APPENDIX A: LIST OF ACRONYMS AND GLOSSARY OF CI TERMS

List of Acronyms

ALA	American Lifelines Alliance
APWA	Association of Public Work Agencies
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ATC	Applied Technology Council
AWWA	American Waterworks Association
Caltrans	California Department of Transportation
CM	Content Management
CMCS	Collaboratory for Multiscale Chemical Science
COSMOS	Consortium of Organizations for Strong Motion Observation Systems
CRREL	Cold Regions Research Engineering Laboratory
CUSEC	Central United State Earthquake Consortium
DFDL	Data Format Description Language
DHS	Department of Homeland Security
DLESE	Digital Library for Earth Science Education
DOT	Department of Transportation
EERI	Earthquake Engineering Research Institute
EPRI	Electric Power Research Institute
ER	Existing Resources
ESRI	Earth Science Research, Inc.
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
GEER	Geo-Engineering Earthquake Reconnaissance Association
GIS	Geographic Information System
GUI	Graphical User Interface
GWT	Google Widget Toolkit
HSIP	Homeland Security Infrastructure Program
IBHS	Institute for Business and Home Safety
IEEE	Institute for Electrical and Electronic Engineering

INA	Information Needs and Applications
ISDR	International Society for Disaster Reduction
JCR	Java Content Repository
JMS	Java Messaging Service
KML	Keyhole Markup Language
MAEC	Mid-America Earthquake Center
MCEER	Multidisciplinary Center for Earthquake Engineering Research
MMC	Multi-hazard Mitigation Council
MOU	Memorandums of understanding
MSC	Multi-state technical clearinghouse
NAFPM	National Association of Floodplain Managers
NCSA	National Center for Supercomputing Applications
NEES	George E. Brown, Jr. Network for Earthquake Engineering Simulation
NEHRP	National Earthquake Hazards Reduction Program
NEON	National Ecological Observatory Network
NIBS	National Institute of Building Sciences
NISEE	National Information Service for Earthquake Engineering
NIST	National Institute for Standards and Technology
NOAA	National Oceanographic and Atmospheric Administration
NSF	National Science Foundation
OOI	Ocean Observatories Initiative
OPM	Open Provenance Model
OPS	Office of Pipeline Safety (DOT)
OSTP	Office of Science and Technology Policy
PEER Center	Pacific Earthquake Engineering Research Center
PIMS	Post-Earthquake Information Management System
PRCI	Pipeline Research Council
QA	Quality Assurance
QC	Quality Control
RAID	Redundant Arrays of Inexpensive Disks
RDF	Resource Description Framework
RBAC	Role-Based Access Control

RTM	Requirements Traceability Matrix
SDSC	San Diego Supercomputing Center
SEAOC	Structural Engineers Association of California
SLA	Service-Level Agreements
SNMP	Simple Network Management Protocol
SOA	Service-Oriented Architecture
SRI	System Requirements and Issues
SSO	Single-Sign-On
TCLEE	Technical Council on Lifeline Earthquake Engineering
USACE	U.S. Army Corps of Engineers
USGS	U.S. Geological Survey
VM	Virtual Machine
VO	Virtual Organizations
WATERS	Water and Environmental Research Systems

Glossary of CI-Related Terms[1]

content management (CM): computer software used to create, edit, manage, and publish content (data) with a variety of types and formats in a consistently organized fashion.

data curation: the process of taking raw data and turning it into data to be retrieved by the end-user; this may include requiring or adding metadata, reformatting, validating input, checking quality, etc.

data discovery: the process wherein a user finds data, e.g. through browsing and searching.

data export: the process where data is taken from PIMS and transferred to the user in his or her desired format, such as Excel, text, etc.

data ingestion: any process where data is entered into PIMS; it includes both direct ingestion from the data's creator and harvesting from other data repositories.

data preservation: maintaining data accessibility and quality over time.

direct ingestion: process where people who have collected data in the field upload their data into PIMS from their laptop, portable device, etc.

[1] All definitions utilize Wikipedia.

extensible markup language (XML): a general purpose specification for creating custom markup languages. A markup language is an artificial language using a set of annotations to text that describe how text is to be structured, laid out, or formatted.

Extensible Stylesheet Language Transformations (XSLT): an XML-based language used for the transformation of XML documents into other XML or "human-readable" documents.

harvesting: process where PIMS exchanges or obtains data from other electronic databases.

metadata: information that is attached to regular data entries whose entire purpose is to describe the data (e.g. where it came from, its format, its provenance (data history), its relationships to other data and to concepts, etc.).

provenance: the history of the data, including details about its creation and subsequent processing (who, when, where, why, how).

Resource Description Framework (RDF): a general method of modeling information based upon the idea of making statements about Web resources with globally unique identifiers in the form of subject-predicate (verb)-object expressions, called *triples* in RDF terminology. The subject denotes the resource, and the predicate denotes traits or aspects of the resource and expresses a relationship between the subject and the object

semantic content repository: a content management (CM) repository in which the data are Web resources with globally unique identifiers and metadata is managed using RDF; such systems are more capable than traditional CM systems in managing distributed data and complex relationships such as provenance and relational metadata given that it is semantic, this means that the meaning of all data is described using metadata such that computer-automated processes can be used to retrieve or organize the data.

semantics: the meaning of data. In the context of the semantic web, semantics of dataare completely defined in a manner that enables computers to interpret and use the data without human intervention. In the context of PIMS, semantic descriptions would, for example, allow a search for “bridge” information to automatically return data related to all subtypes of bridges.

service-orientated architecture (SOA): a software architecture that works by separating its functions into distinct units, or services, which are made accessible over a network in order that they can be combined and reused in the production of applications, which may seen and used by the system user. For example, an application for PIMS would include sorting all data related to a specific hazard event and showing the data.

virtual machine: A virtual machine (VM) is a software implementation of a machine (computer) that executes programs like a real computer. For example, one a specific physical computer, multiple VM could be running, each performing different tasks.

virtual organizations: an organizational entity which is built with the resources from multiple other organizations that all work toward a common goal

workflow: most basically, a workflow is a sequence of operations; in computing, workflow software aims to provide end users with an easier way to orchestrate or describe complex processing of data in a visual form, much like flow charts but without the need to understand computers or programming.

APPENDIX B: LISTS OF EXISTING RESOURCES

		PIMS Community Organization					
		Potential User of PIMS					
		Source of Practices and Procedures					
		Data Source					
		Effort Related to PIMS					
Name	**Website**	**Purpose**					
Alliance for Global Open Risk Analysis (AGORA)	http://www.risk-agora.org/	Open source software to provide solutions to certain problems – group led by University of Colorado (Porter) and Kyoto University (Charles Scawthorn)	•				
American Lifelines Alliance (ALA)	http://www.americanlifelinesalliance.org/	The American Lifelines Alliance (ALA) is a public-private partnership project funded by the Federal Emergency Management Agency (FEMA) and managed by the National Institute of Building Sciences (NIBS), with the goal of reducing risks to lifelines from hazards.		•	•	•	•
American Society of Civil Engineers (ASCE)				•	•	•	•
Applied Technology Council (ATC)	http://www.atcouncil.org/				•		•
ASCE Technical	http://www.asce.org	To advance the state-of-the-art and practice of lifeline earthquake engineering.		•	•	•	•
ATC-20	http://www.atcouncil.org/fandp.shtml	Building Safety Evaluation Forms and Placards			•		
ATC-38	http://www.atcouncil.org/atc38assfms.shtml	Post earthquake Building Assessment Forms			•		
ATC-45	http://www.atcouncil.org/ATC45.shtml	Field Manual: Safety Evaluation of Buildings after Wind Storms and Floods			•		
ATC-58	http://www.atcouncil.org/atc-58.shtml	In September 2001 the Applied Technology Council (ATC) was awarded a contract by the Federal Emergency Management Agency (FEMA) to conduct a long-term project to prepare next-generation Performance-Based Seismic Design Guidelines for new and existing buildings (ATC-58 Project).			•	•	
ATC-63	http://www.atcouncil.org/atc63.shtml	The purpose of this project is to establish and document a recommended methodology for reliably quantifying building system performance and response parameters for use in seismic design.			•		
California Earthquake Authority (CEA)	http://www.earthquakeauthority.com/	The California Earthquake Authority is a publicly managed, largely privately funded organization that provides catastrophic residential earthquake insurance and encourages Californians to reduce their risk of earthquake loss.		•		•	•

