STRUCTURAL DAMAGE AND MITIGATION ASSESSMENT

Capability Definition

Structural Damage and Mitigation Assessment is the capability to conduct damage and safety assessments of civil, commercial, and residential infrastructure and to perform structural inspections, and mitigation activities. The capability includes being able to provide contractor management, construction management, cost estimating, technical assistance, and other engineering services to support and manage response and recovery operations.

Outcome

Accurate situation needs and damage assessments occur. The full range of engineering, building inspection, and enforcement services are implemented, managed, and coordinated in a way that maximizes the use of resources, aids emergency response, implements recovery operations, and restores the affected area to pre-event conditions. Mitigation projects to lessen the impact of similar future events are identified and prioritized.

Relationship to National Response Plan Emergency Support Function (ESF)/Annex

This capability supports Emergency Support Function (ESF) #3: Public Works and Engineering.

Preparedness Tasks and Measures/Metrics

Activity: Develop and Maintain Plans, Procedures, Programs and Systems	
Critical Tasks	
Rec.C3b 1.3.4	Develop standards and procedures to identify qualified contractors offering recovery/restoration services
Rec.C3b 1.1.2	Develop damage assessment procedures
Rec.C3b 1.4	Develop mitigation plans and procedures
Rec.C3b 1.4.1	Identify mitigation measures and emergency restoration procedures
Rec.C3b 1.5	Develop qualification and certification standards for paid and volunteer staff
Rec.C3b 1.1.3	Maintain situation and damage assessment plans

Preparedness Measures	**Metrics**
Damage assessment procedures are in place	Yes/No
Mitigation plans and procedures are in place	Yes/No
Mitigation measures and emergency restoration procedures identified	Yes/No
Relevant qualifications and certification standards for paid and volunteer staff are in place	Yes/No

Situation and damage assessment plans are maintained	Yes/No
Code enforcement activities are conducted	Yes/No
Street maps are available for determining alternate routes	Yes/No
Critical Resource List has been developed	Yes/No

Activity: Develop and Maintain Training and Exercise Programs
Critical Tasks

Rec.C3b 2.1.2	Conduct training on damage assessment procedures
Rec.C3b 2.1.3	Conduct training on mitigation plans and procedures
Rec.C3b 2.2.1	Exercise damage assessment procedures
Rec.C3b 2.2.2	Exercise mitigation plans and procedures

Preparedness Measures	**Metric**
Damage assessment procedures are exercised	Yes/No
Mitigation plans and procedures are exercised	Yes/No

Performance Tasks and Measures/Metrics

Activity: *Direct Structural Damage and Mitigation Assessment Operations*

Definition: In response to a notification for recovery assets, provide the overall management and coordination of the response, through to demobilization.

Critical Tasks	
Rec.C3b 3.1.2	Coordinate resources to conduct building inspections and damage assessment
Rec.C3b 3.7	Support incident response operations according to incident management team (IMT) assignments on the inputs to the incident action plan (IAP) for structural damage and mitigation assessment
Rec.C3b 3.1.3	Recommend prioritization schedule of critical infrastructure services, facilities, and assets restoration based on structural damage and mitigation assessments
Rec.C3b 3.6	Develop standards and procedures to identify qualified contractors offering recovery/restoration services
Rec.C3b 3.7.1	Report and document the incident by completing and submitting required forms, reports, documentation, and follow-up notation for structural damage and mitigation assessment
Rec.C3b 3.5	Integrate appropriate private-sector entities into incident response activities

Performance Measures	**Metric**
Private sector entities are incorporated into recovery efforts	Yes/No
Time to develop prioritization schedule for critical infrastructure	Within 24 hours of assessment completion
FEMA and non-FEMA mitigation activities are identified and prioritized concurrent to development of individual project worksheets for specific repair/reconstruction projects	Yes/No

Activity: *Activate Structural Damage and Mitigation Assessment*

Definition: Alert assessment staff to the potential need for services and conduct notifications, dispatch, and other staff mobilization activities necessary to begin assessment activities.

