STRUCTURAL DAMAGE ASSESSMENT

Capability Definition

Structural Damage 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.C3a 1.3.4	Develop standards and procedures to identify qualified contractors offering recovery/restoration services
Rec.C3a 1.1.2	Develop damage assessment procedures
Rec.C3a 1.4	Develop mitigation plans and procedures
Rec.C3a 1.4.1	Identify mitigation measures and emergency restoration procedures
Rec.C3a 1.5	Develop qualification and certification standards for paid and volunteer staff
Rec.C3a 1.1.3	Maintain situation and damage assessment plans

Preparedness Measures	**Metrics**
Damage assessment procedures are in place	Yes/No
Procedures address identifying and mobilizing personnel to support structural damage assessment operations	Yes/No
Procedures address required forms, reports, documentation, and follow-up notation	Yes/No
Procedures address conducting inspections and assessments	Yes/No
Procedures address post-incident assessments and follow-up	Yes/No

Procedures address demobilization of structural damage assessment operations	Yes/No
Mitigation plans and procedures are in place	Yes/No
Mitigation measures and emergency restoration procedures are in place	Yes/No
Procedures address identifying qualified contractors offering recovery/restoration service	Yes/No
Relevant qualifications and certification standards for paid and volunteer staff are in place	Yes/No
Situation and damage assessment plans are in place	Yes/No
Code enforcement activities are conducted	Yes/No
Street maps are available for determining alternate routes	Yes/No
Critical Resource List is in place	Yes/No

Activity: *Develop and Maintain Training and Exercise Programs*	
Critical Tasks	
Rec.C3a 2.1.2	Conduct training on damage assessment procedures
Rec.C3a 2.1.3	Conduct training on mitigation plans and procedures
Rec.C3a 2.2.1	Exercise damage assessment procedures
Rec.C3a 2.2.2	Exercise mitigation plans and procedures

Preparedness Measures	**Metric**
"Just-in-time" training for personnel is developed and implemented	Yes/No
Damage assessment procedures are exercised	Yes/No
Mitigation plans and procedures are exercised	Yes/No

Performance Tasks and Measures/Metrics

Activity: *Activate Structural Damage 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.C3a 4.1	Conduct emergency dispatch and notification for structural damage and mitigation assessment personnel
Rec.C3a 4.2	Dispatch secondary response agencies

Performance Measures	**Metric**
Time in which damage assessment personnel are mobilized after the observed end of the incident	Within 24 hours from notification

Activity: *Direct Structural Damage 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.C3a 3.1.2	Coordinate resources to conduct building inspections and damage assessment
Rec.C3a 3.7	Support incident response operations according to incident management team (IMT) assignments on the inputs to the incident action plan (IAP)
Rec.C3a 3.1.3	Recommend prioritization schedule of critical infrastructure services, facilities, and assets restoration based on structural damage and mitigation assessments
Rec.C3a 3.6	Develop standards and procedures to identify qualified contractors offering recovery/restoration services
Rec.C3a 3.7.1	Report and document the incident by completing and submitting required forms, reports, documentation, and follow-up notation
Rec.C3a 3.5	Integrate appropriate private-sector entities into incident response activities

Performance Measures	**Metric**
Private sector entities participate in recovery efforts	Yes/No
Time in which prioritization schedule for critical infrastructure is developed	Within 24 hours from 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: *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.C3a 5.4.3	Assist in the identification of incident response coordination centers for rebuilding property
Res.B1a 5.3	Conduct debris assessment
Res.B1a 5.3.1	Assess the requirement for decontamination or safe demolition, removal, and disposition of contaminated debris.
Rec.C3a 5	Conduct building inspections and damage assessments of public and private structures
Rec.C3a 5.4.1	Assessment the need for emergency flood protection and/or emergency erosion control
Rec.C3a 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.C3a 5.4.2	Assist with the assessment to determine the requirement to relocate affected essential services to back-up locations
Rec.C3a 5.3.1	Assess buildings and private structures to determine occupancy eligibility