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California Office of Emergency Services Standardized Emergency Management System (SEMS)	http://www.oes.ca.gov/Operational/OESHome.nsf/Content/B49435352108954488256C2A0071E038?OpenDocument	To assist those responsible for planning, implementing, and participating in emergency response by setting standard guidelines.			•		
California Seismic Safety Commission (CSSC)	http://www.seismic.ca.gov/about.html	The Commission investigates earthquakes, researches earthquake-related issues and reports, and recommends to the Governor and Legislature policies and programs needed to reduce earthquake risk.		•	•	•	•
California’s Earthquake Clearinghouse	http://www.eqclearinghouse.org/	The California Post-Earthquake Clearinghouse will provide a location, real or virtual, after a damaging earthquake, where engineers, geologists, seismologists, sociologists, economists, and other professionals who arrive in the affected area can become part of a larger, temporary organization (the Clearinghouse) to facilitate the gathering of information, maximize its availability, and better use the talents of those present.	•	•		•	
Caltrans Office of Earthquake Engineering:	http://www.dot.ca.gov/hq/esc/earthquake_engineering/	On this page you'll find a number of good Caltrans resources, including the PEQIT manual that describes some of the protocols for the Post EQ Inspection Team. PEQIT does most of the "lessons learned" types of investigations well after the initial damage. They follow a similar protocol to the first wave of inspections, however.			•		
Center for Earthquake Research and Information (CERI)	http://www.ceri.memphis.edu/	CERI is a Tennessee Board of Regents Center of Excellence at the University of Memphis devoted to understanding the causes and consequences of earthquakes and the structure and evolution of the continental lithosphere. CERI addresses these needs through cutting-edge research, comprehensive graduate student education, operation of state-of-the-art seismic and GPS networks, and dissemination of technical and practical information to the private and public sectors. CERI’s vision is to be a leading center for earthquake related studies and for the investigation of the continental lithosphere based upon the quality of our research and educational efforts and upon our dedication to data collection and information transfer. CERI partners with USGS and CUSEC.		•		•	•

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Center for Engineering Strong Motion Data	http://www.strongmotioncenter.org/	Center for Engineering Strong Motion Data (CESMD) is a cooperative center established by the US Geological Survey (USGS) and the California Geological Survey (CGS) to integrate earthquake strong-motion data from the CGS California Strong Motion Instrumentation Program, the USGS National Strong Motion Project, and the Advanced National Seismic System (ANSS). The CESMD provides raw and uniformly processed strong-motion data for earthquake engineering applications. The COSMOS Virtual Data Center, which provides virtual access to national and international strong-motion data, is being brought into the Engineering Strong-Motion Data Center in 2008-2009. (http://db.cosmos-eq.org/scripts/default.plx)		●			
Central United States Earthquake Consortium (CUSEC)	http://www.cusec.org/	CUSEC's primary mission is, "... the reduction of deaths, injuries, property damage and economic losses resulting from earthquakes in the Central United States." CUSEC is developing a plan for a Multi-State Technical Information Clearinghouse (MSTIC) to be used to coordinate information sharing between state technical information clearinghouses (STIC) during large, multi-state hazards. As part of the MSTIC plan, CUSEC will hold a large training exercise where a large hazard event will be simulated. This may occur in 2011. There is a great potential for information sharing between PIMS, MSTICs, and STICs.		●	●	●	●
Consortium of Organizations for Strong-Motion Observation Systems (COSMOS)	http://db.cosmos-eq.org/scripts/default.plx	See Center for Engineering Strong Motion Data.		●			●
Consortium of Universities for Research in Earthquake Engineering (CUREE)	http://www.curee.org/	The Consortium of Universities for Research in Earthquake Engineering (CUREE) is a non-profit organization, established in 1988, devoted to the advancement of earthquake engineering research, education and implementation.		●		●	●

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COSMOS Geotechnical Virtual Data Center (GVDC)	http://www.cosmos-eq.org/GVDC.html	Geotechnical data clearinghouse	•	•		•	
Data Interchange for Geotechnical and GeoEnvironmental Specialists (DIGGS):	http://pims.ncsa.uiuc.edu/wiki/index.php/INAEntry:Evaluate_similar_data_sharing_effort_-_DIGGS	A coalition of government agencies, universities and industry partners whose focus is on the creation and maintenance of an international data transfer standard for transportation related data.			•		•
Department of Homeland Security (DHS)							
Departments of Insurance	http://www.floir.com/ http://www.insurance.ca.gov/	These are state agencies that are involved with insurance policy and regulation (there is no Federal role in insurance regulation, and only some states have these). As part of their policy developing process, these agencies often collect data and publish reports that are relevant to loss estimates, e.g., actual damage caused by events, number of properties exposed, potential total losses, etc. They tend to deal more with residential than commercial insurance. Two important departments of insurance are those of Florida (http://www.floir.com/) and California (http://www.insurance.ca.gov/), because of the potential for catastrophic loss from natural hazards (hurricanes and earthquakes) [Thomas Holzer].		•		•	•
DHS Automated Critical Asset Management System (ACAMS)	http://www.dhs.gov/xinfoshare/programs/gc_1190729724456.shtm	Web-based tool enabling collection of infrastructure and risk information from Owners/operators, law enforcement and first responders at State and Local level			•		
DHS Homeland Security Infrastructure Program (HSIP)	http://pims.ncsa.uiuc.edu/wiki/index.php/ER:HSIP	A database of imagery, geospatial data, and intelligence relating to critical infrastructure. Available to the federal government community and state and local governments.		•			
DHS National Information Exchange Model (NIEM)	http://www.niem.gov/index.php	A Federal, State, Local and Tribal interagency initiative providing a foundation for seamless information exchange.			•		

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Digital Library for Earth System Education (DLESE)	http://www.dlese.org/about/index.php		●			●	
Disaster Research Center at University of Delaware	http://www.udel.edu/DRC/index.html	The Center conducts field and survey research on group, organizational and community preparation for, response to, and recovery from natural and technological disasters and other community-wide crises.		●		●	●
Earthquake Engineering Research Institute (EERI)				●	●	●	●
Earthquake Survey Data at UCLA	http://www.sscnet.ucla.edu/issr/da/earthquake/erthqkstudies2.index.htm	An archive of quantitative survey data collected as part of research at the University of California , Los Angeles about the knowledge, attitudes and behaviors of individuals in responding to earthquakes. FREE TO THE PUBLIC.		●			●
EERI LFE Program	http://www.eeri.org/lfe.html%7C	Reconnaissance reports on past earthquakes.		●			
EERI Post-Earthquake Investigation Field Guide	http://www.eeri.org/lfe/field_guide.html				●		
EERI Reconnaissance Forms	http://www.eeri.org/lfe/recon_forms.html				●		
EERI Virtual Clearinghouse	http://www.eeri.org/lfe/clearinghouse/	Contains basic earthquake data (epicenter, intensity maps, and field reports of damage); also contains geo-referenced photos in Google Earth format.	●	●		●	
Electric Power Research Institute (EPRI)	http://my.epri.com/portal/server.pt?	EPRI has for many years launched post-earthquake data collection efforts to catalogue the performance of utility components for use in developing fragility curves.		●	●	●	●
EPRI Seismic Qualification Utility Group (SQUG)		EPRI SQUG maintains an earthquake experience database of post-earthquake performance of mechanical, electrical, instrumentation and control equipment commonly present in commercial, institutional and industrial facilities as well as electric power generating facilities.		●	●	●	●

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European Association of Earthquake Engineering	http://www.eaee.boun.edu.tr/eaee.htm			●	●	●	●
Federal Emergency Management Agency (FEMA)				●	●	●	●
Federal Geographic Data Committee	http://www.fgdc.gov/	The Federal Geographic Data Committee (FGDC) is an interagency committee that promotes the coordinated development, use, sharing, and dissemination of geospatial data on a national basis.		●	●		
FEMA Flood-Related Standards							
FEMA Multihazard Mapping Initiative	http://gcmd.nasa.gov/records/FEMA-HazardMaps.html	Collections of hazards maps for different hazard types.		●			
FEMA-154 (ATC-21)	http://www.fema.gov/library/viewRecord.do?id=1415	This handbook presents a method to quickly identify, inventory, and categorize buildings for future study			●		
FEMA-178	http://www.fema.gov/library/viewRecord.do?id=1513	The NEHRP Handbook for the Seismic Evaluation of Buildings, FEMA-178, describes analysis procedures and acceptance criteria often referenced when evaluating the seismic hazards of existing buildings.			●		
FEMA-74	http://www.fema.gov/library/viewRecord.do?id=1574	This well-illustrated publication describes the sources of nonstructural earthquake damage and provides information on effective methods of reducing potential risks from such damage.			●		
Geotechnical Earthquake Engineering Reconnaissance (GEER)	http://gees.usc.edu/GEER/	The GEER Steering Committee will develop a systematic approach to conducting the NSF-sponsored post-EQ reconnaissance efforts. The project is seeking to establish a system that formalizes the manner in which post-earthquake reconnaissance efforts are organized by the GeoPrograms of NSF.		●	●	●	●
Global Earthquake Risk Analysis Model (GEM)	http://quake.usgs.gov/research/deformation/modeling/sfeatures/GeoRiskproposal.pdf	This tool would increase hazard awareness, permit risk assessment in policy-making, and enable governments of developing nations to issue catastrophe bonds to provide their countries with some disaster relief.					

