

Damage Assessment Basics

2016 AWWA PNW Conference

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Portland Water Bureau
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Agenda

- **Types of Facilities**
- **Types of Hazards**
- **Types of Damages**
- **Assessments – Safety vs. Damage**
- **Levels of Assessments**
- **Qualifications, Training & Expectations**
- **DAT Deployment**
- **Documentation**
- **Costs**



Types of Facilities



Types of Hazards

- **Earthquakes**
- **Volcanic**
- **Fire**
- **Landslide**
- **Flooding**
- **Wind, Ice, heavy rain storm**
- **Terrorism**
- **Any combination**



Types of Damages

- Its dependent on the type of event – i.e. earthquake, flood, etc
- Type of construction
- Construction material
- Age



Pipelines

- **Joint damage or separation**
- **Loss of pressure**
- **Bursting**



Pump Stations

- **Loss of power and/or emergency power**
- **Fallen electrical and control cabinets**
- **Broken pipe connections**
- **Damage to piping**
- **Building damage**
- **Chemical spills**



Steel Tanks

- **Roof to wall or roof to column separation**
- **Sloshing water can damage the roof**
- **Uplift, breaking connecting piping**
- **Tank wall wrinkling, i.e. elephant's foot buckling**
- **Wall-floor seam can burst**



Concrete Tanks

- Failure of the tank wrapping
- Tanks can slide off their floor slab foundations
- Roofs are also vulnerable
- Connections between columns and roof, roof and walls
- Sloshing damage



Assessments – Safety vs. Damage

- **Safety**
- **Damages for costs and repairs**
- **Initial damage assessment for Disaster Declarations**



Safety Assessments

- **Safety evaluations to determine whether facility is safe to occupy**
- **First priority**



Damage Assessments

- Used to assess the damages to infrastructure, essential facilities
- Used to assess % damages for disaster declarations



Levels of Assessments

- **Windshield**
- **Rapid**
- **Detailed**
- **Comprehensive**



Inspected

- No apparent hazard found
- Repairs may be required
- No significant load capacity decreased
- Lawful occupancy permitted



INSPECTED
LAWFUL OCCUPANCY PERMITTED

This structure has been inspected (as indicated below) and no apparent structural hazard has been found.

Date _____
Time _____
(Caution: Aftershocks since inspection may increase damage and risk.)

Inspected Exterior Only
 Inspected Exterior and Interior

This facility was inspected under emergency conditions for: _____
(Jurisdiction)

Report any unsafe condition to local authorities; reinspection may be required.

Inspector comments: _____
Inspector ID / Agency: _____

Facility Name and Address: _____

Restricted

- Building is damaged, may or may not be habitable
- May have falling hazard
- May be damage to lateral force and/or vertical load systems
- Occupancy permitted per noted restrictions

RESTRICTED USE

Caution: This structure has been inspected and found to be damaged as described below:

Date _____
Time _____

(Caution: Aftershocks since inspection may increase damage and risk.)

Entry, occupancy, and lawful use are restricted as indicated below:

Do not enter the following areas: _____

Brief entry allowed for access to contents: _____

Other restrictions: _____

Facility name and address: _____

This facility was inspected under emergency conditions for: _____
(Jurisdiction) _____
Inspector ID / Agency _____

Do Not Remove, Alter, or Cover this Placard until Authorized by Governing Authority

Unsafe

- **Extreme hazard, building may collapse;**
- **Imminent danger of collapse from an aftershock;**
- **Significant decrease in vertical load and/or lateral force capacity;**
- **Unsafe for occupancy or entry**

UNSAFE
DO NOT ENTER OR OCCUPY
(THIS PLACARD IS NOT A DEMOLITION ORDER)

This structure has been inspected, found to be seriously damaged and is unsafe to occupy, as described below:

Date _____

Time _____

This facility was inspected under emergency conditions for:

(Jurisdiction)

Inspector ID / Agency _____

Do not enter, except as specifically authorized in writing by jurisdiction. Entry may result in death or injury.

Facility Name and Address:

Do Not Remove, Alter, or Cover this Placard until Authorized by Governing Authority

Windshield Assessment

- **0-5 minute drive-by assessment**
 - **At a glance - does facility appear safe or not safe**
 - **Damaged / not damaged**

Rapid Assessments

- **10-15 minute assessment per site to answer basic questions**
 - **Is the facility safe – green, yellow or red plaque**
 - **Is facility operable**
 - **Is facility damaged**
- **Assessment needed for disaster declaration**

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LAWFUL OCCUPANCY PERMITTED

This structure has been inspected (as indicated below) and no apparent structural hazard has been found.

