Post-Disaster Building Assessment Guidelines for Communities

BC HOUSING

In memory of
STEVEN BIBBY
1966 - 2020

Overview

The purpose of the following Post-Disaster Building Assessment (PDBA) Guidelines for Communities is to support local authorities (including municipalities, First Nations, and regional governments) in the development and operation of their own PDBA programs. The following guidelines draw on the research that informed the British Columbia Post-Disaster Building Assessment Framework and Recommendations document, and provide direction and resources with regards to the following elements of PDBA programs:

- Bylaw and regulatory mechanisms for conducting PDBA
- Building assessment models and procedures
- Administrative and operational structures
- Strategies for pre- and post-PDBA operations
- Logistics, equipment, and communications
- Assessment teams
- Information and data management
- Training

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Contents

Bylaw and Regulatory Mechanisms for Conducting PDBA

Legal Authority to Conduct PDBA

The legal authority supporting PDBA programs of local authorities is the BC *Emergency Program Act*. After declaring a provincial state of emergency, powers granted to the minister under Section 10 of the Act include the ability to:

- Acquire or use any land or personal property considered necessary to prevent, respond to or alleviate the effects of an emergency or disaster;
- Control or prohibit travel to or from any area of British Columbia;
- Authorize the entry into any building or on any land, without warrant, by any person in the course of implementing an emergency plan or program or if otherwise considered by the minister to be necessary to prevent, respond to or alleviate the effects of an emergency or disaster;
- Cause the demolition or removal of any trees, structures, or crops if the demolition or removal is considered by the minister to be necessary or appropriate in order to prevent, respond to or alleviate the effects of an emergency or disaster..

The declaration of a state of local emergency for local authorities of municipalities or electoral areas in regional districts is defined under Section 12 of the Act. Local authorities of municipalities or electoral areas in a regional district may declare a state of local emergency to all or any parts of the jurisdictional area if an emergency exists or is imminent. After declaring a state of local emergency defined under Section 12 of the Act, and once signed off by Emergency Management BC, local authorities can exercise any power granted to the minister under Section 10 of the Act in the jurisdictional area affected by the declaration. First Nation communities can access these powers through a State of Local Emergency or Band Council Resolution.

Exemption from civil liability for local authorities and appointed/authorized volunteers acting in good faith is granted under Section 18 of the Act. The exemption from civil liability extends to measures relating to emergencies or disasters, including PDBA procedures.

PDBA functions should be enabled by bylaws and/or legislation that facilitate the transition from the period of emergency powers (i.e. the use of placards) to the normal or revised permitting process. Bylaws and legislation should enable PDBA procedures under smaller scale events without the declaration of emergency powers. Legal and regulatory frameworks established by local authorities should allow pre-planning and information gathering, including:

- Building intelligence
- Access and assessment following an event
- Monitoring
- Managing of repairs during the recovery phase

This also includes access to the results of PDBA performed by critical infrastructure and building owners. Building codes should enable local authorities to manage damaged buildings after an event until they are repaired.

Transition from Response to Recovery

PDBA activities should transition from emergency processes to the resumption of business-as-usual. Local authorities should have the legislative, bylaw, and regulatory frameworks in place to facilitate the transition from placard to building inspection processes. The legal considerations for such frameworks include:

- Multiple events (aftershocks, recurrent flooding) make it difficult to determine which event is associated with specific damage. This may be a problem for insurers.
- Following the initial response, local authorities should establish a process for owners and occupants to challenge building status decisions or appeal damage assessments.
- While PDBA decisions should not be determined by financial considerations, local authorities should be aware of financial implications of placard categories and building status decisions.
- Local authorities should consider the financial and legal implications of short-term temporary safety measures (e.g. short-term countermeasures, cordoning off areas, etc.).

Assumptions from the Province

- Each community will determine, in advance of an emergency, which of their departments and personnel will coordinate their PDBA process.
- Communities will develop a list of their buildings and typologies, along with the priority in which they will require assessment to meet the specific needs of the community.
- Personnel within the community will receive training in PDBA prior to an emergency where it is required, or in a worst-case scenario, will receive “just in time” training when needed
- Following a damaging incident, communities will commence the PDBA process without any directive from the Provincial Government.
- Communities will approach their neighbouring community for mutual aid assistance first, and if additional assistance is required, will approach the Provincial Government to provide building assessors from the Building Assessor Registry.
- The need for building assessors with structural engineering knowledge might exceed the availability of such assessors following a large event, and communities will need to depend on other skilled personnel to help rapidly assess buildings where the typology uses a non-complex design. Personnel who are provided just-in-time training can help fill this gap for non-complex buildings.
- Provincially owned and managed buildings will have their own mechanisms for assessing damage to those buildings which are managed within the Ministry or Provincial Organization responsible for the day to day operation of the building (e.g. Hospitals/Health Authorities, Schools/School Districts, etc.). Each Provincial Organization will report the results of building assessments in the provincial Common Operating Picture (COP). Local authorities should identify who is responsible for assessing buildings within their jurisdiction in advance of a damaging event. This is important to prevent duplication of assessments, and to ensure that all buildings are assessed.

Building Assessment Models and Process

A robust PDBA process typically consists of three phases: initial area assessment, rapid assessment, longer-term detailed engineering/return-to-function assessment:

- **Initial Area Assessment** – An estimate of the location and extent of the damage to inform immediate response strategies. Area assessments might include windshield assessment conducted by emergency responders or local authority personnel, or other forms of formal/informal reconnaissance.
- **Rapid Assessment** – Assessment teams systematically conducting assessments, typically 20-30-minute visual inspections, to categorize building damage. The assessments are used to identify buildings that can be used in the short term (perhaps with restrictions), those requiring detailed assessment, and those that are unsafe.
- **Engineering or Return-to-Function Assessment** – Comprehensive structural engineering assessments to determine requirements for reoccupation, repairs, or demolition. The need for Return-to-Function Assessments is identified by the Rapid Assessment teams. The assessment is a formal engineering process conducted by credentialed building inspection or engineering professionals.