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HAZUS	http://www.fema.gov/plan/prevent/hazus/	FEMA's software for analyzing risks and potential losses due to hazard events. The most recent HAZUS-related release is the Comprehensive Data Management System (CDMS) Version 2.0, which provides users with the capability to update and manage statewide and HAZUS datasets, which are used to support analysis in the HAZUS-MH.	●	●		●	
Hurricane Katrina and Rita Clearinghouse Cooperative	http://www.katrina.lsu.edu/	Clearinghouse (with 20 TB of data) established at the Louisiana State University, Baton Rouge to facilitate the collection, dissemination, and archiving of data related to Hurricane Katrina and Rita. See reference to Mills et al. in text for more information.	●	●			
Imagery for the Nation	http://www.nsgic.org/hottopics/iftn_brochure_0308.pdf	NSGIC is working with the National Digital Orthophoto Program Committee (NDOP) and the Federal Geographic Data Committee (FGDC) to create a new nationwide aerial imagery program that will collect and disseminate standardized multi-resolution products on "set" schedules.		●			
Institute for Business and Home Safety (IBHS)	http://www.disastersafety.org/	The Institute for Business & Home Safety's mission is to reduce the social and economic effects of natural disasters and other property losses by conducting research and advocating improved construction, maintenance and preparation practices.		●		●	●
International Association of Earthquake Engineers	http://www.iaee.or.jp/	The objective of the Association is to promote international cooperation among scientists, engineers and other professionals in the broad field of earthquake engineering through interchange of knowledge, ideas, results of research and practical experience.		●	●	●	●
IRIS Data Management Center (DMC)	http://www.iris.edu/dms/dmc/	The IRIS DMC archives and distributes data to support the seismological research community. The state-of-the-art data center is located near the University of Washington in Seattle.		●			
ISO	http://www.iso.com/	Provider of information about risk. Many insurance companies share their data with ISO who aggregates it.		●		●	●
Japan Association of Earthquake Engineers	http://www.jaee.gr.jp/english/general.html	The Association carries out activities as a universal academic society that covers both the engineering fields such as seismology related to earthquake disaster reduction, applied geology, structure engineering, geotechnical engineering, steel structure and concrete engineering, mechanical engineering, vibration control engineering and lifeline engineering; as well as social system fields such as local disaster prevention planning, crisis management, and risk management.					●

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LandScan	http://www.ornl.gov/sci/landscan/	The LandScanTM Dataset comprises a worldwide population database compiled on a 30" X 30" latitude/longitude grid. Census counts (at sub-national level) were apportioned to each grid cell based on likelihood coefficients, which are based on proximity to roads, slope, land cover, nighttime lights, and other information. LandScan has been developed as part of the Oak Ridge National Laboratory (ORNL) Global Population Project for estimating ambient populations at risk.		•			
Library of Congress	http://www.loc.gov/index.html			•	•		
Local Government Records		Local tax assessor records provide a potential source for obtaining building stock data. Data quality varies with the governing agency.		•			
LSU Hurricane Center	http://hurricane.lsu.edu/	The MISSION of the LSU HURRICANE CENTER is to advance the state-of-knowledge of hurricanes and their impacts on the natural, built, and human environments; to stimulate new interdisciplinary/collaborative research activities; to transfer this knowledge and technology to students and professionals in concerned disciplines; and to assist the state, the nation, and the world in solving hurricane-related problems.		•	•	•	•
MAEViz	http://mae.ce.uiuc.edu/software_and_tools/maeviz.html	Seismic risk assessment software to help perform consequence-based risk management	•	•		•	
MCEER	http://mceer.buffalo.edu/About_MCEER/default.asp	Multidisciplinary Center for Earthquake Engineering Research; MCEER is a national center of excellence dedicated to the discovery and development of new knowledge, tools and technologies that equip communities to become more disaster resilient in the face of earthquakes and other extreme events. MCEER accomplishes this through a system of multidisciplinary, multi-hazard research, education and outreach initiatives.		•	•	•	•
MCEER QUAKELINE Database	http://mceer.buffalo.edu/utilities/quakeline.asp	QUAKELINE® is a bibliographic database developed and maintained by the Information Service. It covers earthquakes, earthquake engineering, natural hazard and disaster mitigation, and related topics.		•			
Mid-American Earthquake Center (MAEC)				•	•	•	•

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National Bridge Inventory (NBI)	http://www.fhwa.dot.gov/bridge/nbi.htm	The National Bridge Inventory (NBI) is a database, compiled by the Federal Highway Administration, with information on all bridges and tunnels in the United States that have roads passing above or below, including basic design information and the dimensions of the usable portions of the bridges.		●			
National Consortium for the Study of Terrorism and Responses to Terror	http://www.start.umd.edu/	START is a U.S. Department of Homeland Security Center of Excellence, tasked by the Department of Homeland Security's Science and Technology Directorate with using state-of-the-art theories, methods, and data from the social and behavioral sciences to improve understanding of the origins, dynamics, and social and psychological impacts of terrorism.		●	●	●	●
National Earthquake Hazards Reduction Program (NEHRP)					●	●	●
National Emergency Management Network (NEMN)	https://www.riskinstitute.org/peri/content/view/620/80/	PERI and the International City/County Management Association (ICMA) are working together to build a national network of communities, businesses, and nonprofit organizations that are willing to share resources with stricken areas, and with each other in the event of a disaster. NEMN is supported by software technologies and educational resources, including a comprehensive database of human and physical resources available for emergency response and recovery efforts and a geo-mapping and situational awareness tool to identify, select, activate, track, and manage response/recovery assets.			●	●	●
National Information Service for Earthquake Engineering (NISEE)	http://nisee.berkeley.edu/	Since 1972, NISEE has guided discovery of significant earthquake engineering information resources. NISEE is supported by the University of California, Berkeley and by personal memberships in The Earthquake Engineering Online Archive.		●	●	●	●
National Institute of Standards and Technologies (NIST)					●	●	●
National Oceanic and Atmospheric Administration (NOAA)				●		●	●
National Science Foundation (NSF)						●	●

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National Spatial Data Infrastructure	http://www.fgdc.gov/nsdi/nsdi.html	National standards for geospatial data			•		
National States Geographic Information Council (NSGIC)	http://www.nsgic.org/hottopics/imageryforthenation.cfm	The Nation will have a sustainable and flexible digital imagery program that meets the r		•			•
Natural Hazards Center at University of Colorado at Boulder	http://www.colorado.edu/hazards/	The mission of the Natural Hazards Center at the University of Colorado at Boulder is to advance and communicate knowledge on hazards mitigation and disaster preparedness, response, and recovery.		•	•	•	•
Nisqually Earthquake Clearinghouse	http://www.ce.washington.edu/~nisqually/index.html		•	•		•	
NOAA National Geophysical Data Center (NGDC)	http://www.ngdc.noaa.gov/hazard/earthqk.shtml	NGDC acquires, processes, and analyzes technical data on earthquake hazards, and disseminates the data in many useable formats, including ArcGIS shapefiles and files compatible with Google Earth.		•			
Ocean and Weather Data Navigator	http://dapper.pmel.noaa.gov/dchart/	A service of the NOAA, the Dapper Data Viewer (aka DChart) allows you to visualize and download in-situ oceanographic or atmospheric data from a Dapper OpenDap server. Features include an interactive map that is draggable, an in-situ station layer that allows you to select data stations, and a plot window that allows you to plot data from one or more stations. This is a good example of an overview map and lists of variables and a way to plot derivative data.	•				
Office of the Federal Coordinator for Meteorological Services and Supporting Research	http://www.ofcm.gov/	The Office of the Federal Coordinator for Meteorological Services and Supporting Research, more briefly known as the Office of the Federal Coordinator for Meteorology (OFCM), is an interdepartmental office established because Congress and the Executive Office of the President recognized the importance of full coordination of federal meteorological activities. The mission of the OFCM is to ensure the effective use of federal meteorological resources by leading the systematic coordination of operational weather requirements and services, and supporting research, among the federal agencies. Contact: Lt. Col. Mark Fitzgerald - Assistant Federal Coordinator for Air Force and Army Affairs		•	•	•	•

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Name	**Website**	**Purpose**					
OpenURL/Link Resolution	http://en.wikipedia.org/wiki/OpenURL	Code or technique useful for sharing information between databases.			•		
Pacific Earthquake Engineering Center (PEER)	http://peer.berkeley.edu/about/what_is_peer.html			•	•	•	•
Public Entity Risk Institute (PERI)	http://www.riskinstitute.org/peri/	The Public Entity Risk Institute (PERI) is a dynamic, forward-thinking organization that serves as a resource to enhance the practice of risk management throughout organizations and communities. Serving public entities, small businesses, and nonprofit organizations, PERI provides relevant and high quality enterprise risk management information, training, data, and data analysis.				•	•
Public Entity Risk Institute (PERI) Data Exchange	https://www.riskinstitute.org/peri/component/option,com_deeppockets/task,catShow/id,51/Itemid,80/	The PERI Data Exchange is an innovative risk management benchmarking and performance measurement program that allows public entities of all types to compare their liability and worker's compensation loss experience with their peers and learn from the experiences of other jurisdictions.		•	•		
Recent Earthquake Databases		Databases for recent earthquakes (e.g. Well, N.V., Niigata, Peru, etc.)		•			
Recommendations for regional interoperability of mobile damage assessment and inspection technologies		A project call The Los Angeles Basin Project is being conducted by Robert Wible at FIATECH, the purpose of which is to develop protocols for the linking of disparate hardware and software systems (PDAs, laptops, cell phones, etc.) used by local building officials to develop an interoperable network to gather and disseminate damage assessment and other field inspection data in the wake of a major natural or human-caused disaster. Use of these protocols would rapidly speed damage assessment surveys and provide for efficient methods to transfer information to clearinghouses for storage and possibly directly to PIMS. The recommendations from this project are intended to be completed by October, 2008.			•		
Risks due to Earthquake DAmage to Roadway Systems (REDARS)	http://mceer.buffalo.edu/research/redars/	A public-domain software package that accounts for how earthquake damage affects post-event traffic flows and travel times, and estimates losses from these travel-time and traffic-flow impacts.	•			•	