Rec.C3a 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.C3a 5.4.4	Determine need for recovery programs

Performance Measures	Metric
Situation assessments are conducted using one of following methods: (1) aerial reconnaissance; (2) remote sensing; (3) computer modeling (e.g., HAZUS); (4) rapid field assessments/windshield surveys	Yes/No
Results of situation assessments are compared and contrasted to provide best initial estimate	Yes/No
Time in which situation assessment is conducted and provides results	Within 24 hours from the incident
Time in which a detailed situation assessment is conducted, to include information on buildings that are in imminent danger of collapse and critical resources of infrastructure are threatened	Within 48 hours from the conclusion of the disaster
Time in which building safety inspections are conducted for habitability (green, yellow, and red tags)	Within 4 weeks from the event
Time in which an emergency work damage assessment and public works (PW) preparation is conducted	Within 6 months from end of the incident period
Time in which a permanent work damage assessment and public works (PW) preparation (FEMA and non-FEMA) is conducted	Within 12 months from 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.C3a 6.1.8	Coordinate, fund, and implement contracts for construction management and inspection
Rec.C3a 6.1.5	Coordinate, fund, and implement contracts for emergency repair of utilities and other services
Rec.C3a 6.1.6	Manage, monitor, and/or provide of technical advice on debris management and reestablishment of ground and water routes into the affected area
Rec.C3a 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.C3a 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 in which jurisdiction provides technical assistance to responders	Within 24 hours from the end of the disaster
Time in which all FEMA project worksheets are processed and eligibility and other reviews are completed	Within 14 days from the project worksheet entry

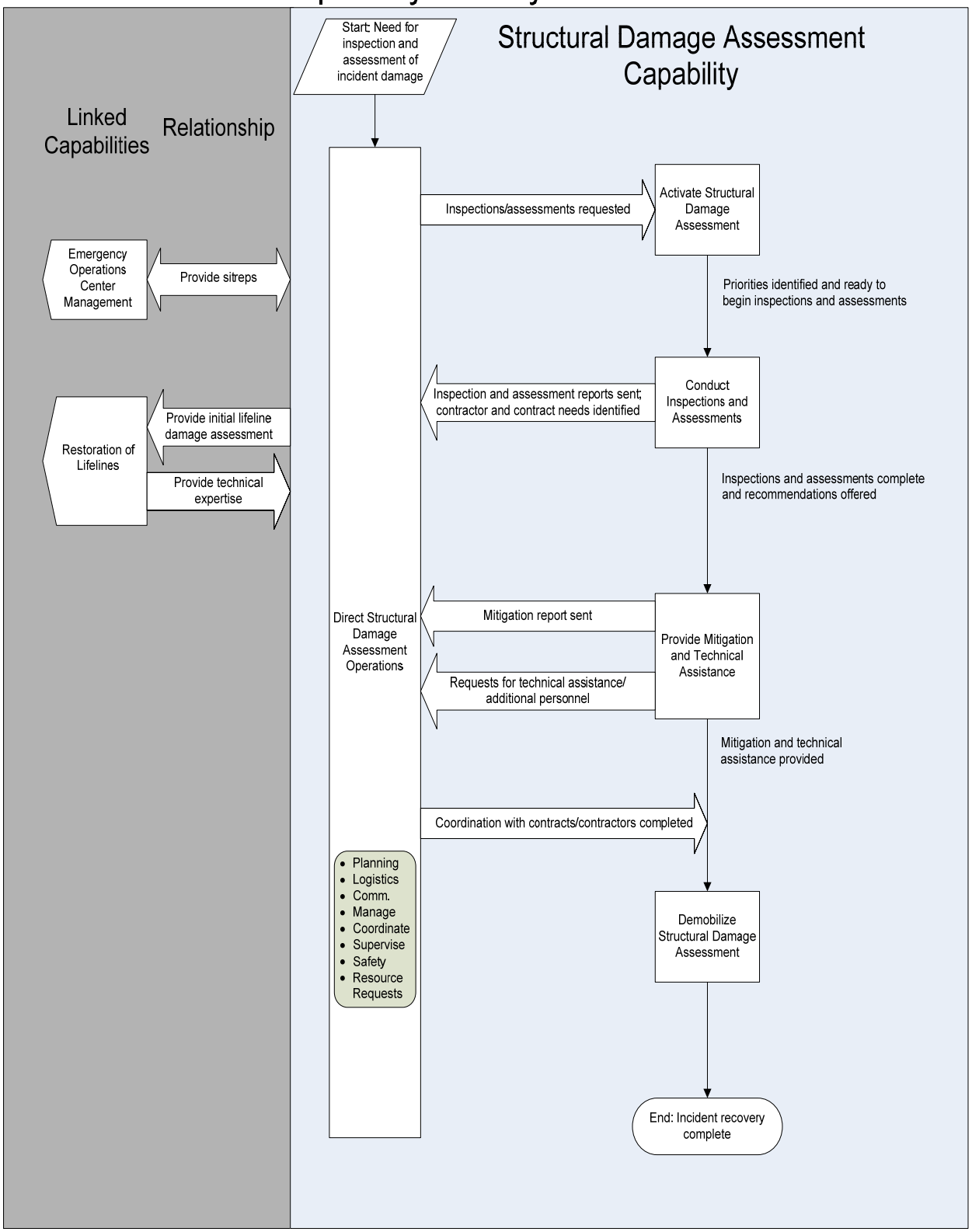
Time in which 200 applicants' briefings for FEMA's Public Assistance Program applicants are completed (based on estimate: 100,000 category E Projects, at 10 buildings per applicant)	Within 2 months

