



# BRITISH COLUMBIA POST-DISASTER BUILDING ASSESSMENT FRAMEWORK AND RECOMMENDATIONS



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# OVERVIEW

The recommendations in this document emerge from the BC Post-Disaster Building Assessment (PDBA) research project. The project was conducted through a partnership between BC Housing, Justice Institute of British Columbia (JIBC), Engineers and Geoscientists BC, and the Architectural Institute of British Columbia (AIBC). The two-year applied research project was funded through the Canadian Safety and Security Program, a federal program of Defence Research and Development Canada's Centre for Security Science, in partnership with Public Safety Canada.

The project team has developed an overall framework and recommendations for building damage and safety assessment following an emergency or disaster. The goal of PDBA programs is to enable communities to more rapidly assess the safety of structures and allow people to remain in, or return to their homes and businesses as soon as possible. The PDBA framework and recommendations in this document identify concepts, tools, models, processes and approaches which support community-level emergency planning and building assessment.

These recommendations emerged from applied research involving review of relevant academic and professional literature, interviews with national and international key informants, and input from stakeholders in provincial and community-level emergency management.

The core research team consisted of Steven Bibby, Ron Bowles, Robyn Fenton, Jim Forrest, Marguerite Francis-La Quinte, Pete Learoyd, Peter Mitchell, and Dawn Ursuliak.

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The project was funded by the Canadian Safety and Security Program, a federal program led by Defence Research and Development Canada's Centre for Security Science (DRDC CSS) in partnership with Public Safety Canada.

We would also like to acknowledge the support of project partners: BC Housing, Justice Institute of British Columbia, Engineers and Geoscientists BC, and the Architectural Institute of British Columbia.

Most of all, we thank the many participants who contributed their time and their expertise to further the research and the recommendations contained within this Framework.

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# INTRODUCTION

The BC Post-Disaster Building Assessment (PDBA) research project was conducted through a partnership between BC Housing, Justice Institute of British Columbia (JIBC), Engineers and Geoscientists of BC, and the Architectural Institute of British Columbia (AIBC). This two-year applied research project was funded through the Canadian Safety and Security Program, a federal program of Defence Research and Development Canada's Centre for Security Science, in partnership with Public Safety Canada.

The research embraced a “system of systems” approach to guiding building damage safety assessment in a provincial context that can be applied at various scales across small and large, rural and urban communities throughout Canada. While the initial project focused on the BC context, the intent was to develop processes that were scalable for implementation across Canada and internationally. The second goal of this project was to develop a network of stakeholder organizations to help implement, sustain, and enrich the resulting process over time.

The objectives of the research program were to:

- a. Develop a provincial framework and recommendations for building damage and safety assessment through research, consultation and collaboration with stakeholders and practitioners.
- b. Develop a community-level framework (assessment matrix) to empower professional (credentialed) and public (non-credentialed) personnel to engage in emergency planning and building damage and safety assessment.
- c. Establish a sustainable network of stakeholder organizations to guide, deliver, and sustain the resulting suite of processes, approaches, and resources.

This mixed methods study consisted of three phases.

**Phase I:** Needs Analysis, employing five concurrent data collection streams, including:

- Literature review
- Stakeholder Workshop
- Key Informant Interviews
- Visit to Exemplar Site
- Consultation with Expert Working Group members

**Phase II:** Analysis and Synthesis employing a series of structured conversations, content analysis, and thematic analysis to inform the development of a draft framework and recommendations

**Phase III:** Stakeholder Validation, through consultation and a stakeholder validation workshop

The researchers collected considerable data from several sources, including a review of professional and academic literature, a stakeholder workshop that included both Canadian and international building assessment experts, and a site visit to New Zealand. The research team explored a variety of well-developed building assessment programs, many of which have been used in multiple events. Particularly useful programs included: the existing BC Housing Rapid Damage Assessment program, ATC-20, and programs developed in New Zealand, Italy, California, Greece, and Japan. Many of these programs are referenced as sources for concepts, tools and processes within this document.

The initial analysis of this data included categorization based on the project's research questions and development of recommendations derived both from the data itself and from analysis of the data by members of the research team. This data (both the categorized findings and the recommendations) formed the data pool from which the framework and recommendations in this document were developed.

A key element of the project was the creation of a Building Assessment macro-map (see Figure 1. PDDBA System or Systems, in the Core Concepts section below), showing the various processes and strategies that the research team has identified. This map serves as a conceptual framework for understanding the major elements, sub-systems, and relationships in a post-disaster building assessment (PDDBA) process. A second key element of this project was the Local Government Program Matrix, which provides guidance to local governments on adapting the recommendations in this document at the community level. Finally, Appendix 3 contains a sample PDDBA Assessment Matrix as an example of how communities can identify local requirements for assessors and their capabilities based on an analysis of the types of buildings in a community.

## **FRAMEWORK AND RECOMMENDATIONS**

The project team has developed an overall framework and recommendations for building damage and safety assessment following an emergency or disaster. The goal is to enable communities to more rapidly assess the safety of structures and allow people to remain in, or return to their homes and businesses as soon as possible. The framework and recommendations identify concepts, tools, models, processes and approaches which support community-level emergency planning and safety assessment.



# CORE CONCEPTS

Throughout this project, the research team has worked to develop a conceptual model of how post disaster building assessment is structured, functions, and fits within broader emergency management planning and operations. The following are core concepts that serve as a starting point for further analysis and development of the project. Note that several of these concepts are further developed in subsequent sections of this document.

## DEFINING CHARACTERISTICS OF A PDBA SYSTEM

Building assessment is a complex safety, scientific, and engineering process that overlaps with a number of emergency management processes. Different programs employ different terminology and have varied goals while sharing common overall frameworks and processes. One of the challenges in our research had been understanding how building assessment is integrated (or not) with other emergency management response and recovery functions such as search and rescue, managing the human aspects of a disaster, incorporating the science of buildings and earthquakes, and long-term repair and remediation of buildings in a community.

The overall goal of PDBA is the development of **situational awareness** of a community's buildings within a broader emergency management framework. A PDBA system consists of three essential functions: an **administrative structure** employing **building assessment processes** whose **outcomes** categorize the safety, usability, and/or damage to a community's buildings. Two key concepts underlie the PDBA process: **information management** which is used to identify, monitor, and update the **building status** of the structures in a community. The overall PDBA process is guided by pre- and post-event **strategies**, many of which are currently undocumented. PDBA is **embedded within**, and overlaps with multiple **other emergency management assessments and processes**. The overall PDBA system exists within a **formal legislative framework** that transitions from business-as-usual through emergency powers and an eventual return to (the new) business-as-usual permitting and building inspection processes.

Several core concepts inform the development of specific PDBA processes within different jurisdictions and contexts. Functionally, PDBA occurs at **multiple levels of organization**, ranging from the assessment of individual buildings to the overall response at the provincial and national/international levels. The **goals of PDBA change over time** from an initial focus on life safety to repair (or demolition) of buildings, and these changes have implications for PDBA practices and resources. Various **contextual factors** influence the structure and functioning of specific PDBA systems, including legal frameworks, frequency of events, personnel and resources available and the experience of those personnel. And PDBA operations themselves are influenced by a number of **critical decisions** based on the nature of the event itself.

PDBA is a layered construct, best thought of as a dynamic system of interrelated sub-systems, which is itself part of larger emergency management, government, and private sector systems (see Figure 1. PDBA System of Systems).

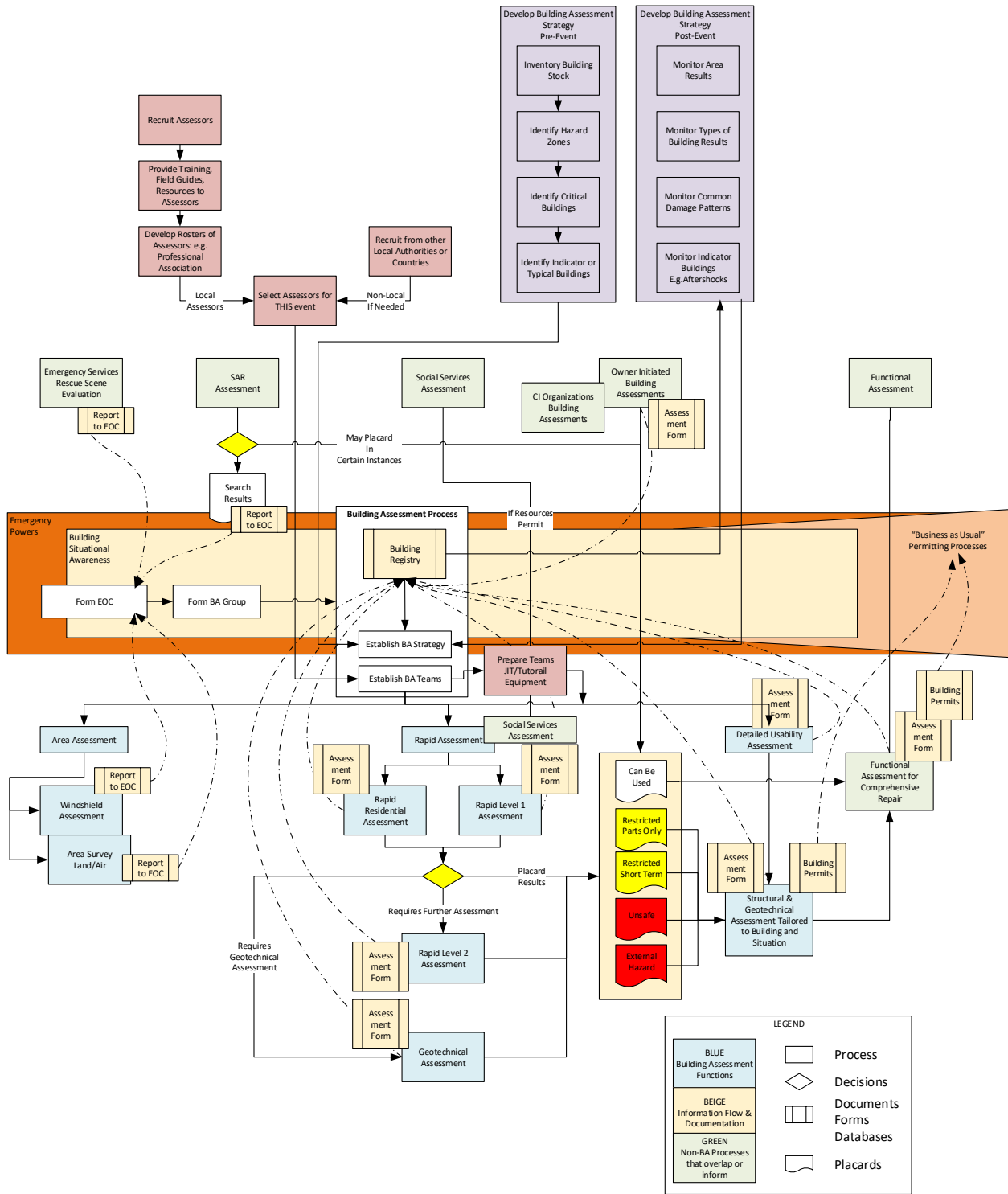


Figure 1. PDBA System of Systems.

These systems are overlapping, but share information, resources, and decisions. Actions within one sub-system have both obvious and covert (or unrecognized) impacts and effects on other sub-systems. Thus, when describing elements and establishing principles, it is important to consider information, resources, decisions, and relationships of the element with both sub- and larger-systems.

This model is “generic” – an abstraction of the various models that the team encountered (Figure 2. Elements of a PDBA System). The model currently identifies several systems:

- The core Building Assessment procedure(s) (blue elements)
- A series of Outcomes (often identified through placards) (light brown box with red, yellow, and white elements)
- A number of overlapping Emergency Management functions and assessments (green elements)
- An information/data collection system (light brown elements)
- A legislative framework including both Emergency Powers and return to Business-as-Usual (orange elements)
- An administrative structure (including both logistics and strategy) (light beige elements)
- Personnel recruitment and training (light red elements)
- Building assessment and monitoring strategy (light purple elements)

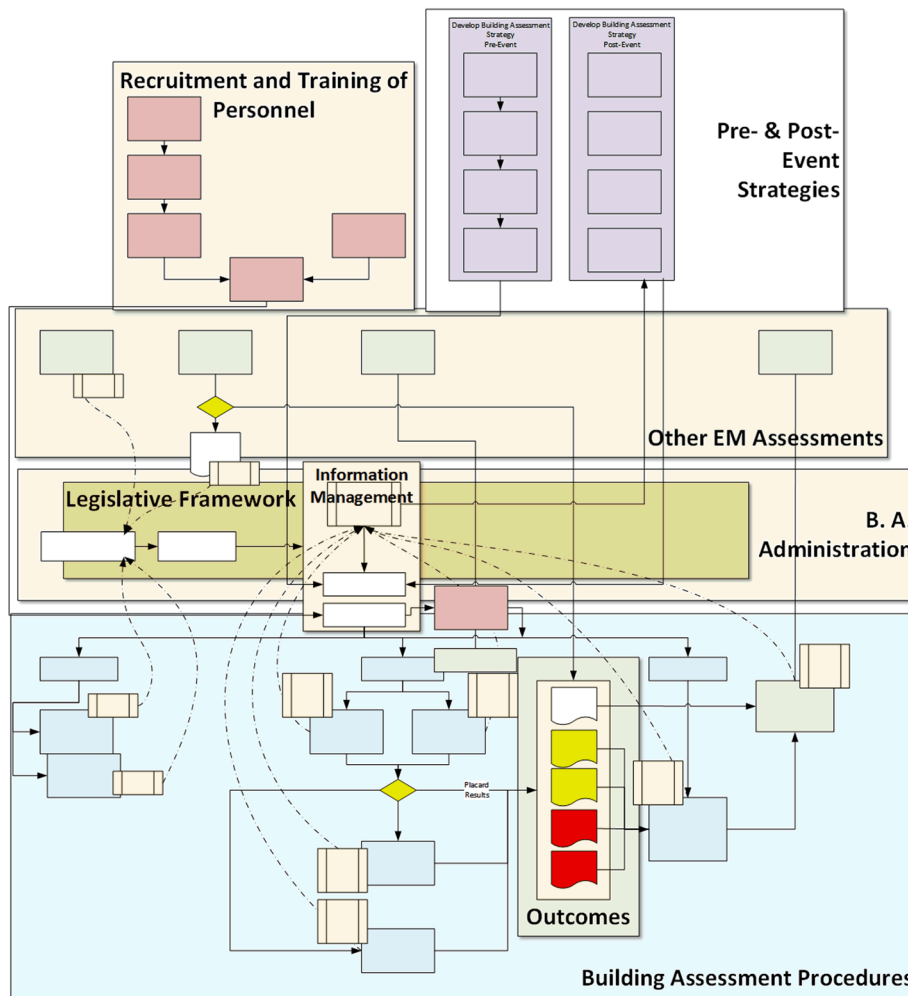


Figure 2. Elements of a PDBA System.

## CHANGING GOALS OVER TIME

The research team noted that various programs include assessment for immediate life safety and evacuation, determination of short-term use, long-term remediation and repair, identification of hazards internal to the building (i.e., risk of collapse, presence of hazardous materials) and external threats (i.e., potential collapse of neighbouring structures, geotechnical hazards, ongoing flooding or aftershocks, etc.). The research team noted considerable variation in the goals and intent of building assessment programs from different countries. In addition, the team documented an evolution in the New Zealand program over several major events.

On analysis, the team noted that several goals were involved in building assessment:

- Area assessment, often including windshield assessments, to determine the location and extent of damage within the overall community. At this point, assessment focuses on general areas or neighbourhoods, rather than specific buildings.
- Initial life safety concerns, evaluation, and rescue – although generally handled by Urban Search and Rescue (USAR) and emergency response personnel, building assessors were occasionally involved in support roles during the initial and ad hoc phases of response.
- Safety/Entry – some systems assess whether buildings are safe for entry (e.g., to remove personal items). Several participants argued that building assessors cannot adequately determine the safety of buildings, particularly those with moderate damage, and that this should not be part of the explicit assessment process.
- Usability – Italy’s framework distinguishes between short term usability following an emergency, and long term usability, with the goal of allowing occupants to stay in buildings even when damaged, reducing the number of displaced persons that must be accommodated.
- Damage – the long-term goal of building assessment is to identify the extent of damage and repairs required. While this is usually conducted later in the response, there is considerable discussion on both the goal posts of this level of assessment (e.g., return to pre-event function, ability to sustain a subsequent similar event, update to current building codes and standards), and on whether this assessment should focus on structural assessment (all agree with this) or should include damage assessment of non-structural elements.

The research team mapped these goals and noted that the intent and focus of building assessment changes over time in several ways. Figure 3. Changing PDBA Goals over Time, arranges the goals of building assessment from simple (lower on the vertical axis) to most complex (detailed structural damage assessment).

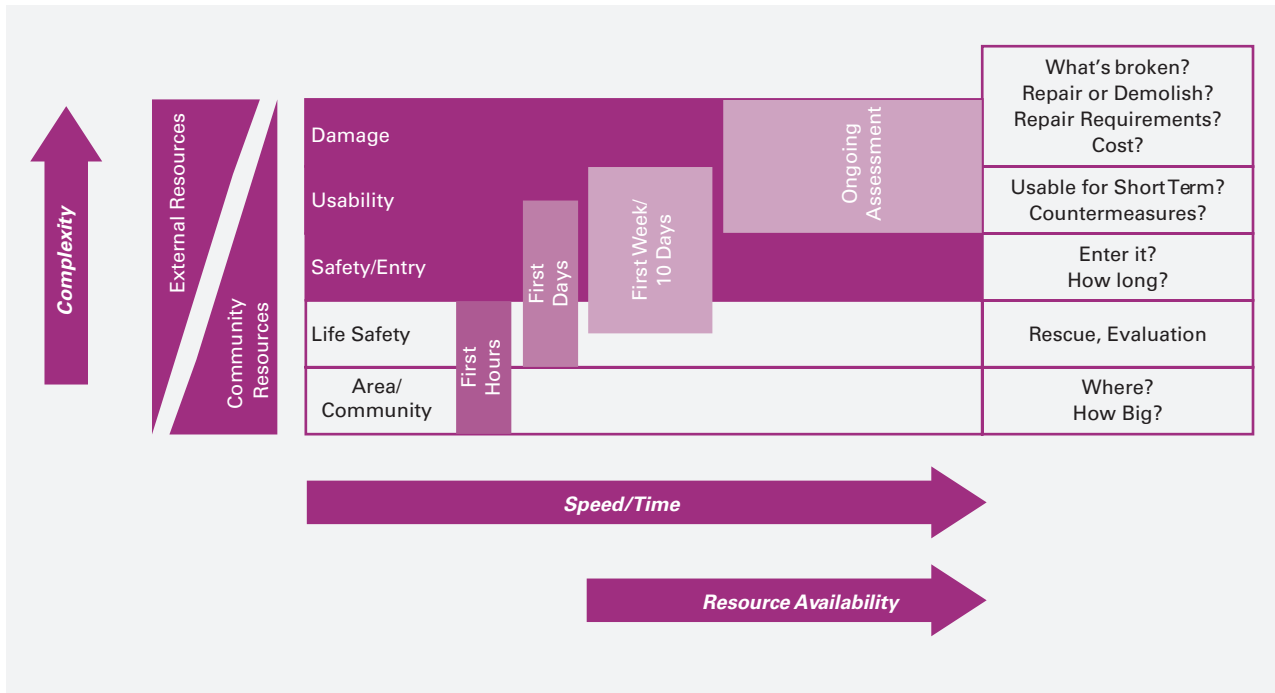


Figure 3. Changing PDBA Goals over Time.