		PIMS Community Organization					
		Potential User of PIMS					
		Source of Practices and Procedures					
		Data Source					
		Effort Related to PIMS					
Name	**Website**	**Purpose**					
Sahana	http://www.sahana.lk/	Sahana is a Free and Open Source Disaster Management system. It is a web based collaboration tool that addresses the common coordination problems during a disaster from finding missing people, managing aid, managing volunteers, tracking camps effectively between Government groups, the civil society (NGOs) and the victims themselves.	●				
Satellite Imaging Corporation	http://www.satimagingcorp.com/	A good source of satellite imagery data, including imagery from Ikonos and Quickbird satellites.		●			
Southern California Earthquake Center	http://www.scec.org/	SCEC's science goal is to understand the physics of the Southern California fault system and develop a model of key aspects of earthquake behavior. To do this, SCEC organizes interdisciplinary research spanning all aspects of earthquake system science, disciplinary activities such as data collection and analysis, and special projects in information technology, earthquake predictability, and other applied research.		●	●	●	●
Spatial Hazard Events and Losses Database for the United States (SHELDUS)	http://webra.cas.sc.edu/hvri/products/sheldus.aspx	SHELDUS is a county-level hazard data set for the U.S. for 18 different natural hazard events types such thunderstorms, hurricanes, floods, wildfires, and tornados. For each event the database includes the beginning date, location (county and state), property losses, crop losses, injuries, and fatalities that affected each county. The data set does not include Puerto Rico, Guam, or other U.S. territories.	●	●			
Standardized Injury Categorization Schemes for Earthquake Related Injuries	http://www.cphd.ucla.edu/	This project attempts to define a common language that can be used to study events across time and geography to improve our ability to estimate casualties in earthquakes. Furthermore, it provides a mechanism for understanding the risk factors associated with injuries in order to reduce those losses.			●		
State Department of Transportations	http://www.dot.ca.gov/	California's (website at left) may be the most pertinent.		●		●	●
State Geologic Surveys	http://www.conservation.ca.gov/CGS/Pages/Index.aspx	California Geologic Survey may be the most prominent (address to left), but other state geologic surveys may have important relationships with PIMS. For example, consider the Illinois State Geologic Survey, which operates a post-earthquake clearinghouse after hazard events.		●		●	●

		PIMS Community Organization					
		Potential User of PIMS					
		Source of Practices and Procedures					
		Data Source					
		Effort Related to PIMS					
Name	**Website**	**Purpose**					
State Offices and Agencies of Emergency Management	http://www.fema.gov/about/contact/statedr.shtm	The FEMA website at left provides an index of all state agencies.		•	•	•	•
Structural Engineering Associations (SEA)	http://www.seaoc.org/	California's (website at left) may be the most pertinent.		•	•	•	•
Studies on Post-Earthquake Investigation for Historical Earthquakes:		Although many reports of post earthquake investigations exist in the literature, three stand out as excellent examples and should serve as models, or at least reference documents, for the PIMS development effort. These studies are: (1) Investigation of 1906 San Francisco Earthquake (2) 1964 Alaska Earthquake (3) 1971 San Fernando Earthquake These describe the geological, seismological, engineering aspects of major earthquakes in the United States. They include analyses of the impacts of the earthquakes and their causes		•	•		
The Institution of Structural Engineers	http://www.istructe.org/about/index.asp	An international organization that is the world's largest professional body dedicated to structural engineering.					•
United States Geologic Survey	http://www.usgs.gov/			•	•	•	•
Universities		Universities can serve many roles in relation to PIMS, including being data providers, PIMS users, and PIMS operators.		•		•	•

		PIMS Community Organization					
		Potential User of PIMS					
		Source of Practices and Procedures					
		Data Source					
		Effort Related to PIMS					
Name	**Website**	**Purpose**					
University Archives	Earthquake Engineering Online Archive at University of California-Berkeley:	For example, consider the earthquake engineering online archive at the University of California at Berkeley (website at left), which is a database of significant, publicly-funded research and development literature, photographs, data, and software in earthquake, structural, and geotechnical engineering.		•		•	•
USGS Advanced National Seismic System	http://earthquake.usgs.gov/research/monitoring/anss/			•			
USGS Circular 1242	http://geopubs.wr.usgs.gov/circular/c1242/	The Plan to Coordinate NEHRP Post-Earthquake Investigations In 2003, the U.S. Geological Survey (USGS) published Circular 1242 with the above title that described an agreement between key federal agencies and EERI to cooperate in a three-phase investigation effort following future significant earthquakes. USGS takes the lead by designating one of its staff members as the National Earthquake Hazard Reduction Program (NEHRP) Investigations Coordinator, currently Tom Holzer from the Menlo Park USGS office. Phase I is from immediately after the disaster to several days. Phase II includes several days to one month. Phase III is one month to 5 years following the disaster.			•		
USGS Did You Feel It?	http://earthquake.usgs.gov/eqcenter/dyfi/%7C	Shaking intensity maps (Modified Mercalli) generated from web submission of reports of shaking from citizens.		•			
USGS Earth Explorer	http://edcsns17.cr.us	Query and order satellite images, aerial photographs, and cartographic products through the U.S. Geological Survey.	•				

APPENDIX C: STAKEHOLDER COMMUNICATIONS

Typical Stakeholder Initial Communication Email

From: Andrews, Blake Michael [mailto:bandrew3@ad.uiuc.edu]
Sent: Monday, April 14, 2008 10:43 AM
To: Chris Poland
Cc: John(Jack) R. Hayes; Laatsch, Edward; DGHConsult@aol.com; Claret Heider; Spencer, B F; Jim Myers
Subject: Feedback for Post-Earthquake Information Management System (PIMS)

Mr. Poland,

I am sending this email to encourage you to share your knowledge in regards to an envisioned Post-Earthquake Information Management System (PIMS). The project has the direct support of and is funded by the Federal Emergency Management Agency; it is being conducted by a team at the University of Illinois for the American Lifelines Alliance of the National Institute of Building Sciences' Multihazard Mitigation Council.

The goal of the PIMS Project is to collect information from the greater earthquake engineering community to create a scoping document for an envisioned PIMS, which, when completed, would provide users with the ability to query data in an intuitive and interactive manner to investigate the past performance of the built environment during earthquakes. PIMS *is not envisioned as a replacement for existing information management systems or other infrastructure*, but is to act to network existing systems and synthesize existing data. The scoping document for PIMS is to be completed by September 2008 and will be used to guide further planning efforts. (Click here for complete project background information.)

I believe that your input is critical to the success of this project. We feel your experiences as the chair of the ASCE 41 Standards Committee and NEHRP Advisory Committee on Earthquake Hazard Reduction would be most informative. In particular, we are interested in learning what you think about

(1) User needs – what do you want to be able to do with the system?
(2) System issues and roadblocks – what problems might be encountered when implementing such a system as PIMS?
(3) Existing resources – what systems, data sources, standard/forms, etc. exist with which PIMS might collaborate or interface?

While I understand that you may be very busy, I hope that you can find minimally one hour of your time to share your valuable knowledge with us so that we can make this project a success.

Please let me know if you would be willing to participate in a short teleconference where you can share your knowledge on the subjects above.

We look forward to your participation in the PIMS Project.

Thanks!

Blake

Blake M. Andrews
Graduate Research Assistant

Department of Civil and Environmental Engineering
University of Illinois at Urbana-Champaign
2109 Newmark Civil Engineering Laboratory, MC-250
205 North Mathews Avenue
Urbana, Illinois 61801

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Office: 217.333.6930
Fax: 217.265.8040

Typical Agenda for a Meeting with a Stakeholder

Teleconference with John Hooper Agenda
5-9-08

Introductions

PIMS Project Background

Conducted by team at UIUC, Admin through ALA, Funded by FEMA

End-Use of PIMS: GIS type interface where you can query data about the past performance of the built environment during earthquakes and other natural hazards.

PIMS Project Objectives: Developing scoping document that identifies user needs, system requirements, issues and roadblocks, existing resources. Used by FEMA for future planning purposes.

Inputs to Project Overview

Information Needs and Applications (Use Cases)
System Requirements, Issues, and Roadblocks
Existing Resources

Tell me about yourself, experiences, etc.

Seismic design and performance of buildings (MKA Seattle head of seismic engineering)

YOUR INPUT:

Information Needs and Applications (Use Cases)

System Requirements, Issues, and Roadblocks

Existing Resources

Can you suggest other contacts?