Critical Tasks

Rec.C3b 4.1	Conduct emergency dispatch and notification for structural damage and mitigation assessment personnel
Rec.C3b 4.2	Dispatch secondary structural damage and mitigation assessment agencies

Performance Measures	Metric
Time to mobilize personnel for damage assessment after the observed end of the incident	Within 24 hours of notification

Activity: *Conduct Inspections and Assessments*

Definition: Conduct safety inspections to support the safety of first responders and to assess the habitability of residences. Support assessments of public facilities, lending civil, structural, and mechanical engineering support to affected entities and other assessment staff.

Critical Tasks	
Rec.C3b 5.4.3	Assist in the identification of incident response coordination centers for rebuilding property
Rec.C3b 5	Conduct building inspections and damage assessments of public and private structures
Rec.C3b 5.4.1	Assist with the assessment to determine the need for emergency flood protection and/or emergency erosion control
Rec.C3b 5.2.2	Identify the need for additional engineering and assessment resources from other Federal agencies and issue mission assignments to activate such resources
Rec.C3b 5.4.2	Assist with the assessment to determine the requirement to relocate affected essential services to back-up locations
Rec.C3b 5.3.1	Assess buildings and private structures to determine occupancy eligibility
Rec.C3b 5.3.2	Provide geo-coded status report of community, homes and facilities identified as safe or unsafe to re-enter and re-occupy
Rec.C3b 5.4.4	Determine need for recovery programs

Performance Measures	Metric
Situation assessments are conducted using one of following methods: ▪ Aerial reconnaissance ▪ Remote sensing ▪ Computer modeling (e.g., HAZUS) ▪ Rapid field assessments/windshield surveys	 Yes/No Yes/No Yes/No Yes/No
Results of situation assessments are compared and contrasted to provide best initial estimate	Yes/No
Time to conduct situation assessment and provide results	Within 12–24 hours after the incident
Time to conduct a detailed situation assessment, to include information on buildings that are in imminent danger of collapse and critical resources of infrastructure are threatened	Within 24-48 hours of the conclusion of the disaster
Time to conduct building safety inspections for habitability (green, yellow, and red tags)	Within 4 weeks of the event
Time to conduct an emergency work damage assessment and public works	Within 6 months of the end of the

(PW) preparation	incident period
Time to conduct a permanent work damage assessment and public works (PW) preparation (FEMA and non-FEMA)	Within 12 months of the end of the incident period

Activity: *Provide Mitigation and Technical Assistance*

Definition: Support recovery personnel as they work to develop scopes of work and costs for restoring public buildings and infrastructure. Participate in the identification of mitigation opportunities that may be factored into repair, restoration, and recovery efforts.

Critical Tasks	
Rec.C3b 6.1.8	Coordinate, fund, and implement contracts for construction management and inspection
Rec.C3b 6.1.5	Assist with the coordination, funding, and implementation of contracts for emergency repair of utilities and other services
Rec.C3b 6.1.6	Assist with the management, monitoring, and/or provision of technical advice on debris management and reestablishment of ground and water routes into the affected area
Rec.C3b 6.1.7	Assist with the implementation and management of Federal Emergency Management Agency (FEMA) Public Assistance Program (PA) to support the repair and restoration of public property
Rec.C3b 6.1.9	Participate in post-incident assessments of structures, public works and infrastructure to develop cost estimates, complete written project worksheets, determine priority repair/reconstruction projects, and help to prioritize engineering and construction resources

Performance Measures	**Metric**
Time for jurisdiction to provide technical assistance to responders	Within 24 hours following the end of the disaster
Time to process all FEMA project worksheets and complete eligibility and other reviews	Within 2 weeks of the project worksheet entry
Time to complete 200 applicants' briefings for FEMA's Public Assistance Program applicants	Within 2 months (100,000 category E Projects, at 10 buildings per applicant)