The team noted that the goals near the bottom are the major focus early in an event, and that the overall goal and complexity of assessment increases over time. An initial focus on area assessment and life safety generally evolves into safety and usability assessment as the PDBA process is established. Early rapid assessment processes tend to employ exterior assessment only, be relatively quick (e.g. 20 minutes), and often employ a triage model: quickly identifying buildings that are obviously safe (green/white) or unsafe (red), but then flagging buildings that are more complex or require a more thorough secondary interior and exterior assessment (yellow). Finally, detailed structural engineering and return-to-function assessments tend to occur farther in time, although critical infrastructure and private owner inspections may be initiated early in the response. The team also noted that the early, shorter assessments tended to be simpler, more prescriptive (e.g. with explicit criteria and processes for categorizing buildings) that were mandated and conducted or supported through the Local Government, while detailed damage assessments tended to occur through private sector assessors using more outcome-based or context-specific assessment processes. Note that some participants in this study identified the lack of criteria, consistency, and oversight of these assessments as a potential area of concern.

# THE RECOMMENDATIONS

The following sections provide an overview of key elements of a robust Post-Disaster Building Assessment framework along with recommendations and useful resources or tools. PDBA is established and draws its legal authority differently in different jurisdictions. The recommendations in this document are presented as concepts, principles, and suggested activities that should be contained in an overall PDBA program. Readers are encouraged to adapt the language and concepts to match their own contexts and use.

Recommendations are provided at three levels:

**Provincial/National.** Many of the building assessment programs encountered in this research are established at national levels (e.g., New Zealand, Italy, Greece, and Japan). However, in Canada, emergency management and disaster response processes and programs may be set at either national or provincial levels. Recommendations at this level are generally at the systems level.

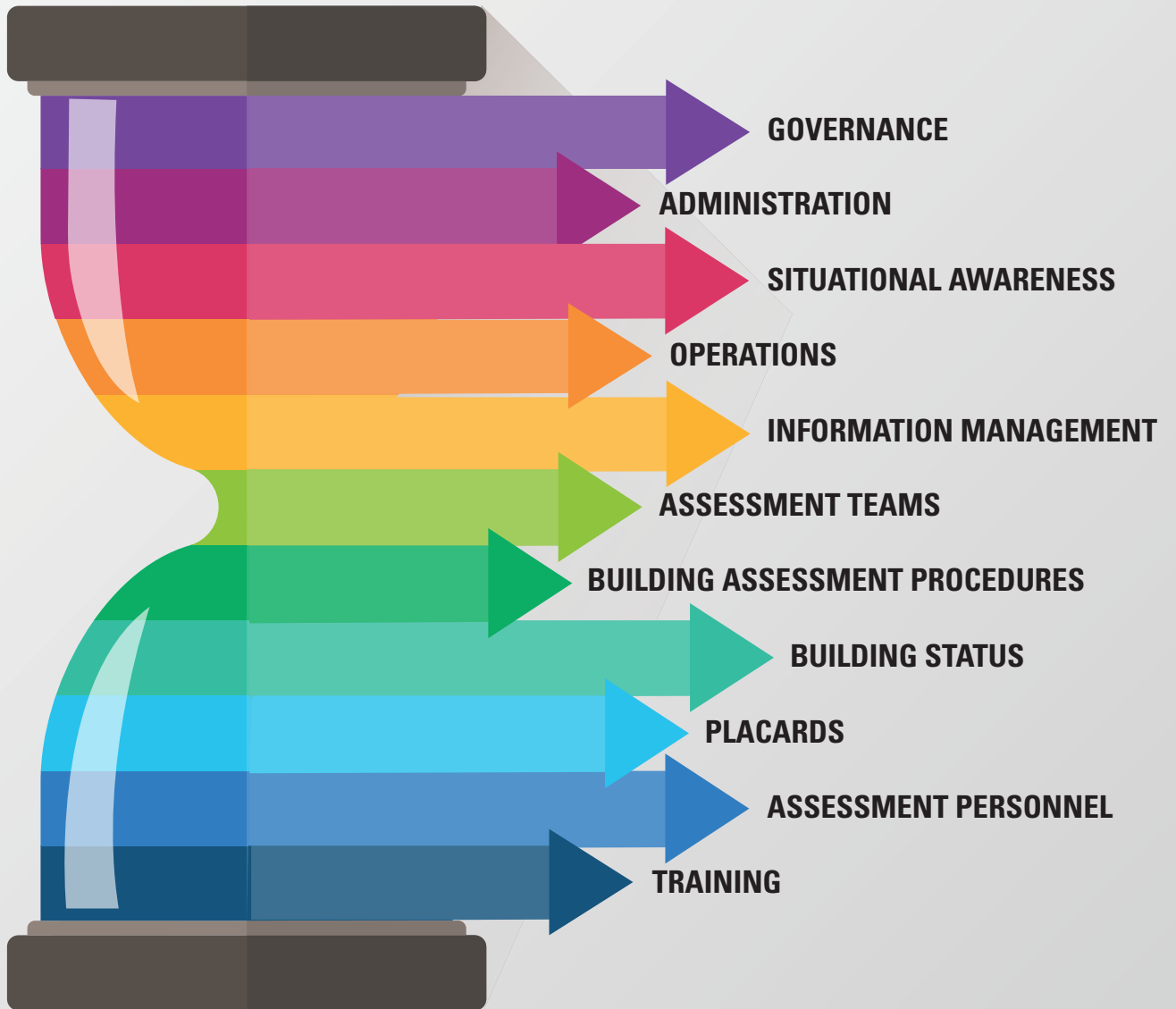
**EOC/Local Government.** PDBA practices are generally conducted at local or regional levels – often referred to in the British Columbia context as “Local Government.” The term “Local Government” is used in a generic sense, with the intention of including Indigenous, rural, municipal, and regional local communities. BC employs the Incident Command System (ICS) and thus language and processes based on ICS and the use of Emergency Operating Centres (EOCs) is used throughout. Recommendations at this level tend to be operational and administrative.

**Assessment Team.** Some recommendations are tailored to individual assessors and teams of assessors. These tend to be operational and tactical recommendations.

## Resource Call out boxes: Resources, Examples, and Links

Call out boxes, such as this one, provide discussion and references to a **PDBA Companion Manual** which contain additional information to support and supplement the recommendations in the PDBA Framework. For example, the recommendations in the Assessment Procedures section provide a generic description of a three-phase building

# POST-DISASTER BUILDING ASSESSMENT FRAMEWORK









01

# GOVERNANCE



# 1 GOVERNANCE

The authority to conduct PDBA is generally enabled by emergency powers granted through provincial or national legislation. However, planning and preparations for PDBA should precede events and extends into recovery and return to business-as-usual.

Ideally, legislation should allow and support pre-event gathering of key data on the existing building stock such as floor plans, structural engineering information, and modifications to a building. Processes or legal avenues should be in place to allow the local authority to obtain the results of assessments performed by critical infrastructure and building owners. Local Government may also face challenges in having PDBA authority only within emergency powers legislation; a local authority must still have powers to enable its PDBA even if a state of emergency is not declared (e.g., the event is manageable by a local authority without exceptional powers). Further, there must be legal mechanisms in place to allow for transition from using placards during the state of emergency to the normal (or revised) permitting processes in a business-as-usual environment.

## 1.1 GOAL

1. Post-disaster building assessment is an overall approach to developing situational awareness of a community's buildings with the purpose of saving lives, ensuring safety, determining the nature and extent of damage, and establishing buildings' usability. The goal of post-disaster building assessment (PDBA) extends beyond assessment of buildings and includes mitigating the impact of a disaster by rapidly identifying buildings that are usable and specifying requirements to return buildings to function. PDPA is part of overall emergency management and an effective PDPA program increases community response and fosters effective response and recovery.

Post Disaster Building Assessment programs have a variety of different goals. Refer to the PDPA Companion Manual: Governance for examples.

2. In this framework, PDBA is presented as a complex process, requiring decision-making based on layered and overlapping sources of information, multiple contextual factors, and a mix of technical and social considerations. PDBA stakeholders have differing goals, ranging from a Provincial/Regional on understanding the extent and nature of damage to building owners' interests in determining whether a building must be demolished or what is required to return it to function.

Refer to the **PDBA Companion Manual: Governance** for examples of the varied areas of focus for different PDBA Stakeholders.

## 1.2 ELEMENTS OF A BUILDING ASSESSMENT PROGRAM

### 1.2.1 PROVINCIAL

1. An effective and robust PDBA program requires an integrated series of legislative, regulatory, and operational links, including:
  - National and/or provincial legislation
  - Provincial mandates and strategies for supporting PDBA at the regional and local levels
  - Regional/Local bylaws and regulations
  - Plans and agreements between levels of government and critical infrastructure agencies and stakeholders with internal building assessment programs
  - Operational plans at the Local Government level
2. Provincial/National legislation should include:
  - Authority for local authorities to perform post-disaster building assessment
  - Mechanisms to allow PDBA under both emergency powers and for smaller scale events
  - Mechanisms for transitioning from emergency powers to business-as-usual
  - Mechanisms for establishing and protecting liability for personnel and agencies engaging in PDBA
3. Procedures for scaling up from local to regional to provincial operations as required by the event

### 1.2.2 EOC/LOCAL GOVERNMENT

1. Local Government should establish post-disaster building assessment programs within their emergency plans that include:
  - Bylaw and regulatory mechanisms for conducting PDBA
  - Building assessment models and procedures
  - Administrative and operational structures
  - Strategies for pre-, post-, and recovery PDBA operations
  - Logistics, equipment, and communications
  - Information and data management
  - Recruitment, training, preparation

Local Governments seeking to develop a robust local PDBA system may have to employ a variety of resources. Refer to the **PDBA Companion Manual: Governance** for examples of resources that address required elements of a PDBA system.

## **1.3 LEGISLATION, REGULATION, AND POLICY**

### **1.3.1 PROVINCIAL**

1. Effective PDBA requires an integrated legislative and regulatory framework:
  - National strategy
  - Provincial legislation and regulation
  - Local authority bylaws and plans
  - Local plans for operations on the ground
  - Local and neighbourhood risk reduction strategies and initiatives
2. Legislation and strategies must balance local needs and processes with national/provincial guidelines. Ideally, provincial guidelines should provide a common foundation that can be adapted to meet the needs and abilities of local authorities.
3. Legislation and bylaws should match requirements with the extent of an event, stages of response and recovery, goals of assessment, and evolving priorities.
4. Legal and liability concerns must be clearly established and managed throughout.

### **1.3.2 EOC/LOCAL GOVERNMENT**

1. PDBA functions should be enabled by bylaws and/or legislation that extends past the period of emergency powers into return to business-as-usual.
2. Bylaws and regulations must enable PDBA functions in smaller scale events in which emergency powers are not brought into effect.
3. Local authorities should establish legal and regulatory frameworks which allow pre-planning and gathering of building intelligence, access and assessment following an emergency, monitoring and management of repairs during recovery, and return to function.
4. Building Codes should allow local authorities to manage damaged buildings after an event, ensuring local authorities have the authority and powers they require up until buildings are repaired.

## **1.4 AUTHORITY FOR POST-DISASTER BUILDING ASSESSMENT FUNCTIONS**

### **1.4.1 PROVINCIAL**

1. Clear legal grounds, authority, powers and implications for conducting PDBA should be established pre-event.
2. Authority for PDBA should follow the principle of acting at the lowest level of government possible (e.g., Local Government), supported by regional and provincial resources and expertise.
3. Note that responsibilities and accountabilities change from pre-event through response and recovery.

### **1.4.2 EOC/LOCAL GOVERNMENT**

1. Authority to conduct PDBA must be:
  - Scalable for small events which are within a local authority's existing building inspection functions, to large scale events requiring PDBA within an EOC under emergency powers
  - Allow for both limited and extended responses
  - Flexible to adapt to changes in scope and governance as required

2. Legal authority must include access to buildings to conduct initial and follow up assessments.
3. Consider legislation allowing landlords access to buildings during and following an emergency.
4. Initial authority for PDBA should reside with local authorities. However, large scale events may require the establishment of a separate structure for conducting and monitoring PDBA over the long term.
5. In recovery, authority may involve local authorities, insurers, and other levels of government.

## 1.5 LEADERSHIP

Leadership is a core consideration of Post-Disaster Building Assessment at all levels and in all phases.

### 1.5.1 PROVINCIAL

1. Leadership is required at the provincial level to establish, then maintain and strengthen PDBA structures, processes, and resources. Ideally, a provincial- or national-level body should be formed with the mandate to identify needs for PDBA, establish and maintain a framework and resources that guide PDBA at regional and local levels, and advocate for PDBA issues and support at all levels of government.

### 1.5.2 EOC/LOCAL GOVERNMENT

1. Local authorities should identify an individual or small group that develops local knowledge, capability, and expertise in PDBA. This leadership group should have links within the local authority structure, and particularly with those areas or departments that will be involved in PDBA, as well as strong links to relevant individuals, agencies/organizations and stakeholders in PDBA in the community.
2. Ideally, the local authority PDBA leadership group should form the nucleus of the PDBA Administration and Operations group.

### 1.5.3 ASSESSMENTTEAM

1. Key individuals with expertise and leadership capabilities should be identified within those who are recruited and or identified for PDBA operations. These personnel should take on leadership roles during PDBA operations.

Refer to the **PDBA Companion Manual: Governance** for examples of organizational charts showing integration of PDBA with overall emergency management.

## 1.6 PDBA PROCESSES AND FIELD GUIDES

### 1.6.1 PROVINCIAL

1. Consider the development of a provincial or national level PDBA process, including guidelines, field guides, and resources. These overarching guidelines may either be implemented at local levels or form the basis of locally developed processes. This will ensure consistency of process and documentation at the individual level and also allow flexibility to meet unique needs of different situations.

## 1.6.2 EOC/LOCAL GOVERNMENT

1. Local authorities, critical infrastructure owners, and other stakeholders with internal building assessment processes should have pre-established PDBA procedures, field guides, and training. Ideally, these should be based on a provincial or national system that is tailored to meet the specific needs of the community or organization.

Refer to the **PDBA Companion Manual: Field Manuals** for links to a variety of PDBA Field Manuals and resources.

## 1.7 TRANSITION FROM EMERGENCY POWERS TO BUSINESS-AS-USUAL

### 1.7.1 EOC/LOCAL GOVERNMENT

1. Over time, PDBA activities and processes should move from emergency processes under the EOC towards resumption of business-as-usual processes. Local authorities should have pre-established plans and ensure legislative, regulatory, and bylaw frameworks exist to aid the transition from placard and PDBA processes to building inspection processes.
2. Local authorities must determine long term goals of recovery and reconstruction: are these goals for return to function, return to original state, or build back better?

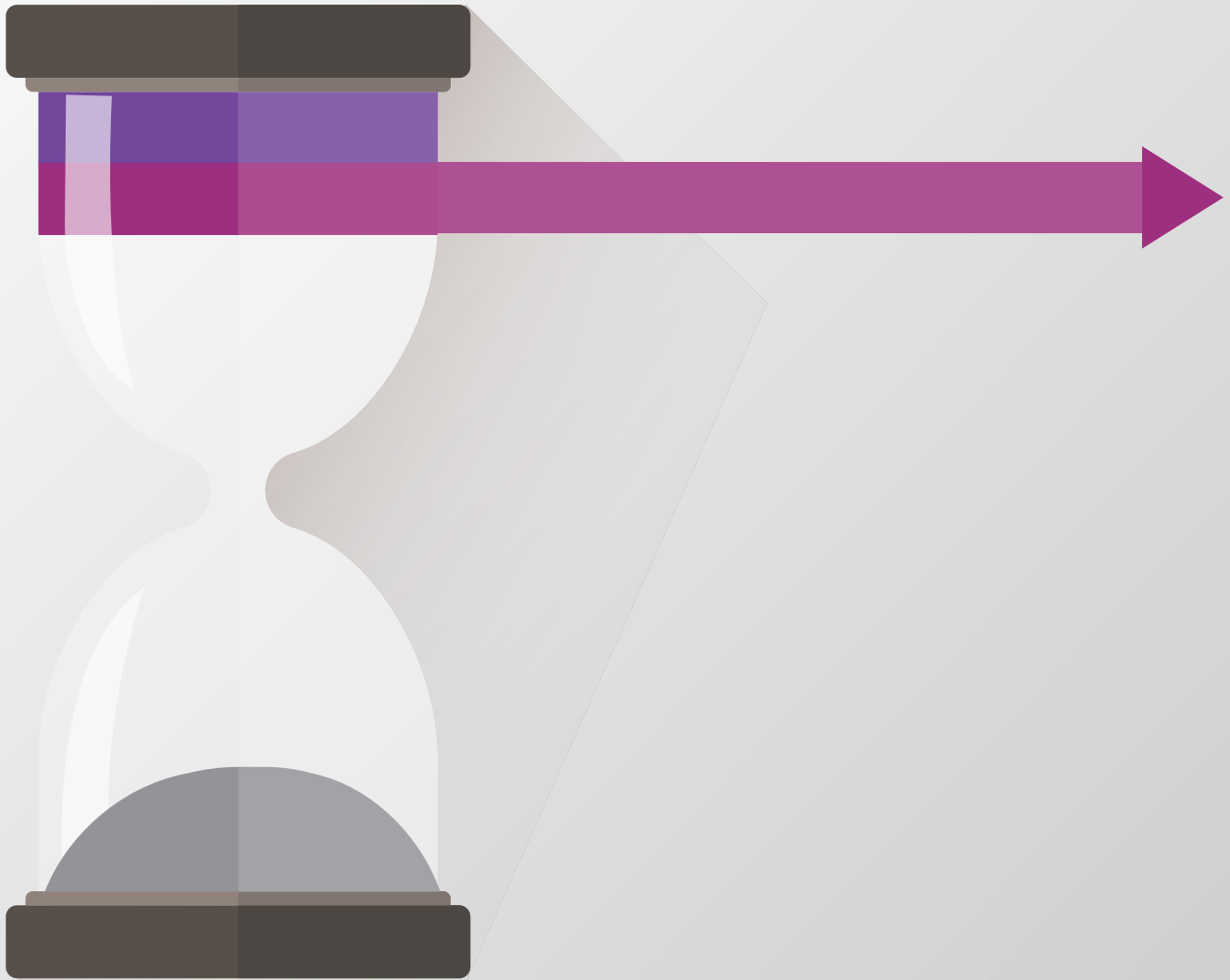
## 1.8 POST-EVENT LEGAL CONSIDERATIONS

### 1.8.1 PROVINCIAL

1. Responders at all levels should be aware that there may be hearings and legal proceedings after the event. It is important that clear documentation and information management procedures be established early and maintained throughout the event.

### 1.8.2 EOC/LOCAL GOVERNMENT

1. Multiple events, such as aftershocks or recurrent flooding, make it difficult to determine which event is associated with specific damage. This may be a problem for insurers.
2. As event moves from initial response, local authorities should establish a process allowing building owners and occupants to challenge building status decisions.
3. Ideally, financial considerations should not be based on PDBA decisions. However, local authorities should be aware of the financial implications of placard categories and building status decisions.
4. Local authorities should consider and pre-plan to understand the financial and legal implications of short-term countermeasures, cordoning off areas, and other temporary safety measures.



02

# ADMINISTRATION



## 2 ADMINISTRATION

An effective PDBA process must include the administrative functions as well as building assessment procedures. Administration of PDBA generally occurs at the local authority level – typically either municipal or regional. Often PDBA is established initially within the Emergency Operations Centre, although operations may be moved to a separate location over time. Most often, Building Assessment occurs within the Operations component of an overall Incident Command System (or similar) process.