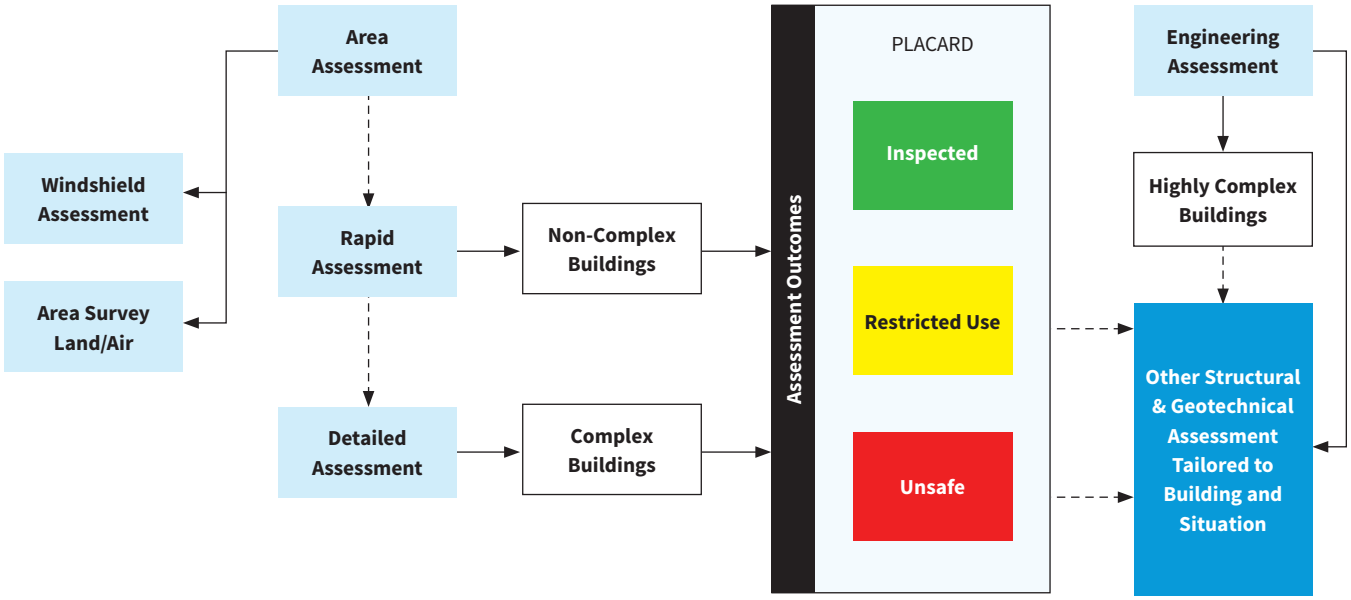


Figure 1. Generic PDBA Building Assessment Process.

The PDBA Assessment Matrix, found in Appendix 2 of the PDBA Framework and Recommendations document, is a tool that communities may use to match the skills, credentials, and backgrounds required to assess different building within their community based on building type, assessment type, and assessor type. The PDBA Assessment Matrix is provided as a starting point for communities to understand the types of buildings in their building stock and who can assess those buildings following a disaster. It should not be used without expert consultation (i.e. Building Officials, Architects, Engineers) and may need to be adapted to the community's specific building stock.

Building Typologies

Local authorities should identify the range of building types and assessment types in their community and, therefore, the assessment skills and personnel required for PDBA based on examination of local building stock. The Building Assessment Matrix in Appendix 2 of the Post-Disaster Building Assessment Framework and Recommendations document includes examples of non-complex, complex, and highly-complex building types that might be found within a community, and examples of what credentials that communities might require of assessors conducting assessments on those building types

Building Status

Building status summarizes the damage, safety, usability, and functionality of a building based on available information. Building status represents a mix of assessment status (e.g. not assessed, needs assessment, initial assessment, detailed assessment, return-to-function assessment, destroyed) and the outcome of the PDBA assessment itself (e.g. placard outcome). Building status should also incorporate other information such as its geographic location, importance, functions (including whether or not it is part of a community's critical infrastructure), vulnerability to hazards, previous history through building permits and plans, and usefulness for post-disaster functions (e.g., temporary housing). Building Status must be monitored and updated over time and include the ability to reassess based on subsequent events (e.g. recurrent flooding, aftershocks, etc.). Pre-planning should include a process for establishing a Building Registry to track, monitor and report building status over time. The concept and monitoring of building status should be incorporated into longer term municipal permitting and inspection programs.

Placard Systems

Placards are placed by PDBA assessment teams to indicate the outcome of building assessment, restrictions, or prohibitions on entry and/or use, and to provide rationale and key information about the extent and nature of the damage to owners and occupants. Placards may be updated or changed based on subsequent assessments, such as following use of countermeasures, repairs, detailed or return-to-function assessment, or secondary events (e.g. recurrent flooding or aftershocks).

Most PDBA systems employ three levels or categories of outcome, generally employing a three-colour model:

- **Green** to indicate no restrictions for entry or use
- **Yellow** to indicate that entry or use is restricted (e.g. shoring or stabilization of debris). The building may require further action (e.g., countermeasures, debris removal, or stabilization, etc.) and/ or a detailed assessment or return-to-function assessment. Restrictions may include:
  - Use of only designated portions
  - Inability to use non-structural components (e.g. water supply, gas appliances, etc.)
  - Use of the whole or a portion of the building once countermeasures or repairs indicated on the placard have been completed and inspected and approved
- **Red** to indicate that the building should not be used or entered. Buildings may be declared unsafe because of the nature and extent of the structural damage, geotechnical hazards such as unstable slopes, or threats caused by adjacent/other buildings

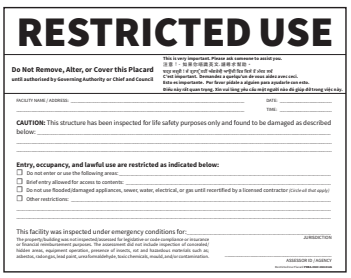
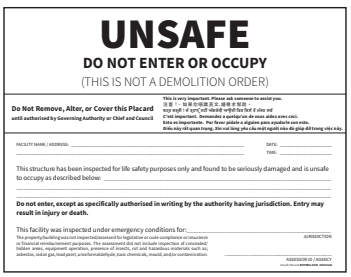
Local authorities must establish the legal authority under which placards may be posted, including placard use by non-local authority personnel, such as critical infrastructure owners. Local authorities must also establish the professional credentials required by assessors to sign, post, change, and remove placards. The established placard placement procedures and credentials should be informed by consultation with a Chief Building Inspector.

Further, local authorities must have a mechanism for informing the public generally, and owners and occupants specifically, about how placards are used, what the different categories require of owners/occupants, and who has the authority to change or remove them, and where to find more information.

Assessment teams should identify who has the authority to sign, change, and/or remove placards/forms. This authority must match the building assessment/type of assessor taxonomy. Assessors should have identification (e.g., identification numbers) and should not put their names on any placards or other documentation at the scene.

Refer to the Credential List found on BC Housing's PDBA website to find eligible credentials for assessors within BC Housing's Building Assessor Registry (BAR). The BAR is a database of assessors who are trained to perform or coordinate PDBA. Assessors may be deployed to assist in other communities in the event of an emergency where there is a need for additional assessors and based on their availability.

Table 1. BC Housing Placard System.

