on applicant operations
 - Reduced accessibility, efficiency
 - Increased operation and maintenance costs
- Increased risk from other hazards
 - Flood vs. wind
 - Flood vs. earthquake

Active vs. Passive Mitigation

- Active mitigation – requires human intervention
- Passive mitigation – no human intervention needed
- Passive mitigation measures preferred

Examples of 406 Mitigation

- Relocation
- Slope stabilization
- Protection from high winds
- Floodproofing of buildings
- Flood protection of bridges and culverts
- Protection of utilities

General Design Principles

- Flood – relocate, elevate or shield
- Wind – protect building envelope
- Coastal Storm – design for both flood and wind, consider corrosion factors

Flood Mitigation – Roads

- Most commonly damaged facilities in floods
- Typically damaged by erosion of
 - Ditches
 - Embankments
 - Surfaces and shoulders

Refer to the > **FLOOD HAZARD MITIGATION HANDBOOK**

Flood Mitigation – Culverts

- Typically damaged by
 - Insufficient Capacity/Inefficient End Sections
 - Plugging
 - Embankment Erosion
 - Misalignment
- Proper assessment of cause of damage is important

Flood Mitigation

Erosion and Scour



Flood Mitigation – Bridges

- Typically damaged by
 - Misalignment
 - Insufficient Capacity (Decks)
 - Erosion (Approaches)
 - Scour (Piers and Abutments)
 - Debris Impact (Piers and Abutments)

Flood Mitigation – Buildings

- Typically damaged by
 - Inundation
 - High Velocity Flows

Flood Mitigation – Utilities

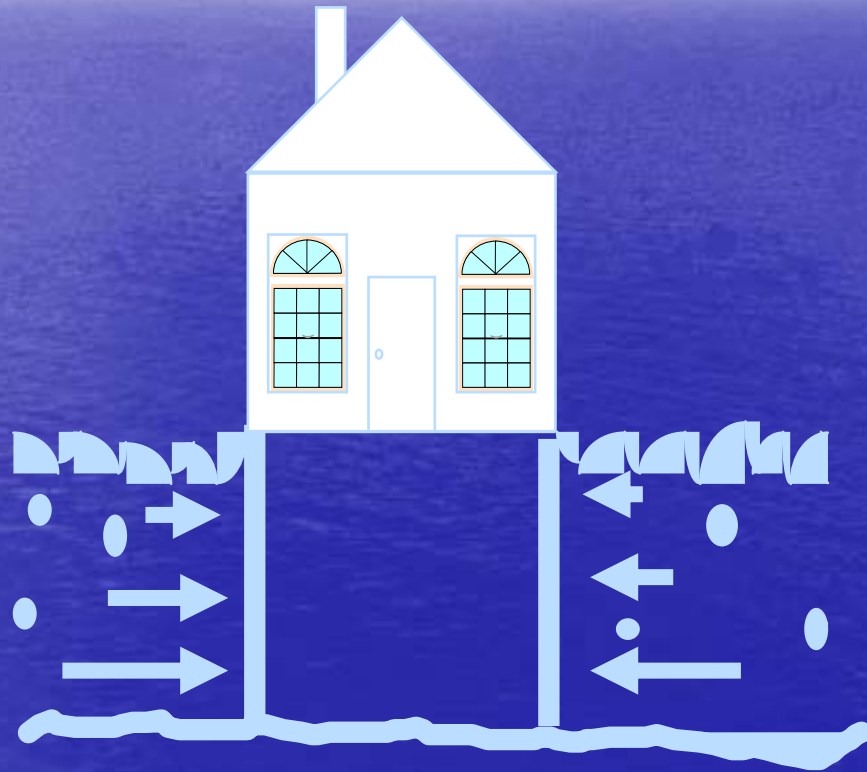
- Typically damaged by
 - High Velocity Flows
 - Soil Settlement
 - Inundation