There are at least three general phases in the administrative aspect of PDBA. In the initial response, administrative priorities include establishing a building assessment group, setting up information management and communication systems, and developing a strategy for forming and deploying teams. The second phase involves setting up and maintaining ongoing building assessment operations. Finally, the administrative process must have a strategy for transition from response to recovery and eventual return to standard building inspection processes.

### 2.1 OPERATIONAL STRUCTURE

#### 2.1.1 EOC/LOCAL GOVERNMENT

1. Ensure that the local Emergency Management Plan includes PDBA administration. Typically, PDBA is established under Operations or Planning in an ICS structure.



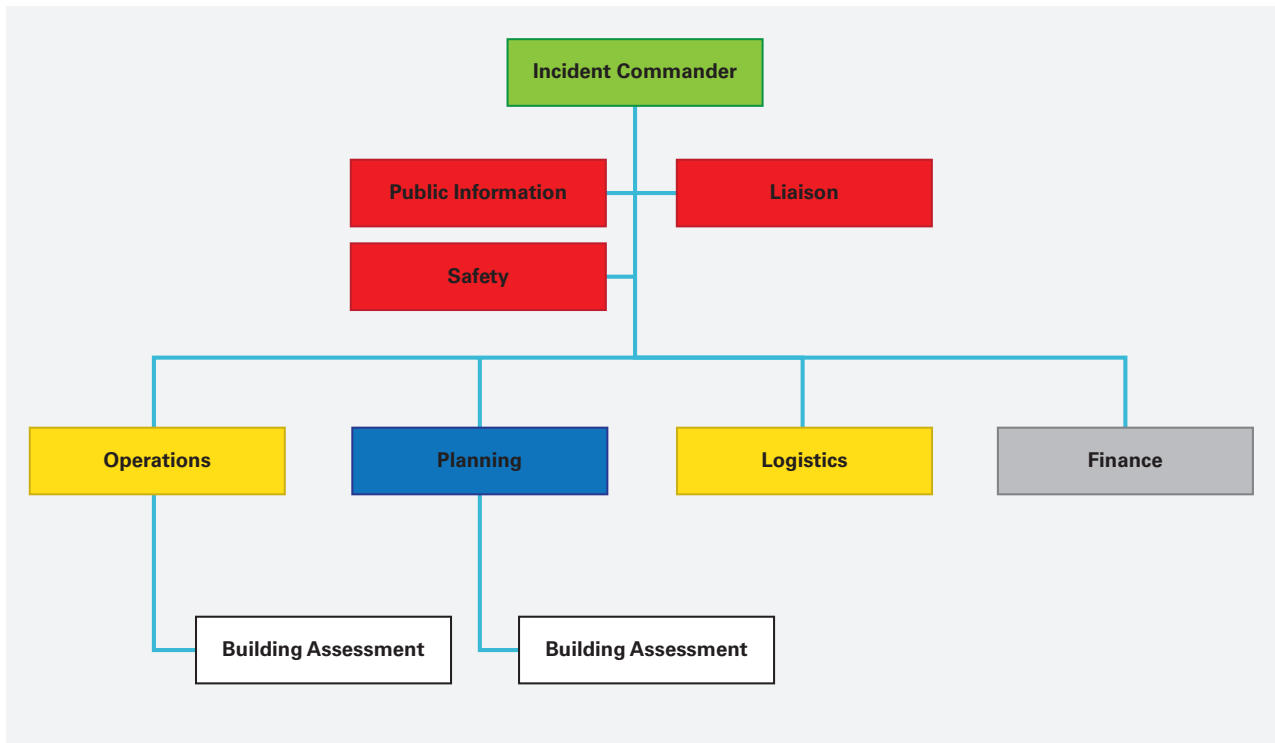


Figure 4. ICS Command Structure with alternative locations for PDBA functions. Adapted from JIBC ICS.

2. Local authorities must plan for transitioning PDBA administration and operations into a separate group as the incident moves from initial response to sustained or long term operations.
3. 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

Refer to the **PDBA Companion Manual: Administration** for links to resources that outline roles and responsibilities for PDBA personnel.

4. Include plan for re-integrating PDBA administration in the Local Government normal operations as incident moves into recovery and “business as usual.” Typically, BA processes will transition back to building inspection assessments usually housed within local or regional authorities.

## 2.2 RELATIONSHIP WITH OTHER EMERGENCY MANAGEMENT FUNCTIONS AND STAKEHOLDERS

### 2.2.1 PROVINCIAL

1. Identify key relationships between local PDBA programs and regional/provincial programs, large Critical Infrastructure owners and other relevant stakeholders.
2. Encourage and foster pre-planning and communication between Local Government, Critical Infrastructure owners, and organizations with internal PDBA processes.

### 2.2.2 EOC/LOCAL GOVERNMENT

1. Local Emergency Plan should identify key relationships between PDBA and other EM functions (e.g., HUSAR, First Responders, Social Services) and stakeholders (e.g., Critical Infrastructure owners, agencies or organizations with internal PDBA processes).
2. Pre-establish relationships and lines of communications between PDBA and other EM and stakeholder groups.
3. Once operational, establish relationships and communications between EM and stakeholder groups.

## 2.3 ADMINISTRATIVE STRUCTURE

### 2.3.1 EOC/LOCAL GOVERNMENT

1. The administrative structure should include the following functions:
  - PDBA Administrator/Manager
  - Building Liaison (if separate from EOC)
  - Assessment Team Section Leader(s)
  - Assessment Team Leaders
  - Support Staff

Refer to the **PDBA Companion Manual: Administration** for descriptions of administrative structures in various PDBA systems.

## 2.4 EQUIPMENT AND RESOURCES

### 2.4.1 EOC/LOCAL GOVERNMENT

1. Pre-plan locations for establishing PDBA administration, PDBA staging areas, and support for PDBA personnel (shelter, equipment stores, etc.).
2. Pre-establish equipment and supplies for both PDBA Administration set up and for initial PDBA assessment teams.

## **2.5 INFORMATION MANAGEMENT**

### **2.5.1 PROVINCIAL**

1. Establish regional and provincial processes and resources to support and integrate information management at the local level. PDBA should occur at the lowest level that is operationally feasible, but link and be supported by senior government.
2. Support development of integrated technologies and data management processes to support PDBA at local levels, and between LA and other building assessment programs.

### **2.5.2 EOC/LOCAL GOVERNMENT**

1. Information Management is a critical function and requires adequate resourcing, including personnel, tools, and processes.
2. Pre-establish technology and processes for data management, with backup plans and resources that require minimal technology support.

## **2.6 TRACKING AND MONITORING PDBA**

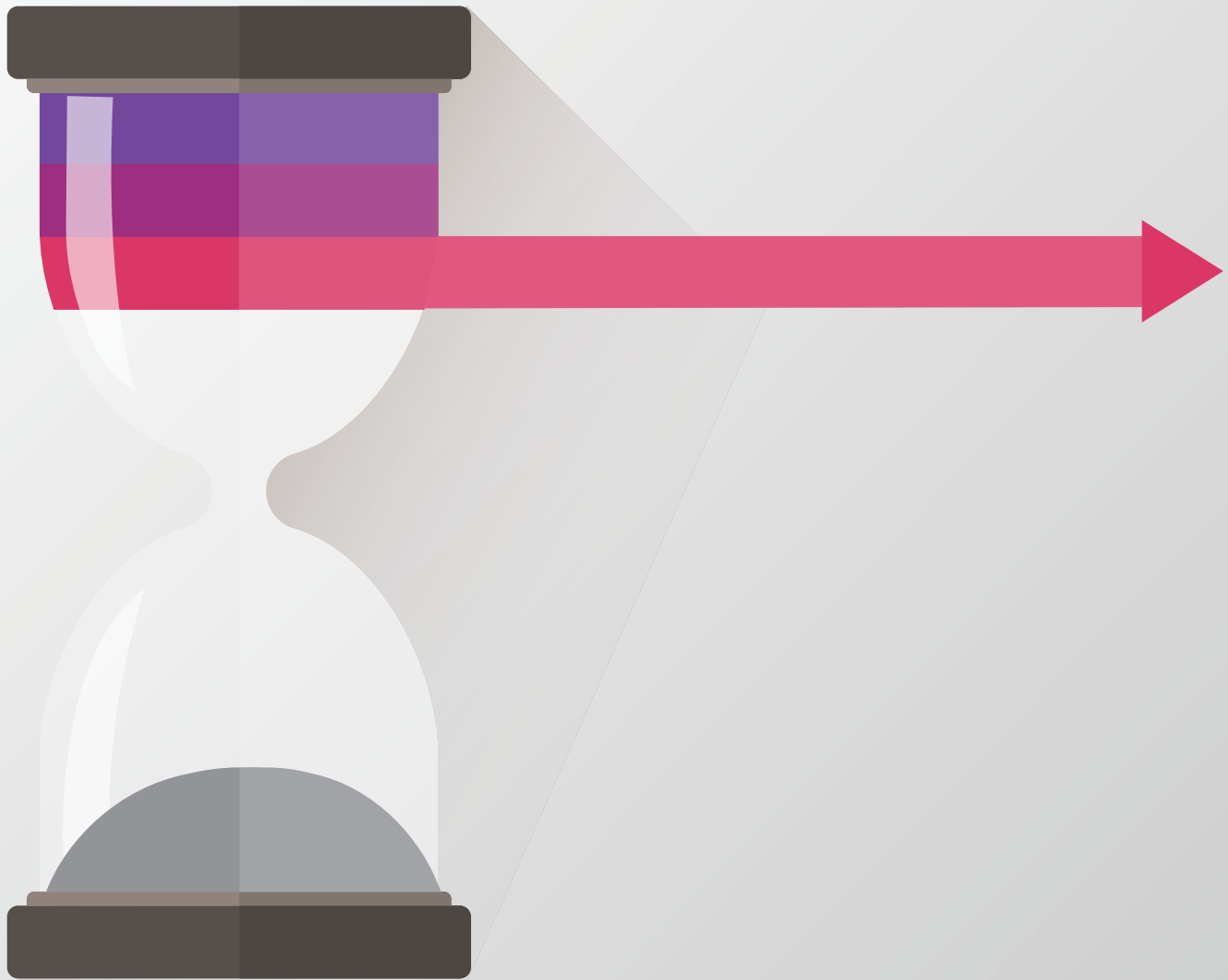
### **2.6.1 EOC/LOCAL GOVERNMENT**

1. Pre-plan process for establishing a Building Registry to track, monitor and report building status over time.

### **2.6.2 ASSESSOR LEVEL**

1. Note that PDBA will overlap with multiple other assessment processes, including CI and private owner assessments. Ensure PDBA teams are aware of and communicate with other EM teams and stakeholders with internal building assessment processes.





03

# SITUATIONAL AWARENESS



### 3 SITUATIONAL AWARENESS

Building assessment occurs as part of an overall emergency management response to a disaster. While much of the documentation and processes describing building assessment focuses on assessment of individual buildings, the overall process of PDBA is both strategic and linked – or overlapping – with other emergency management processes.

The larger goal of PDBA is to develop and maintain an overall awareness of the areas that are damaged, the types of buildings in those areas, damage affecting different types of buildings, which buildings have been inspected and the results of those inspections. An effective PDBA process must consider the broader strategic functions of establishing and maintaining the overall PDBA process and how PDBA information informs and is impacted by other emergency management processes, such as search and rescue in the initial phases of an event and eventual recovery strategies.

Overall damage assessment is a strategic process that overlaps with other emergency management processes. Consistency in the assessment, categorization, and documentation of building assessment is important and requires well-designed processes and support resources, along with both initial and ongoing training. However, local authorities require a flexible set of guidelines to deal with the unique needs of each incident, involving recruitment, preparation, deployment, communications, and information flow. These processes must also be able to accommodate additional events (e.g., aftershock or additional flooding) and changing conditions over time.

In addition, the strategic process should include both pre- and post-event strategies to better inform decision-making. In the pre-event phase, local authorities should gather as much information as possible, including inventories of building stock, types of buildings in the area, identification of hazards and hazard zones (e.g., flood plains or soil maps), lists of critical buildings requiring early assessment after an event, the use of “indicator buildings” to monitor the effect of the event on common types of buildings in the region and the use of technology and sensors to get real-time data during and after an event. Post-event strategies should include more than recording individual building status, but also include ongoing monitoring and analysis of results within and across areas, noting the status across types of buildings, looking for common damage patterns, and the use of “indicator” buildings to guide assessment priorities.

## 3.1 DEVELOPING AN OVERALL STRATEGY

### 3.1.1 EOC/LOCAL GOVERNMENT

1. An effective PDBA strategy is far more than the PDBA algorithms and procedures. Local government must consider and support over EOC priorities as well as social and political considerations.
2. Pre-planning and the establishment of core infrastructures and processes are important. However, each incident is unique and will require adaptation and flexibility.
3. PDBA processes must be flexible and adaptable enough to meet needs in different regions with different levels of support and resources.
4. Keep requirements and processes lean, to allow for simpler solutions.
5. The overall PDBA process must consider a variety of facets: structural damage, land issues, danger from surrounding buildings, geotechnical hazards, health and environmental risks, larger area-sized issues (e.g. liquefaction). These will not only vary from incident to incident, but will often change over the duration of an event and its response.
6. Preplan broad strategies that consider multiple possible scenarios. Use these as starting points for developing your initial response and strategy.
7. Establish initial strategies on a broad scale and consider the bigger picture when setting initial priorities.

## 3.2 OPERATIONAL DECISION-MAKING AND INTERPRETATION OF INFORMATION

### 3.2.1 EOC/LOCAL GOVERNMENT

1. The goal of operational decision-making is to gather and interpret data both at the level of the individual building (e.g., classifying and placarding a building) and at larger levels such as the neighborhood and overall community.

Refer to the **PDBA Companion Manual: Situational Awareness** for a discussion on developing situational awareness.

2. Include a layer of consultation and decision-making above the assessment team to provide support and resolve complex issues and decisions.
3. Centralize core data analysis and decision-making.
4. Implement an audit team, consisting of a small group of skilled and experienced engineers to sample and review assessment results and to provide quality assurance and consistency in decision-making.
5. Use maps and other visuals to support data interpretation and analysis. Databases are useful, but visuals are important for interpreting and understanding complex information, particularly on larger scales.

### 3.2.2 ASSESSMENTTEAM

1. While it is good practice to include multiple people in gathering information and providing opinions, responsibility for decision-making and classification must rest with experienced personnel – ideally credentialed personnel – whenever possible.
2. Recognize when situations are complex or outside the comfort zone of individuals or teams and seek additional consultation or expertise.

## 3.3 LEVERAGING OTHER EMERGENCY MANAGEMENT PERSONNEL AND PROCESSES

### 3.3.1 EOC/LOCAL GOVERNMENT

1. Leverage other emergency management processes and information sources to help contextualize and support building assessment data.
2. Note that the goals and data generated from building assessment are different than other processes such as USAR and emergency response. It is difficult to combine these processes, but they do overlap and should share intelligence and information as much as possible.
3. Building assessment will be undertaken by groups and agencies other than local authorities, such as critical infrastructure owners and agencies or organizations with multiple buildings. Ensure that pre-planning includes developing an awareness and relationships with these groups to facilitate information sharing during an event.
4. Ensure that someone from the PDBA process is liaising with and going through data from USAR, emergency response, and other emergency management functions to gather relevant information.
5. Develop capacity and processes to collect, organize, and make available information in real time to support area planning, team priorities and operational assessment of buildings. Important information to support planning includes extent and duration of shaking, performance of various building types, areas damaged, etc.

### 3.3.2 ASSESSMENTTEAM

1. Consider leveraging emergency personnel and USAR personnel to support PDBA operations. This may include coordinating activities in an area, conducting combined operations when appropriate, or providing support to each other's operations.

Refer to the **PDBA Companion Manual: Situational Awareness** for discussion on leveraging PDBA and other emergency management processes.

## 3.4 ESTABLISH RELATIONSHIPS IN THE PRE-EVENT PHASE

### 3.4.1 PROVINCIAL

1. Establish an overarching strategy to bring together key stakeholders in PDBA. Develop and maintain relationships between organizations, agencies, and key personnel to facilitate common approaches and communication during an event.
2. Ideally, provide support from higher levels of government, but encourage response and decision-making at the local level.



3. Establish communication structures and strategies that can be easily activated and maintained once an event occurs.

### 3.4.2 EOC/LOCAL GOVERNMENT

1. Establish relationships between key personnel from the Local Government and stakeholders from regional and provincial organizations, stakeholder organizations, and local personnel who will be involved in PDBA operations.
2. Ensure that relationships with local geotechnical engineers are developed prior to an event.

### 3.4.3 ASSESSMENT TEAMS

1. Encourage the development of relationships between PDBA personnel through pre-event communication, collaboration, and training.

## 3.5 PRE-EVENT INTELLIGENCE

### 3.5.1 PROVINCIAL

1. Consider provincial programs for pre-event monitoring and building surveillance (e.g., use of ground motion sensors, etc.) through collaboration and/or incentives.
2. Ideally, a provincial-level GIS system should be available for pre-event gathering of information and to support post-event PDBA operations.

### 3.5.2 EOC/LOCAL GOVERNMENT

1. Develop a pre-event strategy for gathering and maintaining key information about buildings in the community, including:
  - Inventory of building stock
  - Construction type
  - Building importance and priority for post-event use and assessment
  - Owner and occupant information
  - Known modifications and/or issues
  - 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
2. Develop a pre-event strategy for gathering and maintaining key information about preventative assets in the community, such as dykes, retaining walls, etc.
3. Conduct pre-event assessment of soil-types, hazard mapping, geotechnical risks, anticipated damage patterns, etc.
4. Develop a communication plan to facilitate contact with owners and occupants during and after building assessment.
5. 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.

## 3.6 INDICATOR BUILDINGS

### 3.6.1 EOC/LOCAL GOVERNMENT

1. Consider the development of Indicator Building program that identifies key or prototype buildings. These buildings are prioritized for assessment following an event to identify types of buildings or types of damage that may be expected for similar buildings in the community.

Refer to the **PDBA Companion Manual: Situational Awareness** for further discussion and examples of the use of Indicator buildings and other pre-event surveillance initiatives.

2. A central registry should support or incorporate a formal or informal indicator building program by classifying buildings as similar to indicator buildings.
3. 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.



04

OPERATIONS



## 4 OPERATIONS

Operations refers to the ongoing performance of building assessment functions. This includes initial activation and set up, daily assessment operations, eventual return to business-as-usual and the deactivation of the building assessment operations.

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.

Actual functioning of PDBA operations will depend on the nature and extent of the event, as well as the personnel and resources that are available. Several key principles should guide PDBA operations:

- Keep administrative and operational processes as lean as possible to encourage adaptability and formation of simple solutions.
- Allow room for innovation and use of alternate personnel and processes as required.
- Assume that many local personnel and resources will not be available, particularly in the early phases of the event.

Refer to the **PDBA Companion Manual: PDBA Systems** for examples and discussion of existing PDBA systems.

## 4.1 PRE-PLANNING

### 4.1.1 EOC/LOCAL GOVERNMENT

1. Pre-planning for building assessment operations should be scalable, with guidelines for incidents which are managed through “business-as-usual” processes (e.g., not large enough to warrant enacting emergency powers or activating an EOC) as well as larger-scale incidents, managed through an EOC and/or requiring sustained operations.
2. Ideally, building assessment operations should begin within three days, and immediately for critical infrastructure. This allows time to initiate early responses, develop an understanding of the nature and extent of the incident, and to activate and acquire required resources.
3. Local Government should develop and maintain a roster or pool of local assessors and support personnel. In addition, Local Government should work with regional and provincial bodies to pre-establish processes for accessing out-of-area personnel.
4. Operations planning should anticipate that many people in the community who would assume specific roles will not be available, particularly in the early stages of the event.