Observed Damage	Assessment Outcome	Placard Issued	Placard Image
Light or no damage (low risk) Available at: https://www.bchousing.org/publications/Inspected-Placard.pdf	***G = INSPECTED*** ***NO RESTRICTION OF USE OR OCCUPANCY*** Structure has no apparent structure or safety hazard was observed	**INSPECTED** (Green)	
Moderate damage (medium risk) Available at: https://www.bchousing.org/publications/Restricted-Use-Placard.pdf	***Y = RESTRICTED USE*** Structure has been found to be damaged as described.	**RESTRICTED USE** (Yellow)	
Heavy damage (high risk) Available at: https://www.bchousing.org/publications/Unsafe-Placard.pdf	***R = UNSAFE – DO NOT ENTER OR OCCUPY*** ***(THIS IS NOT A DEMOLITION ORDER)*** Structure has been seriously damaged or unsafe	**UNSAFE** (Red)	

Administrative and Operational Structures

In British Columbia, PDBA is typically organized by local authorities and housed in either the Operations or Planning sections, or both, within the Incident Command System structure.

There are at least 3 phases in the administrative aspect of PDBA:

1. Initially, priorities include establishing a building assessment group, setting up information management and communication systems, developing a strategy for forming and deploying teams, and establishing triggers that initiate each subsequent phase.
2. The second phase involved the maintenance of ongoing building assessment operations
3. In the third phase, the administrative process must have a strategy for transition from response to recovery.

Typically, PDBA processes will transition back to building inspection assessments usually housed within local or regional authorities. The following roles should be included in the PDBA administrations and operations staff:

- Building Assessment Manager
- Overall Management
- Liaison with Local Government
- Personnel Coordinator
- Section/Area Leader(s)
- Support Services Coordinator
- Planning & Building Intelligence Coordinator
- Data Coordinator

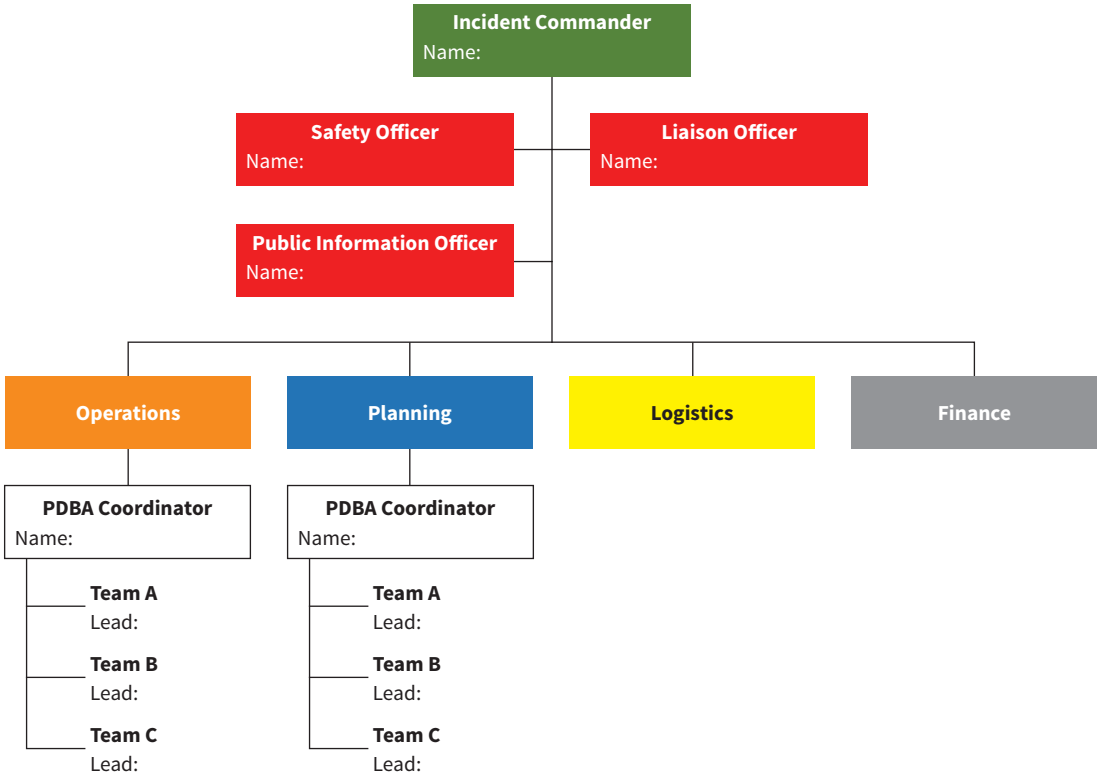


Figure 2. ICS Command Structure with recommended locations for PDBA functions.

Roles and Responsibilities for PDBA Personnel

The Post-Disaster Building Assessment Coordinator reports to the EOC Operations Chief or the EOC Planning Chief, depending on where PDBA is housed within the ICS. The Post-Disaster Building Assessment Coordinator is responsible for:

- Scheduling and identifying needs for Post-Disaster Building Assessors
- Deployment, safety and authority of Post-Disaster Building Assessors
- Flow of information with Assessors, within EOC, and between agencies
- Planning, collating and display of assessments and maps

Post-Disaster Building Assessors report to the Post-Disaster Building Assessment Coordinator. The Post-Disaster Building Assessors are responsible for:

- Conducting Post-Disaster Building Assessments in a safe manner as assigned by the Post-Disaster Building Assessment Coordinator
- Communicate with PDBA team members

Tasks during the activation, operations, and demobilization phases along with a list of resources required for each position can be found in the Post-Disaster Building Assessment Coordinator Position Checklist and the Post-Disaster Building Assessor Position Checklist on the BC Housing PDBA website.

Reporting Structure

Following each assessment, assessment teams should report placard results to the PDBA Coordinator. For paper-based assessments, completed forms should be returned to the PDBA Coordinator during debriefing at the end of a shift or by a runner throughout the day. The PDBA Coordinator should then scan and file the original forms, coordinate with GIS personnel to maintain and update maps, and re-prioritize assessment teams based on information collected in the field as needed. Local authorities should also develop plans for communicating updates from the EOC to assessment teams in the field.