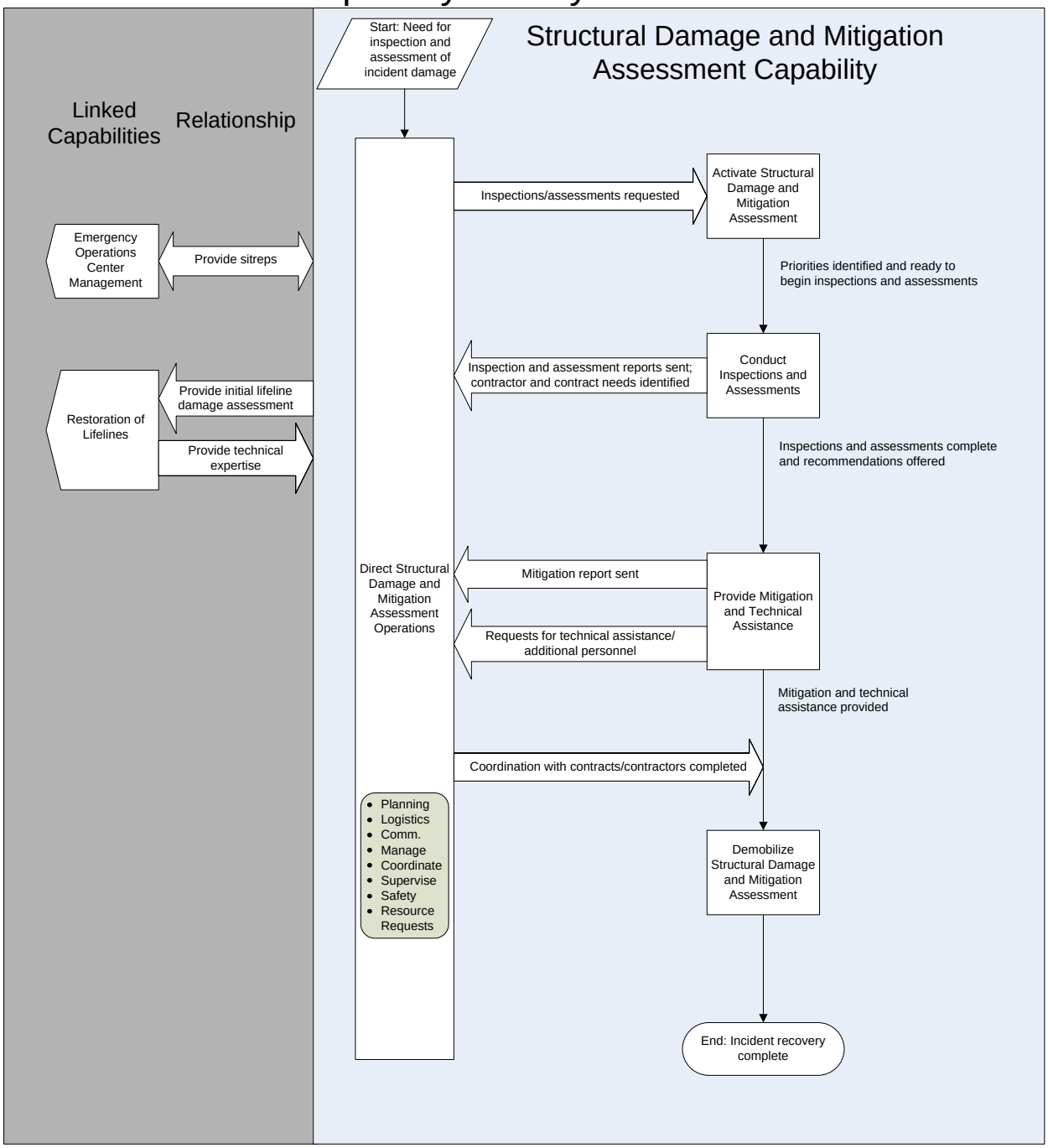
Activity: *Demobilize Structural Damage and Mitigation Assessment* **Definition: Account for all personnel and assets utilized and safely return them to their original location and function.**	
Critical Tasks	
Rec.C3b 7.1	Develop a demobilization plan for structural damage and mitigation assessment
Rec.C3b 7.2	Restore structural damage and mitigation assessment personnel and equipment to normal operations
Rec.C3b 7.3	Complete appropriate structural damage and mitigation assessment documentation

Performance Measures	**Metric**
Personnel and equipment are returned to normal operations	Yes/No
Timely completion of all appropriate documentation	Yes/No

Linked Capabilities

Linked Capability	Relationship
Emergency Operations Center Management	Structural Damage and Mitigation Assessment and Emergency Operations Center Management provide situation reports to each other.
Restoration of Lifelines	Structural Damage and Mitigation Assessment provides initial lifeline damage assessment to Restoration of Lifelines, while Restoration of Lifelines provides technical expertise to Structural Damage and Mitigation Assessment.