Flood-Related Hazards

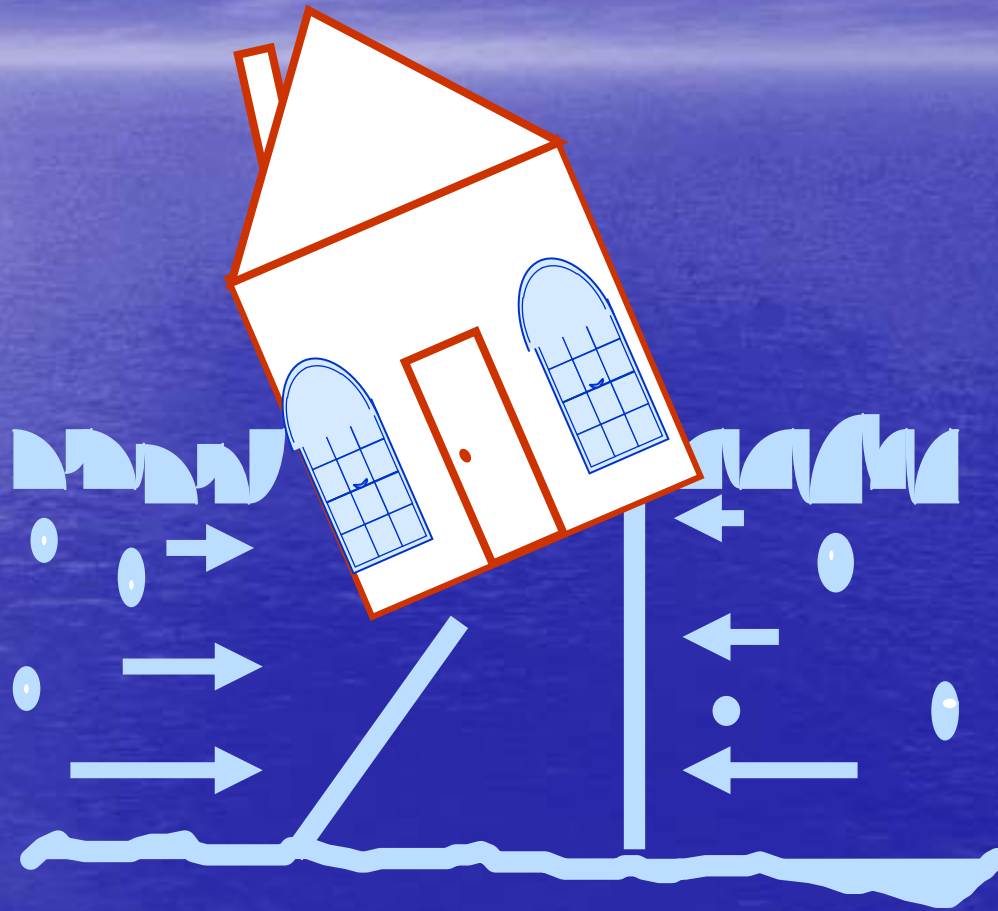
Hydrostatic Forces



Hydrostatic Forces



Hydrostatic Forces



Flood-Related Hazards

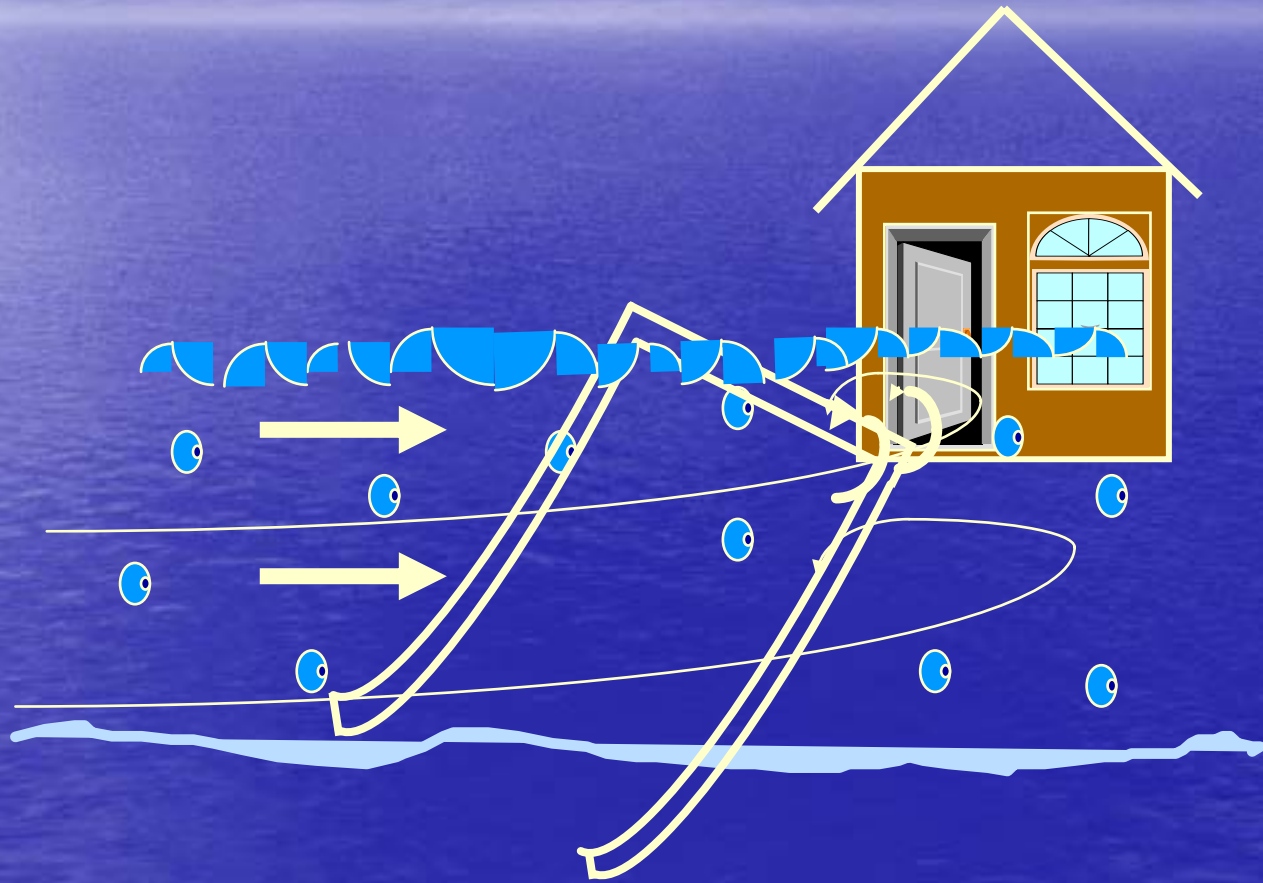
Hydrodynamic Forces



Hydrodynamic Forces



Hydrodynamic Forces



Flood Mitigation

Debris Impact Forces



