

PREPARE

URBAN DISASTER RESILIENCY
AND PREPAREDNESS IN
TRINIDAD + TOBAGO



RAPID DAMAGE ASSESSMENT USER GUIDELINE FORMS A & B

February 2022 – TRINIDAD AND TOBAGO



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Urban Disaster Resiliency and Preparedness in Trinidad and Tobago (PREPARE TT)

The goal of PREPARE TT is to provide a clearer picture of the probable impact of an urban earthquake disaster and facilitate advocacy and planning initiatives around strengthening seismic disaster risk reduction and preparedness measures in Trinidad and Tobago; to reduce the lives lost, people injured, internally displaced persons, and social and economic disruption.

The U.S. Agency for International Development (USAID)

The U.S. Agency for International Development is an independent U.S. federal agency responsible for planning and administering economic and humanitarian assistance around the world.

The Bureau for Humanitarian Assistance (BHA)

The Bureau for Humanitarian Assistance provides life-saving humanitarian assistance—including food, water, shelter, emergency healthcare, sanitation and hygiene, and critical nutrition services—to the world’s most vulnerable and hardest-to-reach people. BHA is the lead federal coordinator for international disaster assistance, harnessing the expertise and unique capacities of other U.S. government entities to effectively respond to natural disasters and complex crises around the world.

BHA takes a holistic look at humanitarian aid, providing assistance before, during and after a crisis—from readiness and response, to relief and recovery. This includes non-emergency programming that is foundational to linking humanitarian assistance to long-term development and the journey to self-reliance.

Miyamoto International, Inc.

Miyamoto International is a global structural engineering and disaster risk management reduction firm providing resiliency expertise that sustains industries and safeguards communities around the world.

Acknowledgements

With the approval of the Government of Trinidad and Tobago the PREPARE TT program is being implemented. The lead government agency for the program is the Officer of Disaster Preparedness and Management, Ministry of National Security.

This guideline was prepared by Engineers Dr. Navin Ramroop and Datta Balroop of Tharuna Limited guidance from the PREPARE TT Program’s Technical Advisory Committee for Rapid Damage Assessment (RDA) which included representatives of Office of Disaster Preparedness and Management (ODPM), APETT, BOETT, Miyamoto, MOWT, MRDLG, TTBS.

Disclaimer

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ACRONYMS AND NOTATIONS

ANSI	American National Standard Institute
APETT	Association Professional Engineers of T&T
ARISE	Private Sector Alliance for Disaster Resilient Societies
BOETT	Board of Engineers of Trinidad and Tobago
GoRTT	Government of the Republic of Trinidad and Tobago
GPS	Global positioning system
MNS	Ministry of National Security
MOWT	Ministry of Works and Transport
MPD	Ministry of Planning and Development
MRDLG	Ministry of Rural Development and Local Government
ODPM	Office of Disaster Preparedness and Management
POS	Port of Spain
PPE	Personal protective equipment
RDA	Rapid Damage Assessment
T&T	Trinidad and Tobago
TAG	Technical Advisory Group
TEMA	Tobago Emergency Management Agency
THA	Tobago House of Assembly
TTBS	Trinidad and Tobago Bureau of Standards
USAID BHA	United States Agency for International Development, Bureau of Humanitarian Assistance (formerly USAID OFDA)
USAID OFDA	United States Agency for International Development, Office of Foreign Disaster Assistance

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I INTRODUCTION

The Rapid Damage Assessment (RDA) form was developed by Tharuna Limited in conjunction with various stakeholders:

- The Office of Disaster Preparedness and Management (ODPM)
- The Ministry of Works and Transport (MOWT)
- Ministry of Rural Development and Local Government (MRDLG)
- Port of Spain City Corporation
- San Fernando City Corporation
- Regional and Borough Corporations
- The Association of Professional Engineers of Trinidad and Tobago
- The Tobago House of Assembly Division of Infrastructure, Quarries and the Environment
- The Trinidad & Tobago Bureau of Standards
- Miyamoto International Incorporated

The RDA is meant to give inspectors of various backgrounds the ability to inspect buildings and bridges for their ability to resume usage after a natural hazard event in a relatively short space of time. Form A is used to assess buildings, and Form B is used to assess bridges

Forms A and B each have five (5) key sections:

- i. Structure Location
- ii. Assessment Particulars
- iii. Structure Details
- iv. Visual Observations of Damages
- v. Summary

This document provides guidelines for using the forms to assess buildings and bridges.

2 ASSESSMENT OVERVIEW

2.1 Method for evaluating damage of structures and bridges

The method for conducting an RDA consists of a visual inspection of structural and non-structural elements of the building or bridge under consideration. Figure 2.1 outlines the procedure for inspection and tagging of buildings and figure 2.2 shows the same for bridges.

2.1.1 Evaluating structures

The method of evaluating structures starts off with the inspector being well equipped with the appropriate personal protective equipment (PPE). Based on the location and type of structure to be inspected (e.g., residential, industrial etc.), the inspector will choose the appropriate PPE. This can be but not limited to:

- i. Safety helmets (ANSI Z89.1 or similar)
- ii. Safety glasses (ANSI Z87/Z87+ or similar)
- iii. Steel-toe safety boots (ANSI Z41 or similar)
- iv. Protective coverall
- v. Dust/Gas mask (depending on the site to be visited)
- vi. Safety gloves (depending on the site to be visited)

Some additional items that might be of interest to the inspector to have for a day of inspections are:

- i. Clipboard with extra RDA forms
- ii. Extra pens
- iii. Torchlight
- iv. 100 ft. measuring tape
- v. 30 ft. measuring tape
- vi. Laser pointer
- vii. Camera
- viii. GPS device/ mobile phone
- ix. Bottle water (for drinking)
- x. Hand sanitizer
- xi. Lunch/snacks
- xii. Backpack to carry items.

The inspector would then need to identify the structure that is to be inspected and assessed. This may require cross-referencing the building with a building number/name, maps, photographs and also confirming the identification with persons within the surroundings who are familiar with it.

Once confirmed, the inspector will survey the surroundings of the structure for live hazards that can be a risk. Such hazards can include but not limited to:

- i. Fallen power lines
- ii. Land slips/sinkholes
- iii. Flooded areas (cannot see the ground)
- iv. Felled trees
- v. Debris from other structures/sites that are precariously propped and can be identified as a potential to fall hazard.
- vi. Exposed sewage

Once the inspector is satisfied that the inspection can continue, the externals of the structure is then inspected for damages. If major damages have developed or if signs of collapse are shown, then the inspector can apply a 'RED TAG' and proceed to inspect the next structure. If little to no damage is seen, then the inspector can proceed to obtain permission from the owner (if not already granted) to inspect inside the structure. If the owner denies entry, then the inspector will apply a 'YELLOW TAG' to the structure. If the owner grants permission to enter, then the inspector will proceed to assess the inside by checking structural elements from signs of collapse or damage. If collapse or heavy damages are found, then the inspector will apply a RED tag, if such damages can be repaired, the inspector will proceed to calculate the tagging parameters and place the appropriate coloured tag. At this stage, the inspector will have a good idea if the structure would need further detailed assessment, which would then be recorded in the RDA form. Once the tag has been placed, the inspector will move onto the next structure.

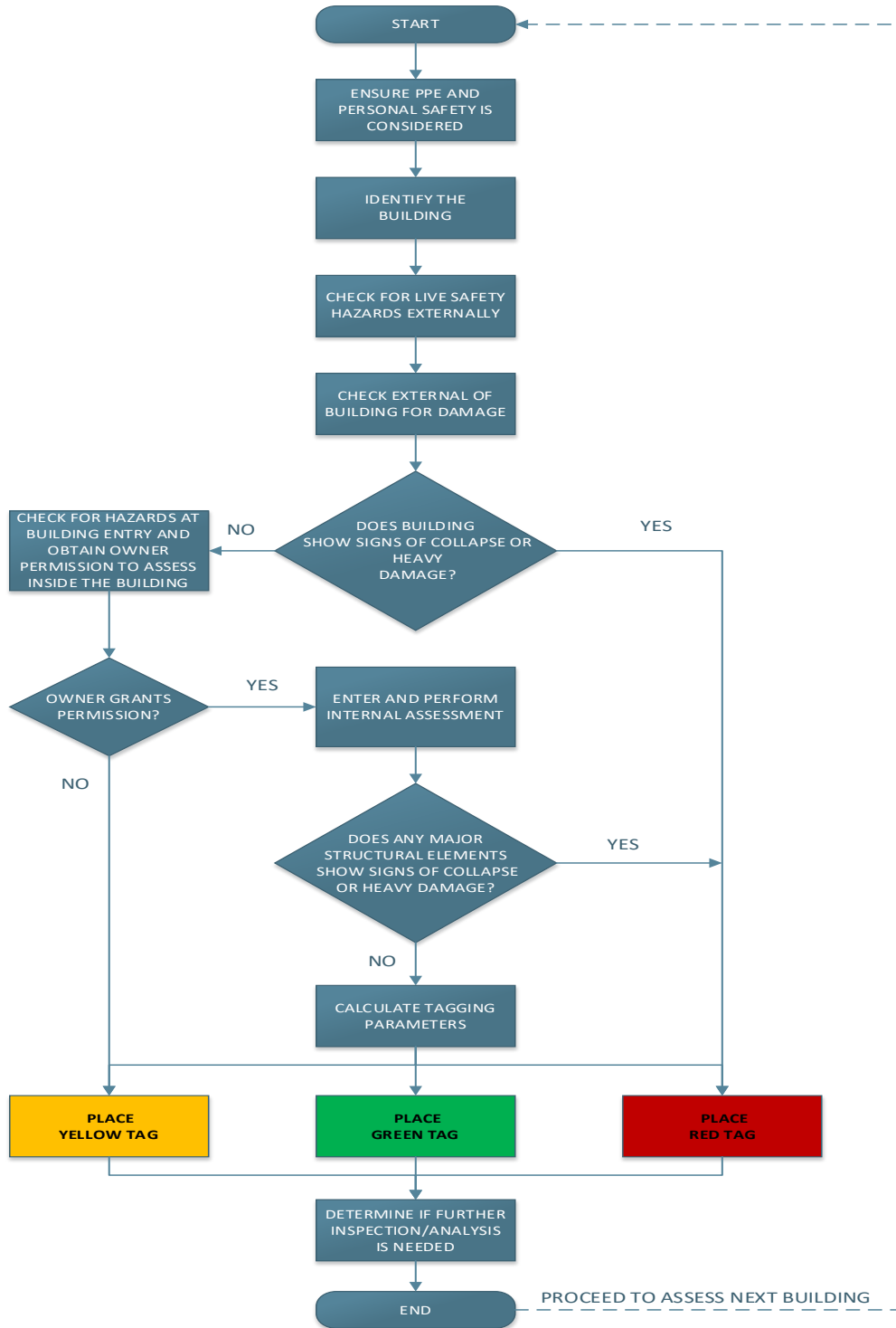


Figure 1 - Evaluating Structures Process Map

2.1.2 Evaluating bridges

After gathering the necessary PPE as discussed in section 2.1.1 above, the inspector would then need to identify the bridge that is to be inspected and assessed. Once confirmed, the inspector will survey the surroundings of the structure for live hazards that can be a risk and when the inspector is satisfied that the inspection can continue, the external area of the bridge is then inspected for damages. If major damages have developed or if signs of collapse are shown, then the inspector can apply a 'RED TAG' and proceed to inspect the next structure. If little to no damage is seen, then the inspector can proceed inspect the whole bridge. If the bridge is unsafe to enter, then the inspector will apply a 'YELLOW TAG' to the structure. Otherwise, the inspector will proceed to assess the inside by checking structural elements from signs of collapse or damage. If collapse or heavy damages are found, then the inspector will apply a RED tag, if such damages can be repaired, the inspector will proceed to calculate the tagging parameters and place the appropriate coloured tag. At this stage, the inspector will have a good idea if the structure would need further detailed assessment, which would then be recorded in the RDA form. Once the tag has been placed, the inspector will move onto the next structure. Figure 2.2 outlines this. Summarising the tagging procedure, figure 2.3 shows a decision tree to aid in considering tags.