Capability Activity Process Flow



Capability Element Description Details

Capability Elements	Components and Description
Public Assistance Teams: buildings	A Public Assistance Team, led by a Public Assistance Coordinator, manages the processing of all of the applicant's recovery projects. The Public Assistance Coordinator is a NIMS-typed resource.
Public Assistance Teams: debris, emergency measures	See above
Public Assistance Teams: other permanent work	See Above
Rapid Needs Assessment Teams	Per NIMS, a team of specialists (e.g., HazMat, medical, mass care, infrastructure) that provides a rapid assessment capability immediately following a major disaster or emergency.
Disaster Assessment Teams	Per NIMS, there are Type I, II, and III Disaster Assessment Teams. NIMS also defines Individual Assistance Disaster Assessment Teams.
Engineering services (to include safety engineers)	
Home and Business Assessment Teams	
DOC NIST National Construction Safety Team	National Institute of Standards and Technology (NIST) teams that are authorized to investigate building failures.

Planning Assumptions

General

- Although applicable to several of the 15 National Planning Scenarios, the capability planning factors were developed from an in-depth analysis of the major earthquake scenario. Other scenarios were reviewed to identify required adjustments or additions to the planning factors and national targets.
- Federal funding to State and local governments is dependent upon Presidential Disaster Declaration.
- Management of significant debris removal operations, emergency protective measures for the public, and the restoration of transportation routes will take immediate precedence over building and structural assessments.
- Requirement for Federal support will be increased because significant numbers of State, local, and private sector personnel in the impacted area will not be available to support structural damage assessment and mitigation activities.
- Public Assistance Teams, Disaster Assessment Teams, and Engineering Services resources could be based regionally (using 10 standard Federal Regions) or at the national level, given the longer timeline of their missions.
- Initial safety assessments will be required before deploying additional resources to conduct building, structural, and mitigation assessments. The Federal Government can provide assistance to State and local governments with building inspections to protect public health and safety.
- Sufficient resources from Federal agencies and the private sector will be available for assessment and recovery operations.

- Appropriate and trained professional staff could be mobilized within 48 hours from multiple locations, nationwide.
- All operations would be managed out of a Joint Field Office (JFO) established for the disaster incident.
- Initial meetings with impacted State/local governments would result in the formation of teams to complete:
  - Emergency inspections (health/safety)
  - Repair/reconstruction project worksheets for public structures and mitigation activities.
- Additional teams would be established by the private sector (including the insurance industry) to focus on inspection/recovery for the private sector, to include mitigation activities. Government should coordinate with these entities.

Scenario-Specific

- Of the 1 million buildings moderately damaged, 200,000 were commercial buildings, 100,000 were public buildings, and 700,000 were residences (300,000 red tagged unsafe for habitation). Of these 1,000 were large office buildings that were partially collapsed and where victims were trapped.
- The scenario identifies earthquake damage to more than 1 million buildings. For purposes of quantifying this capability, the indefinite amount above the 1 million was assumed to be statistically insignificant.
- Total number of Public Assistance Projects: 300,000.
- Port facilities in the affected area are significantly damaged, cargo throughput is reduced by 50 percent.
- Transit system is unavailable by 50 percent.
- Rail system cargo throughput is reduced by 50 percent.
- Highest probability U.S. earthquake areas are: Arkansas, Arizona, California, Colorado, Hawaii, Idaho, Illinois, Kentucky, Missouri, Montana, Nevada, Oregon, South Carolina, Tennessee, Utah, and Washington, according to the United States Geological Survey (USGS). There are approximately 64 metropolitan statistical areas (MSA) with populations greater than 100,000 in these States.
- Rapid Needs Assessment Teams would need to be located in close proximity to these 64 MSAs to perform necessary tasks immediately following the incident.
- FEMA's principal responsibility under this capability will be to prepare project worksheets for the 100,000 damaged public buildings in order to implement the Public Assistance Grant Program.
- Assume that damaged building projects represents 33 percent of total number of FEMA eligible projects with other categories as follows:
  - Debris – 15%
  - Emergency measures – 25%
  - Roads/bridges – 12%
  - Flood control - <1%
  - Utilities – 10%
  - Other – 5%
- Rapid Needs Assessment Teams – 30 for this scenario
- Population of affected area in this scenario – 10,000,000
  - Ratio of teams to population 3 teams/1 million people

- From the Census Bureau's Metropolitan Area Rankings 1997 press release, 69,704,815 people live within the 64 MSA with populations greater than 100,000 that are located in States with the highest earthquake probability.
- Therefore, the total number of Rapid Needs Assessment Teams is 210.