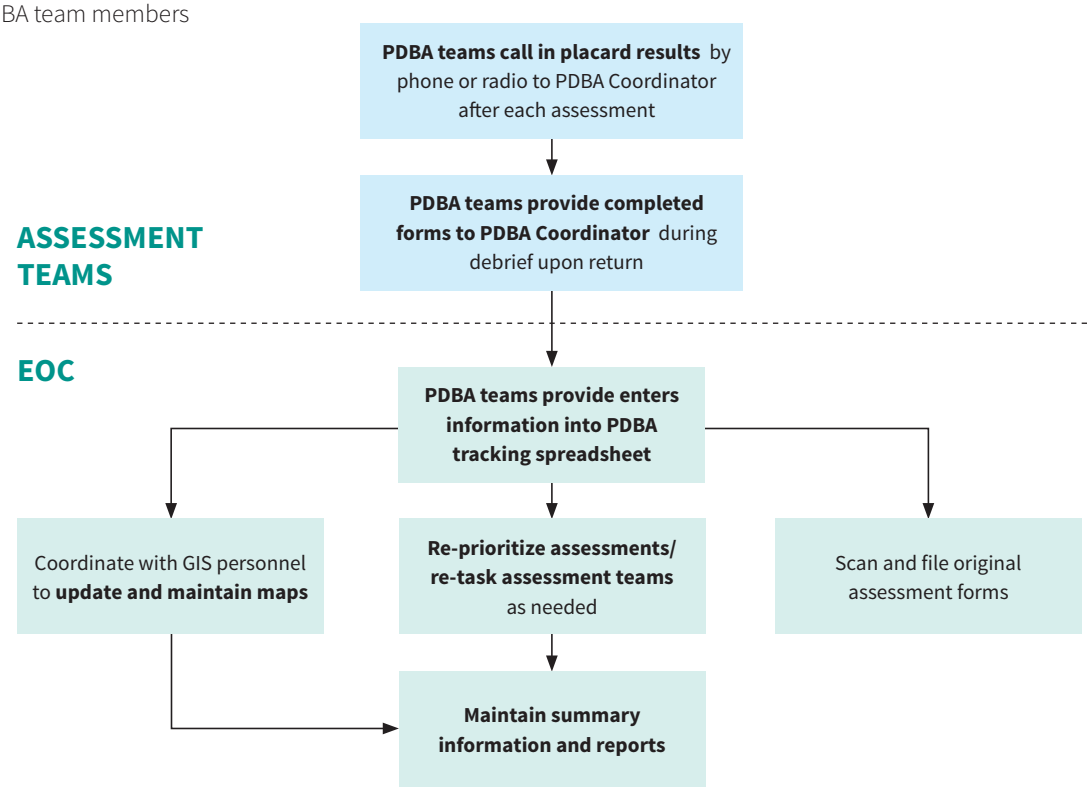


Figure 3. Generic reporting structure for paper-based PDBA.

Strategies for Pre- and Post-PDBA Operations

Local authorities should pre-plan initial PDBA strategies based on hazard analysis, anticipated impact of likely hazards, and community priorities for response. A building assessment strategy should be established pre-event by:

- Gathering and maintaining key information about buildings in the community, including:
  - Inventory of building stock and construction type
  - Building importance and priority for post-event use and assessment
  - Owner and occupant information
  - Known modifications, issues, and/or presence of instrumentation or surveillance systems (e.g., ground motion sensors, etc.)
  - Information on engineers, architects, and construction personnel who designed and constructed the building
  - Access to plans and drawings
- Gathering and maintaining key information about preventative assets in the community (e.g. dykes, retaining walls, etc.)
- Assessments of soil-types, hazard mapping, geotechnical risks, anticipated damage patterns, etc.

Ideally, information on hazards, buildings, prior building permits and assessments should be mapped in a GIS system, and this information should be available to support PDBA planning and operations. Local authorities should develop plans for identifying and honouring culturally sensitive areas/buildings/practices in the area to respect cultural practices/rights (e.g. no entry) and areas that may require a liaison/chaperone/guide/escort. Communities with mixed or multiple levels of jurisdiction should create a document within their emergency plan, outlining the decision-making responsibility between various local authorities.

Indicator Buildings

Aftershocks may cause significant and new damage to buildings. The need to re-assess every building which had already been assessed following the primary earthquake can overwhelm available PDBA resources and cause unmanageable delays. One potential solution to the problem of having to re-assess every building is the use of "indicator buildings." Indicator buildings are exemplar buildings, representative of specific building designs and construction within an affected area. These indicator building reflect structural similarities with similar buildings within a typology (e.g., S1 Steel Moment Frame – High Rise, more than 8 stories).

Local authorities may identify indicator buildings for specific categories or building typologies. These building groupings should consider both construction typology (as above) and include geological conditions related to each construction typology (e.g., there may be a need for an indicator for a type of building that is near the coastline and for similar buildings that are built inland on bedrock). Following an event, the community monitors these indicator buildings. After subsequent events, such as aftershocks, the indicator buildings are re-evaluated. If the indicator buildings experience new damage in the aftershock, it is recommended that other similar buildings in the affected area be re-inspected. If an indicator building sustained significant additional damage during an aftershock, or showed signs of movement, all buildings of that construction type would be re-inspected.

A central registry should support or incorporate a formal or informal indicator building program by classifying buildings as similar to indicator buildings. Indicator buildings should be prioritized for assessment in subsequent events (e.g., recurrent flooding, aftershocks) to help understand and/or prioritize the need for reassessment of types of buildings.

Logistics, Equipment, and Communications

The core operational functions include the management of personnel, equipment, and communications, along with daily priority setting, team formation, deployment, conducting assessments, and receiving incoming information. Logistics plans should include administrative locations, staging for assessor teams and support personnel, and facilities to ensure health and safety of all personnel (e.g., lodging, meals, etc.). Local authorities should have plans to manage transportation to and from the event, movement within the response area, liability, scheduling, and rotation of personnel. Local authorities should pre-establish equipment and supplies for both PDBA administration set up and for initial PDBA assessment teams.

Activation

Local authorities should have pre-established criteria and processes for activation of PDBA. This should include criteria for limited/local response and for accessing outside personnel for larger scale events or extended operations. Local authorities should develop and exercise activation and communication processes and procedures. Ideally, there should be redundant processes which incorporate multiple communication channels (e.g., landline, cellphone, text/email, etc.). Call out strategies may include group alerts, fan out systems, or default responses for situations where communication links are down (e.g., automatic response to pre-established locations).

Local authority operations should include a daily pre-deployment worksheet. Refer to the Pre-Deployment Checklist for PDBA and Deployment Checklist found on the BC Housing PDBA website.

Operations plans should also include daily deployment processes and documentation, including:

- Identify all teams and team members (and associated personnel that are working with the assessment team)
- Team goals and assignments
- Transportation and communication information

Following activation, PDBA operations should be based on daily, short term, and long-term priorities and strategies. Key questions to consider for ongoing operations include:

- Guidelines for allocating resources
- Processes for determining which buildings are assessed (e.g., are all buildings assessed, or just specific types of buildings), as well as who makes those decisions

Equipment and Resources

Planning must include resource requirements for administrative functions (e.g., communications, administration, data entry, etc.), building assessment operations, and personnel management (e.g., rostering and team monitoring, coordination, team safety, etc.). Local authorities should pre-establish equipment and resources required for initial activation and set up of PDBA operations. This includes both the resources required to set up administrative systems and for assessor teams in the field.