Information on the inspection tags (figures 2.4, 2.5 & 2.6) are as follows:

- Inspection Date
- Inspection Time
- Inspector's RDA ID#
- Building RDA ID#

These fields are to be written out and placed in an appropriate location where potential occupants can read its contents prior to entry. In the case of structures, it is the building owner's responsibility that this TAG remains until the ODPM (or other authority) give clearance to have them removed.

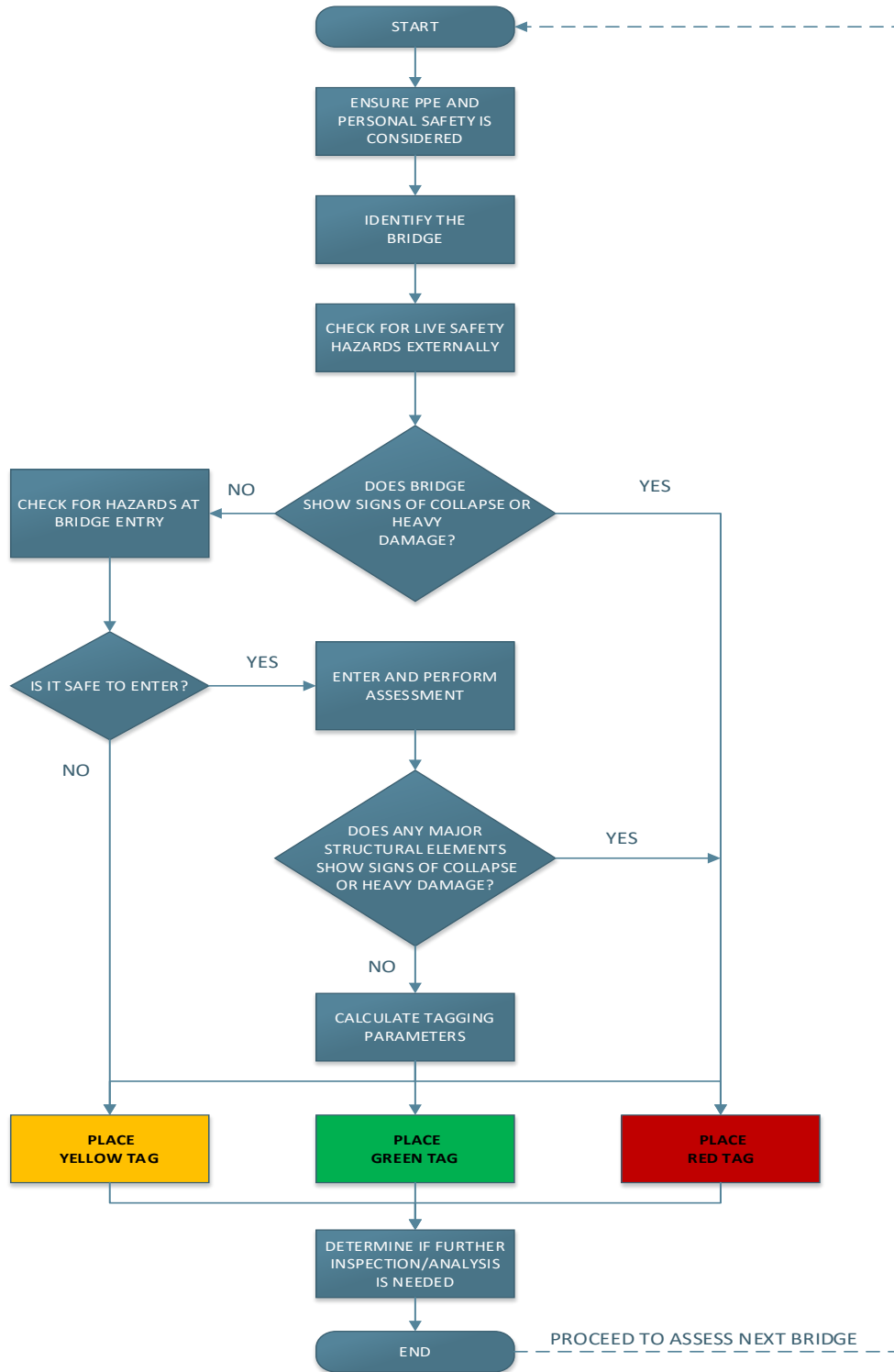


Figure 2 - Evaluating Bridges - Process Map

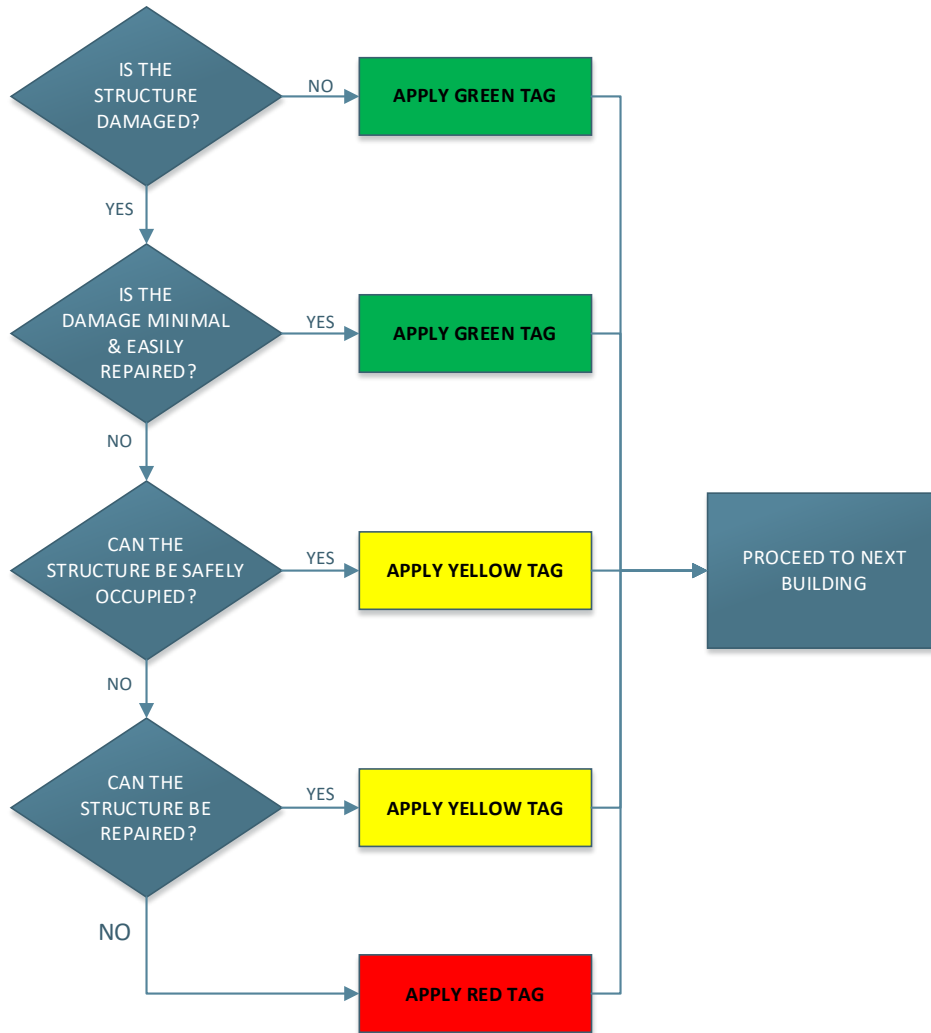


Figure 3 - Evaluating Bridges - Tagging Process

INSPECTION TAG

DO NOT REMOVE

DO NOT REMOVE

INSPECTION DATE: _____

INSPECTION TIME: _____

INSPECTOR'S RDA ID#: _____

BUILDING RDA ID#: _____

This structure has been inspected and no risk structural damage has been found in the environment that represent a threat to the occupants

This structure has been deemed safe to occupy

Caution: New events occurring after the inspection may increase or cause new damages that may change the result of this inspection.

SAFE

Figure 4 - Tagging Process - Green Tag (Entry & Occupancy)

INSPECTION TAG

DO NOT REMOVE

DO NOT REMOVE

INSPECTION DATE: _____

INSPECTION TIME: _____

INSPECTOR'S RDA ID#: _____

BUILDING RDA ID#: _____

This structure has been inspected and some structural damage has been found in the environment that represent a threat to the occupants

This structure has been deemed safe to occupy with restricted access

Caution: New events occurring after the inspection may increase or cause new damages that may change the result of this inspection.

RESTRICTED ACCESS

Figure 5 - Tagging Process - Yellow Tag (Entry & Occupancy with Restricted Access)

INSPECTION TAG

DO NOT REMOVE

DO NOT REMOVE

INSPECTION DATE: _____

INSPECTION TIME: _____

INSPECTOR'S RDA ID#: _____

BUILDING RDA ID#: _____

This structure has been inspected and major structural damage has been found in the environment that represent a threat to the occupants

This structure has been deemed unsafe to enter or occupy
THIS IS NOT A DEMOLITION ORDER

Caution: New events occurring after the inspection may increase or cause new damages that may change the result of this inspection.

NO ENTRY

Figure 6 - Tagging Process - Red Tag (NO Entry & NO Occupancy)

2.1.3 Protocol for deployment of RDA under non-emergency cases

In the event that a structure needs to be assessed when no disasters has occurred, the following protocol has been developed. This is executed in 2 phases, the desktop phase and the execution phase. See figure 2.7.

2.1.4 Desktop phase: Conducted at the main office.

The need for an RDA to be conducted will be brought to the attention of the ODPM. This may be by means of contact from the structure's owner or by means of identification from the procuring entity. The RDA inspector assigned to this site will then contact the owner to gather details such as

- i. Site location
- ii. Directions to site
- iii. Building description
- iv. Types of damages that can be seen (the inspector may want to have photographs forwarded to them)

The inspector will then confirm a date and time that the team will arrive to conduct the assessment.

2.1.5 Execution phase: Conducted at the site.

The inspector would then need to identify the structure that is to be inspected and assessed after arriving at the site. This may require cross-referencing the building with a building number/name, maps, photographs and also confirming the identification with persons within the surroundings who are familiar with it or with the owner

Once confirmed, the inspector will survey the surroundings of the structure for live hazards that can be a risk. Such hazards can include but not limited to:

- i. Fallen power lines
- ii. Land slips/sinkholes
- iii. Flooded areas (cannot see the ground)
- iv. Felled trees
- v. Debris from other structures/sites that are precariously propped and can be identified as a potential to fall hazard.
- vi. Exposed sewage

Once the inspector is satisfied that the inspection can continue, the externals of the structure is then inspected for damages. If major damages have developed or if signs of collapse are shown, then the inspector can apply a ‘RED TAG’ and proceed to inspect the next structure. If little to no damage is seen, then the inspector can proceed to inspect inside the structure by checking structural elements from signs of collapse or damage. If collapse or heavy damages are found, then the inspector will apply a RED tag, if such damages can be repaired, the inspector will proceed to calculate the tagging parameters and place the appropriate coloured tag. At this stage, the inspector will have a good idea if the structure would need further detailed assessment, which would then be recorded in the RDA form. The inspector will proceed to notify the owner of the outcome. The Inspector will place the appropriate tag on the structure, explaining to the owner its use and purpose of it.