Wind Mitigation

- Focus on high, extreme wind events
- Wind hazards:
 - Wind pressures
 - Debris impact forces

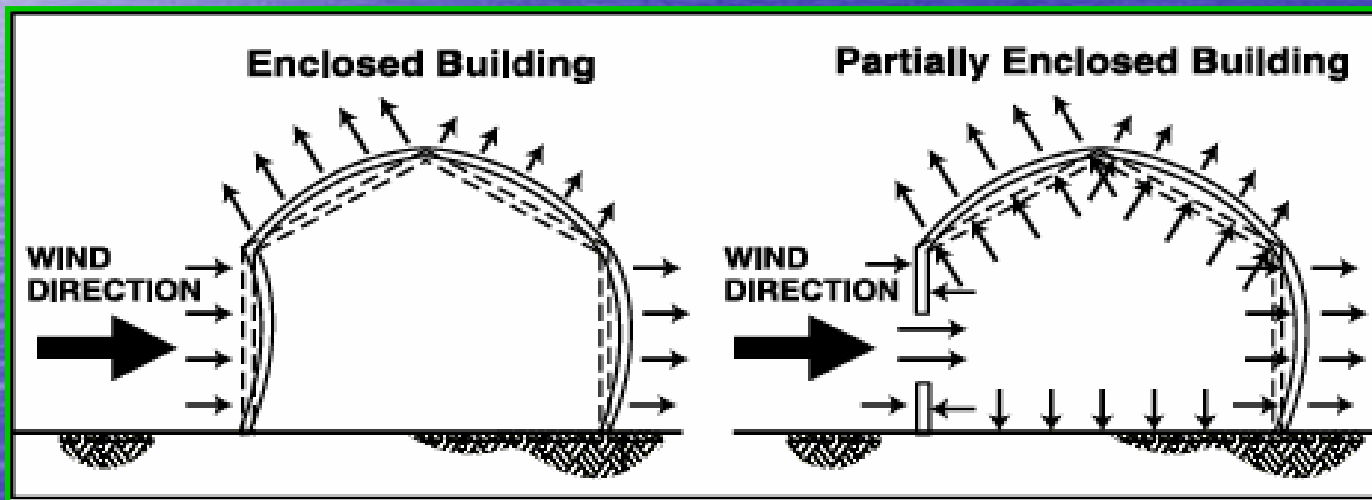


Wind Mitigation – Roads & Bridges

- Mitigation for Wind Pressures
 - Anchor signs
 - Secure utilities
 - Strengthen sign poles
 - Relocate utilities underground