The following resources have included examples of team equipment lists:

- BC Housing (2017). Field Manual: Rapid Damage Assessment:
  - Personal Safety and Equipment, pp. 5 – 6.
- BC Housing (2019). Coordination of Damage Assessment Handout.
  - Building Safety & Damage Assessment Program Coordinator, Resources Required, p. 16.
  - Emergency Operations Centre, Tools and Resources, p. 18.
- Safety Assessment Program Evaluator Go-Kit
- Rapid Damage Assessment Kit (for 2 Persons)

Assessment Teams

Team formation requires ongoing flexibility, adaptation, and innovation due to diverse operational needs, rotating personnel, and the changing goals of PDBA over time. A process should be in place to update guidelines on team composition as resources and assessment needs change.

Team formation should be purposeful and thoughtful. Develop at least two levels of strategy:

- Overall deployment. Factors to consider include:
  - Resources currently available
  - Areas to be assessed
  - Number of teams required
- Formation of individual teams. Factors to consider include:
  - Specific area that team will work in
  - Assessment goals (e.g., initial rapid assessment vs. detailed assessment)
  - Types of buildings in that area and background/skills required to perform assessment
  - Skillsets required (situational dependent)

Consider augmenting team and/or leveraging other resources by including other personnel if available and appropriate. For example:

- If area has potential geographic hazards, include geotechnical engineers on the team.
- Consider including Urban Search and Rescue (USAR) or other fire/rescue personnel to provide safety and short-term countermeasure support.
- Consider including personnel from utilities such as electricity, gas, etc.
- Consider including Emergency Support Services (ESS) personnel for residential areas.
- For culturally sensitive areas and areas that may require a liaison/chaperone/guide/escort, include team members who can provide local knowledge, or act as a cultural guide or translator.
- Pre-determine team leaders within the community, particularly with knowledge of the building types and leadership skills.

The Local Emergency Plan should also identify key relationships and methods of communication and notification between PDBA and other emergency management (EM) functions and stakeholders.

Team size will depend on the complexity of the building. Simple residential structures can be assessed by teams of two or three personnel. Complex structures require larger teams with more specialized skills and knowledge.

Local authorities should have pre-established plans for use of both professionally credentialed and non-credentialed personnel. Ideally, structural engineers should be part of all assessment teams. Additionally, consider having structural engineers available to provide advice and support to teams in the field. Non-credentialed personnel with appropriate backgrounds and training, with support from credentialed personnel, may be effectively used in situations such as:

- Initial assessment or simple residential structures and non-complex buildings
- Areas with minimal damage, etc.

Safety Procedures

Responder safety is paramount. For safety reasons, teams must always have at least two personnel, although three to four personnel are preferred. At least one person must remain outside of buildings as a safety monitor. Ideally, at least one member of each assessment team should be local or have knowledge of the local area. Local authorities should ensure assessment teams are aware of cultural sensitivities in areas they are dispatched to.

Local authorities must ensure that relevant worker safety processes and procedures are in place for all personnel involved in PDBA operations. To reduce the risk of injury during an emergency response:

- Travel in teams of at least two people. For assessment teams, ensure one person remains outside the building.

The outside contact should always know where their team members are and when they are expected to return. Optimally, at least one person should be trained in first aid and safety procedures on each team, though it is preferable that all assessors have received relevant safety training.

- Use appropriate safety equipment and appropriate clothing. A list of appropriate safety equipment and appropriate clothing can be found in the BC Housing Field Manual: Rapid Damage Assessment (pp. 5 – 6).
- Never enter a structure you feel is at risk of collapse or where hazardous materials pose a threat (e.g. asbestos fibres, gas leaks or chemicals).

Local authorities should adopt a safety plan specific to the damaging event to ensure the health and safety of all PDBA personnel.

Local authorities should use their discretion to decide whether it is safe to conduct PDBA. Provincial agencies might not have the resources to develop an understanding of local contexts in the event of an emergency, so local authorities should determine whether it is safe to conduct PDBA procedures under present conditions.

Liability Protection

Local authorities should ensure that they are aware of and address issues of legal protection, liability, and worker safety across all phases of an event. Local authorities must establish and maintain resources and processes to address issues around payment and support of PDBA personnel.

Trained professions should use their best judgement and not take on tasks for which they are not trained or are not comfortable (e.g. assessing complex buildings, buildings with hazardous materials, etc.). To ensure coverage by the province's insurance, assessors must be officially deployed and sign in at their deployment centre using an Emergency Management BC (EMBC) task number. Architectural Institute of British Columbia (AIBC) is currently collaborating with the province to address the insurance coverage gap for volunteer assessor related to the initial legal costs of defending all claims that are unrelated to bodily injury or property damage (e.g. professional negligence).

The community interviews reflected on a few ways to ensure protection. There was a reference to having assessors designated as employees of the community so that they have the same insurance coverage afforded other employees. Others reflected on the protection afforded by Section 18 of the Emergency Program Act.

Identifying a Need for PDBA Personnel

If additional assistance is required after approaching neighbouring communities for mutual aid assistance, local authorities that require PDBA personnel should contact EMBC. Emergency Management BC then would contact BC Housing to request PDBA resources. Trained assessors are notified by BC Housing and guided through self-preparedness and availability checklists, and provided instruction for deployment. Refer to the Instructions for Completing Forms for Damage Assessment Resources in the appendix for more information.

Local authorities should have a procedure for working with non-local teams and personnel. Local authorities should develop procedures for assessing capabilities of non-local resources and have pre-determined tasks or functions that these teams and personnel can assume. Communication and documentation procedures must be in place to ensure that all levels of government and related authorities are aware of the presence and activities of non-local resources and personnel.

Briefing and Debriefing Processes

PDBA operations should include daily briefings and regular intelligence/update briefings. Additional briefings should be scheduled and/or conducted to ensure that all levels of PDBA personnel can maximize the use of information and intelligence from PDBA and other sources. Opportunities should be included to allow personnel from all levels to be creative and problem-solve.