Next Steps: I will summarize my notes from the meeting, send them to you for review, and then post them to the Wiki.

Typical Use Case Entry

Use Case Title: Tank Floating Roof and Interior Column Performance

Author Name: Doug Honegger

Email: dghconsult@aol.com

Phone: 805-473-0856

Explain the background situation and indicate why your question cannot be answered through currently available means.

The provisions of API 650 Appendix E cover the seismic design of steel oil storage tanks. However, these provisions do not address the design of floating roofs or interior columns used to support fixed roofs.

State, succinctly, the specific question to be answered.

What failure modes have been observed for these components in past earthquake and how does this damage relate to operational issues (repair cost and time) and the potential for release of product?

Describe, in a step-wise fashion, how you might envision using the PIMS to answer the question.

Identify inventory of storage tanks that have been exposed to earthquake ground motions based upon (a) severity of ground motion, (b) size of tank, (c) fluid level, (d) type of floating roof, (e) column supported fixed roof

Review floating roof performance as evaluated based upon observations of (a) no damage, (b) damage to perimeter or column seals, (c) fluid leakage outside of tank or onto roof, (d) hanging up of roof on tank shell or interior columns, (e) sinking of roof

Review column-supported roof performance based upon observations of (a) no damage, (b) damage to connections at the base and top of columns, (c) overall column deformation, (d) local column damage at floating roof penetrations

Please list the tools that would you expect to have in extracting information from PIMS? Or, describe how the information in PIMS should best be presented. (for example, use of screening attributes to identify relevant entries, tabular summaries, data files for GIS representation of location and attributes)

Interactively screen attributes to identify relevant data entries in a database format

Generate tabular summaries with information categorized by selected attributes that can be exported to common tools such as Excel

Interactive mapping representation of the location of the observation and with the ability to interactively select additional information (e.g., peak spectral acceleration, soil classification) and tank attributes (perhaps similar to the clickable overlays in Google Earth)

An ability to easily pull up design drawings, extract detailed information (e.g., floating roof tank wall clearance) and add/append this information to table or database generated by screening more general attributes. Thus, one could generate a listing of attributes for oil storage tanks with floating roofs exposed to a peak ground acceleration of 0.5g to 0.75g, that are 80ft-100ft in diameter, at least 40 ft high, and at least 75% full, add information on floating roof clearance and type of seal based upon a review of drawings, and export the results for statistical analysis.

Please identify the top 5 to 10 most important items of information that would be required to answer your question using PIMS in the manner you described above. For each information item, please evaluate whether this information already exists before a field investigation is performed, describe who owns the information, and explain how and when this information should be collected for use in PIMS.

INFORMATION ITEM	EXISTS	OWNER	HOW & WHEN TO COLLECT
Design drawings	Yes	Tank Owner	Non-perishable; can be collected at any time
Design requirements	Yes	Tank Owner	Non-perishable; can be collected at any time
Photographs of damage	Unknown	Tank Owner	After earthquake; requires tank be drained and inspected
Type of tank contents			Non-perishable, can be collected at any time
Height of tank contents at time of earthquake			Collect immediately after earthquake
Key tank design parameters (height, diameter, wall thickness at base of tank, bottom plate thickness, type/grade of wall and bottom plate steel, number of interior columns, type of floating roof, type of floating roof seals)	Yes	Tank Owner (on design drawings)	Non-perishable, can be collected at any time
Ground motions experienced by tank	Partially	Various owners depending upon location (e.g., USGS, state geological surveys, universities, private organizations)	Non-perishable, can be collected at any time; Likely requires processing to extrapolate to tank location and local soil conditions
Time and costs to undertake repairs	Yes	Tank Owner	
Enter data here	Enter data here	Enter data here	Enter data here

Enter data here	Enter data here	Enter data here	Enter data here

Typical System Requirements and Issues Entry

System Requirements and Issues Entry Title: Ron Eguchi Recommendations

Author Name: Ron Eguchi

Email: rte@imagecatinc.com

Phone: 562.628.1675

Please list and describe your system issues or roadblocks here:

(1) Getting data from private organizations.

(2) Convincing people with valuable data sets to give up their data, such as those organizations that charge license fees. One possible solution is for PIMS pay these companies who charge money for their data with profits obtained from license fees for using PIMS. PIMS charges no-fee on certain data but charges fees for the data that has a costs associated with it.

(3) It will be very difficult to get data form heavily competitive industries, such as the insurance industry. The same solution as above might work.

(4) Maintaining the quality of the data over time – data evolution.

(5) Standardization of data; How do you reconcile the differences in data from different forms or standards? You need standard data collection methods.

(6) How do you maintain data quality and integrity? If you mix good and bad data, how do you sort it out? PIMS users need to understand the differences in data quality. For example, consider the differences in remote-sensed data versus data from inspections. Also, consider the differences in data quality between people surveys and field inspection. We need to have standards for his (metadata).

Please list and describe your system requirements here:

(1) PIMS shall act as a clearinghouse where various groups can send/store their disparate data sets.

(2) A PIMS user should be able to answer the most basic questions for free. These include, for example: (1) What areas have been heavily damaged in an event that citizens should avoid? (2) Those people in the affected area at the time of the event may be able to “check-in” with PIMS to indicate that they are alright and do not need assistance.

If you listed system requirements above, please list the top 1 to 10 most important items of information that the PIMS would need to have in order to be able to satisfy your listed system requirements. For each information item, please evaluate whether this information item already exists before a field investigation is performed, describe who owns the information, and explain how and when should this information be collected for use in PIMS.

Field information

Remotely sensed data

Reconnaissance reports

Photos and video (all geo-referenced)

Route maps of field teams

INFORMATION ITEM	EXISTS	OWNER	HOW & WHEN TO COLLECT
Field information	No	Field investigation teams	Collect after the event
Remote sensing data (photos, pre and post-event	Yes	Private companies	Purchase quickly after the event
Photos and videos from the field (geo-referenced)	No	Field investigation	Collect after the event
Route map of field teams	No	Field investigation coordinator	Collect after the event
Your Response	Your Response	Your Response	Your Response
Your Response	Your Response	Your Response	Your Response
Your Response	Your Response	Your Response	Your Response
Your Response	Your Response	Your Response	Your Response
Your Response	Your Response	Your Response	Your Response
Your Response	Your Response	Your Response	Your Response

Typical Existing Resource Entry

Existing Resources from Ron Eguchi

<u>Systems Similar to PIMS</u>

AGORA – Alliance for Global Open Risk Analysis (Keith Porter) – open source software to provide solutions to certain problems – group led by University of Colorado (Porter) and Kyoto University (Charles Scawthorn)

GEM: Global earthquake model; see Ross Stein at USGS

REDARS (for **R**isks due to **E**arthquake **DA**mage to **R**oadway **S**ystems): http://mceer.buffalo.edu/research/redars/ A public-domain software package that accounts for how earthquake damage affects post-event traffic flows and travel times, and estimates losses from these travel-time and traffic-flow impacts.

<u>Sources of Data for PIMS</u>

For building stock for HAZUS, tax assessor records are a common tool.

HAZUS has databases for buildings, lifelines and essential facilities

USGS has earthquake hazard information

CGS (California Geologic Survey) has specific hazard information related to California

<u>Forms/Standards</u>

Earthquake: EERI, ATC

Hurricane/Wind: ASCE 7

Flood: FEMA (see HAZUS-MH)

<u>Resource Organizations</u>

Texas Tech University Wind Center

Multidisciplinary Center for Earthquake Engineering Research (MCEER)

Hurricane Center at LSU – Marc Levitan, Director or John Pine (head of clearinghouse initiative after Hurricane Katrina)

APPENDIX D: DATABASE OF USE CASE ENTRIES

Table D-1 below presents a summary of the collected use case entries, including the entry title, author, and to which use case family it belongs.

Table D-1: Use Case Entry Summary

ID	Title	Author	Family
1	Fiberglass/Plastic Tank Performance	Doug Honegger	1
2	Tank Floating Roof and Interior Column Performance	Doug Honegger	1
3	Data to Support the Next Generation of Performance Based Seismic Design Guidelines	Chris Rojahn	1
4	Evaluation of Overall Building Seismic Performance and Fragilities Development	Chris Rojahn	1
5	Evaluation of Overall Building Seismic Performance	Dan Dolan	1
6	Use Case from Fred Turner	Fred Turner	4
7	Loss Assessment	Poland	4
8	Loss Assessment Validation	Ron Eguchi	4
9	Post-Earthquake Loss Assessment	Ron Eguchi	4
10	Real-World Behavior of Structures subjected to Seismic Loading	Chris Poland	1
11	Validation of Seismic Analyses of Buildings	Dan Dolan	1
12	MacArthur Maze Fire	Susan Tubbesing	3
13	Natural Gas Distribution Pipeline and Service Line Performance in Earthquakes	Woody Savage	3
14	Buried Pipeline Damage Rates	Doug Honegger	3
15	Evaluation of Overall Building Seismic Performance and Development of Fragility Relationships	Bob Bachman	1
16	Evaluation of Overall Building Seismic Performance and Development of Fragility Relationships	John Hooper	1
17	Building Performance for Insurance Industry	Rose Grant	1
18	PIMS to Inform Post-Event Response and Investigations	John Filson	5
19	Resiliency of Structures during Hurricanes	John Pine	1
20	Geologic and Geotechnical Failures	Ed Harp	2
21	PIMS to Facilitate Exchange between Databases	Theresa Jefferson	6
22	Post-Event Loss Assessment Validation	Theresa Jefferson	4
23	Post-Event Emergency Management	John Pine	5
24	Use of PIMS in Clearinghouse	Bob Bauer	5
25	Social Science Archive	Kathie Smarick	4
26	Post-Earthquake Operability of Lifeline Systems and Equipment	Clive Alexander	3

Complete use case entries are presented below, organized by use case family.