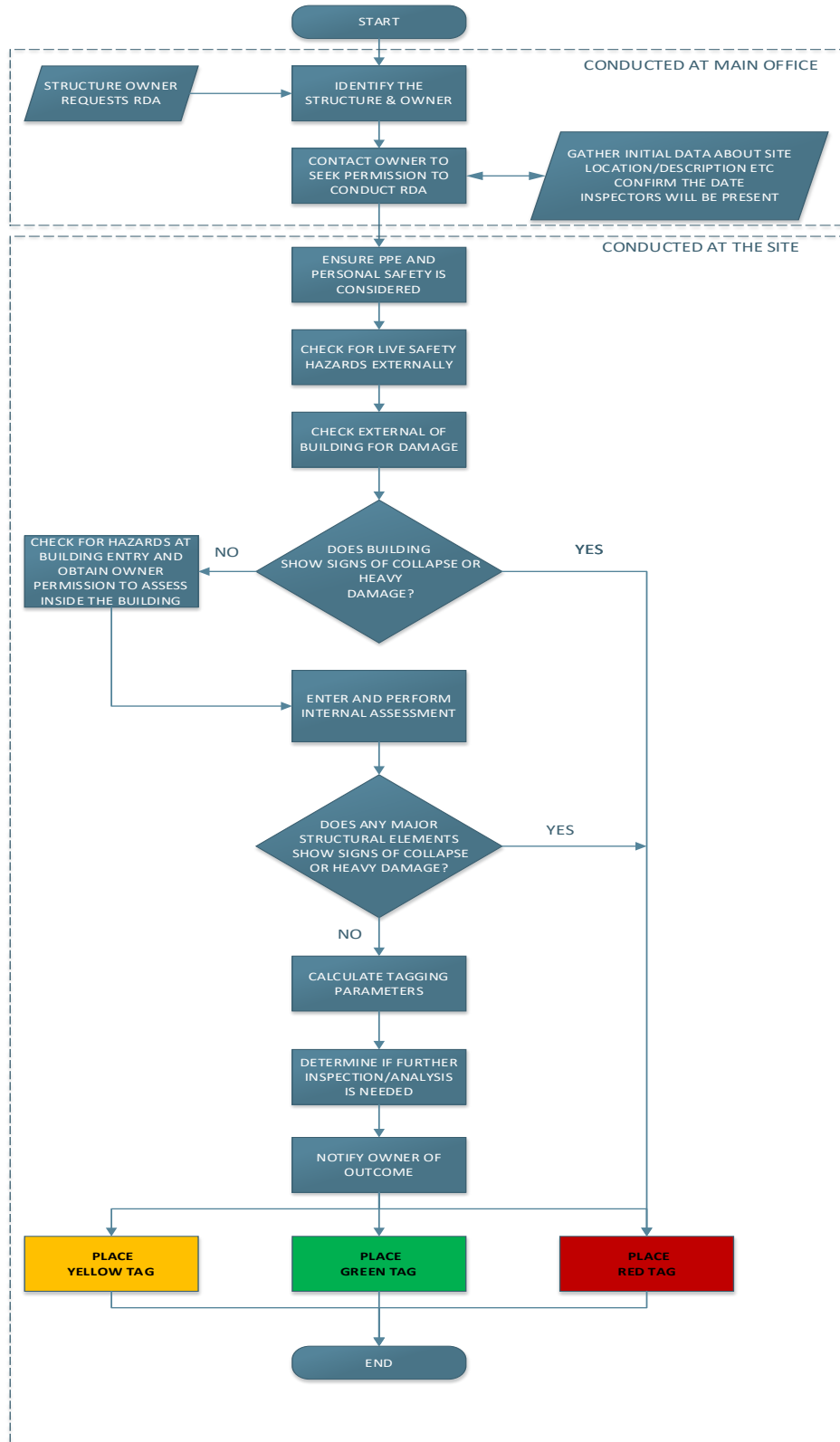


Figure 7 - Protocol for deployment of RDA under non-emergency cases

2.1.6 Damages to look for during a rapid assessment

The undermentioned is a list of key elements that the inspector should inspect and be aware of

Structural damage:

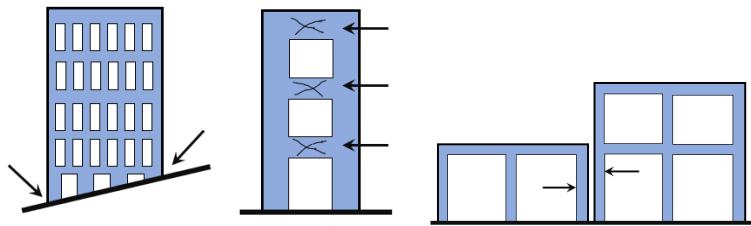
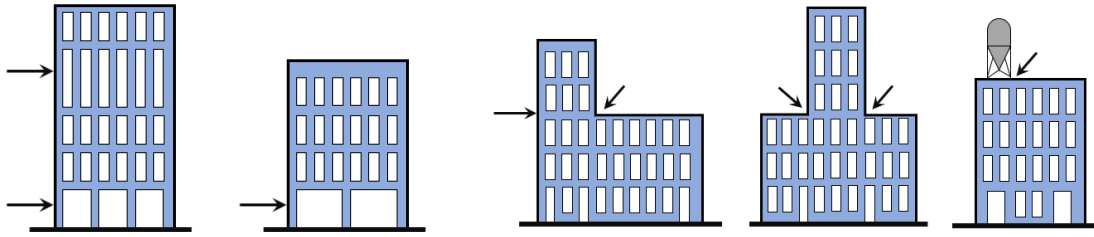
- i. Collapse, partial collapse, foundation out of alignment
- ii. Inclination of the house or one of its floors
- iii. Damage to columns, beams and mezzanine
- iv. Detachment of concrete at the top or bottom of the columns and at the base of the walls.
- v. Significant movement between floors
- vi. Buckling of sheathing and/or missing sheathing
- vii. Damage to the base of walls
- viii. Buckling of steel connections, columns, beams and braces

Non-structural damage:

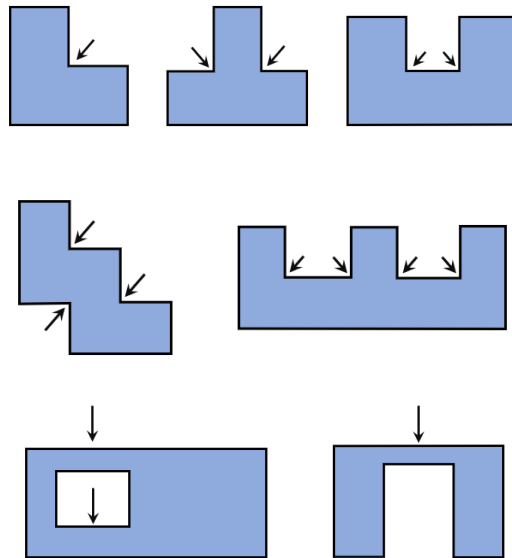
- i. Damage to ceilings and internal cladding
- ii. Shedding or buckling of external cladding
- iii. Damaged or misaligned HVAC, plumbing, electrical services.

External site damages:

- iv. Displacement of the soil under or next to the structure; also landslips
- v. Fall of tree; utility poles
- vi. Collapsed or adjacent structures that pose a threat



(a)



(b)

Figure 8 - Inspection points on (a) vertical sections (elevations) and (b) horizontal sections (plan views)