Inspected Exterior Only
 Inspected Exterior and Interior

Report any unsafe condition to local authorities; remediation may be required.

Inspector comments:

Facility Name and Address:

Date: _____
Time: _____
(Caution: Aftershocks since inspection may increase damage and risk.)

This facility was inspected under emergency conditions for:

(Jurisdiction)
Inspector ID / Agency: _____

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Facility name and address:

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Inspector ID / Agency: _____

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Date: _____
Time: _____
(Caution: Aftershocks since inspection may increase damage and risk.)

This facility was inspected under emergency conditions for:

(Jurisdiction)
Inspector ID / Agency: _____

Detailed Assessments

- In-depth assessment
- Couple hours to couple weeks
- Inventory of everything on site, photos, model numbers, dimensions
- Document what was damaged and what wasn't
- Judgment call on cause of damage
- Cost for damages / cost for repair or replacement

INSPECTED
LAWFUL OCCUPANCY PERMITTED

This structure has been inspected (as indicated below) and no apparent structural hazard has been found.

Date: _____
Time: _____

Inspected Exterior Only
 Inspected Exterior and Interior

Caution: Aftershocks since inspection may increase damage and risk.

This facility was inspected under emergency conditions for: _____
(Jurisdiction)

Inspector comments: _____
Inspector ID / Agency: _____

Facility Name and Address: _____

RESTRICTED USE

Caution: This structure has been inspected and found to be damaged as described below.

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Time: _____

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 Other restrictions: _____

Inspector ID / Agency: _____

Facility name and address: _____

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UNSAFE
DO NOT ENTER OR OCCUPY
(THIS PLACARD IS NOT A DEMOLITION ORDER)

This structure has been inspected, found to be seriously damaged and is unsafe to occupy, as described below.

Date: _____
Time: _____

This facility was inspected under emergency conditions for: _____
(Jurisdiction)

Inspector ID / Agency: _____

Do not enter, except as specifically authorized in writing by jurisdiction. Entry may result in death or injury.

Facility Name and Address: _____

Comprehensive Assessments

- **In-depth specialty assessment**
 - **Materials testing**
 - **Structural**
 - **Geotechnical**
 - **Failure analysis / forensics**
- **Supplements Detailed Assessment**

The image displays three safety placards used for structural assessments. Each placard contains specific instructions and fields for recording inspection details.

INSPECTED (Green Placard):
LAWFUL OCCUPANCY PERMITTED
This structure has been inspected (as indicated below) and no apparent or obvious hazard has been found.
Date: _____
Time: _____
Inspector: _____
Agency: _____
Facility Name and Address: _____

RESTRICTED USE (Yellow Placard):
Caution: This structure has been inspected and found to be damaged as detailed below.
Date: _____
Time: _____
Inspector: _____
Agency: _____
Facility Name and Address: _____

UNSAFE (Red Placard):
DO NOT ENTER OR OCCUPY (THIS PLACARD IS NOT A DEMOLITION ORDER)
This structure has been inspected, found to be severely damaged and is unsafe to occupy as detailed below.
Date: _____
Time: _____
Inspector: _____
Agency: _____
Facility Name and Address: _____

DAT Role

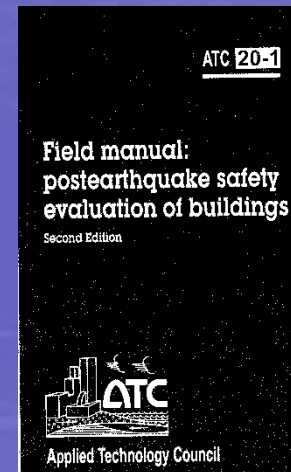
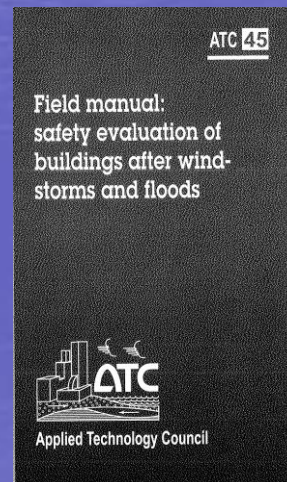
- Assess - safe to enter, operate, or use
- Assess - damages if any
- Assess – is system functional even if damaged
- Assess - cost of damages and cost to replace
- Provide documentation of assessments
- Estimate % damages and costs to replace or repair