The Building Damage Assessment Briefing Sample outlines information that should be provided to assessors as they arrive at the staging area. Daily briefings should include:

- Overall status of PDBA activities
- Current priorities and deployment strategies
- Findings and issues from previous day's assessments and other EM activity
- Issues and trends noted in recent assessments
- Lists of areas and/or specific buildings to be assessed for the day
- Known or suspected risks to personnel
- Intelligence or background information available to teams about their assignments
- Opportunities for teams/personnel to provide input, raise concerns or questions

Further, individual teams should conduct daily preparatory meetings which should include:

- Review of daily goals and assignments
- Updates or reviews on relevant data and/or intelligence related to the team's assignments
- Logistic and personnel changes or issues
- Team and individual responsibilities
- Known or suspected risks to personnel
- Equipment and procedure checks
- Safety and communication checks

Daily debriefings should include:

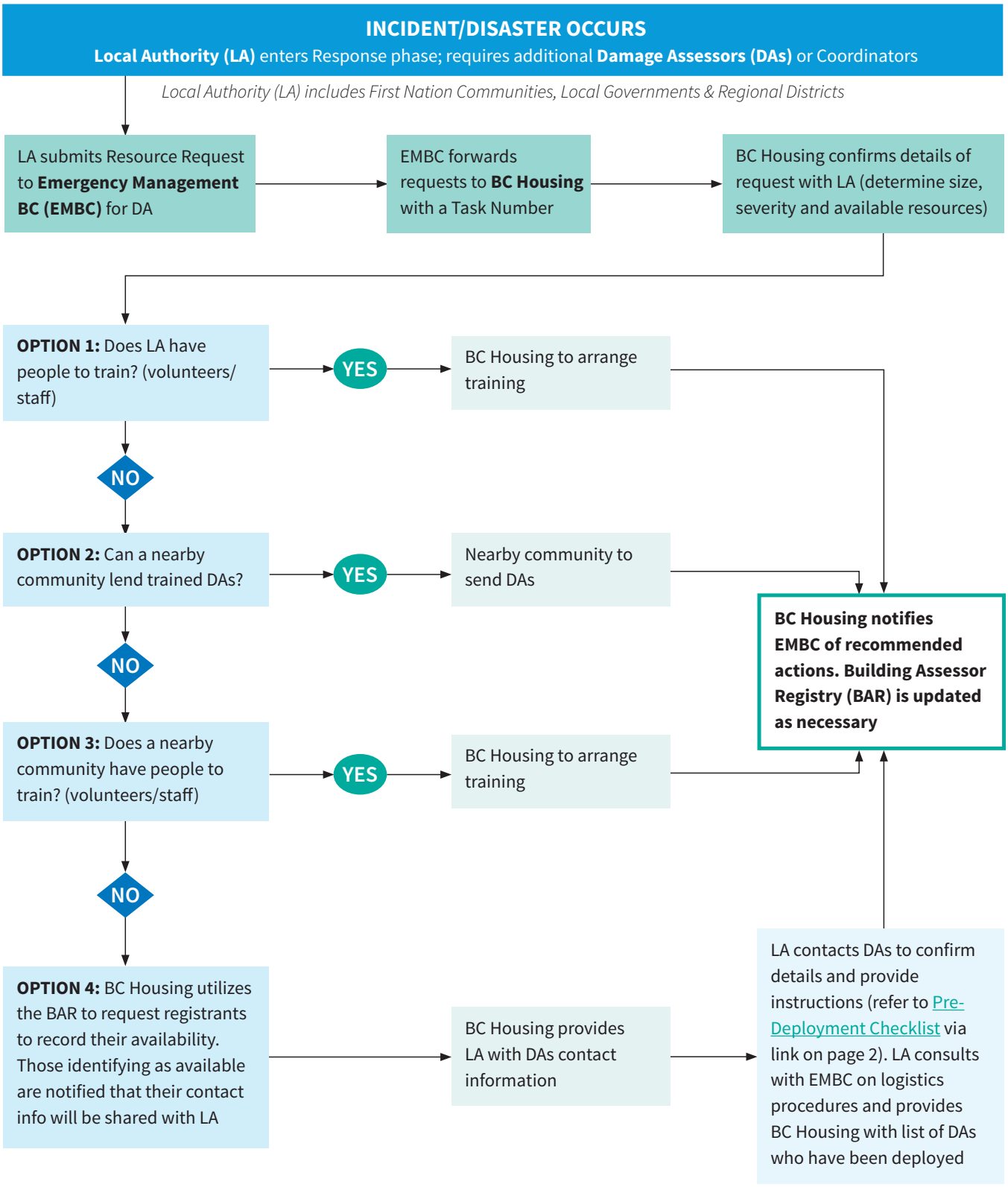
- Review of day's PDBA activities
- Summaries of findings and issues from day's assessments and other EM activity
- Emergent issues or concerns
- Lists of areas and/or specific buildings that were assessed during the day
- Intelligence or background information that should be passed to EOC and other stakeholders
- Opportunities for teams/personnel to provide input, raise concerns or questions

Individual team or group or area teams should conduct daily end-of-day meetings which should include:

- Review of day's activities
- Identification of issues, challenges, or information to be passed back to operations and EOC
- Equipment, communications, or logistics concerns
- Assessment findings and documentation
- Opportunities to discuss any psychosocial impacts or needs

Decision Making Process

Request for Damage Assessors



This flow chart represents the process to support a Local Authority's request for damage assessors. The decision matrix is intended to assist the Damage Assessment Branch(es) at the Local and Provincial level.

The following assumptions are made:

- An Incident Command System such as the British Columbia Emergency Management System (BCEMS) is being utilized;
- A Local Authority is responding to a recent, ongoing, or emerging disaster;
- The Local Authority has activated an Emergency Operation Centre (EOC) to support the local response;
- The Local Authority has situational awareness that some building damage has occurred that requires further rapid and/or detailed assessment;
- Additional response activities are concurrently taking place;
- The Local Authority has submitted a resource request form for damage assessment support to Emergency Management BC (EMBC) using standard forms and processes;
- The request for assessors is intended for buildings only; not bridges, towers, dams, roads, or other types of specialized construction;
- Logistics such as transportation, accommodation and meals will be arranged by the Local Authority with guidance from EMBC;
- The Local Authority is to reimburse Assessors for costs incurred for the duration of deployment.

This information is available on BC Housing's PDBA website along with other resources, information on training and program updates.

https://www.bchousing.org/about/post-disaster-building-assessments

- Operational Guides
- Checklists
- Position Descriptions
- Templates and Samples
- Related Links

Information and Data Management

Information management is a critical function and requires adequate resourcing, including personnel, tools, and processes. Local authorities should develop a local PDBA data and information management system. Ideally, this system should tie into regional and provincial systems, as well as into local emergency management and local authority operational systems. If possible, tie PDBA information management into existing data systems within the local authority – particularly into existing or planned GIS systems.

The central function of data management is to monitor areas and buildings that have been assessed or require assessment. Options range from a wall map with coloured shading to GIS systems integrated with other emergency management and local authority functions. Local authorities should establish a single funnel or entry point to streamline incoming data and job requests and allow for simpler triage and prioritization. Be aware that data entry and analysis are overnight/early morning tasks; ideally teams should have collated and real-time data for briefings and deployment each day.

Use of Technology

There are multiple options for communication and data collection. Smaller communities may rely on paper-based systems, while communities with more resources may have internal technology-based systems. Where possible, technology-based data collection systems should be used in the field to foster consistent data collection and reduce the need for subsequent data entry and data management issues. Effective PDBA requires well-designed documentation tools and processes. Local authorities should develop, test, and implement multiple options for communication and data collection. Redundant systems are required to deal with variable and changing conditions during response (e.g., no power or internet access) and over the duration of the event. Ideally, technology-based data collection systems should be device-agnostic allowing use through smartphones, tablets, laptops, and other devices.