### 4.1.2 ASSESSMENTTEAM

1. PDBA administrative, operational, and assessment personnel should train and/or exercise on a regular basis (e.g., annually) and should be cross-trained to assume multiple roles.

## 4.2 ACTIVATION

### 4.2.1 EOC/LOCAL GOVERNMENT

1. Have pre-established criteria and processes for activation of PDBA. This should include criteria for limited/local response and also for accessing outside personnel for larger scale events or extended operations.
2. Develop and test/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).

## 4.3 LOGISTICS

### 4.3.1 PROVINCIAL

1. Large scale events may involve multiple local and or regional authorities. These events will require a high level of coordination and support. However, operational management of personnel should remain with the Local Government.

### 4.3.2 EOC/LOCAL GOVERNMENT

1. 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.).
2. Local authorities should have plans to manage transportation to and from the event, movement within the response area, pay, liability, scheduling, and rotation of personnel.

## 4.4 EQUIPMENT AND RESOURCES

### 4.4.1 PROVINCIAL

1. Provinces should work with local and regional authorities to establish and maintain equipment and resources required to support long-term PDBA operations.

### 4.4.2 EOC/LOCAL GOVERNMENT

1. 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.).
2. Local Government 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.
3. Establish relationships with telecommunications and other relevant critical infrastructure providers to ensure support for PDBA operations.

Please refer to the **PDBA Companion Manual: Operations** for examples of PDBA Team equipment and resource lists.

## 4.5 NON-LOCAL RESOURCES

### 4.5.1 PROVINCIAL

1. Strategies should be in place to ensure that international and non-local team members for transportation to and from the event, movement within the response area, and facilities to ensure health and safety of their personnel (e.g., lodging, meals, etc.).
2. Ideally, out-of-province and international teams should be self-sufficient.

### 4.5.2 EOC/LOCAL GOVERNMENT

1. Local Government should have guidelines for working with non-local teams and personnel. Note that some non-local teams may be seeking to provide assistance, while other groups may be seeking to gather data and observe operations.
2. Local Government should develop guidelines for assessing capabilities of non-local resources and have pre-determined tasks or functions that these teams and personnel can assume.
3. Communication and documentation guidelines 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.

## 4.6 TEAM FORMATION AND PERSONNEL MANAGEMENT (GENERAL)

### 4.6.1 EOC/LOCAL GOVERNMENT

1. Personnel are a key resource in PDBA operations, and management of personnel and personalities are critical in successful operations.
2. Team formation requires ongoing flexibility, adaptation, and innovation due to diverse operational needs, rotating personnel, and the changing goals of PDBA over time.

3. A process should be in place to update guidelines on team composition as resources and assessment needs change.
4. Team formation should be purposeful and thoughtful. Develop at least two levels of strategy:
  - Overall deployment. Factors to consider include:
    - o Resources currently available
    - o Areas to be assessed (see Priority Setting, below)
    - o Number of teams required
  - Formation of individual teams. Factors to consider include:
    - o Specific area that team will work in
    - o Assessment goals (e.g., initial rapid assessment vs. detailed assessment)
    - o Types of buildings in that area and background/skills required to perform assessment
5. 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 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 social services personnel for residential areas

Refer to the **PDBA Companion Manual: Operations** for a discussion leveraging PDBA and other emergency management processes.

6. Team size will depend on the complexity of the building. Simple residential structures can be assessed by teams of three personnel. Complex structures require larger teams with more specialized skills and knowledge.
7. Local Government should have pre-established plans for use of both credentialed and non-credentialed personnel.
8. Note that there is risk in using non-engineers in rapid assessment. 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.

Refer to the **PDBA Building Assessment Matrix** in Appendix 2 this manual. This table provides an analysis to support matching skills, credentials, and backgrounds required to perform building assessment for common types of buildings.

9. 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.

10. Appoint one person on each team as the team leader.

Refer to the **PDBA Companion Manual: Operations** for a discussion on strategies for forming PDBA assessment teams.

## 4.6.2 ASSESSMENT TEAM

1. Teams must always have at least two personnel, although three to four personnel is preferred. At least one person must remain outside of buildings as a safety monitor.
2. Ideally, at least one member of each assessment team should be local or have knowledge of the local area.

## 4.7 PRIORITY SETTING

### 4.7.1 EOC/LOCAL GOVERNMENT

1. PDBA operations should be based on daily, short term, and long term priorities and strategies.
2. Local Government should have pre-planned initial PDBA strategies based on hazard analysis, anticipated impact of likely hazards, and community priorities for response.
3. Initial priorities for PDBA should include buildings needed for emergency response, critical infrastructure, and core transportation routes.
4. Once operational, the PDBA team must monitor and adjust strategies and priorities, considering factors such as competing priorities, workload and available resources and personnel.
5. Key questions to consider for ongoing operations include:
  - Guidelines for allocating resources
  - Triggers for initiating PDBA
  - 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.

Refer to the **PDBA Companion Manual: Operations** for further discussion on strategies for developing assessment strategies.

## 4.8 WORKING WITH INDIGENOUS COMMUNITIES

### 4.8.1 EOC/LOCAL GOVERNMENT

1. Develop plans for identifying and honouring culturally sensitive areas/buildings/practices in area: respect cultural practices/rights (e.g. no entry).
2. Identify and preplan integration of Indigenous leadership with other Local Government leadership.
3. Communities with mixed or multiple levels of jurisdiction should create a document within their emergency plan, outlining the hierarchy and decision making responsibility/authority between various Local Governments.
4. Ensure assessment teams are aware of cultural sensitivities in areas they are dispatched to.



## 4.9 DAILY BRIEFINGS/INTELLIGENCE REPORTING

### 4.9.1 PROVINCIAL

1. Provincial operations should include daily briefings and regular intelligence/update briefings.
2. Consolidated data and intelligence on all areas affected by the event should be collated, analyzed, and distributed to local authorities.

Refer to the **PDBA Companion Manual: Operations** for examples of Briefing and Debriefing processes and forms.

### 4.9.2 EOC/LOCAL GOVERNMENT

1. PDBA Operations should include daily briefings and regular intelligence/update briefings.
2. 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 (e.g., plans, drawings, reports from other EM processes and assessments)
  - Opportunities for teams/personnel to provide input, raise concerns or questions, make suggestions, etc.
3. 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.
4. Opportunities should be included to allow personnel from all levels to be creative and problem-solve.

### 4.9.3 ASSESSMENTTEAM

1. Individual team or group/ or area 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

## **4.10 DAILY DEPLOYMENT**

### **4.10.1 EOC/LOCAL GOVERNMENT**

1. Local Government operations plans should include daily deployment processes and documentation, including:
  - Identify all teams and team members (and associated personnel from other EM or LA activities that are working with the assessment team)
  - Team goals and assignments
  - Transportation and communication information
2. Operations must include an accountability process to identify and track all PDBA personnel.

### **4.10.2 ASSESSMENT TEAM**

1. Team operations should include a daily pre-deployment worksheet.
2. All personnel must participate in the accountability system.

## **4.11 COMMUNICATIONS**

### **4.11.1 EOC/LOCAL GOVERNMENT**

1. PDBA planning must provide systems, processes, and equipment to ensure effective communication between:
  - The PDBA group and key EOC/Local Government decision-makers
  - The PDBA group and other emergency management stakeholders and operations
  - PDBA operations and field personnel
  - PDBA and other building assessment stakeholders (e.g., critical infrastructure owners, organizations with internal building assessment processes)
  - PDBA and external resources, such as professional organizations and individual assessors
  - PDBA administration and the public, as well as individual building owner/occupants
2. An information plan should be developed to ensure communication and data movement.
3. Communication systems and plans should include conventional and social media channels.
4. Communication systems must be able to handle large amounts of data from the field.
5. Note that communications and data needs will continue to change and evolve over time. Communications and information plans must be updated on an ongoing basis.
6. Consider the development of a publicly available GIS-based system to share building assessment data with the community and other stakeholders.

## **4.12 LINKING WITH OTHER EM FUNCTIONS**

### **4.12.1 EOC/LOCAL GOVERNMENT**

1. Ensure lines of communication and information sharing are in place with all EOC and external stakeholder groups.
2. It's difficult to combine PDBA with other EM functions, but look for opportunities to share information and to leverage other EM processes.

3. Ensure there are mechanisms to obtain information and documentation from other damage assessment processes (e.g. critical infrastructure owners and organizations with internal damage assessment processes).

## 4.13 SHORT TERM COUNTERMEASURES

### 4.13.1 EOC/LOCAL GOVERNMENT

1. Local Government should develop short term countermeasure processes and capacity prior to an event, with the goal of facilitating the use of buildings that might otherwise be unsafe.
2. In addition, pre-plan for cordoning and fencing of unsafe areas.

Refer to the **PDBA Companion Manual: Operations** for further discussion on propping and shoring.

## 4.14 END OF DAY DEBRIEFS

### 4.14.1 PROVINCIAL

1. Provincial operations should include daily debriefings.
2. Consolidated data and intelligence on all areas affected by the event should be collated, analyzed, and distributed to local authorities.

### 4.14.2 EOC/LOCAL GOVERNMENT

1. PDBA Operations should include daily debriefings.
2. 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, make suggestions, etc.

### 4.14.3 ASSESSMENT TEAM

1. 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

## **4.15 STAFF ROTATION**

### **4.15.1 EOC/LOCAL GOVERNMENT**

1. Local Government should pre-establish strategies for long-term personnel and resource requirements.
2. Once an incident is in progress, PDDBA operations must establish and update guidelines for the number of hours teams can work per day, number of consecutive days they can work, and other criteria for staff rotation based on the ongoing nature of the event and resources that are available.
3. Establish rosters and staff rotations to ensure efficient allocation, health, and wellness of team members.
4. Ensure a mechanism is in place to bring in additional personnel and assessors over time.
5. Guidelines should be in place to establish a transition from volunteer responses in the immediate aftermath to paid work on an ongoing basis.

## **4.16 EMERGENT VOLUNTEERS**

### **4.16.1 EOC/LOCAL GOVERNMENT**

1. Local Government should develop process for screening, supporting, and tracking emergent volunteers.
2. Processes should be in place for assessing the background, capabilities, and required orientation or training for emergent volunteers.



05

# INFORMATION MANAGEMENT



## 5 INFORMATION MANAGEMENT

One of the key findings of this research has been the importance of information management to building assessment. This theme emerged both as a critical challenge and as an opportunity for innovation. Various countries have employed trial versions of electronic data capture, supplemented by paper-based backups. Challenges to electronic systems include availability of power, storage and transmission of data, availability of networks to link assessors and central administration, and the need for training of assessors. Challenges to paper-based systems include timely capture and collection of data, along with the need to collate and enter the data before it can be assessed and used. In addition, data may be available from multiple sources, including search and rescue, private building inspections, sensor data, etc.

A robust PDBA system should include a central building registry that allows for multiple forms of data collection such as electronic, paper-based, data from other emergency management processes, social media. The system should also include a process for validating or categorizing incoming data, the ability to collate and analyze data – ideally in real-time – and a process for monitoring the change in status in a building over the duration of response and recovery.

### 5.1 INFORMATION MANAGEMENT SYSTEMS

#### 5.1.1 PROVINCIAL

1. Develop a national/provincial PDBA data and information management strategy that can be implemented with flexibility based on the context within local authorities.
2. There should be a national/provincial data-base capable of capturing and collating information from local authorities which supports building a common operating picture that can then be shared with local authorities.
3. The PDBA data and information strategy should identify (and update on an ongoing basis) types of information systems that may be used to provide or inform PDBA operations. This should include noting what types of systems can share information and/or be accessed by other information systems.
4. PDBA information strategies must consider the relationship of personal information and privacy legislation, other legal constraints on collection and use of personal and private information or data.

## 5.1.2 EOC/LOCAL GOVERNMENT

1. 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.
2. If possible, tie PDBA information management into existing data systems within the local authority – particularly into existing or planned GIS systems.
3. The PDBA information management system must be scalable (small events in localized areas to sustained large-scale incidents), robust (able to be implemented in a post-disaster setting), and flexible (able to gather and disseminate information from a variety of sources and methods).

## 5.2 PRE-EVENT DATA COLLECTION

### 5.2.1 EOC/LOCAL GOVERNMENT

1. The PDBA system should have access to key pre-event information from the community, including:
  - Building stock
  - Building intelligence, such as building plans, drawings, upgrades, etc.
  - Hazard mapping, such as soil maps/liquefaction zones, etc.
  - Critical infrastructure
  - Important buildings, such as schools, hospitals, those used for emergency response, etc.
  - Known potentially vulnerable buildings
  - Existing CI and stakeholders with internal PDBA processes

## 5.3 DATA MANAGEMENT

### 5.3.1 EOC/LOCAL GOVERNMENT

1. 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.
2. It is critical to provide adequate resources for data and information management from the beginning of the event. Personnel and systems must be capable of managing large amounts of data from a variety of sources and allowing analysis to provide useable intelligence in a timely manner. This requires adequate and ongoing resourcing.
3. Data management processes should be set up to accept information and begin developing situational awareness as quickly as possible. Ideally, the system should be scalable and adaptable. Information in the first few days is likely to be unstructured and from multiple sources. As the event unfolds, processes and data will become more consistent. Note, however, that as the event moves into recovery and rebuilding, the system will need to interface with building owners, insurers, builders, as buildings are returned to use.
4. Data management systems should be simple and effective, yet scalable to deal with the amount and type of information that will come in. Local authorities must anticipate the type and volume of information that will be involved and find efficient and effective methods of managing this data.
5. Establish a single funnel or entry point to streamline incoming data and job requests and allow for simpler triage and prioritization.
6. 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.

### 5.3.2 ASSESSMENT TEAM

1. Ensure that there are mechanisms to store and transfer data from the field to the data management personnel if this data cannot be transmitted in real time.

## 5.4 DATA COLLECTION AND FORMS

### 5.4.1 PROVINCIAL

1. Establish national/provincial standards to support data collection at the local level.
2. Establish common elements required by PDBA forms and documentation.

### 5.4.2 EOC/LOCAL GOVERNMENT

1. Local authorities must develop or adopt PDBA forms and data collection methods. Ideally, a standardized form should be available from national and/or provincial PDBA systems.
2. Develop multiple options for data collection and forms, including paper-based and electronic methods. 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.
3. Ensure that all assessors are briefed on how to complete forms and documents and what information to include on them.
4. Note that different forms may be required for different types of events (e.g., floods, earthquakes).

### 5.4.3 ASSESSMENT TEAM

1. Ensure that all team members have access to a primary data collection method (e.g., online form) and backups (e.g., paper-based forms). All team members must be familiar with all types of forms which may be used in an event and how to complete them.

Refer to the **PDBA Companion Manual: Information Management** for examples of various PDBA forms and documentation.

## 5.5 USE OF TECHNOLOGY

### 5.5.1 EOC/LOCAL GOVERNMENT

1. 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.
2. 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.
3. Ideally, technology-based data collection systems should be device-agnostic allowing use through smartphones, tablets, laptops, and other devices.



4. Local authorities require robust, scalable information management systems, which may range from customized desktop-based spreadsheets to commercial GIS-based systems.
5. Requirements for data collection and information management should be presented as specifications rather than solutions, allowing local authorities the flexibility to deal with availability of technology and conditions in the field. Hard wired solutions and processes are difficult to implement or adapt.
6. Be aware of the limits of technology, particularly during and after a disaster, which can include access to power, network availability, difficulty repairing or replacing devices, inability to support user management.

## 5.6 SOURCES OF DATA

### 5.6.1 EOC/LOCAL GOVERNMENT

1. Local authorities must incorporate processes to accommodate varied assessment and outcome information generated by different teams of assessors and from different information sources. PDDBA should not focus on generating a single, best placard - rather the goal should be gathering and disseminating important information about a building's status at any given time.
2. It is critical to collect data whenever the opportunity arises. Information is available from multiple sources and local authorities must incorporate all available data into overall situational awareness and deployment.
3. Ensure to capture and incorporate data from the ad hoc phase from sources including emergency services, USAR teams, social media, and general media. This information, supplemented by more formal windshield assessments and reconnaissance, is important in developing an early awareness of the extent and nature of damage, which in turn will help establish early priorities for PDDBA operations.
4. Gather and share data from other emergency management functions, such as search and rescue, social services, geotechnical assessments, etc.
5. Ensure that data is gathered from critical infrastructure and other stakeholders who have internal building assessment programs.
6. During response and recovery, incorporate results from private assessments, detailed engineering assessments, and return-to-function assessments.

### 5.6.2 ASSESSMENTTEAM

1. Work with other emergency management and local authority services to gather and share information from the field.

## 5.7 DATA VALIDATION

### 5.7.1 EOC/LOCAL GOVERNMENT

1. Ensure that a system is in place to identify the source, validate, and translate/adapt information received from various sources. Non-local authority processes (such as private or critical infrastructure building assessments) may not be looking at the same things as the PDDBA process, which may employ different criteria and/or rating scales, and may be conducted by personnel with varied backgrounds and expertise.
2. Look for ways to leverage information from varied sources, but remember that data will be gathered by different personnel who have different procedures, terminology, and goals for assessment. This information is valuable but must be contextualized for use within a PDDBA perspective.

3. Incoming data and information should include documentation noting the source, background, and an assessment of the reliability and validity of the data.
4. Be aware of the possibility of fraudulent or falsified placards and information.

Refer to the **PDBA Companion Manual: Information Management** for further discussion on use of technology in PDBA operations.

## **5.8 SHARING AND INTEGRATION OF DATA WITH OTHER STAKEHOLDERS**

### **5.8.1 EOC/LOCAL GOVERNMENT**

1. Information gathered at the local level should be provided to regional and provincial levels to ensure adequate situational awareness and inform allocation of resources.
2. Leverage the building assessment process with other emergency management processes. Note that it is difficult to combine processes (e.g. USAR and PDBA), but it is important to share data and intelligence between different processes.
3. Share information with all stakeholders, including the public. This should be two-way communication, with opportunities to gather data from the public as well.
4. Ideally, an online GIS-based application should be available to all stakeholders, including the public showing PDBA results to date.
5. Ensure that PDBA data and intelligence is linked with business-as-usual processes and databases.

### **5.8.2 ASSESSMENT TEAM**

1. Look for opportunities to share experiences between PDBA teams and teams from other processes, such as USAR, social services, and critical infrastructure assessment.



06

# ASSESSMENT TEAMS



## 6 ASSESSMENT TEAMS

Ideally, mechanisms should be in place at both the provincial/national and local authority levels to identify, recruit, select, and train assessors (covered in other sections of this framework). This section looks at requirements for supporting assessors “on the ground.”

### 6.1 PRE-EVENT PREPARATION

#### 6.1.1 PROVINCIAL

1. Ideally, a provincial/national system should be in place with relevant professional bodies to identify, recruit, and train personnel with appropriate backgrounds to conduct post-disaster building assessment.
2. Agreements should identify a mechanism for activating PDBA personnel for potential deployment both for initial response and for ongoing operations.

Refer to the **PDBA Companion Manual: Assessment Teams** for examples and discussion regarding PDBA training.

#### 6.1.2 EOC/LOCAL GOVERNMENT

1. Local authorities should be aware of both provincial/national rosters of PDBA assessors and which of those personnel are within their local area.
2. Local authorities should have mechanisms for notifying local PDBA personnel and resources, and for accessing out-of-region personnel and resources.

3. Local authorities should have pre-deployment processes and checklists ready for use. These should include generic information as well as a method of including up-to-date information about the current event.

Refer to the **PDBA Companion Manual: Assessment Teams** for discussion on notification and deployment processes.