DAT Members

- **DAT teams - four or five members**
- **A DAT consists of at least 1 registered engineer, architect or building inspector**
- **Rest can be just about anyone that has been trained**
- **If needed, could subdivide teams (min. 2 per team) – buddy system**

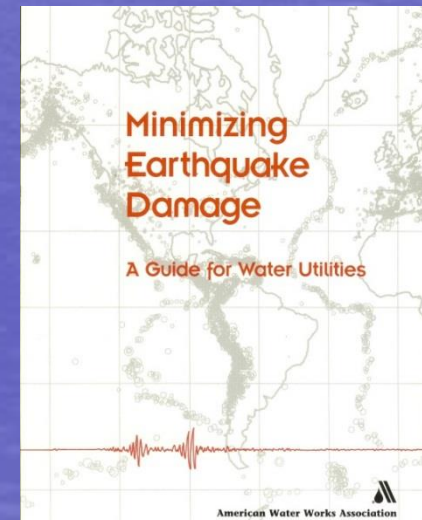
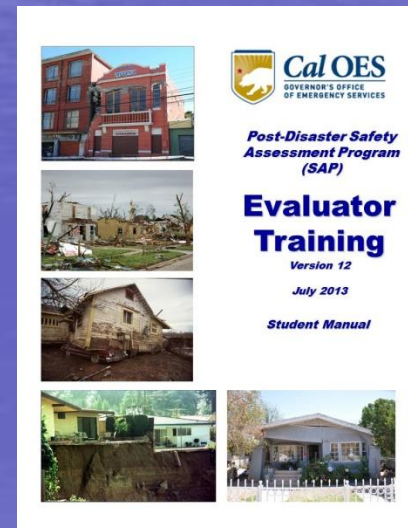
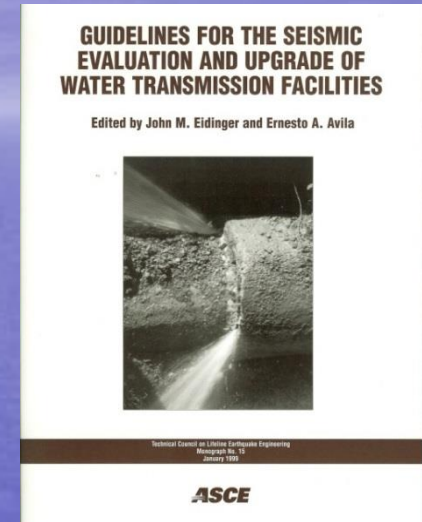
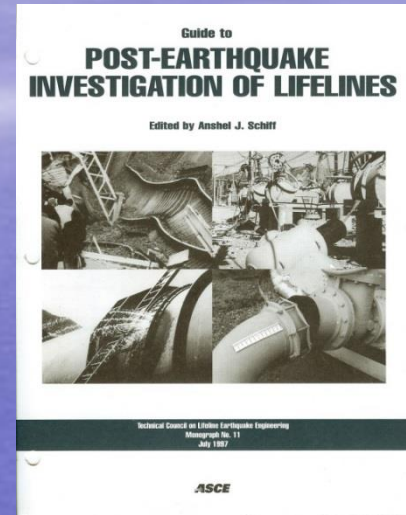
DAT Qualifications

- **ATC 20 (or CA SAP Evaluator class)**
- **General knowledge of construction**
- **Professional experience**
- **Good judgment**
- **Broad building / infrastructure review capability**
- **Deputized**



DAT Training

- ATC 20 / ATC 45
- Ca. SAP
- Hazwoper 24-hr
- First Aid, CPR
- OSHA 10 hr
- Confined Space
- Exercises



DAT Expectations

- **Participate in training**
- **Participate in exercises**
- **Carry radio or cell phone**
- **Respond in emergency**
- **Be prepared**
- **Be flexible**
- **Be safe**



Liability and Immunity

- **Good Samaritan Law – General Immunity**
- **Home jurisdiction immunity by mutual aid**
- **Deputized by local government**