Wind Mitigation – Buildings

Effects of Wind Pressures

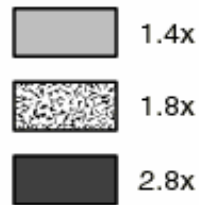


Wind Mitigation – Buildings

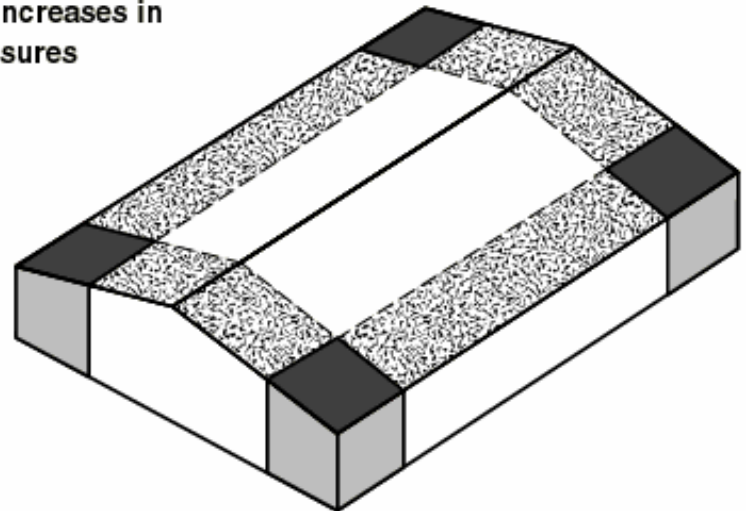


Wind Pressures

Approximate Increases in
Negative Pressures

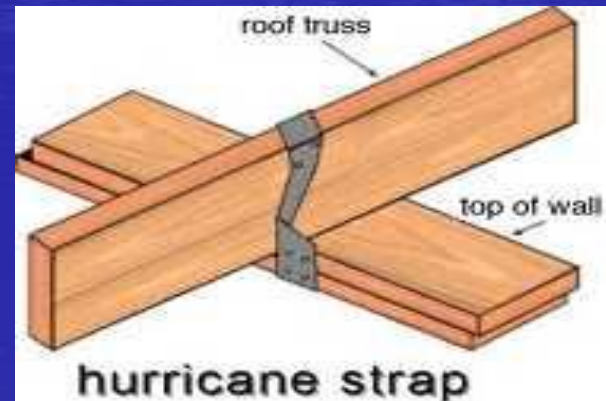


$10^\circ < \Theta \leq 45^\circ$



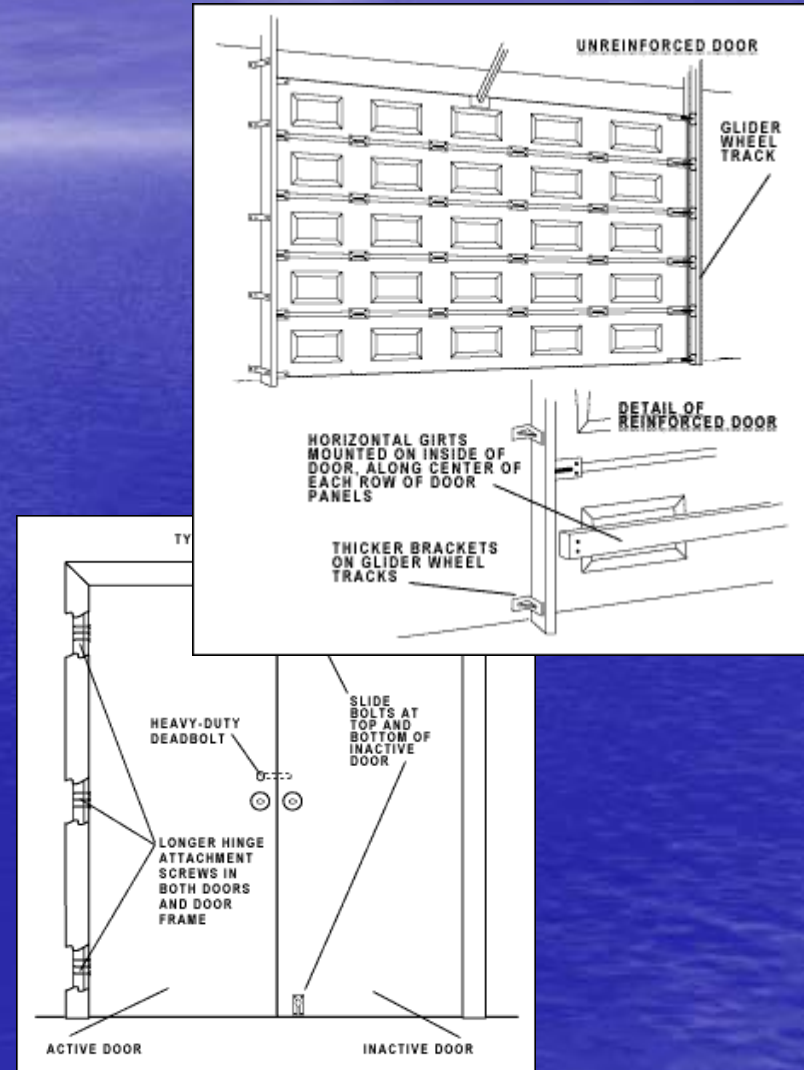
Wind Mitigation – Buildings

- Mitigation for Wind Pressures on Framing
 - Construct a shelter
 - Install hurricane straps
 - Improve end gables
 - Secure roof sheathing
 - Secure metal siding and roofs
 - Anchor structure to foundation



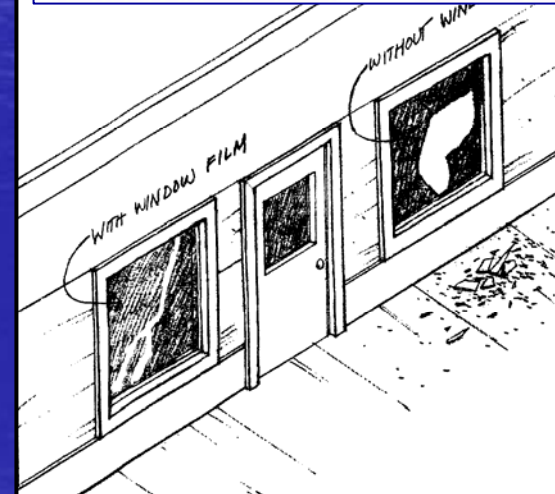