### 6.1.3 ASSESSMENTTEAM

1. PDBA assessors should have a mechanism for acknowledging activation or for offering their services to the local authority.
2. PDBA assessors should have personnel resources and checklists that can be consulted at time of activation.

## 6.2 PERSONAL AND TEAM EQUIPMENT

### 6.2.1 EOC/LOCAL GOVERNMENT

1. Local authorities should ensure that PDBA personnel coming into the area have appropriate personal safety and professional equipment.
2. Processes, such as the use of ID badges, should be developed to identify authorized PDBA personnel.
3. Additional personal safety and professional equipment should be maintained by local authorities to support personnel who do not have access to their own equipment, including local personnel who cannot access their homes or worksites or out-of-region personnel without personal supplies.
4. Field guides and deployment briefings and instructions should emphasize personal safety and identify personal safety equipment required to work in the field.
5. Both long-term and daily deployment briefings must include checks to ensure all personnel going into the field have adequate personal safety equipment and knowledge of potential issues in the areas that they are going into.
6. Pre-event planning should include guidelines for assessment teams including roles, plans for entry and egress, communications, emergency procedures, etc.

Refer to the **PDBA Companion Manual: Assessment Teams** for links to sample Assessment team resources and checklists.

### 6.2.2 ASSESSMENTTEAM

1. PDBA assessors should maintain pre-packed personal safety and professional equipment.
2. PDBA team leaders must emphasize and enforce the use of personal safety equipment and procedures.
3. Team leaders should be trained and prepared to monitor safety and operations of their teams.

## 6.3 HOUSING, TRANSPORTATION, AND SUPPORT

### 6.3.1 EOC/LOCAL GOVERNMENT

1. Emergency plans must include guidelines for ensuring adequate housing, transportation, and support for PDBA personnel. This includes support for personnel both entering and leaving the general area and for daily operations.
2. PDBA operations must include transportation for teams to get to, from, and around their designated operational areas.

## 6.4 FITNESS TO PRACTICE

### 6.4.1 EOC/LOCAL GOVERNMENT

1. PDBA operations must include plans for ensuring fitness to practice of PDBA personnel over time. Pre-training should include topics such as developing and maintaining mental/physical/emotional health, developing stress and psychological resilience, and the daily and ongoing monitoring of personnel.
2. Local authorities should develop plans and resources to monitor and manage stress and psychological health of all responders.

### 6.4.2 ASSESSMENT TEAM

1. Assessors should employ strategies to develop and maintain fitness to practice, including mental, physical, and emotional health, developing stress and psychological resilience, and strategies for daily and ongoing self-assessment and self-care.

Refer to the **PDBA Companion Manual: Assessment Teams** for examples and discussion on fitness to practice.

2. Team leaders and all team members should constantly monitor each other and provide support to ensure wellness, fitness to practice, and safety.

## 6.5 SAFETY ON THE GROUND

### 6.5.1 EOC/LOCAL GOVERNMENT

1. Local Government must ensure that relevant worker safety processes and procedures are in place for all personnel involved in PDBA operations.

Refer to the **PDBA Companion Manual: Assessment Teams** for discussion on coordination of PDBA and other teams.

2. Daily assessments should include identification and monitoring of both local hazards, such as unstable slopes, known buildings that are collapsed or unsafe in an area, and cascading hazards such as upstream dams. This information should be part of daily briefings for all teams.

3. Guidelines and procedures must be established to ensure team safety in regards to potential violence or looting.
4. PDBA strategies should foster creative input and problem-solving from all team members.

### 6.5.2 ASSESSMENTTEAM

1. Ideally, assessment teams should have a minimum of three personnel (while recognizing that this may not be possible in all situations).
2. Team safety is the primary consideration for all teams and team members.
3. Team leaders must foster creativity and problem-solving mindsets to identify and address safety issues in the field.

Refer to the **PDBA Companion Manual: Assessment Teams** for further information on safety procedures and checklists.

4. PDBA teams must always have at least one person remain outside the building to monitor safety.
5. The team member remaining outside the building must be able to communicate with both other team members and with central operations.

## 6.6 COORDINATION WITH OTHER TEAMS

### 6.6.1 EOC/LOCAL GOVERNMENT

1. The PDBA manager should know what other emergency management teams and activities are going on in areas in which PDBA teams will be deployed. This information must be shared with all relevant teams and team members.
2. PDBA strategies should foster creative input and problem-solving from all team members.

### 6.6.2 ASSESSMENTTEAM

1. Ensure that team members are aware of other emergency management teams and activities that are going on in their response agencies. Ideally, communication channels should be set up between PDBA and other teams.
2. Team leaders must foster creativity and problem-solving mindsets to identify and address safety issues in the field.

## 6.7 DAILY BRIEFINGS AND DEBRIEFINGS

### 6.7.1 EOC/LOCAL GOVERNMENT

1. Daily briefings and debriefings should include:
  - Daily assignments
  - Known and potential safety hazards
  - Summaries of recent and overall PDBA activities and goals
  - Known activity of other emergency management teams and activities within each team's operating area
  - Transportation, access, egress, communication, and operational procedures

## 6.7.2 ASSESSMENTTEAM

2. Daily briefings and debriefings for individual teams should include:
  - Daily assignments
  - Team roles and operating procedures
  - Known and potential safety hazards
  - Summaries of recent and overall PDBA activities and goals
  - Discussion of any psychosocial impacts or issues





07

**BUILDING  
ASSESSMENT  
PROCEDURES**



## 7 BUILDING ASSESSMENT PROCEDURES

The core of PDBA is the actual assessment procedures themselves (see Figure 7. PDBA Administration and Procedures, above). Internationally, building assessment processes generally consist of three phases: an initial area assessment, a rapid assessment, and a longer term detailed engineering/return-to-function assessment.

The goal of the area assessment is to establish an initial estimate of what areas are damaged and what the level of damage is within those areas – key information that will guide initial response strategies. This typically includes windshield assessment by emergency responders and local authority personnel, supplemented by other forms of formal and informal reconnaissance. This process overlaps with initial search and rescue and emergency response activities.

The rapid assessment phase involves teams of assessors systematically conducting focused assessments, usually 20-30 minute visual inspections of the exterior, to categorize buildings. Several systems use a triage approach to identify buildings that are able to be used in the short term (sometimes with restrictions or conditions), those requiring more detailed assessment (including both interior and exterior inspection), or buildings which are unsafe (from internal or external hazards).

The third level of assessment involves comprehensive structural and functional assessments of a building to identify requirements for demolition or repair and reoccupation of a building. Note that the goals of rapid assessment may vary over the duration of an event.

## 7.1 GOAL OF BUILDING ASSESSMENT PROCEDURES

### 7.1.1 PROVINCIAL

1. The provincial goal of Building Assessment Procedures is to support Local (or Regional) Authorities in developing and maintaining situational awareness within the affected areas. This, in turn, allows the province to monitor needs and allocate resources as required.

Refer to the **PDBA Companion Manual: PDBA Programs** for descriptions of several Post Disaster Building Assessment algorithms and processes, along with references and links to several PDBA programs.

2. In general, assessment procedures and operations should occur at the lowest or closest level to the community; the role of senior government is to provide guidance, education, and resources to support that to happen.

### 7.1.2 EOC/LOCAL GOVERNMENT

1. The goal of Building Assessment at the Local Government level is to develop and maintain situational awareness related to the state of buildings within the community.
2. Pre-event, communities should conduct strategic planning and discussions to:
  - Determine the initial goals of post-disaster building assessment. These goals may include Safety, Usability, and Level of Damage. Local Government must determine the mix or emphasis of each of these goals for the initial phase of the response.
  - Establish baseline or target criteria for return-to-function assessments (e.g., back to building code as built, building code new, withstand subsequent event, build back better, etc.)
3. Early in the response, Local Government must have a process for discussing and determining the community's risk tolerance in relation to safety and usability. The purpose is to review and reflect on outcomes (White/Green, Yellow, Red) of initial building assessments, particularly as these results impact the community's ability to house and support residents. This review should also examine how assessors are using the placard outcomes and categories and consider making changes based on emerging practice.
4. In addition, Local Government should have a process in place to conduct this review and revision processes on an ongoing basis over time.

### 7.1.3 ASSESSMENT TEAM

1. The primary goal of assessments teams is to conduct building assessment in the safest manner possible. Personnel and citizen life safety must take priority over any other considerations.
2. Team members must be clear on the goals and the priorities of these goals – what are the safety and usability considerations and constraints (e.g., allow use of stable portions of a damaged building on a temporary basis?).

## 7.2 BUILDING ASSESSMENT ALGORITHMS

### 7.2.1 PROVINCIAL

1. A provincial framework for post-disaster building assessment should be in place such as this document, with recommendations or direction to specific assessment models and/or procedures.

2. Some jurisdictions may develop and implement provincial or national level PDBA models which include explicit assessment algorithms and processes. Other jurisdictions may choose to provide guidance, allowing local authorities and critical infrastructure owners to develop their own systems.
3. The provincial guidelines should specify categories of building assessment (e.g., area, rapid, and return-to-function), along with definitions, algorithms or procedures, guidelines, and resources (e.g., examples, job aids, etc.)
4. A robust PDBA system has the following characteristics:
  - Area Assessment: with the goal of determining an overall sense of areas that are damaged and some degree of the damage within those areas.
  - Rapid Assessment: with the goal of determining the safety, usability, and/or level of damage to buildings. Ideally, the Rapid Assessment should allow triage processes that quickly identify buildings that are obviously lightly (or not) damaged and those that are obviously unsafe, then identify those buildings which require a more comprehensive or technical assessment.
  - Return-to-Function Assessment: with the goal of identifying the nature and extent of damage, structural engineering assessment for repair or demolition, and functional assessment for return-to-function.

## 7.3 DESCRIPTIONS OF ASSESSMENT PROCEDURES

### 7.3.1 PROVINCIAL

1. A provincial or national description of building assessment procedures should include:
  - Overview of building assessment processes
  - Approach or goal of building assessment processes
  - Types of assessment
  - Procedures or steps in completing specific types of assessment
    - Diagrams, flowcharts, and/or algorithms
    - Descriptions of steps or procedures
  - Outcomes of assessment and placard categories
  - Procedures for completing, posting, changing placards
  - Criteria or elements to examine during assessment
  - Completing of forms associated with specific types of assessment
  - Integration with other emergency management assessments (e.g., geotechnical, HAZMAT, etc.)
  - Guidelines and advice for assessors
  - Examples and samples

Refer to the **PDBA Companion Manual** for examples and links to existing PDBA field guides and processes.

## 7.4 SPECIFIC ASSESSMENTS FOR PARTICULAR BUILDING TYPES/ TAXONOMIES

### 7.4.1 PROVINCIAL

1. Assessment procedures should be developed for specific types of buildings. The PDBA system should include taxonomies and procedures to guide selection of assessment procedures and types of assessors. These should include:
  - Building Assessment categories (e.g., simple residential, complex residential, commercial, high rise, etc.)
  - Building Construction (e.g., wood frame, masonry, reinforced concrete, etc.)
  - Building Importance (e.g., critical infrastructure, low priority storage, etc.)
  - Building Functions (e.g., residential, retail, water treatment complex, heritage, etc.)

Refer to the **PDBA Companion Manual: Building Status** for examples of taxonomies that may be useful in classifying and categorizing a community's building stock

### 7.4.2 EOC/LOCAL GOVERNMENT

1. 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.

### 7.4.3 ASSESSMENT TEAMS

1. Assessment teams must have personnel trained and capable of performing specific types of building assessment within their assigned areas.

Refer to the **PDBA Building Assessment and Personnel Matrix** in Appendix 2. This table provides an analysis to support matching skills, credentials, and backgrounds required to perform building assessment for common types of buildings.





08

BUILDING  
STATUS



## 8 BUILDING STATUS

The concept of Building Status incorporates a holistic evaluation of what is known about the damage, safety, usability, and functionality of a building based on the information available at any given time. As noted elsewhere, there are multiple sources of information about the status of a building, including sensor data, early USAR/search and rescue assessments, building assessment by local authority teams, geotechnical hazard assessment, private building assessments, or assessments by social services. Each of these groups may use placards, assessment forms, or other markings to indicate the status of a building from their own perspectives, which may sometimes conflict with outcomes or status identified through other processes. In addition, the status of a building may change based on subsequent events or more detailed or focused assessments (such as Wellington's experience in identifying specific classes of building that were more likely to suffer damage, based on analysis of the event). As the event moves from response to recovery, owners may make repairs and the PDBA system must be able to note the change in status. We suggest that a PDBA system should employ the concept of building status as a way of recording, monitoring, and responding to these changes over time.

Refer to the **PDBA Companion Manual: Building Status** for further discussion on the concept of Building Status.



## 8.1 COMPONENTS OF BUILDING STATUS

### 8.1.1 EOC/LOCAL GOVERNMENT

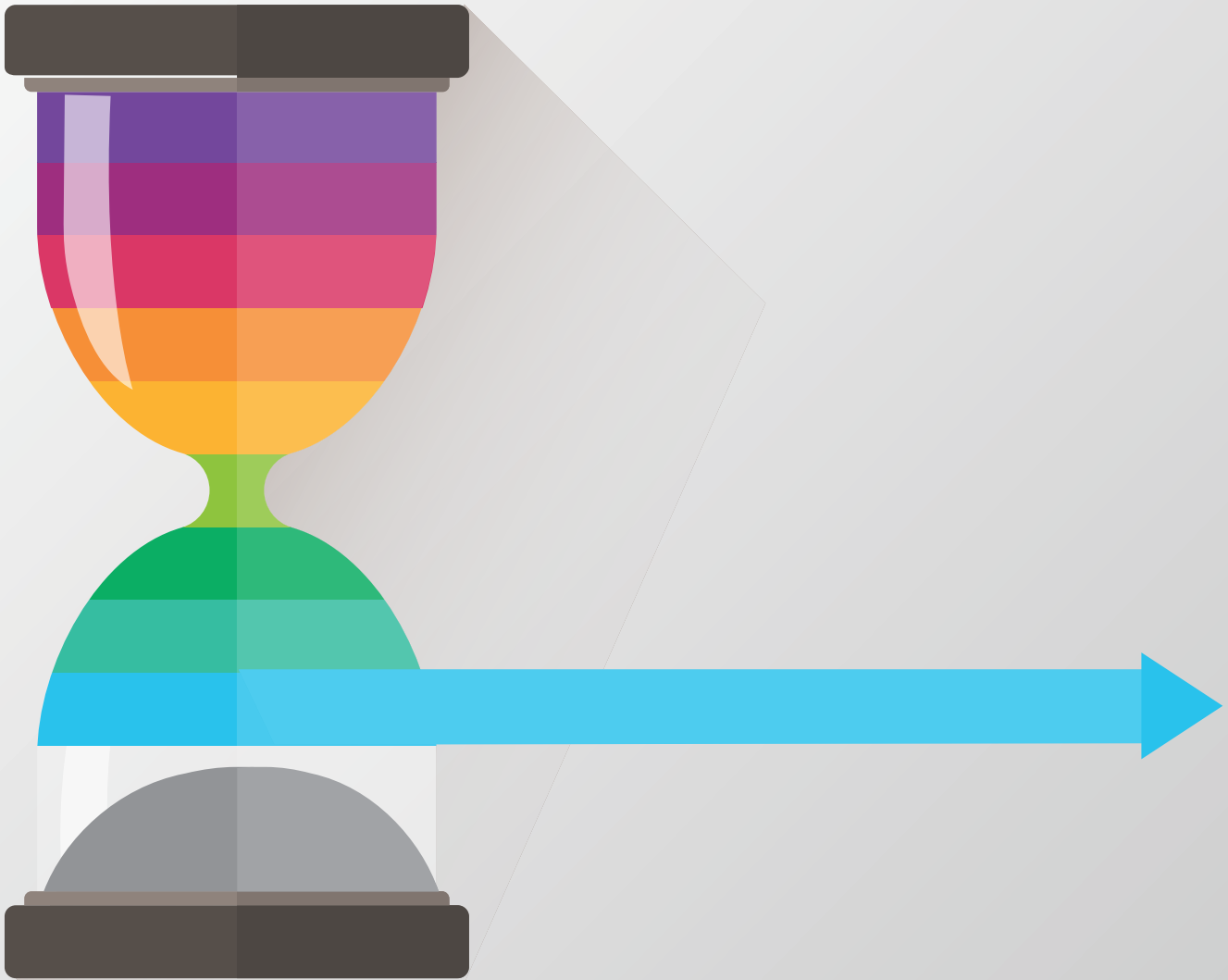
1. Local authorities should pre-establish initial criteria for determining Building Status. Building status goes beyond simply identifying the degree of structural damage to a building. Building status should represent a holistic summary of what is known about the damage, safety, usability, and functionality of a building based on the information available at any given time.
2. At a minimum, building status should represent a mix of a building's 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., it's placard outcome). Ideally, building status should incorporate area assessments, geotechnical assessments, and other assessments and relevant information sources.
3. Additional sources of information to inform overall building status include building assessments performed by CI owners and stakeholders with internal building assessment programs, building surveillance programs (e.g., pre-placement of accelerometers and other monitor devices in key buildings), social and general media, insurance assessments, and private engineering assessments, etc.
4. Local Government may also include useful categorizations, which may include, but are not limited to:
  - Building importance
  - Heritage or special status
  - Building construction type
  - Building assessment type (e.g. simple residential, complex commercial, etc.)
  - Use of short term countermeasures or cordons
  - Repair and/or demolition priority
5. A building's status should include results and categorizations based on assessments by local authorities as well as those performed by critical infrastructure and stakeholders with internal building assessment processes (if any).
6. Organizations with multiple units or assets may consider additional assessment and/or reporting scales to support more comprehensive assessment and asset allocation. For example, a scale of 1 to 10 could be used to determine the urgency for assessment, the level of damage, and/or the priority for repair.

## 8.2 CHANGING BUILDING STATUS OVER TIME

### 8.2.1 EOC/LOCAL GOVERNMENT

1. 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.).
2. Building Status must be updated over time to incorporate:
  - Additional assessments
  - Remediation, demolition, and/or repairs
  - Impact of subsequent events (e.g. recurrent flooding, aftershocks, etc.)
  - Other changes which may impact the damage, safety, usability, and functionality of a building
3. The concept and monitoring of building status should be incorporated into longer term municipal permitting and inspection programs.





09

PLACARDS



## 9 PLACARDS

Placards are the most visible aspect of PDBA. Placards are used 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 damage to owners and occupants. Placards are initially placed by authorized PDBA assessment teams (see Figure 5. Use of Placards in Building Assessment). These may be updated or changed based on subsequent assessment, such as following use of countermeasures, repairs, subsequent detailed or return-to-function assessment, and/or re-assessment based on secondary events such as recurrent flooding or aftershocks. This section discusses post-disaster building assessment conducted by a local authority. Be aware that other groups may be conducting building assessments, such as critical infrastructure owners or stakeholders with internal building assessment programs. Ideally, these assessments, and the use of placards indicating their outcomes, should be the same or similar.