Mutual Aid Deployment

- **Mutual aid safety inspection resources are deployed through the Building Officials**
- **In Oregon, the mutual aid resources can be requested through the City, the county or the state or through ORWARN**



FIELD SAFETY

- **Travel in teams of at least two**
- **Leave someone outside to call for help**
- **Wear PPE Use safety equipment and safety gear**
- **Enter only if safe**
- **Avoid hazardous materials**
- **Be alert for falling objects**
- **Block off and post collapse zones ($1.5 \times H_t$) in all directions**
- **Report gas leaks and other utility damages**

Disaster Occurs



- **EOC is activated**
- **DAT members are called**
- **If needed, additional resources can be requested**

DAT Daily Routine

- **Report to staging area, likely EOC**
 - **Sign in**
 - **Obtain briefing packet**
 - **DAT refresher**
- **Obtain work assignment**
 - **Team to work with**
 - **Assignment location**
- **Check out equipment**



DAT Daily Routine (cont'd)

- **Follow DAT Coordinator directions while in field**
- **At end of day, return to staging area**
- **Complete assessment forms**
- **Review assessments w/ Coordinator**
- **Sign out for the day**
- **Return next day until assignment is done.**

Documentation

- **Narratives**
- **Photos**
- **Sketches**
- **Site / Facility Plans**
- **Inventories**
- **Paper & electronic copies of reports**
- **Keep copy of everything you submit**



Ideal Timeline

Time	Activity
0 to 48 hrs	<ul style="list-style-type: none">• Safety assessment of critical facilities• Rapid assessment for disaster declaration
48 hrs to 2 weeks	<ul style="list-style-type: none">• Start on detailed assessments for City's critical facilities• Start detailed assessments for houses and businesses• Start detailed assessments for infrastructure• Start using FEMA project worksheets for damage assessments and cost estimating
2 to 3 weeks	<ul style="list-style-type: none">• Joint preliminary damage assessment – City will compile with Multnomah Co, OEM and FEMA
60 days	<ul style="list-style-type: none">• Goal is to have all safety assessments complete• Continue with damage assessments

Costs for Assessments

- **Safety assessments are eligible for FEMA Category B – Emergency Protective Measures**
- **Damage assessments for the infrastructure are eligible for FEMA**
 - **Category C for Roads and Bridges,**
 - **E for Buildings and Equipment,**
 - **F for Utilities, and**
 - **G for Parks, Recreational Facilities and Other Facilities**

Questions?

Teresa.Elliott@portlandoregon.gov



Rapid Assessment Forms

Portland Water Bureau Rapid Damage Assessment Form

BUILDING DESCRIPTION: Name: _____ Address: _____ _____ No. Stories: _____ Basement: <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown Primary Occupancy: _____		OVERALL RATING: (Check One) INSPECTED: (Green) <input type="checkbox"/> Exterior Only Exterior and Interior LIMITED ENTRY (Yellow) <input type="checkbox"/> UNSAFE (Red) <input type="checkbox"/>	
		INSPECTOR: Inspector ID: _____ Affiliation: _____ INSPECTION DATE: Mo/day/year _____ Time _____ am	
Instructions: Review structure for the conditions listed below. A "yes" answer to 1, 2, 3, or 5 is grounds for posting the entire structure UNSAFE . If more review is needed, post LIMITED ENTRY . A "yes" answer to 4 require posting AREA UNSAFE and/or barricading around the hazard. Hazards such as a toxic spill or an asbestos release are covered by 6 and are to be posted and/or barricaded to indicate AREA UNSAFE .			
Condition	Yes	No	More Review Needed
1. Collapse, partial collapse, or building off foundation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Building or story noticeably leaning	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Severe racking of walls, obvious severe damage and distress	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Chimney, parapet or other falling hazard	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Severe ground or slope movement present	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Other hazard present	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Recommendations: <input type="checkbox"/> No further action required <input type="checkbox"/> Detailed Evaluation required <input type="checkbox"/> Comprehensive Evaluation required, Type: <input type="checkbox"/> Structural <input type="checkbox"/> Geotechnical <input type="checkbox"/> Other _____ <input type="checkbox"/> Barricades needed in the following areas: _____ <input type="checkbox"/> Other: _____			
Posted at this Assessment: <input type="checkbox"/> Yes <input type="checkbox"/> No		Occupants Notified to Vacate <input type="checkbox"/> Yes <input type="checkbox"/> No	
Temp Housing Req. <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> ?			
Comments: _____ _____ _____			
Estimated Damage <input type="checkbox"/> 0% <input type="checkbox"/> 25% <input type="checkbox"/> 50% <input type="checkbox"/> 100% \$ _____			

PBWW 7/99

INSPECTED

LAWFUL OCCUPANCY PERMITTED

This structure has been inspected (as indicated below) and no apparent structural hazard has been found.