Family 1: Evaluation of structure performance

Use Case 1

Use Case Title: Fiberglass/Plastic Tank Performance

Author Name: Doug Honegger

Email: dghconsult@aol.com

Phone: 805-473-0856

Explain the background situation and indicate why your question cannot be answered through currently available means.

Plastic tanks (including fiber-reinforced plastic) are commonly used in a variety of process applications to store chemicals that are reactive to metals and, in some case, could pose a health hazard if released. There is currently no real guidance on how to properly design such tanks for seismic loads and most practitioners adapt methods for aboveground steel storage tanks for design. However, plastic tanks differ significantly from steel tanks in terms of material properties, anchorage attachments, flexibility, and geometry (some are rectangular). No detailed information is available on the failure modes and causes in past earthquakes.

State, succinctly, the specific question to be answered.

How have various plastic tank design methods affected the performance of plastic tanks in past earthquakes?

Describe, in a step-wise fashion, how you might envision using the PIMS to answer the question.

Identify inventory of plastic storage tanks that have been exposed to earthquake ground motions based upon (a) severity of ground motion, (b) size of tank, (c) fluid level, (d) tank geometry, (e) type of anchorage, (f) tank material

Review floating roof performance as evaluated based upon observations of (a) no damage, (b) damage to tank walls, (c) damage to tank penetrations, and (d) damge to tank anchorage.

Please list the tools that would you expect to have in extracting information from PIMS? Or, describe how the information in PIMS should best be presented. (for

example, use of screening attributes to identify relevant entries, tabular summaries, data files for GIS representation of location and attributes)

Interactively screen attributes to identify relevant data entries in a database format

Generate tabular summaries with information categorized by selected attributes that can be exported to common tools such as Excel

Interactive mapping representation of the location of the observation and with the ability to interactively select additional information (e.g., peak spectral acceleration, tank damage mode) and tank attributes (perhaps similar to the clickable overlays in Google Earth)

An ability to easily pull up design drawings, extract detailed information (e.g., tank wall thickness, anchorage detail, fiber layup) and add/append this information to table or database generated by screening more general attributes. Thus, one could generate a listing of attributes for cylindrical chemical storage tanks with top restraint exposed to a peak ground acceleration of 0.5g to 0.75g, that are 8ft-10ft in diameter, at least 8 ft high, and at least 75% full, add information on restraint mechanism (e.g., cables or external bands) and restraint anchorage, and export the results for statistical analysis.

Please identify the top 5 to 10 most important items of information that would be required to answer your question using PIMS in the manner you described above. For each information item, please evaluate whether this information already exists before a field investigation is performed, describe who owns the information, and explain how and when this information should be collected for use in PIMS.

INFORMATION ITEM	EXISTS	OWNER	HOW & WHEN TO COLLECT
Ground Motion	NO	Various (USGS, facility owner)	following earthquake
Tank Drawings	YES	Tank Owner or Manufacturer	Non-perishible, can be collected before or after event
Photos of Tank Damage	NO	Tank Owner	Perishible; needs to be collected prior to repair
Tank Inventory (location, geometry, material)	YES	various facility owners	Non-perishible, can be collected before or after event
Tank Design Specifications	YES	Tank Owner or Manufacturer	Non-perishible, can be collected before or after event
Your Response	Your Response	Your Response	Your Response
Your Response	Your Response	Your Response	Your Response

Use Case 2

Use Case Title: Tank Floating Roof and Interior Column Performance

Author Name: Doug Honegger

Email: dghconsult@aol.com

Phone: 805-473-0856

Explain the background situation and indicate why your question cannot be answered through currently available means.

The provisions of API 650 Appendix E cover the seismic design of steel oil storage tanks. However, these provisions do not address the design of floating roofs or interior columns used to support fixed roofs.

State, succinctly, the specific question to be answered.

What failure modes have been observed for these components in past earthquake and how does this damage relate to operational issues (repair cost and time) and the potential for release of product?

Describe, in a step-wise fashion, how you might envision using the PIMS to answer the question.

Identify inventory of storage tanks that have been exposed to earthquake ground motions based upon (a) severity of ground motion, (b) size of tank, (c) fluid level, (d) type of floating roof, (e) column supported fixed roof

Review floating roof performance as evaluated based upon observations of (a) no damage, (b) damage to perimeter or column seals, (c) fluid leakage outside of tank or onto roof, (d) hanging up of roof on tank shell or interior columns, (e) sinking of roof

Review column-supported roof performance based upon observations of (a) no damage, (b) damage to connections at the base and top of columns, (c) overall column deformation, (d) local column damage at floating roof penetrations

Please list the tools that would you expect to have in extracting information from PIMS? Or, describe how the information in PIMS should best be presented. (for example, use of screening attributes to identify relevant entries, tabular summaries, data files for GIS representation of location and attributes)

Interactively screen attributes to identify relevant data entries in a database format

Generate tabular summaries with information categorized by selected attributes that can be exported to common tools such as Excel

Interactive mapping representation of the location of the observation and with the ability to interactively select additional information (e.g., peak spectral acceleration, soil classification) and tank attributes (perhaps similar to the clickable overlays in Google Earth)

An ability to easily pull up design drawings, extract detailed information (e.g., floating roof tank wall clearance) and add/append this information to table or database generated by screening more general attributes. Thus, one could generate a listing of attributes for oil storage tanks with floating roofs exposed to a peak ground acceleration of 0.5g to 0.75g, that are 80ft-100ft in diameter, at least 40 ft high, and at least 75% full, add information on floating roof clearance and type of seal based upon a review of drawings, and export the results for statistical analysis.

Please identify the top 5 to 10 most important items of information that would be required to answer your question using PIMS in the manner you described above. For each information item, please evaluate whether this information already exists before a field investigation is performed, describe who owns the information, and explain how and when this information should be collected for use in PIMS.

INFORMATION ITEM	EXISTS	OWNER	HOW & WHEN TO COLLECT
Design drawings	Yes	Tank Owner	Non-perishable; can be collected at any time
Design requirements	Yes	Tank Owner	Non-perishable; can be collected at any time
Photographs of damage	Unknown	Tank Owner	After earthquake; requires tank be drained and inspected
Type of tank contents			Non-perishable, can be

			collected at any time
Height of tank contents at time of earthquake			Collect immediately after earthquake
Key tank design parameters (height, diameter, wall thickness at base of tank, bottom plate thickness, type/grade of wall and bottom plate steel, number of interior columns, type of floating roof, type of floating roof seals)	Yes	Tank Owner (on design drawings)	Non-perishable, can be collected at any time
Ground motions experienced by tank	Partially	Various owners depending upon location (e.g., USGS, state geological surveys, universities, private organizations)	Non-perishable, can be collected at any time; Likely requires processing to extrapolate to tank location and local soil conditions
Time and costs to undertake repairs	Yes	Tank Owner	
Enter data here	Enter data here	Enter data here	Enter data here
Enter data here	Enter data here	Enter data here	Enter data here

Click Here for List of Use Case Entries: INAA

Use Case 3

Use Case Title: Data to Support the Next Generation of Performance Based Seismic Design Guidelines

Author Name: Chris Rojahn

Email: crojahn@atcouncil.org

Phone: 650/595-1542

Explain the background situation and indicate why your question cannot be answered through currently available means.

The purpose of PIMS in this use case is to gather data to support the development, calibration, and improvement of next-generation performance based seismic design guidelines. ATC is in the process of preparing such guidelines in a multi-year, multi-million dollar project, funded by FEMA (ATC-58 project), that will go on for at least another five to ten years. The first major product will be Seismic Performance Assessment Guidelines for Buildings, which will enable engineers to estimate, for a given building and earthquake shaking level, the expected damage, repair cost, casualties, and down-time (risk parameters that we have concluded are of the highest interest to stakeholders). Post-earthquake data would be very useful in confirming or calibrating the models used in that methodology.

State, succinctly, the specific question to be answered.

PIMS shall contain data that will be useful to support the development, calibration, and improvement of next-generation performance based seismic design guidelines.

Describe, in a step-wise fashion, how you might envision using the PIMS to answer the question.