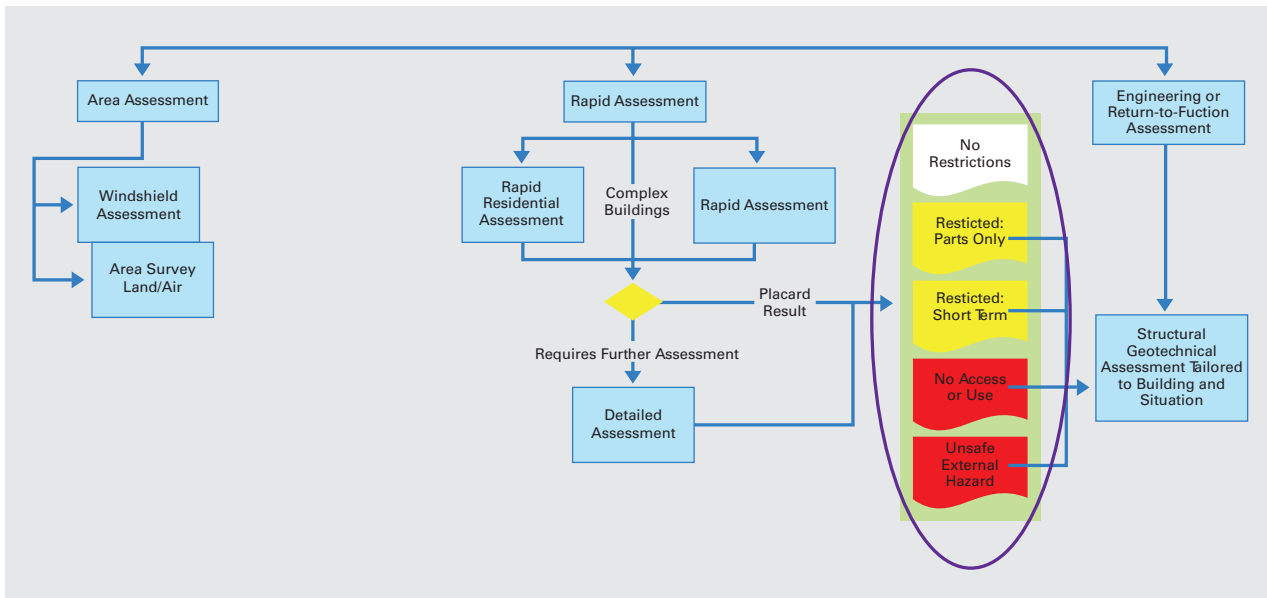


Figure 5. Use of Placards in Building Assessment.

Most PDBA systems employ three levels or categories of outcome, generally employing a three-colour model: White or Green to indicate no restrictions; Yellow to indicate that parts of the building are usable or that the whole building is usable with restrictions (e.g. shoring or stabilization of debris); and, Red to indicate that buildings should not be used or entered into (see Figure 6. Examples of Placard Models).

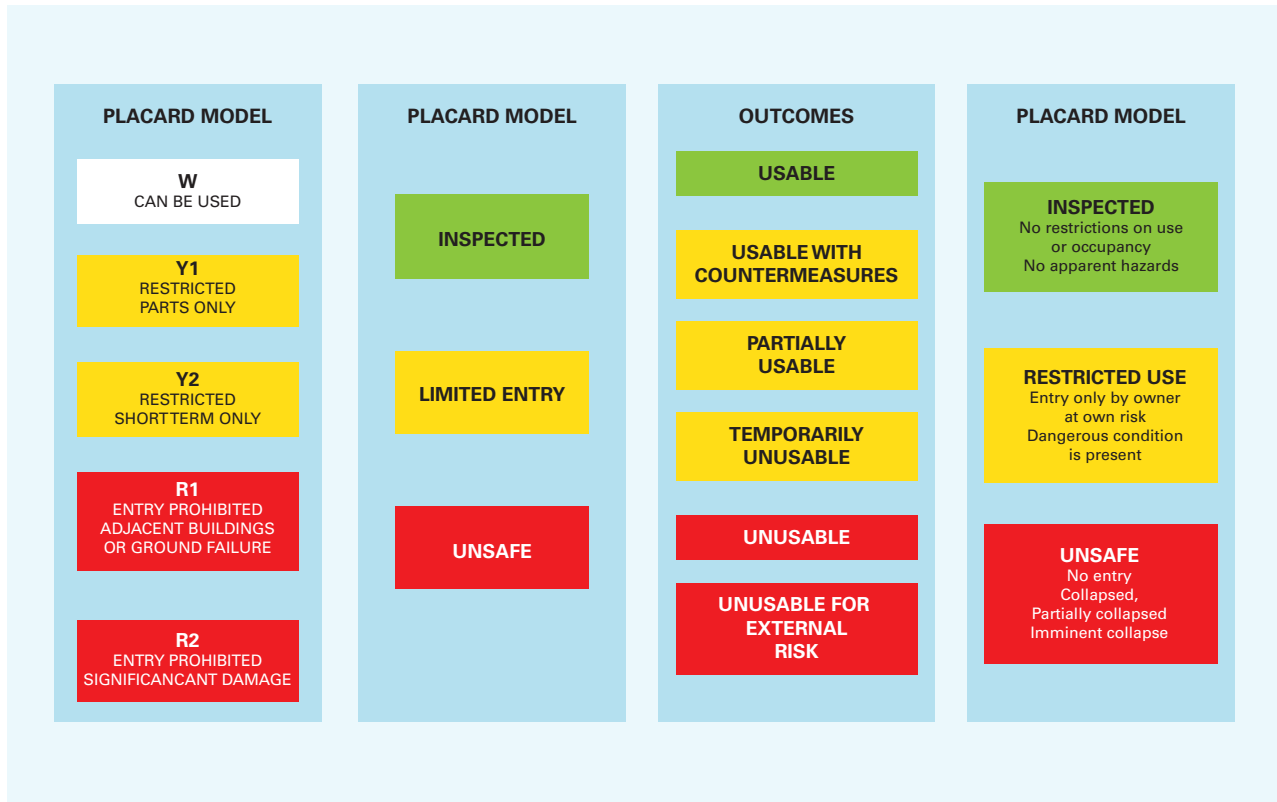


Figure 6. Examples of Placard Models.

The language used by different PDBA models varies, with nuances related to the overall goal of each system. Green criteria may indicate: “inspected,” “usable,” or “no restrictions on occupancy or use.” New Zealand recently changed from using Green to White for this level of placard to emphasize that the outcome states only that a building had been inspected and could be used, but that the building might still require a detailed engineering or return-to-use assessment. Many systems had multiple levels of Yellow which allowed “temporary use,” or “use after interventions or countermeasures” (e.g., shoring or tearing down unstable features such as chimneys), or “restricted use” of only portions of a building. Red generally indicated that a building was unsafe, although some systems had multiple categories distinguishing when a building was unsafe due to significant damage or from external hazards (e.g. unstable adjacent buildings or geohazards such as unstable slopes).

Also note that, as the event moves from initial response to sustained operations and recovery, the goals of building assessment may change. Local authorities should review and update their categories and definitions to reflect changing PDBA priorities and conditions.

## 9.1 PLACARD SYSTEMS

### 9.1.1 PROVINCIAL

1. A provincial/national standard should be established for colours, categories, and use of placards.

## EOC/Local Government

2. Local Government should follow recommendations of the provincial level to allow for consistency between communities. This is particularly important with mutual aid or shared resources.
3. Ideally, a system should include placards for use in initial response, some form of certificate for interim use of buildings during response and recovery, articulating into the local authority's inspection and permitting system.
4. Placard systems must include:
  - The categorization or outcome of building assessment (e.g., White/Green, Yellow, Red)
  - Rationale or notes explaining the outcome.
5. The colour and categorization indicate the safety and/or usability of a building, while reporting notes identify factors impacting the outcome (e.g., listing structural damage or identifying external/geotechnical hazards).
6. Guidelines are required for placement, maintenance and removal of placards (e.g., how many are required for a building? What location(s) should placard(s) be placed? Who is authorized to remove placards and under what condition?).
7. Guidelines and standardized information should be developed (e.g., door hanger, flyers, handouts, etc.) for building owners and occupants regarding placards, contacting Local Authorities, insurance, etc.

## 9.2 CATEGORIES AND DEFINITIONS

Refer to the **PDBA Companion Manual: Placards** for more information, descriptions, and examples of placard systems.

### 9.2.1 PROVINCIAL

The following definitions are proposed as a starting point for development of a placarding system :

#### **WHITE/GREEN**

Indicates that a building has been inspected by an authorized PDBA team and that there are no restrictions for entry or use. Further inspection or assessment may be required to identify need for repairs or return-to-function.

**YELLOW**

Indicates that a building has been inspected by an authorized PDBA team and that entry or use of the building is restricted. 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 portion(s) of a building as indicated on the placard
- Inability to use non-structural building components, such as water supply, gas appliances, septic field, 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**

Indicates that a building has been inspected by an authorized PDBA team and that a building is unsafe for entry or use. Buildings may be declared unsafe because of:

- Nature and extent of structural damage
- Geotechnical hazards such as unstable slopes
- Threatened by other buildings

**9.2.2 EOC/LOCAL GOVERNMENT**

1. Local authorities should have pre-established categories and definitions, as well as pre-printed placards.
2. PDBA systems vary in the degree to which they allow multiple outcomes within categories. For example, some systems have multiple outcomes under the yellow category including “further assessment required,” “restricted use of portions of the building,” and “restricted use until countermeasures completed.” These nuances often emerge based on experience over time or based on multiple events.
3. Categories and definitions should be reviewed during initial set up to ensure that they are relevant to the nature and extent of damage in the event. Similarly, these categories and definitions should be reviewed at regular intervals during extended operations to ensure that they remain useful to the changing context of response and recovery.

**9.2.3 ASSESSMENT TEAMS**

1. All assessors must know and understand the placard categories. Any changes to placard categories, definitions, or documentation must be reviewed by the PDBA leadership at daily briefings.
2. Ensure that documentation of White/Green placards includes explicit instructions on the need for further structural and return-to-use assessment and repairs.
3. Ensure that documentation of Yellow placards includes any restrictions, the rationale for those restrictions, and any actions required by owners and occupants (e.g., use of countermeasures or immediate repairs to allow restricted use).
4. Ensure that documents of Red placards includes the rationale for declaring the building unsafe (e.g., structural damage, geotechnical hazards, or threat from other buildings).

## 9.3 FORMAT AND CONTENT OF PLACARDS

### 9.3.1 EOC/LOCAL GOVERNMENT

1. Placards should contain, at a minimum:
  - Date of assessment
  - Identity of building (e.g., civic address, description/name, etc.)
  - Type of assessment (e.g., rapid residential, detailed, etc.)
  - Outcome of assessment
  - Restrictions or notes related to assessment outcome
  - Comments or rationale to support outcome
  - Required follow up actions, if any (e.g., use of countermeasures, need for detailed or structural engineering assessment, etc.)
  - Placard authority, such as the Identification ID (NOT assessor's name), credentials, and signature of assessor
  - Conditions under which placards may be removed or changed
  - Contact information for further information

Refer to the **PDBA Companion Manual: Placards** which provides descriptions and samples of placards and their content on the placards.

2. Placards or accompanying documentation may include:
  - Additional notes or clarification related to the assessment and its outcome
  - Use or requirement for short-term countermeasures
  - Other rating scales or assessments (e.g., geohazards, social services, etc.)
  - Contact numbers or locations where additional assessment information can be obtained
3. Placards should be:
  - Weather and UV ray resistant – e.g., synthetic paper, plasticized or printed on plastic
  - Sized appropriately so that the placard is easily visible, and the font size is large enough for easy review
  - Completed using permanent ink
4. Information provided on placards and accompanying documentation and assessor forms must be consistent.
5. PDBA placards, forms, documentation should include strategies for dealing with multiple languages that are common in an area/community.

## 9.4 AUTHORITY TO USE PLACARDS

### 9.4.1 EOC/LOCAL GOVERNMENT

1. Local authorities must establish the legal authority under which placards may be posted.
2. Guidelines and legal authority must be established to coordinate assessment and placard use by non-Local Authority personnel, such as critical infrastructure owners.



3. Local authorities must establish the credentials and/or background required by assessors to:
  - Sign and post placards
  - Change placards
  - Remove placards
4. Note that this authority must match the building assessment/taxonomy and assessor skill and ability.
5. Placards and documents must include the Identification ID (NOT name) and signature of an authorized assessor.
6. Local authorities must have mechanism for informing the public generally, and owners and occupants of affected building specifically, about how placards are used, what the different categories mean and require of owners/occupants, who has authority to change/remove them, and where to obtain further information.
7. Placards should indicate under what conditions or who can remove placards.

Refer to the **PDBA Companion Manual: Placards** for further discussion on issues around the authority to place, modify, and remove placards.

8. These criteria may be indicated on the placards (e.g., pre-agreement and wording already on the placard) or may have section on the placard to put on the conditions
9. Local authorities must develop a mechanism to transition from use of placards during an emergency (e.g., emergency powers, or authority in legislation) to business-as-usual inspections and permitting.

## 9.4.2 ASSESSMENT TEAMS

1. Ensure that teams identify who has the authority to sign, change, and/or remove placards/forms.
2. Note that this authority must match the building assessment/type of assessor taxonomy.
3. Assessors should have identification ID (e.g., identification numbers) and should NOT put their names on any placards or other documentation at the scene.

## 9.5 OVERLAP OF PLACARDS WITH OTHER EMERGENCY MANAGEMENT ASSESSMENTS

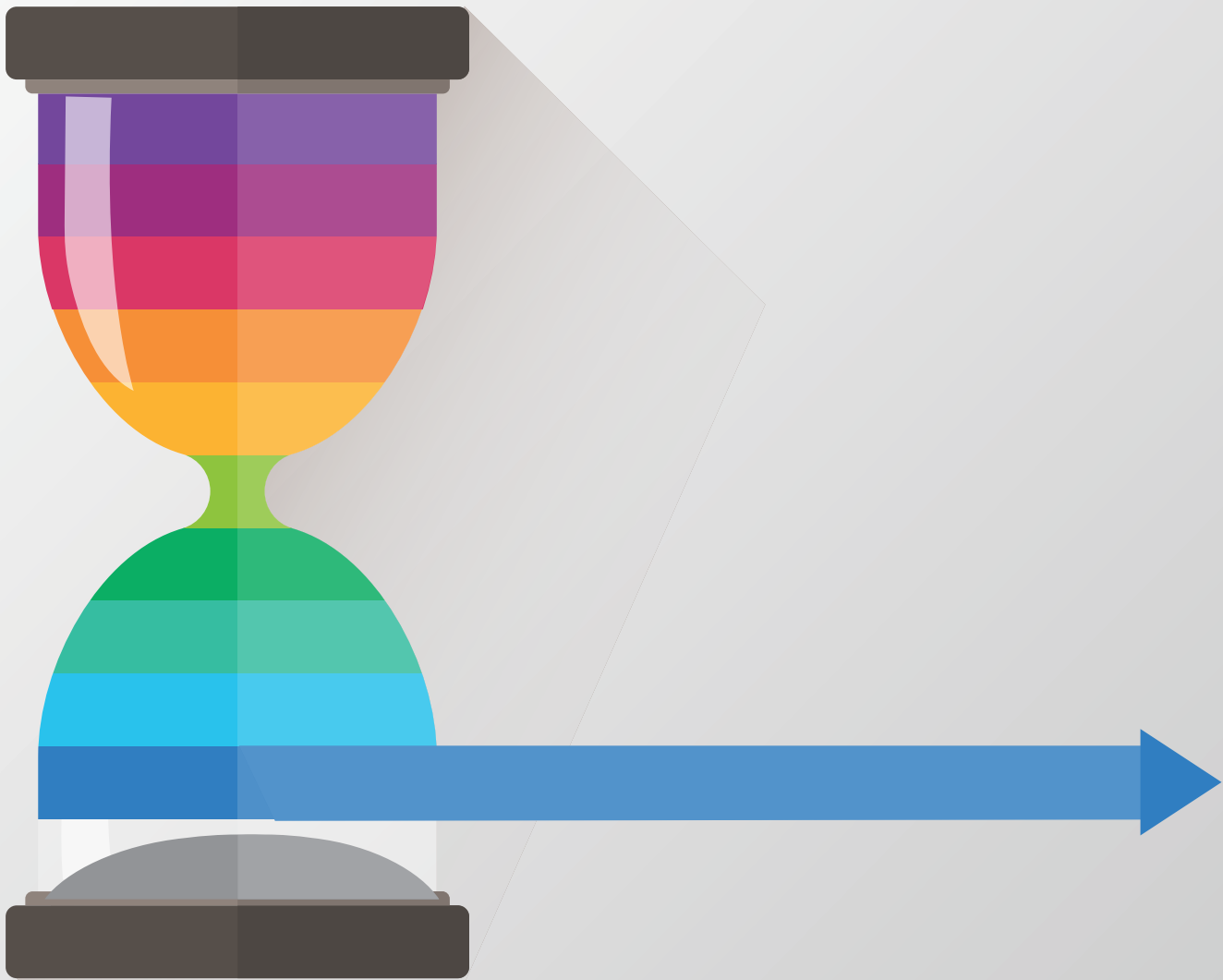
### 9.5.1 EOC/LOCAL GOVERNMENT

1. Local authorities must establish an overall mechanism for reconciling status from various assessments, such as initial USAR searches, use of countermeasures, rapid damage assessment, geotechnical hazards assessment, danger from other buildings, and return-to-function assessments (see section on Building Status).
2. Potential strategies include:
  - Establishing a Damage Assessment Branch within their Emergency Operations Centre to serve as the focal point for coordinating all damage and safety assessments within the community.,
  - Integrating use of short-term countermeasures and geotechnical assessment into the overall building assessment process.
  - Strategic scheduling to ensure that area, USAR, countermeasures, environmental, and/or geotechnical hazard assessments have been completed in an area prior to building assessment.

- Incorporating an overall “Building Status” model that includes all potential assessments in placarding and onsite documentation.
3. Local authorities should develop a public information system that allows assessors, owners and occupants, and the public to obtain current status of buildings, including whether or not they have been assessed, outcomes and restrictions from the building assessment, and status from other assessments.

## 9.5.2 ASSESSMENT TEAMS

1. Assessment teams should check status of other assessments, such as geotechnical hazards, before beginning building assessment.



10

ASSESSMENT  
PERSONNEL



## 10 ASSESSMENT PERSONNEL

Provincial or national departments or agencies that are involved in PDBA networks should work with professional associations (e.g., building officials, engineers and architects, etc.), CI owners, and stakeholder organizations with internal building assessment programs to establish guidelines for recruitment and rosters of appropriately trained personnel. In the pre-event phase, all stakeholders, including government, should collaborate to identify the credentials, background, experience, and training required to participate in PDBA. Local authorities should have processes in place to identify and recruit appropriate personnel during an event and for sustained or large-scale operations.

### 10.1 ROLES AND EXPECTATIONS

#### 10.1.1 PROVINCIAL

1. A provincial or national agency responsible for PDBA should establish roles and expectations for key personnel involved in PDBA operations, including:
  - PDBA Manager
  - Assessment Section Leaders
  - Assessment Team Leaders
  - Assessors

Refer to the **PDBA Companion Manual: Assessment Personnel** for examples of personnel charts and descriptions of roles and expectations for assessment personnel.

## 10.1.2 EOC/LOCAL GOVERNMENT

1. Local authorities should establish roles and expectations for key personnel involved in PDBA operations, including:
  - PDBA Manager
  - Assessment Section Leaders
  - Assessment Team Leaders
  - Assessors

## 10.1.3 ASSESSMENT TEAM

1. Team leaders must ensure that all team members are aware of their respective roles, authority, and expectations.

# 10.2 RECRUITMENT, EDUCATION, BACKGROUND, EXPERIENCE

## 10.2.1 PROVINCIAL

1. Ideally, a provincial or national body responsible for PDBA operations should establish relationships and/or memoranda of understandings with key professional organizations (e.g., engineers, architects, etc.), CI owners, and stakeholder organizations with internal building assessment programs with the goal of:
  - Recruiting appropriate personnel for PDBA training and operations
  - Developing and/or establishing standards for PDBA personnel and training
  - Conducting and/or monitoring training (both initial and ongoing) by other bodies
  - Maintaining up-to-date rosters of personnel who may be deployed to a damaging event

Refer to the **PDBA Companion Manual: Assessment Personnel** for discussion on how New Zealand has developed a comprehensive national-level recruitment and training program.