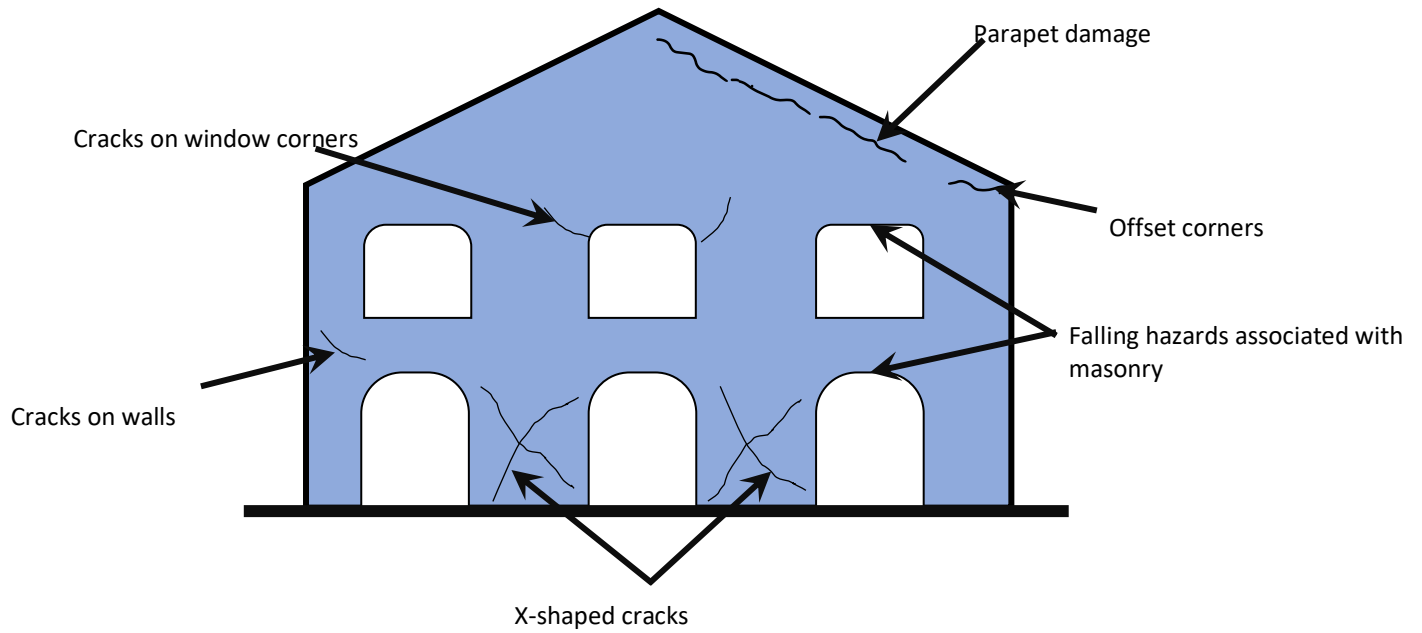


Figure 9 - Inspection points on unreinforced masonry bearing-wall structures

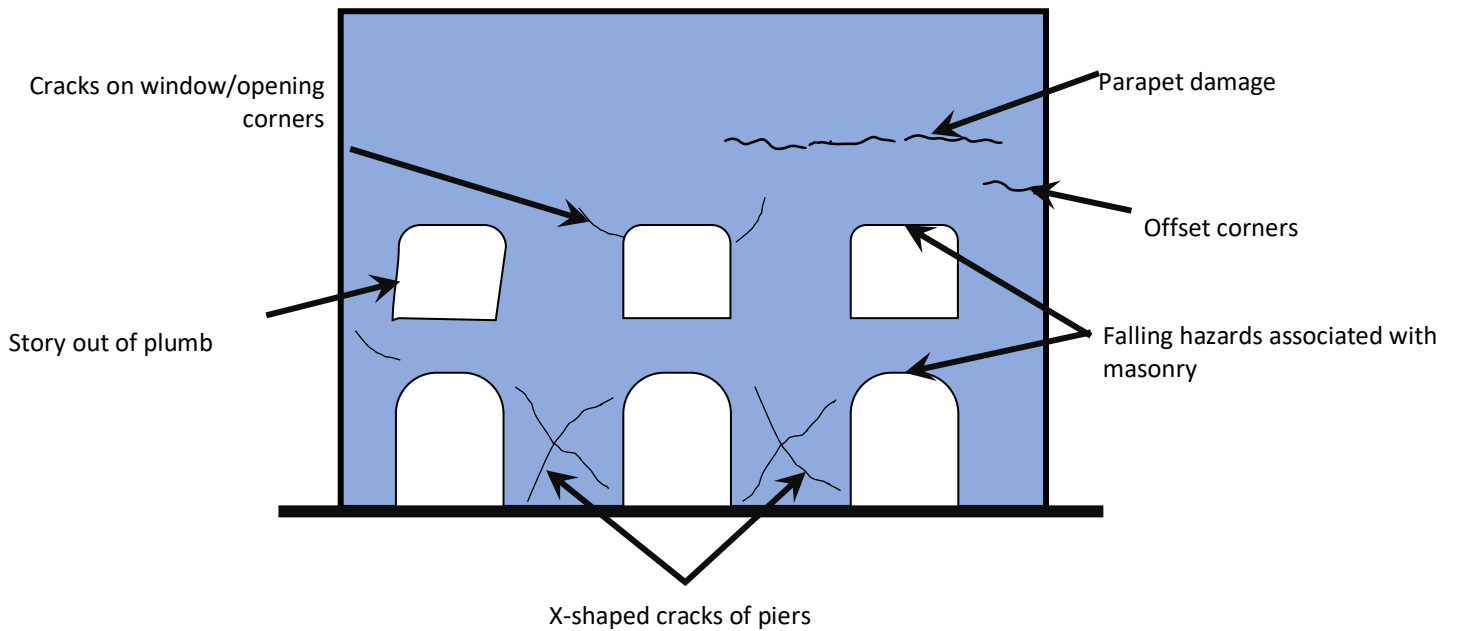


Figure 10 - Inspection points on reinforced concrete shear wall structures

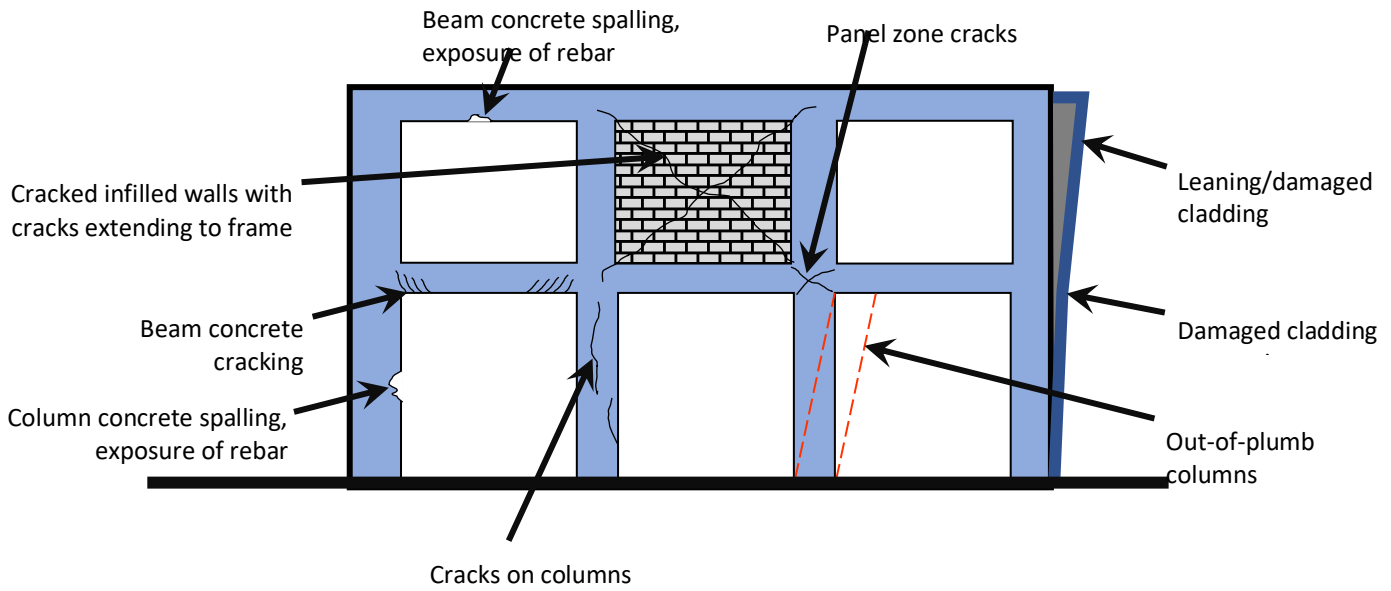


Figure 11 - Inspection points on reinforced concrete moment-framed structures

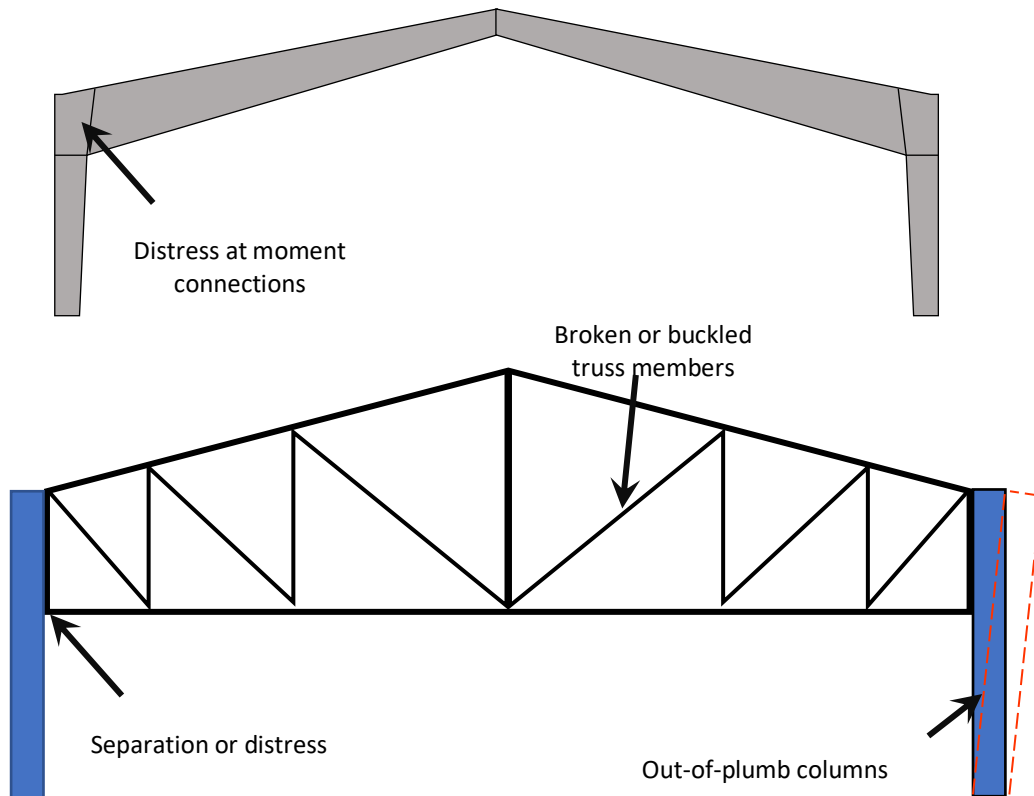


Figure 12 - Inspection points on light-braced steel framed structures

FORM A – USER GUIDELINE

I STRUCTURE LOCATION

This section identifies the address and location of the structure. The downstream users must be able to identify and locate the structure from the information given in this section. Refer to Figure 1A.

1 – Homeowner/Building Name: Insert the name of the building (if applicable) or the homeowner’s name if it is a residential structure.

2 – Address: Use the postal address if available, if not, record the building number, street name and city or town.

3 – Regional Corporation Area: This would be the district where the Regional Corporation for that area is responsible.

4 – GPS: Record the coordinates from a global positioning system (GPS) device. This would be the latitude and longitude to six (6) decimal places. The use of Google Maps on any Android or iOS device is acceptable.

[SECTION A] – GENERAL DETAILS OF STRUCTURE	
HOMEOWNER OR BUILDING NAME	<input type="text"/>
ID #	<input type="text"/>
ADDRESS	<input type="text"/>
	<i>(Number and Street Address)</i>
	<input type="text"/>
	<i>(City/Town)</i>
	<input type="text"/>
	<i>(Postal Code)</i>
REGIONAL CORPORATION	<input type="text"/>
GPS (LOCATION)	L O N <input type="text"/> . <input type="text"/> L A T <input type="text"/> . <input type="text"/>

Figure 13 – Form A - General Details of Structure

2 ASSESSMENT PARTICULARS

This section identifies the inspector via a unique identification number. This number is given to an inspector once this training has been completed. Other information regarding the date and time of inspection as well as the type of disaster that the structure experienced. Refer to Figure 2A.

- 1 – **RDA Inspector ID#:** Insert the unique RDA inspector’s identification number
- 2 – **Inspection Date:** Record date the inspection was conducted. This is given in two-digit format (dd-mm-yy).
- 3 – **Inspection Time:** Insert the start time that the inspection was conducted. This is given in a 12-hour format. Tick the appropriate box for AM or PM.
- 4 – **Disaster type:** Record the type of disaster by ticking the appropriate box. If there are more than one disasters that affects the structure, tick all appropriate boxes that may apply.

[SECTION B] – ASSESSMENT OF PARTICULARS			
RDA INSPECTOR ID #	<input type="text"/>	Structure Collapse	<input type="text"/>
INSPECTION DATE	<input type="text"/> / <input type="text"/> / <input type="text"/> D D - M M - Y Y	INSPECTION TIME	<input type="text"/> : <input type="text"/> H R : M M
DISASTER TYPE	<input type="text"/>	DETAILS (If Other)	<input type="text"/>
	<small>(i.e. Tropical Cyclone; Earthquake; Flood; Landslide; Tsunami or Other)</small>		

Figure 14 – Form A - Assessment of Particulars

3 STRUCTURE DETAILS

This section identifies basic properties of the building such as size, usage and structural system. Refer to Figure 3A.

1 – Footprint: Insert the overall dimensions of the building. This would be the length and width measured outside. In cases where the structure has an irregular shape, record only the maximum length and perpendicular width of the structure. The dimensions that are to be used is feet.

2 – Number of Stories (superstructure): Record the number of floors above ground level. This would include the ground floor as well. For example, if a structure has 2 floors above the ground floor, it would be considered a 3-storey building, and 3 floors would be recorded.

3 – Number of Stories (substructure): Insert the number of floors below ground level. These are floor (or basement levels) below the ground floor.

4 – Building Usage: Identify and record the usage type for the structure by ticking the appropriate box. Space is given to record a usage that is not given.

5 – Typology: Identify the percentage of the structural system that is utilised. In most cases, this will be 100% for a given structure. If there is more than one structural system, fill in the estimated percentages that will eventually sum to 100%. There may be cases where the structural system cannot be seen due to finishes etc. In such cases, fill in the estimated percentage that was determined.