Wind Mitigation – Buildings

- Mitigation for Wind Pressures on Openings
 - Reinforce/replace garage doors
 - Reinforce entry doors
 - Replace gable vents
 - Install shutters
 - Strengthen window glass



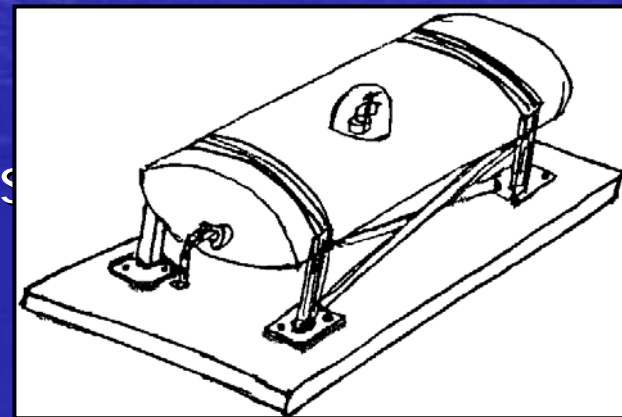
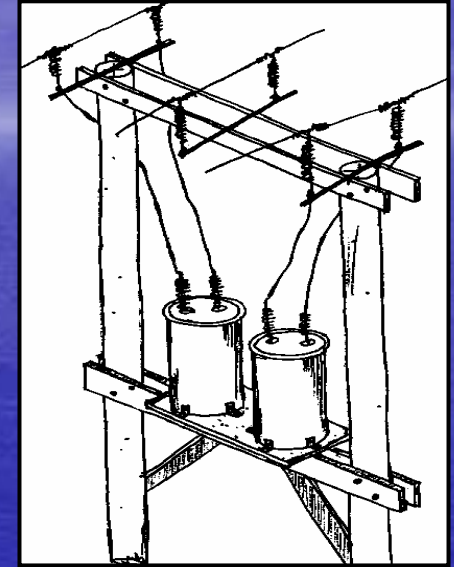
Wind Mitigation – Buildings

- Mitigation for Debris Impact
 - Install shutters
 - Strengthen window glass
 - Anchor/eliminate sheds



Wind Mitigation – Utilities

- Mitigation for Wind Pressures and Debris Impact
 - Anchor heavy equipment
 - Secure tanks
 - Strengthen utility poles
 - Relocate utilities underground