Inspected Exterior Only

Inspected Exterior and Interior

Report any unsafe condition to local authorities; reinspection may be required.

Inspector comments:

Facility Name and Address:

Date _____

Time _____

(Caution: Aftershocks since inspection may increase damage and risk.)

This facility was inspected under emergency conditions for:

(Jurisdiction)

Inspector ID / Agency:

RESTRICTED USE

Caution: This structure has been inspected and found to be damaged as described below:

Entry, occupancy, and lawful use are restricted as indicated below:

Do not enter the following areas:

Brief entry allowed for access to contents:

Other restrictions: _____

Facility name and address:

Date _____

Time _____

(Caution: Aftershocks since inspection may increase damage and risk.)

This facility was inspected under emergency conditions for:

(Jurisdiction)

Inspector ID / Agency:

Do Not Remove, Alter, or Cover this Placard until Authorized by Governing Authority

UNSAFE

DO NOT ENTER OR OCCUPY (THIS PLACARD IS NOT A DEMOLITION ORDER)

This structure has been inspected, found to be seriously damaged and is unsafe to occupy, as described below:

Do not enter, except as specifically authorized in writing by jurisdiction. Entry may result in death or injury.

Facility Name and Address:

Date _____

Time _____

This facility was inspected under emergency conditions for:

(Jurisdiction)

Inspector ID / Agency:

PWB Detailed Assessment Form

CITY OF PORTLAND WATER BUREAU		NAME OF EVENT	
DETAILED DAMAGE ASSESSMENT FORM		DATE OF DAMAGE	
Cat U			
A. PWB NUMBERS PWB PROJ # PWP		VEMA DECLARATION # FEMA - DR	
B. TYPE OF DISASTER FIRE EARTHQUAKE		FLOOD TORM OTHER	
C. DAMAGE SITE ADDRESS/LOCATION			
LATITUDE		ELEVATION	
LONGITUDE		PHONE NO.	
D. CONTACT:		DISTRICT:	
E. TYPE CONSTRUCTION UNREINFORCED MASONRY (URM)		APPROX. SIZE ft x ft x ft	
CONCRETE CONCRETE MASONRY UNITS (CMU) STEEL		NO. OF STORIES NO. OF OCCUPIED AREAS	
DUCTILE IRON CAST IRON OTHER		BASEMENT: YES NO UNKNOWN	
F. PRIMARY SITE PURPOSE OR OCCUPANCY: (Check one, only)			
D1 DAMS D2 SANDY RIV STA D3 WELLSITE D4 PUMP STA		D5 CROSSING D6 INTERSTATE D7 REPAIRER STA	
D8 HEADWORKS D9 LISTED HILL D10 TARBOR D11 MAIN D12 BRIDGE D13 DOC D14 GENERATOR		D15 HYDRO D16 TREATMENT D17 WA. PARK D18 VALVE D19 ROADS D20 CHEM STORAGE D21 TELEMETRY	
D22 CONDUIT D23 POWELL BUTTE D24 RESERVOIR D25 VALVE D26 CNTRL.CTR. D27 OTHER BLDG D28 OTHER		D29 INTERTR. D30 GRID W/RS D31 TANK D32 TRUSTEE D33 FLDG BLDG D34 MICROWAY TRW	
G. INSTRUCTIONS: Examine the building to determine if any hazardous conditions exist. A "YES" answer in Categories 1, 2, or 4 is grounds for posting building UNSAFE. If a condition is suspected to be unsafe and more review is needed, check appropriate Unknown box(es) and post LIMITED ENTRY. A "YES" answer in category 3 requires posting and/or barricading to indicate AREA UNSAFE. Explain "YES," "UNKNOWN" findings and extent of damage under "Comments."			
H. EXISTING HAZARDOUS CONDITIONS			
Condition YES NO UNK			
1. Structure Hazardous Overall		3. Nonstructural Hazards	
Collapse/partial collapse		Parapets/ornamentation	
Building or story leaning		Chadling/glazing	
Other		Ceiling/light fixtures	
		Interior walls/partitions	
2. Hazardous Structural Elements		Elevators	
Foundations		Shafts/excels	
Roof/floors (vertical loads)		Electric/gas	
Columns/pilasters/correls		Chimney	
Diaphragms/horizontal bracing		Other	
Walls/vertical bracing		4. Geotechnical Hazards	
Moment Frames		Slope failure/debris	
Precast connections		Ground movement, fissures	
Other		Other	
I. OVERALL RATING: Existing Recommended		J. RECOMMENDATIONS: (Circle Number/Fill in Data)	
INSPECTED (Green)		1. No Further Action Required	
Exterior Only		2. Detailed Evaluation Required	
Exterior and Interior		1. Structural 2. Geotechnical 3. Other	
LIMITED ENTRY (yellow)		3. Barricades needed in the following UNSAFE areas:	
UNSAFE (red)		4. Disconnect Utilities Water Electric	
Building		Communications Gas Other	
Area (See Section J-3)		K. VACATE BLDG: YES NO PARTIALLY VACATE BLDG: YES NO NO LIVING UNITS VACATED:	
DAMAGE ASSESSMENT TEAM (List all DAT members):			
Team Leader / Phone:		DATE INSPECTED:	
Other Team Members:		Date:	
Damage Site:		Time:	
		PWB Project #	