SECTION C] – STRUCTURAL DETAILS

FOOTPRINT F T X F T

SUPERSTRUCTURE – NUMBER OF STORIES SUBSTRUCTURE – NUMBER OF STORIES

BUILDING USAGE DETAILS IF OTHER:

(i.e. Residential (Single Use); Residential (Multi-Us); Commercial; School; Critical Facility; Industrial; Office or Other)

TYPOLOGY <small>(for mixed typologies choose more than one and approximate percentage)</small>	<input type="checkbox"/>	<input type="checkbox"/>	Indeterminable	<input type="checkbox"/>	<input type="checkbox"/>	Reinforced concrete moment resisting frame
	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Non Engineered	<input type="checkbox"/>	<input type="checkbox"/>	Reinforced concrete shear wall
	<input type="checkbox"/>	<input type="checkbox"/>	Wood light frame/panel	<input type="checkbox"/>	<input type="checkbox"/>	Structural Steel moment resisting frame
	<input type="checkbox"/>	<input type="checkbox"/>	Unreinforced/unconfined masonry	<input type="checkbox"/>	<input type="checkbox"/>	Structural Steel braced frame
	<input type="checkbox"/>	<input type="checkbox"/>	Confined masonry	<input type="checkbox"/>	<input type="checkbox"/>	Structural Steel frame (masonry infilled walls)
	<input type="checkbox"/>	<input type="checkbox"/>	Reinforced concrete (masonry infilled walls)	<input type="checkbox"/>	<input type="checkbox"/>	

Figure 15 – Form A - Structural Details

4 VISUAL OBSERVATIONS OF DAMAGES

This section identifies damages the structure developed due to the disaster. Damages are categorised in three (3) groups: structural, non-structural and external site damages. The RDA inspector must look at all damages and conclude whether damages are structural or non-structural. Damages are graded from 0 to 3.

0 = no damage

1 = minor damage

2 = moderate damage

3 = major damage

Structural Damages	Damage Rating			
	0	1	2	3
External walls	No signs of cracks	Hairline cracks can be seen	Structural cracks are seen penetrating through plaster. Spalling of plaster can be seen.	Structural cracks penetrate through plaster and wall. Separation cracks between adjacent connections and walls occur. Spalling of plaster and wall materials can be seen. Partial or full collapse may be seen.
External columns (concrete)	No signs of cracks	Hairline cracks can be seen	Structural cracks are seen penetrating through plaster. Spalling of plaster can be seen.	Structural cracks penetrate through plaster and Column. Spalling of plaster and concrete can be seen. Buckling of the column occurs. Partial or full collapse may be seen.
External columns (Structural Steel)	No signs of buckling	Paint/fireproofing cracks/spalls off	Warping of flanges/webs/stiffeners can be seen. Paint/fireproofing cracks/spalls off	Buckling of flanges/webs/stiffeners can be seen. Paint/fireproofing cracks/spalls off. Full Collapse can occur
External beams (concrete)	No signs of cracks	Hairline cracks can be seen	Structural cracks are seen penetrating through plaster. Spalling of plaster can be seen. Beam deflections may be noticeable.	Structural cracks penetrate through plaster and beam. Spalling of plaster and concrete can be seen. Deflection of the beam occurs. Partial or full collapse may be seen.

External beams (Structural Steel)	No signs of buckling	Paint/fireproofing cracks/spalls off	Warping of flanges/webs/stiffeners can be seen. Paint/fireproofing cracks/spalls off. Beam deflections may be noticeable.	Buckling of flanges/webs/stiffeners can be seen. Paint/fireproofing cracks/spalls off. Deflection of the beam occurs. Partial or full Collapse can occur
Foundations	No signs of settlement or differential settlement	Hairline cracks due to settlement or differential settlement occurs.	Structural cracks due to settlement or differential settlement occurs.	Partial or full Collapse of supported columns / floors occur.
Ground Floor	No signs of cracks	Hairline cracks can be seen	Structural cracks are seen penetrating through the slab. Variations of slab elevations can be evaluated using a tennis ball.	Structural cracks are seen penetrating through the slab. Variations of slab elevations can be evaluated visually.
Internal columns (concrete)	No signs of cracks	Hairline cracks can be seen	Structural cracks are seen penetrating through plaster. Spalling of plaster can be seen.	Structural cracks penetrate through plaster and Column. Spalling of plaster and concrete can be seen. Buckling of the column occurs. Partial or full collapse may be seen.
Internal columns (Structural Steel)	No signs of buckling	Paint/fireproofing cracks/spalls off	Warping of flanges/webs/stiffeners can be seen. Paint/fireproofing cracks/spalls off	Buckling of flanges/webs/stiffeners can be seen. Paint/fireproofing cracks/spalls off. Full Collapse can occur
Internal beams (concrete)	No signs of cracks	Hairline cracks can be seen	Structural cracks are seen penetrating through plaster. Spalling of plaster can be seen. Beam deflections may be noticeable.	Structural cracks penetrate through plaster and beam. Spalling of plaster and concrete can be seen. Deflection of the beam occurs. Partial or full collapse may be seen.

Internal beams (Structural Steel)	No signs of buckling	Paint/fireproofing cracks/spalls off	Warping of flanges/webs/stiffeners can be seen. Paint/fireproofing cracks/spalls off. Beam deflections may be noticeable.	Buckling of flanges/webs/stiffeners can be seen. Paint/fireproofing cracks/spalls off. Deflection of the beam occurs. Partial or full Collapse can occur
Framed Connections	No sign of warping. Paint/fireproofing remains intact	Paint/fireproofing cracks/spalls off	Paint/fireproofing cracks/spalls off. Beam deflections may be noticeable. Bolts maybe bent/sheard or missing. Nuts are missing.	Warping of flanges/webs/stiffeners can be seen. Paint/fireproofing cracks/spalls off. Beam deflections are noticeable. Bolts maybe bent/sheard or missing. Nuts are missing.
Staircases (concrete)	No signs of cracks	Hairline cracks can be seen	Structural cracks are seen penetrating through plaster. Spalling of plaster can be seen. Beam deflections may be noticeable.	Structural cracks penetrate through plaster and beam. Spalling of plaster and concrete can be seen. Deflection of the staircase occurs. Differential Settlement occurs. Partial or full collapse may be seen.
Staircases (Structural Steel)	No signs of buckling	Paint/fireproofing cracks/spalls off	Warping of flanges/webs/stiffeners can be seen. Paint/fireproofing cracks/spalls off. Beam deflections may be noticeable.	Buckling of flanges/webs/stiffeners can be seen. Paint/fireproofing cracks/spalls off. Deflection of the beam occurs. Partial or full Collapse can occur
Elevated floors	No signs of cracks	Hairline cracks can be seen	Structural cracks are seen penetrating through the slab. Variations of slab elevations can be evaluated using a tennis ball.	Structural cracks are seen penetrating through the slab. Variations of slab elevations can be evaluated visually. Partial or full Collapse can occur

Roof connections	No sign of warping. Paint/fireproofing remains intact	Paint/fireproofing cracks/spalls off	Paint/fireproofing cracks/spalls off. Beam deflections may be noticeable. Bolts maybe bent/sheard or missing. Nuts are missing.	Warping of flanges/webs/stiffeners can be seen. Paint/fireproofing cracks/spalls off. Beam deflections are noticeable. Bolts maybe bent/sheard or missing. Nuts are missing.
Rafters	No signs of buckling	Cracks may be visible	Warping of the rafter occurs. Beam deflections may be noticeable. Longitudinal cracks occur.	Rafters sheard off. Missing or collapsed
Roof sheeting	No signs of damage	Sheets may be bent or sustained dents	Sheets may become loose	Sheets missing
Parapet	No signs of cracks	Hairline cracks can be seen	Structural cracks are seen penetrating through plaster. Spalling of plaster can be seen.	Structural cracks penetrate through plaster and wall. Separation cracks between adjacent connections and walls occur. Spalling of plaster and wall materials can be seen. Partial or full collapse may be seen.
Non-structural Damages				
Cladding/glazing	No signs of damage	Cracks may be visible	Cracks are visible, parts become dislodged	Partial or full Collapse
Ceiling	No signs of damage	Some sections may have small deflections	Some sections may have large deflections	large deflections. Partial or full Collapse
Electrical	No signs of damage	Power in some or all areas not working	Power in most areas not working	Exposed wiring, sparking occurs; damage to main electrical supply to the structure
HVAC	No signs of damage	HVAC works but noisy	HVAC not working	HVAC systems collapsed
Plumbing	No signs of damage	Cracks in pipes and minor leaks	Cracks in pipes and major leaks	Ruptured pipelines
Waste water	No signs of damage	Cracks in pipes and minor leaks	Cracks in pipes and major leaks	Ruptured pipelines
External Site Damages that pose a danger to the immediate structure				

Utility poles	No signs of damage	Pole may be in place but minor buckling.	Pole may be in place but major buckling occurs.	Fallen
Trees	No signs of damage	Branches fallen, tree remains intact	Branches fallen, tree may be partially intact	Fallen/uprooted
landslips	No signs of damage	surrounding areas show minor cracks in soil	Large separation cracks in the soil can be seen. Partial slippage occurs	Full slippage occurs

Table 1 – Form A – Damage Rating

Damages must be viewed at the local site and their potential impact on the neighboring members.

Indeterminate (IN) – This means that the extent of damage is unable to be determined at the time of inspection and should be checked off with a note indicating that that particular element may need further review.

Not Applicable (NA)- This means that the particular structural or non-structural element does not apply to the particular structure

An importance rating (IR) is also given to members where damages can be more critical than others. This factor is multiplied by the rating assigned for that particular member. For example:

An external column with a damage rating of 3 is multiplied by an IR of 3 to give a total of 9, which is now the new assigned grade for the external column. Similarly,

Roof sheeting with a damage factor of 3 multiplied by an IR of 1 to give a total of 3, which is now the new assigned grade for the roof sheeting.

Here both examples show the difference in assigning a numerical value to each member with similar damage ratings. The external column is more critical when considering the structure for occupancy.

The sum total of all calibrated damage ratings (i.e. damage rating x importance rating) is then calculated and recorded.

The subsections to be filled out are:

1 – Structural Damages: Inspect each structural element listed and assign a damage rating (from 0 to 3). Now multiply each of these by the importance rating.

2 – Non-structural Damages: Inspect each structural element listed and assign a damage rating (from 0 to 3).

3 – External site damages that pose a danger to the immediate structure Inspect each structural element listed and assign a damage rating (from 0 to 3). Now multiply each of these by the importance rating.

4 – Photographs attached: Tick appropriately if photographs are attached to the RDA form.

5 – Total: Sum all the factored damage ratings from the structural damage and External site damages and place number in the box.