Wind Mitigation

Debris Impact Forces



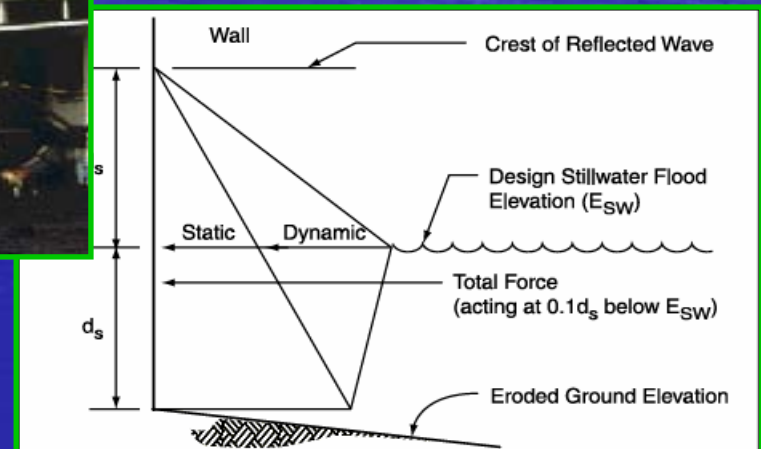
Coastal Storm Mitigation

Mitigation measures determined by cause of damage

- Consider **flood** mitigation
- Consider **wind** mitigation
- Focus on **both**