2. Recruitment and training programs must anticipate differences in the background, expertise, availability, and ability of potential assessors. The recruitment process should have opportunities and mechanisms to ensure that all participants have a common foundation or meet established prerequisites before taking PDBA training.

## 10.2.2 EOC/LOCAL GOVERNMENT

1. Local authorities should establish relationships with local and/or regional professional bodies, CI owners, and stakeholders with internal building assessment programs with the goal of:
  - Identifying personnel who may be deployed to a damaging event
  - Conducting local orientation, training and exercises
2. Local authorities must have systems in place to ensure that assessors have appropriate education, background, and/or experience before engaging in PDBA operations.

## 10.2.3 ASSESSMENT TEAM

1. Assessment team leaders should ensure that personnel on operational teams have the required background, experience, and/or training to perform their roles.

## 10.3 REGISTRIES AND ROSTERS

### BC CONSIDERATIONS:

Due to legal considerations, professional associations in British Columbia may not be directly involved in establishing a PDBA registry. However, a provincial agency may establish a roster of professionals (e.g. engineers and architects) who volunteer to take training and participate in PDBA operations. The role of professional associations in this model is to encourage support from their membership, and to confirm registration, education, and date/expiry of relevant training through the organization.

### 10.3.1 PROVINCIAL

1. Ideally, a registry should be established at a provincial or national level that identifies personnel who have been recruited and trained for PDBA operations, including:
  - Name
  - Contact
  - Credentials
  - Background/experience
  - Types of roles/assessments that may be assumed
  - Initial PDBA training
  - Ongoing PDBA refresher training or experience
  - Authority to share their contact information with impacted local authorities in emergencies
2. In the absence of provincial or national registries, provincial or national departments responsible for PDBA should have access to rosters maintained by professional bodies, CI owners, and stakeholders with internal building assessment programs.
3. Ideally, memorandums of understanding or equivalent agreements should be in place between government, professional bodies, CI owners, and other stakeholders with internal building assessment programs to facilitate use of personnel with PDBA training in an emergency.
4. Ideally, rosters should allow members to indicate their availability for sustained deployment and/or ability to respond outside their normal local or geographical areas.
5. Provincial and national government agencies and departments should have mechanisms in place to allow activation of PDBA trained personnel from different regions for large scale or ongoing operations.

### 10.3.2 EOC/LOCAL GOVERNMENT

1. Local authorities should identify local resources and personnel who have PDBA training and experience, including personnel within the local authority organizations.
2. Local authorities should have mechanisms to access lists of PDBA trained personnel from provincial and national registries, or registries of professional bodies, CI owners, and other stakeholders with internal building assessment programs.
3. Local authorities should have memorandums of understanding or equivalent agreements in place with other levels of government, professional bodies, CI owners, and other stakeholders with internal building assessment programs to facilitate use of personnel with PDBA training in an emergency.
4. Local authorities should have plans in place to facilitate the use of volunteers, including mechanisms for identifying and validating credentials and training, as well as identifying appropriate roles for these personnel, when appropriate.

## 10.4 LEGAL AND LIABILITY ISSUES

### 10.4.1 PROVINCIAL

1. Provincial and national governments should establish a framework to address legal protection, liability, and worker safety across all phases of an event.

Refer to **PDBA Resources: Assessment Personnel** for discussion and examples of how several systems have addressed these issues.

### 10.4.2 EOC/LOCAL GOVERNMENT

1. 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.
2. Local authorities must establish and maintain resources and processes to address issues around payment and support of PDBA personnel.

## 10.5 PERSONNEL REQUIREMENTS FOR SUSTAINED OPERATIONS OR LARGE SCALE EVENTS

### 10.5.1 PROVINCIAL

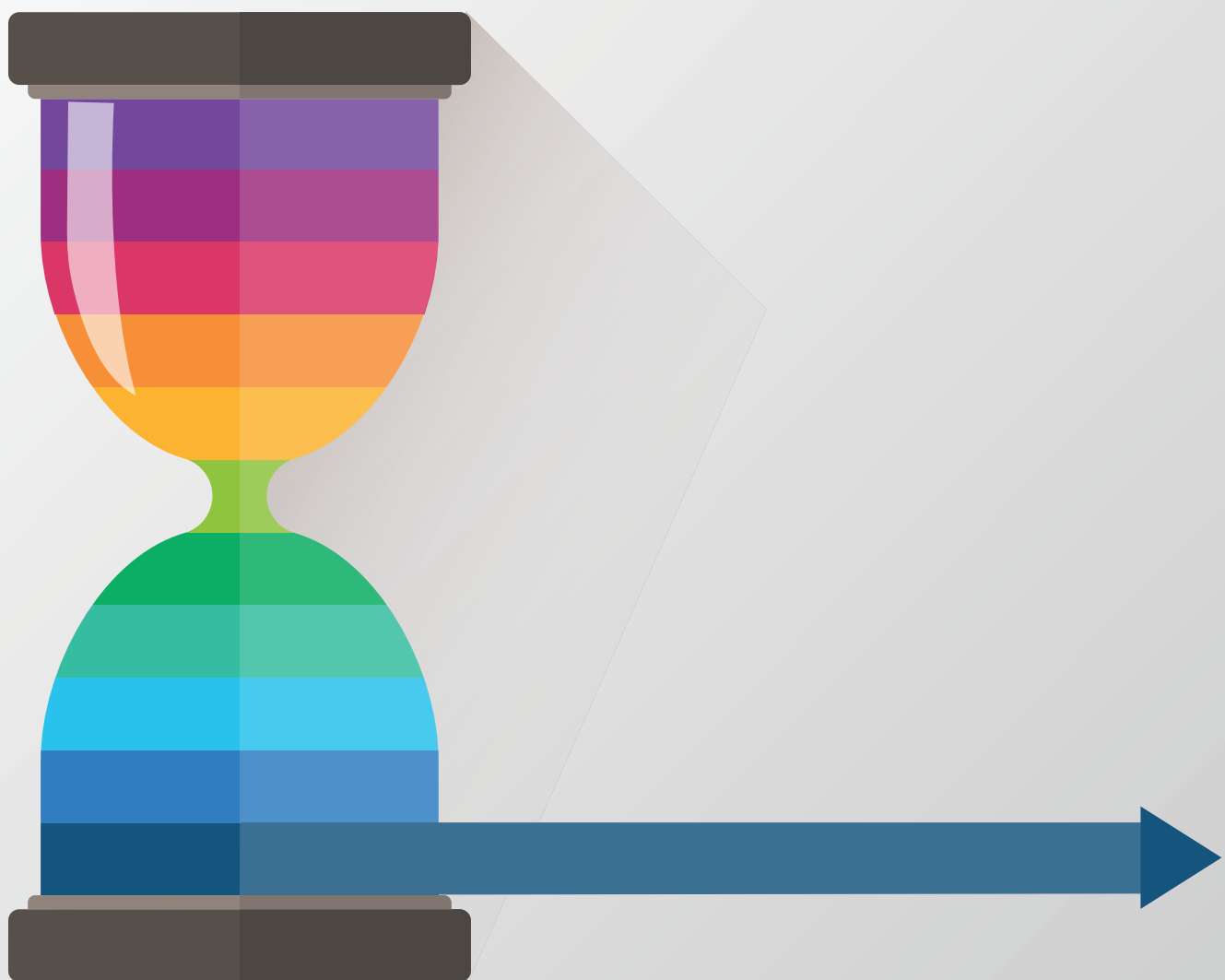
1. Provincial and national governments must balance local needs and available resources during an event. Recruitment of PDBA personnel for the event (as opposed to pre-event recruitment and training) should be managed at the lowest level, for example by local authorities. However, this must be supported, and supplemented when required, by more senior levels of government.
2. Senior levels of government should monitor ongoing operations with the goal of early identification of need for additional personnel and resources. When required, senior levels of government should collaborate to identify and/or train additional personnel for sustained operations or large-scale events.

### 10.5.2 EOC/LOCAL GOVERNMENT

1. Local authorities must establish and monitor personnel and resource needs on an ongoing basis. Local authorities should anticipate need for additional resources, or for resources required for sustained operations and work with senior levels of government to maintain adequate levels of staffing.







11

TRAINING



# 11 TRAINING

National or Provincial bodies that are involved in PDBA networks should develop guidelines and standards for curriculum. Ideally, a standardized approach and core education program should be developed by the overall agency or organization (e.g., Provincial or National government agency or department, network, or consortium of stakeholders) that establishes and maintains PDBA processes. This core curriculum should then be used as the basis for tailored training for Local Government, professional associations who support PDBA, and other stakeholders with internal building assessment programs. Initial training should include distributed and online material, classroom sessions, and, ideally, practical sessions incorporating role play, simulation, and/or live exercises as appropriate. Initial training should be supplemented by annual refresher training and/or exercises.

## 11.1 GOALS OF TRAINING

1. Post-Disaster Building Assessment training has several goals to:
  - Foster capacity and proficiency of key personnel to establish and maintain PDBA operations, lead PDBA assessment teams and sections, and perform building assessments.
  - Establish foundational knowledge and develop proficiency in conducting PDBA operations. This requires both theoretical knowledge and the opportunity to perform and practice (in role play, simulations, and/or exercises) the key activities required of participants' PDBA roles.
  - Ensure, and, if necessary, addressing gaps in foundational PDBA capabilities, gain situational and operational awareness, become familiar with operational roles, requirements, and procedures of the event-in-progress through initial orientation training.
  - Maintain readiness, foster proficiency, and ensure up-to-date skill and knowledge of PDBA operations through ongoing training.
  - Update personnel on new or revised operational requirements (e.g., revised procedures, equipment, etc.) over the duration of the event through just-in-time training.

## 11.2 CORE CURRICULUM PRINCIPLES

1. Education and training for PDBA should address four levels:
  - Assessors: those who perform building assessments
  - Assessment Team and Section Leaders: those perform building assessments, manage teams or groups of teams within an area, and have authority and expertise to sign-off placards
  - Building Assessment Coordinator/Manager: those who set up and maintain building assessment operations at the local authority level
  - EOC/Emergency Management Leaders with PDBA responsibilities: to develop awareness of building assessment operations within the context of overall EOC/Emergency Management event
2. Core education and training for PDBA should include:

### 11.2.1 CURRICULUM GUIDELINES FOR ASSESSORS

- Introduction to PDBA
- EOC/Emergency Response overview
- Overview of PDBA operations
  - Structure and command
  - Scope of assessor roles
  - Team roles and membership
  - Equipment
  - Communications
  - Liability, logistics, and administration
- Leadership and communications
  - Team dynamics
  - Interaction with other emergency response personnel
  - Interaction with owners, occupants, and bystanders
  - Interaction with media
- Managing personal health, wellness, and fitness to practice (including stress and psychosocial considerations)
- Field safety practices
  - Area safety and approach to buildings
  - Identifying life safety hazards
  - Building hazards
  - Non-structural hazards
  - Geo-hazards
  - Hazardous Materials
  - Short Term Countermeasures: Propping, shoring, cordoning
- Skills and procedures for building assessment
  - Skills/procedures required based on gap between assessment requirements and type/background of assessors (e.g., engineers, architects, building inspectors, etc.) – based on assessment matrix.
- Documentation
  - Principles
  - Placards, permits
  - Forms
  - Technology-supported data collection
- Building Assessment Procedures
  - Outcomes and placards
  - Conducting rapid residential assessments
  - Conducting rapid building assessments
  - Conducting detailed engineering assessments
  - Principles of return-to-function assessments
- Assessment of Specific Building/Construction Types

Ideally, this training should be a mix of distributed/online learning, classroom, and practical/simulation-based delivery. Existing international programs range from 4 hour sessions focused strictly on specific assessment procedures for particular types of buildings to comprehensive multi-week programs that include PDBA within a larger emergency response framework for dedicated teams.

## 11.2.2 CURRICULUM GUIDELINES FOR ASSESSMENT TEAM AND SECTION LEADERS

Additional training should be developed for those who are leading assessment teams and/or groups/sections of assessment teams. This training should include the core Assessor training as well as:

- Roles, responsibilities, and expectations for Building Assessment Team Leaders and Section Leaders
- Authority and legal considerations for signing placards/permits
- Leadership and communications for team leaders
- Team health, wellness, and fitness to practice (including stress and psychosocial considerations)

Ideally, this training should be a mix of distributed/online learning and classroom delivery, including the use of practical learning activities such as simulation- or role play-based delivery.

## 11.2.3 CURRICULUM GUIDELINES FOR PDBA COORDINATOR/MANAGERS

In addition to Assessor and Assessment Team/Section Leader training, personnel who will assume administrative, coordinator, or management functions for PDBA should receive training that includes:

- Role of PDBA within the overall context of emergency management
- Pre-planning and preparation
- Activation, deployment, and demobilization
- Establishing and sustaining PDBA operations
  - Set up
  - Equipment
  - Communications
  - Logistics
  - Personnel: operational and support
- Data and information management
- PDBA strategies and priority formation
- Team Management
  - Recruitment
  - Team formation
  - Deployment and monitoring
  - Briefings and debriefings
- Health, wellness, and fitness to practice
- Liaison with EOC, LA, and other stakeholders
- Transition to sustained operations

Ideally, this training should be a mix of distributed/online learning and classroom delivery. We recommend additional practical learning activities, including simulation- or role play-based delivery, as well as application in community level exercises.

## 11.2.4 EOC/EMERGENCY MANAGEMENT LEADERS WITH PDBA RESPONSIBILITIES

Orientation training should be developed for EOC personnel or emergency management leaders who will work alongside or provide leadership to PDBA operations. This training should include:

- Goal and function of PDBA
- Principles of PDBA operations
- Relationship of PDBA to other EOC functions

This training may be provided by distributed/online learning and/or classroom delivery. Consideration of PDBA orientation should be included in EOC and community-level exercises and training.

Refer to the **PDBA Companion Manual: Training** for discussion and examples of PDBA education and training programs.

## 11.3 RESPONSIBILITY FOR PDBA TRAINING

### 11.3.1 PROVINCIAL

1. Core education and training, along with supporting material and resources, should be developed at a provincial and/or national level. This programming should then serve as the core components of training programs developed at the Local Government level, and by professional bodies such as engineers, architects, building inspectors, etc., and by stakeholder organizations with internal building assessment programs.

PDBA training is currently available in BC through BC Housing. In addition, many critical infrastructure organizations and local authorities have developed internal PDBA training programs.

### 11.3.2 EOC/LOCAL GOVERNMENT

1. Local authorities should ensure that training in local PDBA response is available for all personnel who will engage in PDBA operations. Some of this training may be conducted through stakeholder organizations, particularly for assessor-level training (e.g., through professional associations). Local Government should develop ongoing exercise and/or refresher training on an annual basis.

### 11.3.3 ASSESSMENT TEAM

1. Personnel engaged in PDBA operations should receive initial training from their professional associations or through provincial or local authorities. Specific training, exercises, and refresher training should be available for assessors at the local level.

## **11.4 STANDARDS, GUIDELINES, OWNERSHIP, AND RESPONSIBILITY FOR CURRICULUM**

### **11.4.1 PROVINCIAL**

1. Core education and training, along with supporting material and resources, should be developed at a provincial and/or national level. This programming should then serve as the core components of training programs developed at the Local Government level, and by professional bodies and/or stakeholder groups such as engineers, architects, building inspectors, etc.
2. Core education and training guidelines should be based on an analysis of the roles and requirements of specific PDBA functions (e.g., assessors, assessment team and section leaders, PDBA coordinators/managers, and EOC/Emergency Management leaders) and the background and experience of likely personnel performing those roles (e.g., structural engineers, other engineers, architects, building inspectors, building managers, building construction personnel, etc.).
3. Ideally, core education and training should be included in entry-to-practice education for relevant professions, disciplines, and trades (e.g., Engineering, Architects, Building Officials, Construction personnel, etc.).
4. Core curriculum for EOC and Emergency Management Leaders, as well as for Building Assessment Coordinators/Managers, should be developed and delivered at the provincial or national level.
5. Curriculum at the Assessor level, based on the provincial core curriculum, should be developed and delivered for their personnel by key stakeholder groups, such as structural engineers, geotechnical engineers, architects, building inspectors/officials, and construction personnel.
6. Training programs must be scalable and have multiple methods of delivery to ensure accessibility by personnel in remote, rural, and urban communities.

### **11.4.2 EOC/LOCAL GOVERNMENT**

1. Local authorities should develop local training and/or orientation for EOC and Emergency management Leaders as well as those who will assume Building Assessment Coordinator/Manager roles that build on participants' core PDBA training. Local Government training should focus on local context, operational structures, and processes.
2. Local Government should develop training and/or orientation for building assessors and support personnel that build on participants' core PDBA training. This training should focus on local context, operational procedures, and processes.

### **11.4.3 ASSESSMENT TEAM**

1. Ongoing training and exercises at the Team level may be developed by dedicated teams, professional bodies and stakeholder groups, or Local Government.

## **11.5 PRE-EVENT TRAINING**

### **11.5.1 PROVINCIAL**

1. A provincial or national body should develop, maintain, and monitor overall training and education plan for PDBA. Ideally, this plan should identify, coordinate, and monitor PDBA training at local levels and by professional and stakeholder groups.

### **11.5.2 EOC/LOCAL GOVERNMENT**

1. Local authorities should develop, maintain, and monitor local training and plans for PDBA. Ideally, local authorities should be aware of PDBA training conducted by CI owners and other stakeholders with internal building assessment training.

2. Local Government should develop orientation training for volunteers and out-of-area personnel who will support local PDBA operations.

## **11.6 ONGOING AND REFRESHER TRAINING**

### **11.6.1 PROVINCIAL**

1. A provincial or national body should establish guidelines and expectations for ongoing and refresher training by professional bodies, stakeholder organizations with internal building assessment programs, and local authorities.

### **11.6.2 EOC/LOCAL GOVERNMENT**

1. Local Government PDBA personnel should engage in PDBA training and/or exercises on an annual basis.

### **11.6.3 ASSESSMENT TEAM**

1. Assessors and Team/Section Leaders should attend regular refresher training sessions, ideally annually, unless they have engaged in PDBA operations in that time.

## **11.7 PDBA PROCESSES AND FIELD GUIDES**

### **11.7.1 PROVINCIAL**

1. Consider the development of a provincial or national level PDBA process, including guidelines, field guides, and resources. These overarching guidelines may either be implemented at local levels or form the basis of locally developed processes. This will ensure consistency of process and documentation at individual level but allow flexibility to meet unique needs of different situations.

### **11.7.2 EOC/LOCAL GOVERNMENT**

1. Local authorities, critical infrastructure owners, and other stakeholders with internal building assessment processes should have pre-established PDBA procedures, field guides, and training. Ideally, these should be based on a provincial or national system that is tailored to meet the specific needs of the community or organization.

## **11.8 ORIENTATION TRAINING**

### **11.8.1 EOC/LOCAL GOVERNMENT**

1. Training programs should be developed with the goal of allowing local communities to provide adequate and effective training to personnel post-event on an as-needed basis.
2. Local Government must develop orientation training for all incoming PDBA personnel. This training should reinforce and review core PDBA content, provide orientation to the overall event and current PDBA activities, and prepare personnel for operational roles (e.g., team structures, equipment, logistics, communications, etc.).

## 11.9 JUST-IN-TIME TRAINING

### 11.9.1 EOC/LOCAL GOVERNMENT

1. Just-in-time training should include modules and/or content for team members, team leaders, and PDBA coordinators.
2. Local authorities should develop just-in-time PDBA training for incoming assessors to augment pre-trained personnel. This training should include both PDBA principles based on provincial training and orientation to local context, operational structures, and procedures.
3. Ideally, training and/or communication mechanisms should allow the capacity to learn in real time regarding specific situations.
4. Local authorities should pre-plan for additional training of PDBA personnel during ongoing operations. This training should provide updates to personnel on new or revised operational requirements (e.g., revised procedures, equipment, etc.) over the duration of the event, as well as emerging trends or operational issues.