[SECTION D] – VISUAL OBSERVATION OF DAMAGES

STRUCTURAL DAMAGES

Details	Ratings				IN/NA	IR	SUM
	0	1	2	3			
External walls						3	
External columns						3	
External beams						3	
Foundations						3	
Ground Floor						3	
Internal Columns						3	
Internal Beams						3	
Framed Connections						3	
Staircases						3	
Elevated floors						3	
Roof connections						3	
Rafters						1	
Roof sheeting						1	
Parapet						1	

IR – Importance Rating
 0 – None IN – Indeterminable NA – Not Applicable 3 – Major
 1 – Minor 2 – Moderate

NON-STRUCTURAL DAMAGES

Details	Ratings				IN/NA
	0	1	2	3	
Cladding/glazing					
Ceiling					
Electrical					
HVAC					
Plumbing					
Waste water					

EXTERNAL SITE DAMAGES

Details	Ratings				IN/NA	IR	SUM
	0	1	2	3			
Utility poles						1	
Trees						1	
Landslips						3	
Adjacent structure						3	
Other						3	

PICTURE ATTACHED

 (i.e. Yes/No)

TOTAL

Figure 16 – Form A - Visual Observation of Damages

5 SUMMARY

This section provides feedback from the assessment and instruction on the viability of occupancy and the need for further assessment. Refer to *Figure 17 – Form A – Rapid Damage Assessment Summary*.

Based on the total damage rating from section 4, three (3) options are now available to tick.

ND = No to Minor Damage = 0 > 51

MD = Moderate Damage = 52 > 102

HD = Heavy Damage = 102 > 153

Based on these ranges, tick the appropriate box.

If members from section 4 have a modified damage factor of 9, the structure can be deemed as ND or HD.

Tick appropriately if a further structural assessment is needed.

Comments can be written by the RDA inspector.

The Senior Engineer can sign after reviewing the completed RDA form, and comments can be made.

[SECTION E] – RAPID DAMAGE ASSESSMENT SUMMARY			
ASSESSMENT POSITION/TAG OF STRUCTURE			
No to Minor Damage	Can Be Occupied	ND 0>51	<input type="checkbox"/> Green
Moderate Damage	Can Be Occupied with Restrictions	MD 52>102	<input type="checkbox"/> Yellow
Significant/Heavy Damage	Entry Prohibited/Do Not Occupy	HD 102>153	<input type="checkbox"/> Red
TYPE OF ASSESSMENT CONDUCTED	<input type="checkbox"/>	FURTHER ASSESSMENT REQUIRED	<input type="checkbox"/>
REMARKS/COMMENTS	<i>(i.e. Internal, External, or Combination)</i>		<i>(i.e. Yes/No)</i>
			RDA Inspector
			INSPECTION END TIME
			<input type="text"/> : <input type="text"/> AM <input type="text"/> PM
<small>Produced for the Prepare TT Project in collaboration with The Office of Disaster Preparedness and Management (ODPM) Association of Professional Engineers of Trinidad and Tobago Board of Engineering of Trinidad & Tobago Ministry of Local Government and Rural Development Ministry of National Security Ministry of Works and Transport Miyamoto International Tobago House of Assembly – Division of Infrastructure, Quarries and the Environment Trinidad & Tobago Bureau of Standards</small>			

Figure 17 – Form A - Rapid Damage Assessment Summary

FORM B – USER GUIDELINE

I ASSESSMENT PARTICULARS

This section identifies the inspector via a unique identification number. This number is given to an inspector once this training has been completed. Other information regarding the date and time of inspection as well as the type of disaster that the Bridge experienced. Refer to Figure 1B.

- 1 – RDA Inspector ID#:** Insert the unique RDA inspector’s identification number
- 2 – Inspection Date:** Record date the inspection was conducted. This is given in two-digit format (dd-mm-yy).
- 3 – Inspection Time:** Insert the start time that the inspection was conducted. This is given in a 12-hour format. Tick the appropriate box for AM or PM.
- 4 – Disaster type:** Record the type of disaster by ticking the appropriate box. If there are more than one disasters that affects the Bridge, tick all appropriate boxes that may apply.

[SECTION A] - ASSESSMENT PARTICULARS			
RDA INSPECTOR ID #	<input type="text"/>	Structure Collapse	<input type="text"/>
INSPECTION DATE	<input type="text"/> D D - M M - Y Y	INSPECTION TIME	<input type="text"/> : <input type="text"/> H R : M M
			<input type="checkbox"/> A M <input type="checkbox"/> P M
DISASTER TYPE	<input type="text"/> <i>(i.e. Tropical Cyclone; Earthquake; Flood; Landslide; Tsunami or Other)</i>	DETAILS (If Other)	<input type="text"/>

Figure 18 - Form B - Assessment Particulars

2 STRUCTURE LOCATION

This section identifies the address and location of the Bridge. The downstream users must be able to identify and locate the Bridge from the information given in this section. Refer to Figure 2B.

- 1 – **Bridge Name:** Insert the name of the bridge (if applicable).
- 2 – **Bridge ID#:** Insert the ID# of the bridge (if applicable).
- 3 – **Location:** Record the street name and city or town.
- 3 – **Regional Corporation Area:** This would be the district where the Regional Corporation for that area is responsible.
- 4 – **GPS:** Record the coordinates from a global positioning system (GPS) device. This would be the latitude and longitude to six (6) decimal places. The use of Google Maps on any Android or iOS device is acceptable.

[SECTION B] – STRUCTURE LOCATION	
Bridge Name	<input type="text"/>
ID #	<input type="text"/>
Location	<input type="text"/>
	<i>(Road/Street Address)</i>
	<input type="text"/>
	<i>(City/Town)</i>
	<input type="text"/>
	<i>(Postal Code)</i>
REGIONAL CORPORATION	<input type="text"/>
GPS (LOCATION)	L A T <input type="text"/> . <input type="text"/> L O N <input type="text"/> . <input type="text"/>

Figure 19 - Form B- Structure Location

4 VISUAL OBSERVATIONS OF DAMAGES

This section identifies damages the bridge developed due to the disaster. Damages are categorised in three (3) groups: structural, non-structural and external site damages. The RDA inspector must look at all damages and conclude whether damages are structural or non-structural. Damages are graded from 0 to 3.

0 = no damage

1 = minor damage

2 = moderate damage

3 = major damage

Structural Damages	Damage Rating			
	0	1	2	3
Girders	No signs of cracks	Hairline cracks can be seen	Structural cracks are seen. Beam deflections may be noticeable.	Structural cracks penetrate through beam. Spalling of concrete can be seen. Deflection of the beam occurs. Partial or full collapse may be seen.
Piers	No signs of cracks	Hairline cracks can be seen	Structural cracks are seen	Structural cracks penetrate through the pier. Spalling of concrete can be seen. Buckling of the pier occurs. Partial or full collapse may be seen.
Abutments/ Wingwall	No signs of cracks	Hairline cracks can be seen	Structural cracks are seen	Structural cracks penetrate through the abutment /wing wall. Separation cracks between adjacent connections and walls occur. Spalling of concrete can be seen. Partial or full collapse may be seen.
Truss	No signs of buckling	Paint/fireproofing cracks/spalls off	Warping of struts/chords can be seen. Paint/fireproofing cracks/spalls off. Beam deflections may be noticeable.	Buckling of struts/chords. Paint/fireproofing cracks/spalls off. Deflection of the beam occurs. Partial or full Collapse can occur
Deck	No sign of warping. Paint/fireproofing remains intact	Cracks in the wearing course can be seen	Major cracks can be seen, erosion of deck material can be seen	Major structural cracks in the roadway can be seen. Partial or full collapse can occur

Non-structural Damages				
Railing	No sign of warping. Paint/ fireproofing remains intact	Rails show signs of warping	Some rails become warped and dislodged	Rails collapse
Lighting	No sign of warping.	Poles show signs of warping/ buckling	Some Poles buckle and connections show distress	Poles collapse
Electrical	No signs of damage	Cracked conduits	Cracked conduits, Wires are exposed	Broken conduits, Exposed wiring, sparking occurs
Utilities	No signs of damage	Cracked conduits	Cracked conduits, Wires are exposed	Broken conduits, Exposed wiring, sparking occurs
Drainage	No signs of damage	Drains show minor cracks	Drains show major cracks and spalling	Drains appear to be non-functional

Table 2 -Form B - Damage Rating

Damages must be viewed at the local site and their potential impact on the neighboring members.

An importance rating (IR) is also given to members where damages can be more critical than others. This factor is multiplied by the rating assigned for that particular member. For example:

A girder with a damage rating of 3 is multiplied by an IR of 3 to give a total of 9, which is now the new assigned grade for the girder. Similarly,

The sum total of all calibrated damage ratings (i.e. damage rating x importance rating) is then calculated and recorded.

The subsections to be filled out are:

1 – Structural Damages: Inspect each structural element listed and assign a damage rating (from 0 to 3). Now multiply each of these by the importance rating.

2 – Non-structural Damages: Inspect each structural element listed and assign a damage rating (from 0 to 3).

3 – External site damages that pose a danger to the immediate Bridge Inspect each structural element listed and assign a damage rating (from 0 to 3). Now multiply each of these by the importance rating.

4 – Photographs attached: Tick appropriately if photographs are attached to the RDA form.

5 – Total: Sum all the factored damage ratings from the structural damage and External site damages and place number in the box.

[SECTION D] – VISUAL OBSERVATION OF DAMAGES

STRUCTURAL DAMAGES

Details	Ratings				IN/NA	IR	SUM
	0	1	2	3			
Girders						3	
Piers						3	
Abutments						3	
Wingwall						3	
Truss						3	
Deck						3	

EXTERNAL SITE DAMAGES

Details	Ratings				IN/NA	IR	SUM
	0	1	2	3			
Utility poles						1	
Trees						1	
Landslips						3	
Adjacent structure						2	
Watercourse						3	
Other						3	

NON-STRUCTURAL DAMAGES

Details	Ratings				IN/NA
	0	1	2	3	
Railing					
Lighting					
Electrical					
Utilities					
Drainage					

TOTAL

PICTURE ATTACHED (i.e. Yes/No)

IR – Importance Rating
 IN – Indeterminable
 NA – Not Applicable

1 – Low Rate
 0 – None
 2 – Moderate

3 – High Rate
 1 – Minor
 3 – Major

Figure 21 - Form B - Visual Observation of Damages

5 SUMMARY

This section provides feedback from the assessment and instruction on the viability of occupancy and the need for further assessment. **Refer to Figure 22 – Form B – Rapid Damage Summary.**

Based on the total damage rating from section 4, three (3) options are now available to tick.

ND = No to Minor Damage = 0 > 20

MD = Moderate Damage = 21 > 40

HD = Heavy Damage = 41 > 60

Based on these ranges, tick the appropriate box.

If members from section 4 have a modified damage factor of 9, the Bridge can be deemed as ND or HD.

Tick appropriately if a further structural assessment is needed.

Comments can be written by the RDA inspector.

The Senior Engineer can sign after reviewing the completed RDA form, and comments can be made.

SECTION E1 – RAPID DAMAGE ASSESSMENT SUMMARY			
ASSESSMENT POSITION/TAG OF STRUCTURE		<input type="text"/>	
No to Minor Damage	Regular Traffic and or Loading	ND 0>20	<input type="checkbox"/>
Moderate Damage	Reduced Traffic and or Loading	MD 21>40	<input type="checkbox"/>
Significant/Heavy Damage	Restricted Traffic and or Loading	HD 41>60	<input type="checkbox"/>
TYPE OF ASSESSMENT CONDUCTED	<input type="text"/>	FURTHER ASSESSMENT REQUIRED	<input type="checkbox"/>
REMARKS/COMMENTS	(i.e. Road surface and above including side; under bridge deck or combination)		(i.e. Yes/No)
<hr/> <hr/> <hr/>			
		TAG ID/RDA Inspector	
		INSPECTION END TIME	
		<input type="text"/> : <input type="text"/> AM <input type="checkbox"/> PM	
<small>Produced for the Prepare TT Project in collaboration with The Office of Disaster Preparedness and Management (ODPM) Association of Professional Engineers of Trinidad and Tobago Board of Engineering of Trinidad & Tobago Ministry of Local Government and Rural Development Ministry of National Security Ministry of Works and Transport Miyamoto International Tobago House of Assembly - Division of Infrastructure, Quarries and the Environment Trinidad & Tobago Bureau of Standards</small>			

Figure 22 - Form B - Rapid Damage Summary

INSTRUCTIONS FOR INSTALLING AND USING KOBO TOOLBOX HUMANITARIAN RESPONSE APP

All users shall create a free KoBo Account for the practical application of the digital form.