Immediately following an earthquake, technology can help to pinpoint areas which require building assessments using shake-maps developed from strong motion detectors, or from images captured by unmanned aerial vehicles (UAV's). Buildings of high importance can also be equipped with devices that detect the level of damage they experience following an earthquake, and then automatically report the anticipated level of damage experienced by the building in real time. Examples of shake map use developed from strong motion detectors can be viewed on the BC Ministry of Transportation and Infrastructure.

Data Collection and Forms

Local authorities should be prepared to use multiple options for data collection and forms, including paper-based and electronic methods. In collaboration with BC Housing, the University of British Columbia Department of Engineering, and North Shore Emergency Management, GeoBC has developed a free Damage Assessment App to assist in PDBA using the ArcGIS Collector platform. The app lets field teams record the location and severity of damage to buildings and sites using a smartphone or tablet. Local authorities should contact GeoBC to setup an account for the Collector app. For more information, refer to the Operations Guide from GeoBC.

Note that it is likely that both paper and electronic systems will be in use at different times or in different locations. It is important that these forms are as similar as possible (in data collected, not necessarily in format and structure), both for users and for data entry. Ensure that all assessors are briefed on how to complete forms and documents and what information to include on them. Note that different forms may be required for different types of events (e.g., floods, earthquakes). For paper-based data collection, use the BC Housing Rapid Damage Assessment Form. Refer to the appendix for an example of a completed form.

For paper-based assessments, whether the assessments are confidential depends on the systems a local authority uses to store the information. A local authority might store the information in an Excel spreadsheet, but they are not obliged to share that information with anyone outside of that jurisdiction. However, assessments conducted using the Collector app are uploaded to the Common Operating Picture (COP) and viewable by other local authorities who have

access to the COP. The question of privacy has been brought up to GeoBC before, but will require further discussion to be addressed in the COP.

Data Validation

A process should be developed to validate the results of all, or a sampling of the building assessments submitted from each team of assessors. This process should be performed by building professionals who would be qualified to assess the building typology for which they are validating a review.

This process is easy to achieve for those assessments which are saved electronically in an online GIS System such as the provincial Damage Assessment App using ESRI software. Individual assessments and building photographs saved to the provincial system can be viewed remotely, allowing one or more building professionals to review and validate or identify concerns of the placard outcomes that were recorded by each team. The benefit of an online filing system of this nature allows the validating team to perform their work away from the incident area, avoiding the necessity of travel or other incidental risks and costs.

Where paper systems have been used to record the results of the assessments, a validation team may be needed on site. Alternatively, the paper records and the photographs could be transferred to an electronic/online system for later review, but this process requires considerable time, resource, and creates a risk of data integrity during transfer.

Sharing and Integration of Data with Other Stakeholders

Non-local authority processes (such as private or critical infrastructure building assessments) may not be looking at the same things as the PDBA process, which may employ different criteria and/or rating scales, and may be conducted by personnel with varied backgrounds and expertise. This information is valuable but must be contextualized for use within a PDBA perspective. Incoming data and information should include documentation noting the source, background, and an assessment of the reliability and validity of the data. Be aware of the possibility of fraudulent or falsified placards and information.

Local authorities should share information with all stakeholders, including the public. This should be two-way communication, with opportunities to gather data from the public as well. Ideally, an online GIS-based application should be available to all stakeholders, including the public showing PDBA results to date.

Training

Local authorities should adopt existing training to prepare assessors to conduct PDBA. Ideally, local authorities should also be aware of PDBA training conducted by critical infrastructure owners and other stakeholders with internal building assessment training. PDBA personnel should engage in PDBA training every three years and participate in exercises on an annual basis. Tabletop exercises are an important to tool for refining PDBA procedures.

In the event of a disaster, local authorities should brief all incoming PDBA personnel to provide orientation to the overall event and current PDBA activities, and prepare personnel for operational roles (e.g., team structures, equipment, logistics, communications, etc.). Just-in-time training should include both PDBA principles based on provincial training and orientation to local context, operational structures, and procedures.

BC Housing offers two damage assessment courses based on the Applied Technology Council 20 & 45 guidelines from California: One for Post-Disaster Building Assessors, and an additional course on the coordination of PDBA. More information is available on the BC Housing PDBA Training website.

The Architectural Institute of BC (AIBC) offers a one-day PDBA Training Workshop to AIBC registrants, architectural students, and others with building construction expertise. The workshop covers technical and operational PDBA procedures, enabling trained professionals to assess damaged buildings for occupancy and use following a disaster. More information on AIBC's PDBA Training Workshop is available on the AIBC PDBA website, and upcoming workshops can be found on the AIBC Professional Development Opportunities website.

RESOURCE REQUEST: Instructions for Completing Form for Damage Assessment Resources

What is being Requested?

Field	Instructions	Example
Resource Type/ Kind:	Enter the resource kind (what the resource is e.g., personnel, equipment) and type (specify details required) that is being requested.	Damage Assessment trained personnel
Quantity:	Enter number of resource(s) required.	10
Units of Measure:	Enter measure of unit used for the Quantity field, (e.g., per, each, case, flat, dozen, gross, etc.)	N/A
When Required:	If there is a specific time for delivery or availability of the resource, enter it in this field.	DD MMM YYYY - TIME
Mission (Purpose for Resource)	Indicate how you intend to use the resource. This information will help Logistics source alternatives, if the initial resource is not available.	Rapid Damage Assessment teams to conduct DA
Resource must come with:	Indicate under Other if there are additional associated resources required (e.g., RDA team(s) to come with their own DA kits, PPE, communication devices or transportation).	Other: RDA kits & vehicles for transportation
Special Instructions	Enter special instructions regarding the request, or delivery of the requested item (e.g., safety message, ingress/egress routes, level of DA training).	Hwy 16 is closed. Use posted detour route to DA Staging Area

Forward Request To: (Organization/Agency/Vendor who ultimately obtains resource – use required fields only)

Field	Instructions	Example
Contact Name/ Position:	Enter the contact name and position of the individual associated with the resource supplier.	S. Bibby
Organization/ Agency/Vendor:	If the Resource Request has been forwarded to an Organization/Agency/ Vendor (resource supplier), enter the organization/business name here.	BC Housing
Contact Number:	Enter the phone number/email for the person identified in the *Contact Name/Position* field above.	778-555-1357
Estimated Cost:	Enter the estimated cost of the resource as indicated by the supplier (organization, agency or vendor).	Unknown at this time
Actions Taken:	Indicate arrangements made with the supplier (e.g., where resource should report to, delivery instructions provided to vendor).	Confirmed need for personnel to be deployed for 3-days

Resource Request

Date of Request: | Time of Request: | Request No.