# APPENDICES

# APPENDICES

## APPENDIX 1. LOCAL GOVERNMENT PROGRAM MATRIX

### APPENDIX 1: POST-DISASTER BUILDING ASSESSMENT - LOCAL GOVERNMENT PROGRAM MATRIX

Every community is different and will have varying resources to develop and maintain a Post-Disaster Building Assessment Program. This matrix provides context to some of the recommendations from the report and places them within the scope of basic, moderate or advanced actions for a local government assessment program. The matrix does not outline all potential actions, but hopes to provide some guidance for those developing or reviewing a program within their jurisdiction.

The first column of the matrix outlines potential focus areas for a program and are placed in sequential order. Although it should be noted that some actions may be carried out simultaneously or in different orders based on the unique needs of each community. The following three columns represent potential actions or recommendations which are basic, moderate or advanced in nature. Basic actions could be for a program under development or a program from a small community without dedicated resources. Moderate actions could be carried out as resources are made available or as goals for a moderately sized community. Advanced actions are those that could be considered for larger communities, those with dedicated resources or jurisdictions at significant risk.

The matrix does not outline all potential actions that a program should consider, nor does it include all the recommendations from the report, but it does provide a context for communities to consider when identifying priorities and allocating resources to their Post-Disaster Damage Assessment Program.

### LOCAL GOVERNMENT PDBA PROGRAM MATRIX

	Focus Area	Basic Actions	Moderate Actions	Advanced Actions
1	Identify scope and complexity of PDBA requirements	<ul style="list-style-type: none"> <li>Review HRVA and community context</li> </ul>	<ul style="list-style-type: none"> <li>Identify generalized building/ infrastructure vulnerabilities</li> <li>Identify the range of building types and potential assessment types for the community</li> <li>Evaluate current/required resource needs to address PDBA requirements</li> </ul>	<ul style="list-style-type: none"> <li>Gather and maintaining key information about buildings, soil-types, hazard impacts, geotechnical risks, and anticipated damage patterns in the community</li> <li>Evaluate/determine the community's risk tolerance in relation to safety and post-disaster usability of buildings</li> </ul>
2	Establish PDBA leadership group	<ul style="list-style-type: none"> <li>Identify/ engage internal champion(s) to support PDBA program</li> </ul>	<ul style="list-style-type: none"> <li>Strike informal advisory group to provide PDBA program input</li> </ul>	<ul style="list-style-type: none"> <li>Formalize PDBA leadership committee with links to/ involvement of external stakeholders</li> </ul>
3	Obtain formal commitment from organization	<ul style="list-style-type: none"> <li>Obtain approval to proceed from supervisor</li> </ul>	<ul style="list-style-type: none"> <li>Obtain program commitment from key departments and organizational leadership</li> </ul>	<ul style="list-style-type: none"> <li>Secure agency/community policy/directive to empower PDBA program and organizational involvement</li> <li>Secure ongoing funding</li> </ul>

	Focus Area	Basic Actions	Moderate Actions	Advanced Actions
4	Confirm/establish suitable legal and regulatory mechanism to support PDBA	<ul style="list-style-type: none"> <li>Identify capabilities of existing legal and regulatory mechanism</li> </ul>	<ul style="list-style-type: none"> <li>Identify limitations of existing legal and regulatory mechanism</li> </ul>	<ul style="list-style-type: none"> <li>Establish bylaws and/or legislation that addresses limitations and extends past the period of emergency powers into return to business-as-usual</li> <li>Consider the financial and legal implications of short-term countermeasures, cordoning off of areas, and other temporary safety measures</li> </ul>
5	Develop operational plan, procedures and guidelines	<ul style="list-style-type: none"> <li>Develop Basic PDBA program description</li> </ul>	<ul style="list-style-type: none"> <li>Develop PDBA Plan including:                             <ul style="list-style-type: none"> <li>program purpose/ description</li> <li>criteria and processes for activation of PDBA</li> <li>roles and responsibilities</li> <li>daily deployment processes</li> <li>personnel accountability processes</li> <li>procedures for manage stress and psychological health of responders</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Develop detailed procedures and guidelines for field operations and support/ coordination functions</li> <li>Ensure integration of PDBA plan within community's overall emergency management plan and plans of related stakeholders</li> <li>Establish initial PDBA strategies based on hazard analysis/ anticipated impact</li> </ul>
6	Develop assessment personnel	<ul style="list-style-type: none"> <li>Identify/establish roster of internal assessment personnel</li> <li>Provide standard RDA training for identified personal</li> <li>Brief personnel on local PDBA program expectations</li> </ul>	<ul style="list-style-type: none"> <li>Identify capabilities/utilization of credentialed and non-credentialed assessment personnel</li> <li>Identify plan to use external assessment personnel based on capabilities/qualifications</li> <li>Develop/deliver customized local training on specific operational plans, procedures and guidelines</li> </ul>	<ul style="list-style-type: none"> <li>Implement ongoing recruitment and training plans for personnel</li> <li>work with regional and provincial bodies to establish processes for accessing out-of-area personnel</li> <li>Establish an audit team to sample and review assessment results for quality assurance and decision-making</li> <li>Conduct regular drills and exercises with personnel, including:                             <ul style="list-style-type: none"> <li>activation and communication processes and procedures</li> </ul> </li> </ul>

Focus Area	Basic Actions	Moderate Actions	Advanced Actions
7 Enhance situational awareness capabilities and data/information management systems	<ul style="list-style-type: none"> <li>Develop/adopt standardized PDBA forms and data collection methods</li> <li>Develop daily team briefing and debriefings practices, including the method for collecting damage information for assessment teams</li> <li>Identify means to access local building data</li> </ul>	<ul style="list-style-type: none"> <li>Develop a practice for the collection, analysis and dissemination of PDBA data</li> <li>Implement a system to identify the source, validate, and translate/adapt PDBA information received from external sources</li> </ul>	<ul style="list-style-type: none"> <li>Develop/utilize technology-based data collection systems in the field to foster consistent data collection and reduce manual data entry requirements</li> </ul>
8 Develop program support/coordination personnel	<ul style="list-style-type: none"> <li>Identify program support and coordination functions and integrate into plans</li> <li>Develop and maintain a roster of support personnel</li> </ul>	<ul style="list-style-type: none"> <li>Formalize/conduct local training for support personnel</li> </ul>	<ul style="list-style-type: none"> <li>Conduct regular drills and exercises with support personnel</li> <li>Implement ongoing recruitment and training plans for personnel</li> </ul>
9 Compile required resources, equipment and supplies	<ul style="list-style-type: none"> <li>Compile plans/procedures, copies of forms/placards and basic supplies/equipment for PDBA</li> </ul>	<ul style="list-style-type: none"> <li>Identify contents for field assessment team kits including operational tools and safety/ personal protective equipment</li> <li>Expand equipment and resource stock to address team and support/administrative requirements</li> </ul>	<ul style="list-style-type: none"> <li>Identify locations for PDBA administration/support, PDBA personnel staging/support areas</li> <li>Stockpile equipment and supplies for sustained PDBA support/administration and field assessment teams</li> </ul>
10 Address recovery/reconstruction damage assessment implications	<ul style="list-style-type: none"> <li>Identify potential recovery/reconstruction issues</li> </ul>	<ul style="list-style-type: none"> <li>Determine long term goals of recovery and reconstruction</li> <li>Identify practice and any associated policy/legislation required to integrate PDBA placards with regular building inspections practices</li> <li>Identify how the concept and monitoring of building status should be incorporated into long-term local permitting and inspection programs</li> </ul>	<ul style="list-style-type: none"> <li>Ensure suitable legislative powers are enacted to address reconstruction implications</li> <li>Identify modification to building permitting and inspection practices</li> <li>Identify method to pre-screen contractors for expedited permitting progress during reconstruction</li> <li>Identify/approve assessment standards for occupant/owner directed inspections</li> <li>Establish a Building Registry to track and monitor building status over time</li> </ul>

## APPENDIX 2: PDBA ASSESSMENT MATRIX

A key component of PDBA operations is the community-level formation of assessment teams, and – more directly – ensuring that assessment teams have the skills and capabilities required to function effectively. The PDBA Assessment Matrix provides an example of how communities can assemble teams of credentialed and non-credentialed personnel to effectively engage in post disaster building assessment.

Communities consist of a number of types of building, ranging in complexity by location, size, construction material, construction type, and other factors. Similarly, communities have a variety of different credentialed or professional personnel who may be involved in PDBA assessment, including structural engineers, architects, and other engineers. In addition, communities may have non-credentialed personnel who, with additional training, may participate in building assessment.

The PDBA Assessment Matrix is an example of a tool that communities may use to better understand what types of building stock are in their community and who can assess those buildings after a disaster.

**NOTE: The following matrix is an example only** – it is not intended to be a definitive tool, but rather a starting point which communities can adapt based on their own unique needs and capabilities. Please see the example provided after the generic matrix for how a small community might adapt the matrix to meet its own needs.

### DEFINITIONS AND DESCRIPTIONS

The Matrix relates three elements: building type, assessment type, and assessor type.

**Building Type:** The matrix lists a variety of buildings types, based on a standardized building taxonomy from the University of British Columbia. Communities should edit and adapt this taxonomy (e.g., delete building types that are not in the community, or add/adapt for other/specialized types of buildings) to reflect their current and planned building types.

**Assessment Type:** The assessment types in this matrix are based on the generic PDBA assessment algorithm in this PDBA Framework document. Communities are encouraged to adopt common PDBA processes to foster compatibility of processes and information between communities.

- Area is a general assessment of a community to determine what areas are damaged and to what extent. This assessment is often performed by first responders or designated local government personnel (e.g., a windshield assessment) and do not require PDBA assessors.
- Rapid Ext corresponds to a rapid (approximately 15 minute) exterior assessment.
- Rapid Ext/Int involves a rapid (approximately 15 – 20 minute) exterior and interior assessment.
- Detailed assessments are longer and more comprehensive (2 to 4 hour) structural assessments involving interior and exterior inspection.
- Engineering assessments involve comprehensive structural and functional assessment of a building to identify requirements for demolition or repair and reoccupation of a building. Options for this process could include developing an “all hazards” matrix, or matrices for different types of events.

**Assessor Type:** Note that the examples given in this matrix are based on a seismic event. Communities are encouraged to consider the types of personnel that will be available to their community and also how the matrix would have to change to meet the impact of different types of events, such as flooding or wild fire.

**Responsibility** refers to what stakeholder group has the responsibility for completing building assessments. Stakeholders identify in the example matrix include Local Government (LG), Local Government and/or Building Owner LG/OWNER, and building owner (OWNER).

**Authority** refers to who has the authority to conduct PDBA assessments, usually the Authority Having Jurisdiction (AHJ).

As noted above, the following example is based on the work of the PDBA research team. We would expect each of the elements in this matrix and process to be further developed by the newly formed British Columbia Post-Disaster Building Assessment (PDBA) Advisory Committee.

### Assessor Categories

The following categories of personnel for performing specific assessments are proposed for this example matrix. Communities should revise as required based on their analysis of hazard and building types.

**Level 3:** Non-credentialed personnel with relevant experience, such as contractors, construction tradespersons, or building managers. Level 3 assessors require formal PDBA assessor training, such as ATC 20/45 or equivalent.

**Level 2:** Building officials, architects, or engineers of any background. Level 2 assessors require formal PDBA assessor training, such as ATC 20/45 or equivalent.

**Level 1:** Structural engineers with formal PDBA assessor training, such as ATC 20/45 or equivalent.

### Team Composition Requirements

Each community must develop its own team composition requirements, similar to the following:

- Exterior teams may consist of a minimum of two personnel.
- Interior assessment teams should have a minimum of three personnel, one of whom remains outside during the assessment.
- The matrix identifies the minimum levels of personnel required for each type of assessment and type of building. Teams may have higher levels of expertise (e.g., an assessment listed as Level 3 may be conducted by teams including credentialed personnel or structural engineers), but not lower.
- Additional team members (e.g., fourth team members) may have any relevant background.
- Teams may be augmented by specialty members (e.g., geotechnical engineers, USAR members, ESS personnel) as required.

## POST DAMAGE BUILDING ASSESSMENT MATRIX: SAMPLE “GENERIC” MATRIX

Taxonomy		Description		RESPONSIBILITY AUTHORITY				
				LA	LA	LA	LA/OWNER	OWNER
					AHJ	AHJ	AHJ	AHJ
				Emergency Response				Return to Function
		ASSESSMENT TYPE		Area	Rapid Ext only	Rapid Ext/Int	Detailed	Engineered
TYPE A: SPECIALISED/ HIGHLY COMPLEX	C1H	Reinforced Concrete Moment Resisting Frames (C1)-High-Rise (> 8 stories)		2	1	1	1	1
	C2H	Concrete Shear Walls (C2)- High-Rise (> 8 stories)		2	2	1	1	1
	C3H	Concrete Frame Buildings with Unreinforced Masonry Infill Walls (C3)-High-Rise (> 8 stories)		2	2	1	1	1
	PC2H	Precast Concrete Frames with Concrete Shear Walls (PC2)-High-Rise (> 8 stories)		2	1	1	1	1
	RM2H	Reinforced Masonry Bearing Walls with Precast Concrete Diaphragms (RM2) - High-Rise (> 8 stories)		2	1	1	1	1
	S1H	Steel Moment Frame (S1) - High-Rise (> 8 stories)		2	2	1	1	1
	S2H	Steel Braced Frame (S2) - High-Rise (> 8 stories)		2	2	1	1	1
	S4H	Steel Frame with Cast-In-Place Concrete Shear Walls (S4) - High-Rise (> 8 stories)		2	2	1	1	1
	S5H	Steel Frame with Unreinforced Masonry Infill Walls (S5)- High-Rise (> 8 stories)		2	2	1	1	1
TYPE B: COMPLEX	C1L	Reinforced Concrete Moment Resisting Frames (C1)-Low-Rise ( 1-3 stories)		2	1	1	1	1
	C1M	Reinforced Concrete Moment Resisting Frames (C1)- Mid-Rise ( 4 -7 stories)		2	1	1	1	1
	C2L	Concrete Shear Walls (C2)- Low-Rise ( 1 -3 stories)		2	2	1	1	1
	C2M	Concrete Shear Walls (C2)- Mid-Rise ( 4 -7 stories)		2	2	1	1	1
	C3L	Concrete Frame Buildings with Unreinforced Masonry Infill Walls (C3)-Low-Rise ( 1 -3		2	2	1	1	1
	C3M	Concrete Frame Buildings with Unreinforced Masonry Infill Walls (C3)-Mid-Rise ( 4 -7		2	2	1	1	1
	PC1	Precast Concrete Tilt-Up Walls (PC1)		2	2	1	1	1
	PC2L	Precast Concrete Frames with Concrete Shear Walls (PC2)-Low-Rise ( 1 -3 stories)		2	2	1	1	1
	PC2M	Precast Concrete Frames with Concrete Shear Walls (PC2)-Mid-Rise ( 4 -7 stories)		2	1	1	1	1
	RM1L	Reinforced Masonry Bearing Walls with Wood or Metal Deck Diaphragms (RM1)- Low-Rise ( 1-3 stories)		2	2	1	1	1
	RM1M	Reinforced Masonry Bearing Walls with Wood or Metal Deck Diaphragms (RM1)- Mid-Rise (> 4 stories)		2	1	1	1	1
	RM2L	Reinforced Masonry Bearing Walls with Precast Concrete Diaphragms (RM2)- Low-Rise ( 1-3 stories)		2	2	1	1	1
	RM2M	Reinforced Masonry Bearing Walls with Precast Concrete Diaphragms (RM2)- Mid-Rise ( 4 -7 stories)		2	1	1	1	1
	S1L	Steel Moment Frame (S1) - Low-Rise ( 1 -3 stories)		1	2	2	1	1
	S1M	Steel Moment Frame (S1) - Mid-Rise ( 4 -7 stories)		2	2	1	1	1
	S2L	Steel Braced Frame (S2) - Low-Rise ( 1 -3 stories)		2	2	2	1	1
	S2M	Steel Braced Frame (S2) - Mid-Rise ( 4 -7 stories)		2	2	2	1	1
	S4L	Steel Frame with Cast-In-Place Concrete Shear Walls (S4)- Low-Rise ( 1 -3 stories)		2	2	2	1	1
	S4M	Steel Frame with Cast-In-Place Concrete Shear Walls (S4)- Mid-Rise ( 4 -7 stories)		2	2	2	1	1
	S5L	Steel Frame with Unreinforced Masonry Infill Walls (S5)- Low-Rise ( 1 -3 stories)		2	2	2	1	1
S5M	Steel Frame with Unreinforced Masonry Infill Walls (S5)- Mid-Rise ( 4 -7 stories)		2	2	1	1	1	
URML	Unreinforced Masonry Bearing Walls (URM) - Low-Rise ( 1 -2 stories)		2	2	1	1	1	
URMM	Unreinforced Masonry Bearing Walls (URM)- Mid-Rise (> 3 stories)		2	2	1	1	1	
TYPE C: SIMPLE, NON-COMPLEX	W1	Wood, Light Frame (W1)		3	3	3	2	2
	W2	Wood, Greater than 5,000 Sq. Ft. (W2)		3	2	2	1	1
	WPB	Wood Post & Beam		3	2	2	1	1
	MH	Mobile Homes (MH)		3	3	3	2	2
	S3	Steel Light Frame (S3)		3	2	2	1	1

## POST DAMAGE BUILDING ASSESSMENT MATRIX – SAMPLE SMALL COMMUNITY

The following is a sample created by a small community in British Columbia. It is provided as an example of how a smaller community might adapt the more comprehensive generic Matrix based on the community's needs.

Sample Small Community

Taxonomy			ASSESSMENT TYPE		RESPONSIBILITY AUTHORITY					
					LA	LA	LA	LA/OWNER	OWNER	
						AHJ	AHJ	AHJ	AHJ	
					Emergency Response				Return to Function	
Description			Area	Rapid Ext only	Rapid Ext/Int	Detailed	Engineered			
TYPE B: COMPLEX	C1L	Reinforced Concrete Moment Resisting Frames (C1)-Low-Rise (range between 1 -3 stories)		2	1	1	1			
	C2L	Concrete Shear Walls (C2)- Low-Rise (range between 1 -3 stories)		2	2	1	1			
	C3L	Concrete Frame Buildings with Unreinforced Masonry Infill Walls (C3)-Low-Rise (range between 1 -3)		2	2	1	1			
	PC1	Precast Concrete Tilt-Up Walls (PC1)		2	2	1	1			
	PC2L	Precast Concrete Frames with Concrete Shear Walls (PC2)-Low-Rise (range between 1 -3 stories)		2	2	1	1			
	S1L	Steel Moment Frame (S1) - Low-Rise (range between 1 -3 stories)		1	2	2	1			
	URML	Unreinforced Masonry Bearing Walls (URM)		2	2	1	1			
	C1L	Reinforced Concrete Moment Resisting Frames (C1)-Low-Rise (range between 1 -3 stories)		2	1	1	1			
TYPE C: SIMPLE NON-COMPLEX	W1	Wood, Light Frame (W1)		3	3	3	2			
	W2	Wood, Greater than 5,000 Sq. Ft. (W2)		3	2	2	1			
	WPB	Wood Post & Beam		3	2	2	1			
	MH	Mobile Homes (MH)		3	3	3	2			
	S3	Steel Light Frame (S3)		3	2	2	1			