Step 1

- Create a free KoBo Toolbox Account
- Create a free humanitarian kobo account using your phone / tablet web browser/ laptop using the following link
- Kobo Registration Link
<https://kobo.humanitarianresponse.info/accounts/register/#/>

Step 2-

KoBo Form Field Use: Android Users

If you use an Android Phone or tablet, Download and install the “ KoBoCollect" app via the play store

After downloading the app,

1. Install [KoboCollect](#) on your Android device.
2. Click on to open settings.
3. Enter the server URL <https://kc.humanitarianresponse.info> and your username and password
4. Open "Get Blank Form" and select this project. The two forms will show up. Select them and click “Get Selected”. This will down load the forms onto your device.
5. Click “Fill blank form”. Selecting this will display the two forms. Select the one you want to fill.
6. Open "Enter Data."
7. Fill out the form with the relevant data
8. After reaching to the end of the form, select” Mark form as finalized”
9. Click “Save Form and Exit”
10. The menu will show up again showing the number of finalized forms in brackets with the two following options:
11. Edit Saved Form (1)
12. Send Finalized Form (1)
13. Select “Edit Saved Form” if you want to go back to make changes or
14. Select “Send Finalized Form”. This will open up the list of forms that have been finalized.
15. Select the forms you want to upload and click “ Send Selected”

IOS and Laptop Users

1. Login to your kobo account using your phone / tablet web browser laptop using the following link

Kobo Login Link

<https://kobo.humanitarianresponse.info/accounts/login/#/>

2. Select the form required i.e., Form A or Form B

3. Under the “Form” tab scroll down to collect data

4. Ensure that online offline multiple submission is selected

5. Click on “Open”. This will open the form on another page where the data can be entered.

6. After the form is filled out click “submit”. The form will ask you to enter your login information.

Once this is done the form will be uploaded within five minutes.

7. If there is no internet connection, the forms will be saved as drafts and uploaded when an internet connection is restored

DEMONSTRATION OF THE KOBO TOOLBOX HUMANITARIAN RESPONSE APP

DEMONSTRATION

USE OF THE KOBO APPLICATION



Picture 1 Kobo presentation

The following pictures show the procedure to use the KOBO application and the instructions are similar to that of the paper based forms.

Instructions for use are in RED.

**Government of the Republic of Trinidad & Tobago -
"PREPARE TT PROGRAM RAPID DAMAGE ASSESSMENT FORM
A – Building Structures"**

This note can be read out loud



Picture 2 Form A Building Structures Opening Page

[SECTION A] – GENERAL DETAILS OF STRUCTURE

HOMEOWNER OR BUILDING NAME

Enter the name of the home owner or building name here

Identification number Select one form of identification for the home/ building owner and enter the details

- Drivers Permit Passport National ID
 Not Applicable

Drivers Permit

Passport

E.g. BA23C345

National ID

ADDRESS

Number and Street Address

Enter the address of the building being inspected



Picture 3 Form A Section A.1

City/Town

Postal Code

» **REGIONAL CORPORATION** Select Trinidad or Tobago regions and then further select the Local Government region

REGIONAL CORPORATION

- Trinidad Regions Tobago Regions

Trinidad Regions

- | | |
|---|---|
| <input type="radio"/> a. Port Of Spain City Corporation | <input type="radio"/> b. San Fernando City Corporation |
| <input type="radio"/> c. Arima Borough Corporation | <input type="radio"/> d. Tunapuna/ Piarco Regional Corporation |
| <input type="radio"/> e. Sangre Grande Regional Corporation | <input type="radio"/> f. Couva/ Tabaquite/ Talparo Regional Corporation |
| <input type="radio"/> g. Point Fortin Borough Corporation | <input type="radio"/> h. Penal Debe Regional Corporation |
| <input type="radio"/> i. Diego Martin Regional Corporation | <input type="radio"/> j. Siparia Regional Corporation |
| <input type="radio"/> k. Mayaro/ Rio Claro Regional Corporation | <input type="radio"/> l. San Juan/ Laventille Regional Corporation |
| <input type="radio"/> m. Princes Town Regional Corporation | <input type="radio"/> n. Chaguanas Borough Corporation |



Picture 4 Form A Section A.2

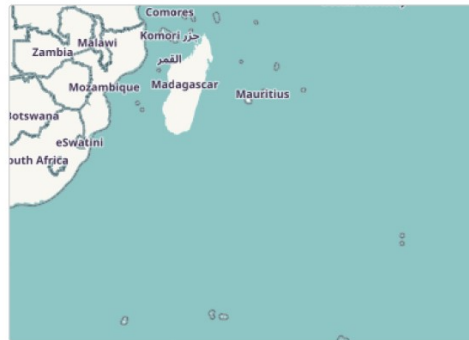
GPS Touch the GPS location button to automatically enter the GPS location. The data can be entered manually if required.

latitude (x.y °)

longitude (x.y °)

altitude (m)

accuracy (m)



Picture 5 Form A Section A.3

[SECTION B] – ASSESSMENT OF PARTICULARS

Structure Collapse Is the structure collapsed? Select Yes or No

- Yes No

INSPECTION DATE Enter the date of the inspection

yyyy-mm-dd _____

INSPECTION START TIME Enter the time the inspection has started

hh:mm _____

AM/PM Select AM or PM

- AM
 PM

DISASTER TYPE Select the relevant disaster type. If it is not listed select "Other" and enter the details.

- Tropical Cyclone Earthquake Flood
 Landslide Tsunami Other

DETAILS (If Other)



Picture 6 Form A Section B

[SECTION C] – STRUCTURAL DETAILS

Building Footprint Type in the approximate dimensions of the structure concerned

FT

E.g. 50 _____

X

FT

30 _____

SUPERSTRUCTURE - NUMBER OF STORIES Enter the number of stories above ground. E.g. if the building has a ground floor and one floor above, enter 2

2 _____

SUBSTRUCTURE - NUMBER OF STORIES Enter the number of stories below ground. E.g. if the building has basement parking for one level then enter 1. If there is none enter 0.

0 _____

BUILDING USAGE Select the building usage type. If it is not listed select "Other" and enter the details

- Residential (Single Use) Residential (Multi-Use) Commercial
 School Critical Facility Industrial
 Office Other

Other



Picture 7 Form A Section C.1

» **TPOLOGY** Select the building typology for the building under inspection. If the building is a mixed typology select them and input the approximate percentage of each.

for mixed typologies choose more than one and approximate percentage

- Indeterminable
- Non Engineered
- Wood light frame/panel
- Unreinforced/unconfined masonry
- Confined masonry
- Reinforced concrete (masonry infilled walls)
- Reinforced concrete moment resisting frame
- Reinforced concrete shear wall
- Structural Steel moment resisting frame
- Structural Steel braced frame
- Structural Steel frame (masonry infilled walls)
- Other Typology

Other Typology



Picture 8 Form A Section C.2

<p>Indeterminable Percentage (%)</p> <hr/>	<p>Reinforced concrete moment resisting fran Percentage (%)</p> <hr/>	
<p>Non Engineered Percentage (%)</p> <hr/>	<p>Reinforced concrete shear wall Percentage (%)</p> <hr/>	<p>Structural Steel frame (masonry infilled walls) Percentage (%)</p> <hr/>
<p>Wood light frame/panel Percentage (%)</p> <p style="text-align: center;">75</p> <hr/>	<p>Structural Steel moment resisting frame Percentage (%)</p> <hr/>	<p>Other Typology Percentage (%)</p> <hr/>
<p>Unreinforced/unconfined masonry Percentage (%)</p> <p style="text-align: center;">25</p> <hr/>	<p>Structural Steel braced frame Percentage (%)</p> <hr/>	
<p>Confined masonry Percentage (%)</p> <hr/>		



Picture 9 Form A Section C.3

[SECTION D] – VISUAL OBSERVATION OF DAMAGES

» Reminders

Damages must be viewed at the local site and their potential impact on the neighboring members.

Indeterminate (IN) – This means that the extent of damage is unable to be determined at the time of inspection and should be checked off with a note indicating that that particular element may need further review.

Not Applicable (NA)- This means that the particular structural or non-structural element does not apply to the particular structure.

The RDA inspector must look at all damages and conclude whether damages are structural or non-structural. Damages are graded from 0 to 3.

0 = no damage, 1 = minor damage, 2 = moderate damage, 3 = major damage



Picture 10 Form A Section D.1

1 – Structural Damages: Inspect each structural element listed and assign a damage rating (from 0 to 3). These will be multiplied automatically by the importance rating.

2 – Non-structural Damages: Inspect each structural element listed and assign a damage rating (from 0 to 3).

3 – External site damages that pose a danger to the immediate structure Inspect each structural element listed and assign a damage rating (from 0 to 3). These will be multiplied automatically by the importance rating.

E.g. an external column with a damage rating of 3 is multiplied by an IR of 3 to give a total of 9, which is now the new assigned grade for the external column.

Remember to verify the final grade of the structural element being reviewed by entering the number calculated in the blank field provided.



Picture 11 Form A Section D.2

» **STRUCTURAL DAMAGES Details** Fill in the visual observation of damages and enter the respective damage ratings based on your observations for all relevant structural elements.

» » **External walls**

External walls

0 1 2
 3 IN/NA

SUM: 0

SUM: 3

SUM: 6

SUM: 9



Picture 12 Form A Section D.3

» » **External columns**

External columns

0 1 2
 3 IN/NA

SUM: 0

SUM: 3

SUM: 6

SUM: 9

External columns

6



Picture 13 Form A Section D.4

» » External beams

External beams

- 0 1 2
 3 X IN/NA

SUM: 0

SUM: 3

SUM: 6

SUM: 9

External beams

0



Picture 14 Form A Section D.5

» » Foundations

Foundations

- 0 1 2
 3 IN/NA

SUM: 0

SUM: 3

SUM: 6

SUM: 3

Parapet



Picture 15 Form A Section D.6

» **NON-STRUCTURAL DAMAGES (Details)** Select the relevant non-structural damage ratings where applicable. If there is none select IN/NA (Indeterminate/ Not applicable)

Cladding/glazing

0 1 2
 3 IN/NA

Ceiling

0 1 2
 3 IN/NA

Electrical

0 1 2
 3 IN/NA

HVAC

0 1 2
 3 IN/NA

Plumbing

0 1 2
 3 IN/NA

Waste water

0 1 2
 3 IN/NA



Picture 16 Form A Section D.7

» **EXTERNAL SITE DAMAGES Details** Select the relevant external site damage ratings where applicable. If there is none select IN/NA (Indeterminate/ Not applicable)

» » **Utility poles**

Utility poles

0 1 2
 3 IN/NA

SUM: 0

SUM: 1

SUM: 2

SUM: 3

Utility poles

1



Picture 17 Form A Section D.8

» » Trees

Trees

- 0 1 2
 3 IN/NA

SUM: 0

SUM: 1

SUM: 2

SUM: 3

Trees



Picture 18 Form A Section D.9

» » Landslips

Landslips

- 0 1 2
 3 IN/NA

SUM: 0

SUM: 3

SUM: 6

SUM: 9

Landslips



Picture 19 Form A Section D.10

» » **Adjacent structure**

Adjacent structure

- 0 1 2
 3 IN/NA

SUM: 0

SUM: 3

SUM: 6

SUM: 9

Adjacent structure



Picture 20 Form A Section D.11

» » **Other**

Enter other relevant external site damage where applicable. If there is none select IN/NA (Indeterminate/ Not applicable)

- 0 1 2
 3 IN/NA

SUM: 0

SUM: 3

SUM: 6

SUM: 9

Other

0



Picture 21 Form A Section D.12

Total [Assessment Value (ND/MD/HD)] Re enter the total assessment value calculated

52

PICTURE/VIDEO/AUDIO ATTACHED Select to attach pictures, video and audio. You may take photos directly from the camera or from saved files.