Priority: ☐ High (Emergency) ☐ Medium (Priority) ☐ Low (Routine) | Task No.

Requested by: Name | Dept/Agency/Function | Contact Number

What is being Requested?

Resource Type/Kind: | Quantity:

Units of Measure: | When Required:

Mission (Purpose for Resource)

Resource must come with: ☐ Fuel ☐ Meals ☐ Operator(s) ☐ Water ☐ Maintenance ☐ Lodging ☐ Power

Other:

Special Instructions (e.g. Safety message, ingress/egress routes...)

Forward Request To: (Organization/Agency/Vendor who ultimately obtains resource – use required fields only)

Contact Name/Position: | Organization/ Agency/Vendor:

Contact No.: | Estimated Cost:

Actions Taken:

Delivery/Assigned Location (use required fields only)

Location/ Site Name: | Street Address:

City, Province: | Report To: | Contact Number:

Intersection Street 1: | Intersection Street 2:

Completed by: Name | Function/Title | Date & Time | Entered ☐

Financial Approval

Spending Authority: Name | Function/Title | Signature

Distribution: Operations ☐ Planning ☐ Logistics ☐ Finance ☐ Other:

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Rapid Damage Assessment Form

Inspection

Inspector ID: 1234 Inspection date: 15 NOV 12 (dd MMM yy) time: 1515 (24 hour clock)

Agency: CITY Areas inspected: ☐ Exterior Only ☒ Exterior and interior

Building Description

Building Name:

Address: 56 ANY STREET NEW CITY

Building contact/phone:

Number of stories above ground: 2 below ground: Ø

Number of residential units:

Type of Construction

☒ Wood Frame ☐ Masonry
☐ Steel Frame ☐ Other:
☐ Concrete Frame

Primary Occupancy

☒ Single Family Dwelling ☐ Industrial ☐ School
☐ Multi-residential ☐ Offices ☐ Government
☐ Emergency Services ☐ Commercial ☐ Other:

Evaluation

Investigate the building and area around it for the conditions below and check the appropriate column.

Observed Conditions:	Minor/None	Moderate	Severe
Collapse, partial collapse, or building off foundation	☒	☐	☐
Building or story leaning / out of plumb	☒	☐	☐
Damage to primary structural members, racking of walls	☒	☐	☐
Falling hazards such as chimney, parapet, etc	☒	☐	☐
Ground movement or slope failure, scour, erosion	☒	☐	☐
Damaged / submerged fixtures or services, (electric / gas)	☐	☒	☐
Proximity risks / other (specify):	☒	☐	☐

Number of residential units not habitable:

Estimated Building Damage (excluding contents)

☐ None
☐ 1 - 10 %
☐ 11 - 30 %
☐ 31 - 60 %
☐ 61 - 99 %
☐ 100 %

Comments: WATER HAD FLOODED TO 1.5 METRES ABOVE GROUND FLOOR

Posting

Severe conditions endangering the overall building are grounds for an Unsafe posting. Localised Severe and overall Moderate conditions may allow a Restricted Use posting. Where required, ensure that RESTRICTED USE and UNSAFE placards are posted at all entrances.

☐ **INSPECTED** (Green placard) ☒ **RESTRICTED USE** (Yellow placard) ☐ **UNSAFE** (Red placard)

Record any use and entry restrictions exactly as written on placard:

☐ Do not enter or use the following areas:
☐ Brief entry allowed for access to contents:
☒ Do not use flooded/damaged appliances, devices or services (electric, gas) until recertified by a licensed contractor
☐ Other restrictions:

Further Actions

Check the boxes below only if further actions are needed.

☐ Barricades needed in the following areas:

☐ Detailed Evaluation recommended ☐ Structural ☐ Geotechnical ☐ Other

☐ Other recommendations:

Comments:

Rapid Damage Assessment Form

Inspection

Inspector ID: 1234 Inspection date: 18 JAN 13 (dd MMM yy) time: 0930 (24 hour clock)

Agency: CITY Areas inspected: ☒ Exterior Only ☐ Exterior and interior

Building Description

Building Name: CEDAR PLACE

Address: 78 ANY ROAD NEW CITY

Building contact/phone:

Number of stories above ground: 3 below ground: 1

Number of residential units: 14

Type of Construction

☒ Wood Frame ☒ Masonry
☐ Steel Frame ☐ Other:
☐ Concrete Frame

Primary Occupancy

☐ Single Family Dwelling ☐ Industrial ☐ School
☒ Multi-residential ☐ Offices ☐ Government
☐ Emergency Services ☐ Commercial ☐ Other:

Evaluation

Investigate the building and area around it for the conditions below and check the appropriate column.

Observed Conditions:	Minor/None	Moderate	Severe
Collapse, partial collapse, or building off foundation	☒	☐	☐
Building or story leaning / out of plumb	☒	☐	☐
Damage to primary structural members, racking of walls	☐	☒	☐
Falling hazards such as chimney, parapet, etc	☐	☒	☐
Ground movement or slope failure, scour, erosion	☒	☐	☐
Damaged / submerged fixtures or services, (electric / gas)	☒	☐	☐
Proximity risks / other (specify):	☒	☐	☐

Estimated Building Damage (excluding contents)

☐ None
☐ 1 - 10 %
☐ 11 - 30 %
☐ 31 - 60 %
☐ 61 - 99 %
☐ 100 %

Number of residential units not habitable: 14

Comments: CRACKING OF WALLS AND DAMAGE TO PARAPET CHIMNEY CRACKED AND PARTIALLY ROTATED

Posting

Severe conditions endangering the overall building are grounds for an Unsafe posting. Localised Severe and overall Moderate conditions may allow a Restricted Use posting. Where required, ensure that RESTRICTED USE and UNSAFE placards are posted at all entrances.

☐ **INSPECTED** (Green placard) ☒ **RESTRICTED USE** (Yellow placard) ☐ **UNSAFE** (Red placard)

Record any use and entry restrictions exactly as written on placard:

☐ Do not enter or use the following areas:
☒ Brief entry allowed for access to contents:
☐ Do not use flooded/damaged appliances, devices or services (electric, gas) until recertified by a licensed contractor
☒ Other restrictions: DO NOT ENTER FROM WEST SIDE OF THE BUILDING

Further Actions

Check the boxes below only if further actions are needed.

☒ Barricades needed in the following areas: WEST SIDE OF BUILDING - FALLING HAZARD AREA FROM PARAPET AND CHIMNEY

☒ Detailed Evaluation recommended ☒ Structural ☐ Geotechnical ☐ Other

☐ Other recommendations:

Comments:

Amendment Record

For the Post-Disaster Building Assessment Operational Guidelines for Communities

Page Numbers	Footer Date	Context
17 & 18	December 2022	Replaced pages 17 & 18 with the most current version.