(1) Select an event of interest and zoom to the affected area. (2) Select structures of interest. (3) Overlay hazard (ground shaking) maps over the area of interest. (4) Create a database that, for the selected structures, lists a. General building information (location, type, use, design and construction date, owner information) b. Ground shaking level c. Performance evaluation (reports of damage/failure) d. Casualties related to the building's performance e. Repair costs f. Down-time for repairs

Please list the tools that would you expect to have in extracting information from PIMS? Or, describe how the information in PIMS should best be presented. (for example, use of screening attributes to identify relevant entries, tabular summaries, data files for GIS representation of location and attributes)

Interactively screen attributes to identify relevant data entries in a database format

Generate tabular summaries with information categorized by selected attributes that can be exported to common tools such as Excel

Interactive mapping representation of the location of the observation and with the ability to interactively select additional information (e.g., peak spectral acceleration, soil classification) and structure attributes (perhaps similar to the clickable overlays in Google Earth)

An ability to easily pull up design drawings, extract detailed information and add/append this information to table or database generated by screening more general attributes.

Please identify the top 5 to 10 most important items of information that would be required to answer your question using PIMS in the manner you described above. For each information item, please evaluate whether this information already exists before a field investigation is performed, describe who owns the information, and explain how and when this information should be collected for use in PIMS.

INFORMATION ITEM	EXISTS	OWNER	HOW & WHEN TO COLLECT
hazard overlays	yes	USGS	Auto-download into PIMS
Basic structure information (location, type, year of construction, owner info)	Yes	Public domain (tax assessments)	Collect before or after event
Performance evaluation	No	Field investigator	Collect right after event
casualty reports	yes	emergency management agencies? hospitals?	Harvest soon after the event
repair costs	yes	owner	collect in long-term after the event
structure down-time	yes	owner	collect in long-term after event

Use Case 4

Use Case Title: Evaluation of Overall Building Seismic Performance and Fragilities Development

Author Name: Chris Rojahn

Email: crojahn@atcouncil.org

Phone: 650/595-1542

Explain the background situation and indicate why your question cannot be answered through currently available means.

Little high-quality information exists on the overall performance of building structures during earthquakes that may be used to evaluate the adequacy of code design provisions.

State, succinctly, the specific question to be answered.

What are the correlations between structure performance and experienced hazard levels?

Here, the experience hazard levels should be quantified by shaking time histories or elastic spectra, not just PGA or PGV regional estimates.

Answers to this question may be used to evaluate the adequacy of structure design provisions and codes.

Describe, in a step-wise fashion, how you might envision using the PIMS to answer the question.

(1) Select an event of interest and zoom to the affected area. (2) Identify strong motion recording stations. (3) Identify structures of interest near strong motion recording stations. (4) Generate a data listing regarding the selected structures that provides a. The year of construction and design (thus providing the applicable design code) b. Building performance (using an appropriate metrics) c. Structural information and/or drawings (5) Correlate performance to experienced hazard levels.

Please list the tools that would you expect to have in extracting information from

PIMS? Or, describe how the information in PIMS should best be presented. (for example, use of screening attributes to identify relevant entries, tabular summaries, data files for GIS representation of location and attributes)

Interactively screen attributes to identify relevant data entries in a database format

Generate tabular summaries with information categorized by selected attributes that can be exported to common tools such as Excel

Interactive mapping representation of the location of the observation and with the ability to interactively select additional information (e.g., peak spectral acceleration, soil classification) and structure attributes (perhaps similar to the clickable overlays in Google Earth)

An ability to easily pull up design drawings, extract detailed information and add/append this information to table or database generated by screening more general attributes.

Please identify the top 5 to 10 most important items of information that would be required to answer your question using PIMS in the manner you described above. For each information item, please evaluate whether this information already exists before a field investigation is performed, describe who owns the information, and explain how and when this information should be collected for use in PIMS.

INFORMATION ITEM	EXISTS	OWNER	HOW & WHEN TO COLLECT
hazard overlays	yes	USGS	Auto-download into PIMS
Basic building information (location, type, year of construction)	Yes	Public domain (tax assessments)	Collect before or after event
Performance evaluation	No	Field investigator	Collect right after event
design drawings	yes	structure owner	Collect before or after event
Your Response	Your Response	Your Response	Your Response
Your Response	Your Response	Your Response	Your Response

List of Use Case Entries

Do not delete me: INAA

Use Case 5

Use Case Title: Evaluation of Overall Building Seismic Performance

Author Name: Dan Dolan

Email: jddolan@wsu.edu

Phone: (509) 335-7849

Explain the background situation and indicate why your question cannot be answered through currently available means.

Little high-quality information exists on the overall performance of building structures during earthquakes that may be used to evaluate the adequacy of code design provisions. Currently, the information available is the year of construction. However, if information on the overall building performance (e.g., structural system description, permanent drift, estimate of maximum drift, site class, nearby time history of event, etc.) were available, the actual loading could be estimated. This would allow the reviewer to back calculate from the current code what the system demands would have been and comparisons to design detailing could be made.

State, succinctly, the specific question to be answered.

Is the building design code in question resulting in building seismic performance as desired or planned, and are there improvements that need to be made to the design code?

Describe, in a step-wise fashion, how you might envision using the PIMS to answer the question.

(1) Select an event of interest and zoom to the affected area. (2) Identify all building stock of interest. (3) Overlay hazard map (ground shaking intensity). (4) Identify building structures in a hazard zone level of interest. (5) Generate a listing of the selected building structures that provides a. The year of construction and design (thus providing the applicable design code) b. Building performance (using an appropriate metrics such as residual drift, maximum drift, and failed components) (6) Compare performance to applicable design code and make conclusions

Please list the tools that would you expect to have in extracting information from

PIMS? Or, describe how the information in PIMS should best be presented. (for example, use of screening attributes to identify relevant entries, tabular summaries, data files for GIS representation of location and attributes)

Interactively screen attributes to identify relevant data entries in a database format

Generate tabular summaries with information categorized by selected attributes that can be exported to common tools such as Excel

Interactive mapping representation of the location of the observation and with the ability to interactively select additional information (e.g., peak spectral acceleration, soil classification) and structure attributes (perhaps similar to the clickable overlays in Google Earth)

An ability to easily pull up design drawings, extract detailed information and add/append this information to table or database generated by screening more general attributes.

Please identify the top 5 to 10 most important items of information that would be required to answer your question using PIMS in the manner you described above. For each information item, please evaluate whether this information already exists before a field investigation is performed, describe who owns the information, and explain how and when this information should be collected for use in PIMS.

INFORMATION ITEM	EXISTS	OWNER	HOW & WHEN TO COLLECT
hazard overlays	yes	USGS	Auto-download into PIMS
Basic building information (location, type, year of construction)	Yes	Public domain (tax assessments)	Collect before or after event
Performance evaluation	No	Field investigator	Collect right after event
Building structural system	No	Field Investigator	Collect right after event
Non-structural materials affecting structural response	No	Field Investigator	Collect right after event
Your Response	Your Response	Your Response	Your Response

List of Use Case Entries

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Use Case 10

Use Case Title: Real-World Behavior of Structures subjected to Seismic Loading

Author Name: Chris Poland

Email: cpoland@degenkolb.com

Phone: 415.354.6551

Explain the background situation and indicate why your question cannot be answered through currently available means.

Currently, there is a disconnect between the means by which structures subjected to seismic loadings are analyzed and designed and their real world behavior.

State, succinctly, the specific question to be answered.

The goal of this Use Case is to provide sufficient information to allow engineers to gain insight into the true behavior or structures subjected to seismic loadings and how this behavior relates to the means by which they are analyzed and designed.

Describe, in a step-wise fashion, how you might envision using the PIMS to answer the question.

(1) Select an event of interest and zoom to the affected area.

(2) Identify structure(s) of interest.

(3) Overlay hazard quantification information a. nearby strong motion recording stations i. location ii. records; corrected and uncorrected iii. spectrums iv. intensity measures b. derived hazard maps

(4) Generate a listing of structure information a. location b. description c. structure type d. design drawings/plans e. foundation plans

(5) Overlay soil information a. Classification b. Shear wave velocity

(6) Generate a listing of structure performance or damage information a. Should be to a level of detail that a structural engineer designing the structural repairs would need b. List of repairs c. Repair costs d. Downtime

Please list the tools that would you expect to have in extracting information from PIMS? Or, describe how the information in PIMS should best be presented. (for example, use of screening attributes to identify relevant entries, tabular summaries, data files for GIS representation of location and attributes)

Interactively screen attributes to identify relevant data entries in a database format

Generate tabular summaries with information categorized by selected attributes that can be exported to common tools such as Excel

Interactive mapping representation of the location of the observation and with the ability to interactively select additional information (e.g., peak spectral acceleration, soil classification) and structure attributes (perhaps similar to the clickable overlays in Google Earth)

An ability to easily pull up design drawings, extract detailed information and add/append this information to table or database generated by screening more general attributes.

Please identify the top 5 to 10 most important items of information that would be required to answer your question using PIMS in the manner you described above. For each information item, please evaluate whether this information already exists before a field investigation is performed, describe who owns the information, and explain how and when this information should be collected for use in PIMS.

