

1. Introduction

The research is oriented to the following objectives by means of systematizing the actual situation of the survey methods for earthquake damages related with buildings in Asia-Pacific Region.

1.1. Objectives

1.1.1. Guideline for the Survey Methods

The guideline is expected to be used by researchers and practitioners related with the earthquake damages on buildings in order to discuss and to establish their own survey methods in their own countries. For various existent survey methods of earthquake damage related with buildings and houses, the information about the methods ("**how**") is systematized with the indexes, "**when**" and "**for what**". These may be edited with real examples and clear specification for quantity, quality, means for collection and arranging of required data. The subjects that will be included in the guideline are listed in the Table 1.1-1.

1.1.2. Data and materials on that the guideline is based

These are the data and materials that will be used by researchers and practitioners for discussion and establishment on their own survey methods in their own countries. They are the base or the background information for the guideline mentioned above. Any complete data set is not expected, but examples showing the necessary information will be made.

Table 1.1-1 Categorization of Survey and Research Subjects

Period	Type of survey	Objects of survey	Earthquake source & seismic motion		Earthquake disaster				
			Earthquake source	Seismic motion	Ground & foundation	Structure & materials	Non-structural materials	Fires	Regional disaster prevention
Before Eq.	Usual Research	Background Knowledge of Area	Seismotectonics Earthquake geology Historical earthquakes Seismicity Active fault Earthquake occurrence probability	Geomorphology Geology Surface geology Deep ground condition Micro-zoning Hazard map Strong motion records Experienced earthquake disaster	Liquefaction potential Aseismic code Input ground motion Required performance Type Construction technique Distribution Construction year History of damage Past earthquake damages Evaluation of seismic performance and retrofitting	Aseismic code Input ground motion Required performance Type Construction technique Distribution Construction year History of damage Past earthquake damages Evaluation of seismic performance and retrofitting	Aseismic code Input ground motion Required performance Type Construction technique Construction year Distribution History of damage Past earthquake damages Evaluation of seismic performance and retrofitting	Fire resistant code Input ground motion Required performance Type Construction technique Construction year Distribution	Land usage Urban planning Risk map Regional disaster mitigation planning Earthquake disaster information system Estimated economic loss
Just after eq.	Quick Notice	Eq. Information	Hypocenter Location Magnitude Focal Mechanism	Quick Notice on Intensity	Wide range survey on damaged area by air plane Survey by few scouts in damaged area Preliminary estimation of damage scale and glade			Same as left	
		Disaster Feature	Aftershock distribution	Regional intensity distribution PGA distribution Attenuation relation					
Few days - few weeks after eq.	Emergency survey	Disaster outline	Source process by teleseismic data Outline of surface fault Aftershock observation	Strong motion records PGV distribution Response spectra Aftershock observation Detailed intensity distribution	Emergency risk assessment and restoration (damaged buildings) Extraction of damage type	Emergency risk assessment and restoration (damaged buildings) Emergent survey and countermeasure(damaged buildings) Extraction of damage type		Extraction of damage type	Functional disorder of cities
Few weeks - few months after eq.	Detailed survey in selected area	Detailed information in selected area	Detail of surface fault Crustal deformation (SAR)	Intensity distribution by questionnaire	Survey of all the buildings in selected area Detailed survey of selected damage buildings(damage level assessment and retrofitting)			Damage distribution in selected area	
Few months after Eq. or Later	Detailed survey in the whole area	Detailed information in the whole area	Crustal deformation (GPS)	2. +	Survey of all the buildings in whole area			Damage distribution in whole area Damage statistics Estimation of direct economic loss	
Until few years after Eq.	Post-disaster research	Clearing up the causes	Detailed rupture propagation Propagation characteristics of seismic waves	Microtremor observation local amplification characteristics Estimation of strong ground motion in damaged area	Design Structure Construction technique Ground condition Ground improvement	Design Structure Construction technique Evaluation of response Performance	Design Structure Construction technique Performance	Structure Construction technique Performance	+
		Process of rehabilitation	3. +	4. +	Evaluation of seismic performance and retrofitting			Rehabilitation planning Estimation total economic loss	
Long Term	Long Term Counter-Measures	Earthquake Disaster Mitigation	Review of the background knowledge of area					Review of risk map Review of regional disaster mitigation planning	

Hatched area: Subjects for the background data, **Block letters:** Subjects for this research project

1.2. Guideline for the Survey Methods

Discussion on the outline of the guideline has been conducted. The subjects shown in Table 1.1-1 are ordered in the groups as shown in Table 1.2-1 and the skeleton of text for each group is made tentatively, in order to extract the subjects appropriate for the guideline and to draw up a simple and enough description.

Table 1.2-1 Tentative Grouping of the subjects handled in the guideline

Research Field	Group	Subgroup	Subjects (example)
Seismology	Seismic Source	Information of Hypocenter & Magnitude	Hypocenter, Magnitude
		Source Mechanism	Focal Mechanism
		Crustal Deformation	Geometry, GPS
		Source Process	Source Inversion
		Aftershock Distribution	Fault Plane
Seismology & Earthquake Engineering	Ground Motion	Intensity Distribution	Intensity, Damage Index
		Peak Value Distribution	PGA, PGV, Attenuation Relation
		More detailed information of Ground Motion Characteristics	Strong Motion Records, Response Spectra, Source Effect, Path effect, Local Amplification, Microtremor Observation
Earthquake Engineering	Ground Damage		Damage Investigation Flow Quick Inspection Damage Classification
	Building Damage		Quick Inspection Damage Classification Damage Index
	Building Foundation Damage		Damage Investigation Flow Pile Damage Investigation Methods