Yes No

» If Yes

» » .

Attached Video

Click here to upload file. (< 10MB)

Take Picture

Click here to upload file. (< 10MB)

Attached Video

Click here to upload file. (< 10MB)

Take Picture

Click here to upload file. (< 10MB)

Attached Video

Click here to upload file. (< 10MB)



Picture 22 Form A Section D.13

[SECTION E] – RAPID DAMAGE ASSESSMENT SUMMARY

Tag of Structure The tag of the structure will be automatically selected based on the total assessment value confirmed.

Green
 Yellow
 Red

Tag of Structure

Green
 Yellow
 Red

Tag of Structure

Green
 Yellow
 Red



Picture 23 Form A Section E.1

ASSESSMENT POSITION Select the appropriate assessment position based on the tag of the structure.

- No to Moderate Damage- Can Be Occupied Moderate Damage- Can Be Occupied with Restrictions
 Significant/Heavy Damage- Entry Prohibited/Do Not Occupy

TYPE OF ASSESSMENT CONDUCTED Select whether the structure was assessed internally or externally only or both.

- Internal External
 Combination

FURTHER ASSESSMENT REQUIRED Is a further assessment required? Select yes or no and enter the relevant comments below.

- Yes No

INSPECTION END TIME Enter the time the inspection ended

hh:mm _____

REMARKS/COMMENTS Enter any remarks that are relevant to the structure.

This note can be read out loud



Picture 24 Form A Section E.2

**GOVERNMENT OF THE REPUBLIC OF TRINIDAD AND TOBAGO
RAPID DAMAGE ASSESSMENT FORM (RDA) FORM B – Bridges**

This note can be read out loud



Picture 25 Form B Opening Page

[SECTION B] – STRUCTURE LOCATION

Bridge Name Enter the name of the bridge structure here

ID Enter the bridge structure ID number here

» Location Enter the bridge structure address

Road/Street Address

City/Town

Postal Code

REGIONAL CORPORATION Select Trinidad or Tobago regions and then further select the Local Government region

Trinidad Regions Tobago Regions



Picture 26 Form B Section B.1

Trinidad Regions

- a. Port Of Spain City Corporation
- b. San Fernando City Corporation
- c. Arima Borough Corporation
- d. Tunapuna/ Piarco Regional Corporation
- e. Sangre Grande Regional Corporation
- f. Couva/ Tabaquite/ Talparo Regional Corporation
- g. Point Fortin Borough Corporation
- h. Penal Debe Regional Corporation
- i. Diego Martin Regional Corporation
- j. Siparia Regional Corporation
- k. Mayaro/ Rio Claro Regional Corporation
- l. San Juan/ Laventille Regional Corporation
- m. Princes Town Regional Corporation
- n. Chaguanas Borough Corporation

Tobago Regions

- a. Bagatelle/Bacolet
- b. Belle Garden/Glamorgan
- c. Bethel/New Grange
- d. Bethesda/Les Coteaux
- e. Bon Accord/Crown Point
- f. Buccoo/Mt. Pleasant
- g. Darrel Spring/Whim
- h. Lambeau/ Lowlands
- i. Mason Hall/Moriah
- j. Mt. St. George/Goodwood
- k. Parlatuvier/L'Anse Fourmi/Speside
- l. Plymouth/Black Rock
- m. Roxborough/Argyle
- n. Scarborough/Mt. Grace
- o. Signal Hill/Patience Hill



Picture 27 Form B Section B.2

GPS Touch the GPS location button to automatically enter the GPS location. The data can be entered manually if required.

latitude (x,y °)

longitude (x,y °)

altitude (m)

accuracy (m)



Picture 28 Form B Section B.3

[SECTION C] – STRUCTURAL DETAILS Type in the approximate dimensions and other details of the bridge structure concerned

Footprint

FT

E.g. 50

X

FT

30

Number of Vehicles Lanes

2

Pedestrian

1



Picture 29 Form B Section C.1

» **TYPOLOGY** Select the **typology** for the bridge under inspection. If the bridge is a mixed typology structure select them and input the approximate percentage of each.
 for mixed typologies choose more than one and approximate percentage

- Prestressed Concrete Girder
 Structural Steel Girder
 Timber Girder
 Structural Steel Truss
 Suspension
 Other

Other

Prestressed Concrete Girder
 Percentage (%)

Structural Steel Girder
 Percentage (%)

100

Timber Girder
 Percentage (%)

Structural Steel Truss
 Percentage (%)

Other
 Percentage (%)



Picture 30 Form B Section C.2

[SECTION D] – VISUAL OBSERVATION OF DAMAGES

» **Reminders**

Damages must be viewed at the local site and their potential impact on the neighboring members.

Indeterminate (IN) - This means that the extent of damage is unable to be determined at the time of inspection and should be checked off with a note indicating that that particular element may need further review.

Not Applicable (NA)- This means that the particular structural or non-structural element does not apply to the particular structure.



Picture 31 Form B Section D.1

The RDA inspector must look at all damages and conclude whether damages are structural or non-structural. Damages are graded from 0 to 3.

0 = no damage, 1 = minor damage, 2 = moderate damage, 3 = major damage

1 – Structural Damages: Inspect each structural element listed and assign a damage rating (from 0 to 3). These will be multiplied automatically by the importance rating.

2 – Non-structural Damages: Inspect each structural element listed and assign a damage rating (from 0 to 3).

3 – External site damages that pose a danger to the immediate structure Inspect each structural element listed and assign a damage rating (from 0 to 3). These will be multiplied automatically by the importance rating.



Picture 32 Form B Section D.2

E.g. an external column with a damage rating of 3 is multiplied by an IR of 3 to give a total of 9, which is now the new assigned grade for the external column.

Remember to verify the final grade of the structural element being reviewed by entering the number calculated in the blank field provided.



Picture 33 Form B Section D.3

» **STRUCTURAL DAMAGES Details** Fill in the visual observation of damages and enter the respective damage ratings based on your observations for all relevant structural elements.

» » **Girders**

Girders

0 1 2
 3 IN/NA

SUM: 0

SUM: 3

SUM: 6

SUM: 9

Girders

9



Picture 34 Form B Section D.4

» » **Piers**

Piers

0 1 2
 3 IN/NA

SUM: 0

SUM: 3

SUM: 6

SUM: 9

Piers

3



Picture 35 Form B Section D.5

» » Abutments

Abutments

0 1 X 2
 3 IN/NA

SUM: 0

SUM: 3

SUM: 6

SUM: 9

Abutments

6



Picture 36 Form B Section D.6

» » Wingwall

Wingwall

0 1 2
 3 X IN/NA

SUM: 0

SUM: 3

SUM: 6

SUM: 9

Wingwall

0



Picture 37 Form B Section D.7

» » Truss

Truss

0 1 2
 3 X IN/NA

SUM: 0

SUM: 3

SUM: 6

SUM: 9

Truss

0



Picture 38 Form B Section D.8

» » Deck

Deck

0 X 1 2
 3 IN/NA

SUM: 0

SUM: 3

SUM: 6

SUM: 9

Deck

3



Picture 39 Form B Section D.9

» **NON-STRUCTURAL DAMAGES (Details)** Select the relevant non-structural damage ratings where applicable. If there is none relevant or you are unable to determine the damages select IN/NA (Indeterminate/ Not applicable)

Railing

X 0 1 2
 3 IN/NA

Lighting

X 0 1 2
 3 IN/NA

Electrical

X 0 1 2
 3 IN/NA

Utilities

X 0 1 2
 3 IN/NA

Drainage

X 0 1 2
 3 IN/NA



Picture 40 Form B Section D.10

» **EXTERNAL SITE DAMAGES Details** Select the relevant external site damage ratings where applicable. If there is none applicable select IN/NA (Indeterminate/ Not applicable)

» » **Utility poles**

Utility poles

0 X 1 2
 3 IN/NA

SUM: 0

SUM: 1

SUM: 2

SUM: 3

Utility poles

1



Picture 41 Form B Section D.11

Other Enter other relevant external site damage where applicable. If there is none present

0
 1
 2 select IN/NA (Indeterminate/ Not applicable)

3
 IN/NA

SUM:

SUM: 3

SUM: 6

SUM: 9

Other



Picture 42 Form B Section D.12

Total [Assessment Value (ND/MD/HD)] Re enter the total assessment value calculated

 E.g. 18

PICTURE/VIDEO/AUDIO ATTACHED Select to attach pictures, video and audio. You may take photos directly from the camera or from saved files.

X Yes No

» If Yes

» » .

<p>Take Picture</p> <p>Click here to upload file. (< 10MB)</p>	<p>Attached Video</p> <p>Click here to upload file. (< 10MB)</p>	<p>Attached Audio</p> <p>Click here to upload file. (< 10MB)</p>
<p>Take Picture</p> <p>Click here to upload file. (< 10MB)</p>	<p>Attached Video</p> <p>Click here to upload file. (< 10MB)</p>	<p>Attached Audio</p> <p>Click here to upload file. (< 10MB)</p>



Picture 43 Form B Section D.13

[SECTION E] – RAPID DAMAGE ASSESSMENT SUMMARY

Tag of Structure The tag of the structure will be automatically selected based on the total assessment value confirmed.

- Green
- Yellow
- Red

Tag of Structure

- Green
- Yellow
- Red

Tag of Structure

- Green
- Yellow
- Red



Picture 44 Form B Section E.1

ASSESSMENT POSITION Select the appropriate assessment position based on the tag of the structure.

- Regular Traffic and or Loading
- Reduced Traffic and or Loading
- Restricted Traffic and or Loading

TYPE OF ASSESSMENT CONDUCTED Select how the structure was assessed

- Road Surface and Above including sides
- Under Bridge Deck
- Combination

FURTHER ASSESSMENT REQUIRED Is a further assessment required? Select yes or no and enter the relevant comments below.

- Yes
- No

INSPECTION END TIME Enter the time the inspection ended

hh:mm _____

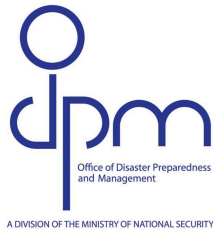
REMARKS/COMMENTS Enter any remarks that are relevant to the structure.

This note can be read out loud



Picture 45 Form B Section E.2

For further information please contact:



The Office of Disaster Preparedness and
Management
A Division of the Ministry of National Security
4a Orange Grove Road
Trincity, Trinidad W.I.
Telephone: (868) 640-1285



TRINIDAD AND TOBAGO RAPID DAMAGE ASSESSMENT USER GUIDELINE 2022