PWB Rapid Assessment Form 02/18/2009

Page 1 of 4

L. COMMENTS: (Indicate Section and Item to be explained further, include description of damage, add sheets as necessary)

Empty comment box for L. COMMENTS.

M. ESTIMATED DAMAGE COSTS (Home, add units if necessary)			
1.	EST. DAMAGE: \$	EST. DAMAGE: %	
2.	EST. DAMAGE: \$	EST. DAMAGE: %	
3.	EST. DAMAGE: \$	EST. DAMAGE: %	

N. PHOTOS

Insert photo in here

Insert photo in here

Photo # 1: Overall site view (insert description and caption here)

Photo # 2: Overall site view (insert description and caption here)

Insert photo in here

Insert photo in here

Photo # 3: (insert description and caption here)

Photo # 4: (insert description and caption here)

DAMAGE ASSESSMENT TEAM (List all DAT members):		DATE INSPECTED:	
Team Leader / Phone:		Date:	
Other Team Members:		Time:	
Damage Site:		PWB Project #	

PWB Rapid Assessment Form 02/18/2009

Page 2 of 4

Photo #9: (insert description and caption here)

Photo # 10: (insert description and caption here)

(Add additional pages if necessary)

DAMAGE ASSESSMENT TEAM (List all DAT members):		DATE INSPECTED:	
Team Leader / Phone:		Date:	
Other Team Members:		Time:	
Damage Site:		PWB Project #	

PWB Rapid Assessment Form 02/18/2009

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N. PLOT, PLAN, DIAGRAM (Sketch damage area or attach existing drawing, with red-lined damages marked)

Empty plot area for N. PLOT, PLAN, DIAGRAM.

DAMAGE ASSESSMENT TEAM (List all DAT members):		DATE INSPECTED:	
Team Leader / Phone:		Date:	
Other Team Members:		Time:	
Damage Site:		PWB Project #	

PWB Rapid Assessment Form 02/18/2009

Page 4 of 4

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LAWFUL OCCUPANCY PERMITTED

This structure has been inspected (as indicated below) and no apparent structural hazard has been found.

Inspected Exterior Only

Inspected Exterior and Interior

Report any unsafe condition to local authorities; remediation may be required.

Inspector comments:

Inspector ID / Agency:

Facility Name and Address:

RESTRICTED USE

Caution: This structure has been inspected and found to be damaged as described below.

Caution: Alterations may increase damage.

This facility was emergency confined.

Entry, occupancy, and lawful use are restricted as indicated below.

Do not enter the following areas:

Do not enter allowed for access to contents.

Other restrictions:

Inspector ID / Agency:

Facility Name and Address:

UNSAFE

DO NOT ENTER OR OCCUPY (THIS PLACARD IS NOT A DEMOLITION ORDER)

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(Jurisdiction)

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