Activity: *Demobilize Structural Damage Assessment*	
Definition: Account for all personnel and assets utilized and safely return them to their original location and function	
Critical Tasks	
Rec.C3a 7.1	Develop a demobilization plan for structural damage and mitigation assessment
Rec.C3a 7.2	Restore personnel and equipment to normal operations
Rec.C3a 7.3	Complete appropriate documentation
Performance Measures	**Metric**
Personnel and equipment are returned to normal operations	Yes/No
Percent of appropriate documentation completed in timely manner	100%

Linked Capabilities

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

Capability Activity Process Flow



Resource Element Description

Resource 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 service Teams	A team of engineers that includes safety engineers
Home and Business Assessment Teams	Teams that include staff who are SBA Verifiers
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 Service Teams	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
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.

Target Capability Preparedness Level

Resource Element Unit	Type of Element	Number of Units	Unit Measure (number per x)	Lead	Capability Activity supported by Element
Public Assistance Teams: Buildings	NIMS Typed Resource Organization	110	Per incident (with composition apportioned 80% Federal, 20% State/local reps)	Federal/State/ Local	Provide Mitigation and Technical Assistance
Public Assistance Teams: Debris, emergency measures	NIMS Typed Resource Organization	310	Per incident (with composition apportioned 80% Federal, 20% State/local reps)	Federal/State/ Local	Provide Mitigation and Technical Assistance
Public Assistance Teams: Other permanent work	NIMS Typed Resource Organization	102	Per incident (with composition apportioned 80% Federal, 20% State/local reps)	Federal/State/ Local	Provide Mitigation and Technical Assistance
Rapid Needs Assessment Teams	NIMS Typed Resource Organization	210	Per incident (with composition apportioned 33% Federal, 66% State/local reps)	Federal/State/ Local	Conduct Inspections and Assessments
Disaster Assessment Teams	NIMS Typed Resource Organization	1,000	Per incident (with composition apportioned 78% State/local, 22% private reps)	State/Local/ Private Sector	Conduct Inspections and Assessments
Engineering Service Teams	Non-NIMS Resource Organization	112	Per incident	Federal	Conduct Inspections and Assessments Provide Mitigation and Technical Assistance
Home and Business Assessment	Personnel	3,000	Per incident	Federal	Provide Mitigation and Technical Assistance
National Construction Safety Team	Federal Resource Organization			Federal (DOC/NIST)	Conduct Inspections and Assessments

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