- Moderately damaged means that the impacted building is less than 50 percent damaged.
- Normal deployment time for required response personnel increased by 24-48 hours.
- 300,000 project worksheets for approximately 10,000 applicants
- 50 applicants will participate in each applicant's briefing
- 20 of the Rapid Needs Assessment (RNA) Teams will be deployed to the county with the greatest amount of damage, while the other affected counties will require only two RNA teams each.

Planning Factors from an In-Depth Analysis of a Scenario with Significant Demand for the Capability (Major Earthquake)

Resource Organization	Estimated Capacity	Scenario Requirement Values	Quantity of Resources Needed
Public Assistance Team: buildings	35 public structures per team, per week	100,000 public structures [(100000 structures 7 days/week)/ (35structures/team/week *365days)]	55 Public Assistance Teams for completion within 365 days
Public Assistance Team: debris, emergency measures	30 PWs per team per week	120,000 projects [(30 PWs/team/week *180 days/7 days)]	155 Public Assistance Teams
Public Assistance Team: other permanent work	30 PWs per team per week	80,000 projects [(80,000 PWs)/(30 PWs/team/day * 365 days/7 days)]	51 Public Assistance teams
Rapid Needs Assessment Team	1.4 teams per counties per day	Six counties impacted; 1,000 buildings partially collapsed	30 Rapid Needs Assessment teams
Disaster Assessment Team	30 structures per day, per team	200,000 private/commercial structures; 700,000 residences [900,000 structures/(30 structures/team/day * 30 days)]	1,000 teams
Engineering Services	30 structures per day, per team	100,000 public buildings with 15,000 destroyed; require inspection to determine safety (e.g., need for "Red Tag"). [100,000 structures/(30 structures/team/day * 30 days)]	112 teams

Resource Organization	Estimated Capacity	Scenario Requirement Values	Quantity of Resources Needed
Home and Business Assessment			3,300 SBA Verifiers

Approaches for Large-Scale Events

- By extending the time for public building inspections/project worksheets to be completed from one to two years, the workload will be reduced by 50 percent.
- By extending the time for private building inspections to be completed from one month to two or more months, the workload is reduced by at least 50 percent.
- By extending the time for building inspections to be completed from one month to two or more months, the workload is reduced by at least 50 percent.

National Targets and Assigned Levels

Responsible	Element Resource Unit	Type of Element	Number of Units	Unit Measure (number per x)	Capability Activity supported by Element
Federal/ State/ Local	Public Assistance Teams: Buildings	NIMS Typed Resource Organization	110	Per incident (with composition apportioned 80% Federal, 20% State/local reps)	Provide Mitigation and Technical Assistance
Federal/State/ Local	Public Assistance Teams: Debris, emergency measures	NIMS Typed Resource Organization	310	Per incident (with composition apportioned 80% Federal, 20% State/local reps)	Provide Mitigation and Technical Assistance
Federal/State/ Local	Public Assistance Teams: Other permanent work	NIMS Typed Resource Organization	102	Per incident (with composition apportioned 80% Federal, 20% State/local reps)	Provide Mitigation and Technical Assistance
Federal/State/ Local	Rapid Needs Assessment Teams	NIMS Typed Resource Organization	210	Per incident (with composition apportioned 33% Federal, 66% State/local reps)	Conduct Inspections and Assessments
State/Local/ Private	Disaster Assessment Teams	NIMS Typed Resource Organization	1,000	Per incident (with composition apportioned 78% State/local, 22% private reps)	Conduct Inspections and Assessments

Responsible	Element Resource Unit	Type of Element	Number of Units	Unit Measure (number per x)	Capability Activity supported by Element
Federal	Engineering Service Teams	Non-NIMS Resource Organization	112	Per incident	Conduct Inspections and Assessments Provide Mitigation and Technical Assistance
Federal	Home and Business Assessment Staff – SBA Verifiers	Personnel	3,000	Per incident	Provide Mitigation and Technical Assistance
DOC/NIST	National Construction Safety Team	Federal Resource Organization			Conduct Inspections and Assessments

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