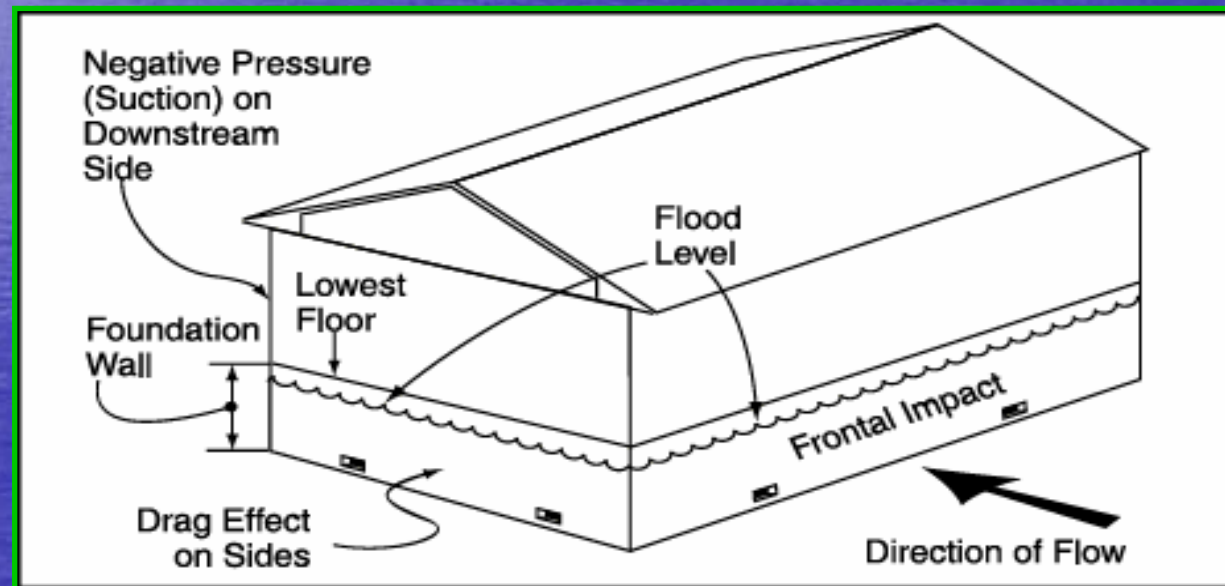
Coastal Storm Hazards

Breaking Wave Forces



Coastal Storm Hazards

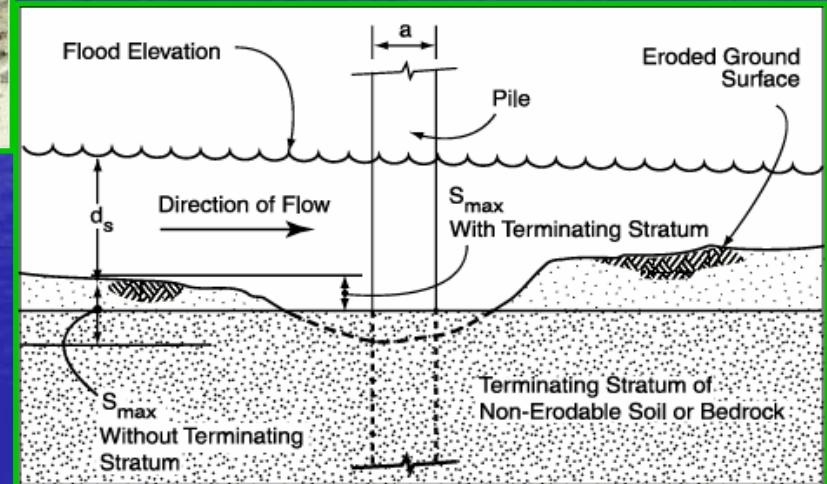
Hydrodynamic Forces



Coastal Storm Hazards



Erosion and Scour



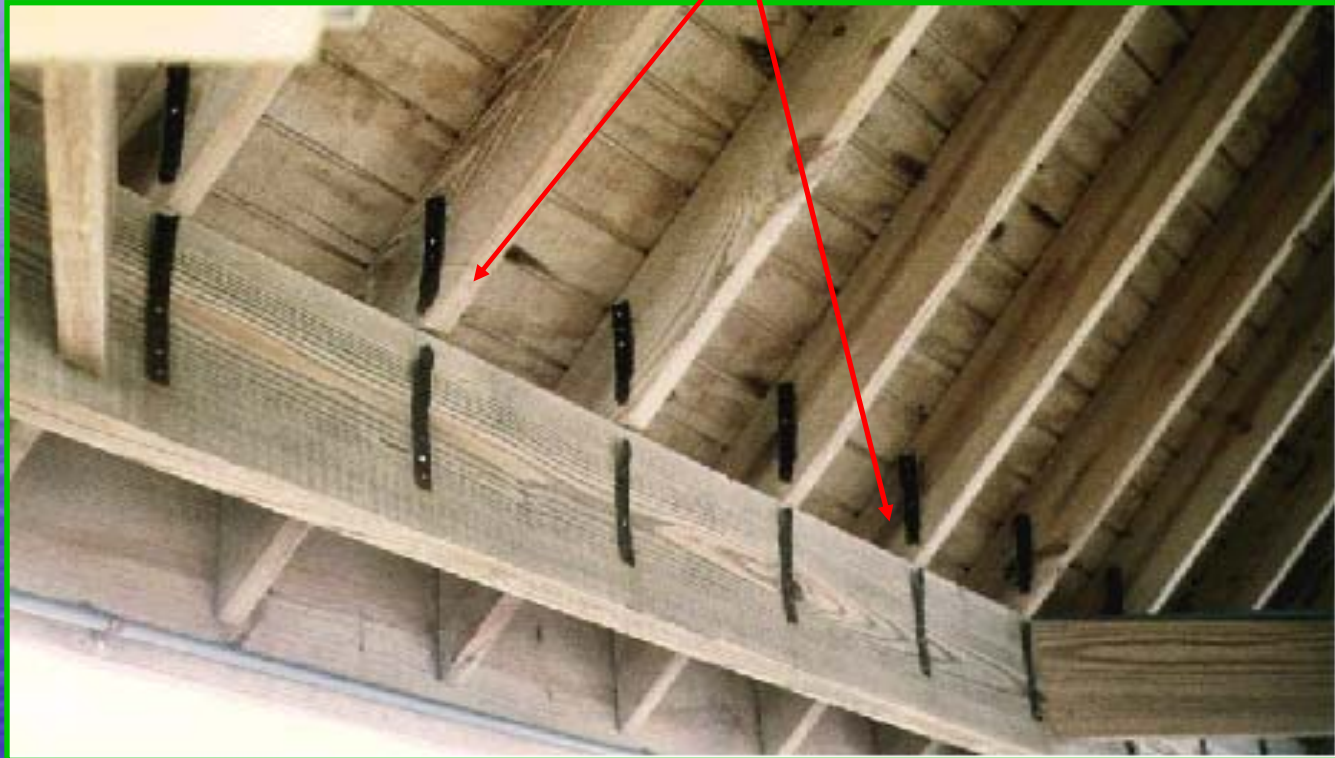
Coastal Storm Hazards

Debris Impact Forces



Coastal Storm Hazards

Corrosion





Questions?

...mitigation measures
must apply to the
damaged elements of a
facility...

What are the Damaged Elements?

- Damaged Element is used to determine “benefits” for mitigation measure
- Damages to contents if related to element (e.g. windows broken result in water-infiltration)
- Review damaged element example in the Policy Digest (FEMA 321) page 61

Mitigation Benefits

- The project benefits calculation is based on three key elements:
 - Hazard frequency and severity
 - Damages and losses before mitigation
 - Damages and losses after mitigation

...mitigation measures
must be determined to be
cost-effective...

What is Cost-Effective?

- 15% Rule
- 100% Rule (Appendix A)
- Benefit-Cost Analysis

Refer to >

**FEMA Policy 9526.1 - HAZARD MITIGATION
FUNDING UNDER SECTION 406 (STAFFORD ACT)**

The Benefit-Cost Model

$$\frac{\text{BENEFITS}}{\text{COSTS}} = \text{BC RATIO}$$

Federal Emergency Management Agency Mitigation Benefit and Cost Effectiveness Analysis

Delaration No:	Project No: REF#6TR007	FIPS No: 003-56540-00	Date: 2/3/06	Category: G
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FEMA DR-1607	DR-			
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Applicant: CITY OF OAKDALE	County: ALLEN	PW No.: 708
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1. Cost to Repair to pre-disaster condition in accordance with applicable standards.	\$4,273.00	
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2. Additional cost to mitigate the damage (Cost of Mitigation)	\$2,214.00	
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3. Total Project Cost(1+2)	\$6,487.00	
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4. Frequency of the event causing the damage (for a 50 year event, enter 50)	9	yrs
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5. Actual Annual Probable Benefit from the mitigation. (Item 1 divide by item 4)	\$474.78	
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6. Effective life of the mitigation (the lesser of the facility life or the mitigation life)	20	yrs
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7. Present Value Coefficient.	\$10.59	/yrs
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8. The Present Value of Future Project Benefits (item 5 multiplied by item 7)	\$5,027.90	
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9. The Benefit Cost Ratio (item 8 divided by item 2)	2.27	
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Approved: E. DON ANDREWS	Denied:
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PA Mitigatorer: _____	Date: _____
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Comments: _____

Providing Mitigation without a Hazard Mitigation Proposal

- Codes and Standards
- Good Construction Practices
- Least Cost Alternatives

Codes and Standards

"The Five Criteria"

- Apply to the repair work being performed
- Be appropriate to the pre-disaster use of the facility
- Be reasonable, formally adopted, in writing, and implemented prior to the disaster
- Apply uniformly to all facilities of the type being repaired with the applicant's jurisdiction
- Be enforced during the time that it was in effect

Note: If codes/standards are arbitrary, discretionary, subjective and all five criteria are not met then they do not meet the criteria for eligible upgrades.

Codes and Standards

- Identify as a mitigation measure in the Scope of Work:
 - “Hazard Mitigation achieved by compliance with current codes and standards or pre-approved policy”
 - Identify the cost (or percentage of total PW costs) associated with the codes or standards used.

Good Construction Practices

- Identify as a mitigation measure in the Scope of Work:
 - “Hazard Mitigation achieved through good construction practice and will not require a benefit cost analysis for approval”
 - Identify the cost (or percentage of total PW costs) associated with the construction practice used

PW and HMP Documentation

Project Worksheet

Special Considerations Sheet

Hazard Mitigation Proposal

Project Worksheet

- Damage description
 - Identify damages by flood
 - Identify damages by wind
- Scope of work
 - Repair to pre-disaster condition
 - ✓ Codes and standards provides mitigation
 - ✓ Good construction practices provides mitigation
 - ✓ Mitigation considered but not technically feasible
 - Hazard Mitigation Proposal attached
- Project Costs
 - Estimate “Repair to pre-disaster condition” cost
 - FEMA Cost Code 0909—“Hazard Mitigation Proposal Attached”
 - Leave cost blank

Hazard Mitigation Proposal (HMP)

- Scope of Mitigation Work
 - Brief description of damage
 - Describe both the repair/replacement in-kind and the mitigation measure
 - Reference either 15%, 100%, or Benefit Cost Analysis as the cost effective measure
- Cost of Mitigation Work
 - Item 1, Cost Code 0000, "Items Needed if HMP Approved"
 - List items and costs for HMP
 - Item #, Cost Code 0000, "Items Not Needed if HMP Approved"
 - List items and costs not needed in PW estimate if HMP is approved (as negative numbers)

PAC/PO/Specialist Responsibilities

- Identify mitigation opportunities
- Help applicant identify:
 - Scope of Mitigation Work
 - Cost Estimates
 - Special Considerations Issues
- Request additional technical expertise, if needed

The HMP Review Process

- PAC review of PW and HMP
- Concurrence by State Liaison and Applicant Representative
- Data entry toggles HM tab in NEMIS
- Dollar amount of HMP transfers to the PW
- Approval by the Hazard Mitigation Specialist

Case Management File (CMF)

- Summarize mitigation measure in CMF
- Document that the applicant has been notified that they *must* perform the HM Scope of Work or risk loss of funding
- List other pertinent information

*R*eview Course Objectives

- Differentiate between 404 and 406 Mitigation
- Understand FEMA regulations and policies regarding 406 mitigation
- Identify Mitigation Opportunities
- Define Cost-Effectiveness
- Discuss PW and HMP preparation