INFORMATION ITEM	EXISTS	OWNER	HOW & WHEN TO COLLECT
strong motion recording station data	yes	COSMOS, etc.	Auto-download into PIMS
derived hazard maps	Yes	USGS	Auto-download into PIMS
structure location, type, use	Yes	Public (tax assessment records?)	Auto-download into PIMS
design drawings/plans	Yes	Owner	Collect before or after event
foundation plans	Yes	Owner	Collect before or after event
soil maps	Yes	public soil survey organizations	Auto-download into PIMS
soil shear wave velocity	Yes	Calculate from soil maps	Auto-download into PIMS
structure damage surveys	No	Field investigation	Collect right after event
structural repairs	No	Owner, repair engineer	Collect before or after repairs are made
repair costs	No	Owner, repair engineer	Collect after repairs are made
structure downtime	No	Owner	Quantify after structure reopens

Use Case 11

Use Case Title: Validation of Seismic Analyses of Buildings

Author Name: Dan Dolan

Email: jddolan@wsu.edu

Phone: (509) 335-7849

Explain the background situation and indicate why your question cannot be answered through currently available means.

Currently, experimental or analytical studies performed to ascertain the seismic response and performance of building structures have little or no information from the real-world response of structures with which to validate the analyses. While sometimes large or significant structures are monitored during earthquakes, the more common structures, low to medium-rise buildings, are almost never monitored. Laboratory-built specimens are rarely able to include all of the finish materials or durability issues that affect the building response. The laboratory specimens are typically simplified structures (e.g., bare steel frame or one room per floor). While these simple structures provide some insight into idealized building response, they do not represent the building stock. Light-frame structural response has been shown to be very sensitive to finish material types and attachments. Frame systems are probably just as sensitive, and development of accurate methods for design or improvements in performance need to be validated with real-world data.

State, succinctly, the specific question to be answered.

For a specific building structure subjected to seismic loads, what are the significant structural characteristics of the building sufficient with which to build an analytical model of the structure and what was the structure's performance (fundamental frequency, acceleration amplification, residual drift, damage, etc.) due to the earthquake?

The goal is to attain enough information about the structure as constructed to be able to construct an analytical model of the structure and compare the results from the analytical model from the actual performance of the structure during the earthquake.

Describe, in a step-wise fashion, how you might envision using the PIMS to answer the question.

(1) Specify the earthquake of interest and zoom to the affected area. (2) Select a building for which data was systematically collected after the event. (3) Query and download detailed information about the building regarding its a. Lateral-resistance system b. Non-structural components and their influence on the lateral resistance of the structure c. Square footage per floor d. Column grid layout e. Wall to window area ratio on the outside of the building f. Wall spacing and location inside the building (or information that may be used to estimate this, such as number of bedrooms and bathrooms in the building) g. Site class for soil (4) Query and download information regarding the structures performance a. Residual drift b. Estimate of maximum drift experienced if possible (e.g., estimate from nail deformation or other similar evidence.) c. Component failures and their location in structure d. Estimate of non-building loading (e.g., occupancy loading) (5) Get information describing the hazard a. Ground shaking intensity b. Shaking history and spectrums from nearby recording stations

Please list the tools that would you expect to have in extracting information from PIMS? Or, describe how the information in PIMS should best be presented. (for example, use of screening attributes to identify relevant entries, tabular summaries, data files for GIS representation of location and attributes)

Interactively screen attributes to identify relevant data entries in a database format

Generate tabular summaries with information categorized by selected attributes that can be exported to common tools such as Excel

Interactive mapping representation of the location of the observation and with the ability to interactively select additional information (e.g., peak spectral acceleration, soil classification) and structure attributes (perhaps similar to the clickable overlays in Google Earth)

An ability to easily pull up design drawings, extract detailed information and add/append this information to table or database generated by screening more general attributes.

Please identify the top 5 to 10 most important items of information that would be required to answer your question using PIMS in the manner you described above. For each information item, please evaluate whether this information already exists before a field investigation is performed, describe who owns the information, and explain how and when this information should be collected for use in PIMS.

INFORMATION ITEM	EXISTS	OWNER	HOW & WHEN TO COLLECT
Ground shaking overlays	Yes	USGS	Auto-download into PIMS
Acceleration time histories and spectrums	Yes	USGS	Auto-download into PIMS
Building location information	Yes	Public records (tax assessments)	Collect before or after; no time limitations
Basic building info (type, square footage, use)	Yes	Building Permit Office	Collect before or after; no time limitations
Design documents for building	Yes	Owner or Building Permit Office	Collect before or after event, though after you may face resistance
Lateral-resistance system information	No	Field investigation or Design Documents	Collect right after event before building is repaired/demolished
Interior wall and partition layout and fixity to structural frame	No	Field investigation	Collect right after event before building is repaired/demolished
Wall to window ratio on exterior walls	No	Field investigation	Collect right after event before building is repaired/demolished
Residual drift of structure	No	Field investigation	Collect right after event before building is repaired/demolished
Structure performance or damage notes	No	Field investigation	Collect right after event before building is repaired/demolished

List of Use Case Entries

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Use Case 15

Use Case Title: Evaluation of Overall Building Seismic Performance and Development of Fragility Relationships

Author Name: Bob Bachman

Email: rebachmanse@aol.com

Phone:

Explain the background situation and indicate why your question cannot be answered through currently available means.

Little high-quality information exists on the overall performance of building structures during earthquakes that may be used to evaluate the adequacy of code design provisions and develop fragilities for structures. Currently, the information available is the year of construction. However, if information on the overall building performance (e.g., structural system description, permanent drift, estimate of maximum drift, site class, nearby time history of event, etc.) were available, the actual loading could be estimated. This would allow the reviewer to back calculate from the current code what the system demands would have been and comparisons to design detailing could be made.

State, succinctly, the specific question to be answered.

Is the building design code in question resulting in building seismic performance as desired or planned, and are there improvements that need to be made to the design code? What fragility relationships may be derived from structures and nonstructural components based on past performance during earthquakes?

Describe, in a step-wise fashion, how you might envision using the PIMS to answer the question.

(1) Select an event of interest and zoom to the affected area. (2) Identify all building stock of interest. (3) Overlay hazard map (ground shaking intensity). (4) Identify building structures in a hazard zone level of interest. (5) Generate a listing of the selected building structures that provides a. The year of construction and design (thus providing the applicable design code) b. Building performance (using an appropriate metrics such as residual drift, maximum drift, and failed components) (6) Compare performance to

applicable design code and make conclusions (7) Relate building performance (quantified by residual drift, maximum drift, interstory drifts, damage/failure, or etc.) to imposed hazard level (peak ground parameters, intensity measures, etc.) to develop fragility relationships for classes of structures and nonstructural components. It is important to define performance levels (or failure) clearly such that you can evaluate which structures and nonstructural components failed and which did not. To do this, data must be available that describes damage or lack of damage in the same components in the same class of structures.

Please list the tools that would you expect to have in extracting information from PIMS? Or, describe how the information in PIMS should best be presented. (for example, use of screening attributes to identify relevant entries, tabular summaries, data files for GIS representation of location and attributes)

Interactively screen attributes to identify relevant data entries in a database format

Generate tabular summaries with information categorized by selected attributes that can be exported to common tools such as Excel

Interactive mapping representation of the location of the observation and with the ability to interactively select additional information (e.g., peak spectral acceleration, soil classification) and structure attributes (perhaps similar to the clickable overlays in Google Earth)

An ability to easily pull up design drawings, extract detailed information and add/append this information to table or database generated by screening more general attributes.

Please identify the top 5 to 10 most important items of information that would be required to answer your question using PIMS in the manner you described above. For each information item, please evaluate whether this information already exists before a field investigation is performed, describe who owns the information, and explain how and when this information should be collected for use in PIMS.

INFORMATION ITEM	EXISTS	OWNER	HOW & WHEN TO COLLECT
hazard overlays	yes	USGS	Auto-download into PIMS

Basic building information (location, type, year of construction)	Yes	Public domain (tax assessments)	Collect before or after event
Building structural system	No	Field Investigator	Collect right after event
Non-structural materials affecting structural response	No	Field Investigator	Collect right after event
Overall building performance (residual drift, interstory drift, etc.)	No	Field investigator	Collect right after event
Structural components damage or failure reports	No	Field investigator	Collect right after event
Non-structural components damage or failure reports	No	Field investigator	Collect right after event
Post-event building functionality (normal use, limited use, no use, etc.)	No	Field investigator	Collect right after event
Your Response	Your Response	Your Response	Your Response

List of Use Case Entries

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Use Case 16

Use Case Title: Evaluation of Overall Building Seismic Performance and Development of Fragility Relationships

Author Name: John Hooper

Email:

Phone:

Explain the background situation and indicate why your question cannot be answered through currently available means.

Little high-quality information exists on the overall performance of building structures during earthquakes that may be used to evaluate the adequacy of code design provisions and develop fragilities for structures. Currently, the information available is the year of construction. However, if information on the overall building performance (e.g., structural system description, permanent drift, estimate of maximum drift, site class, nearby time history of event, etc.) were available, the actual loading could be estimated. This would allow the reviewer to back calculate from the current code what the system demands would have been and comparisons to design detailing could be made.

State, succinctly, the specific question to be answered.

Is the building design code in question resulting in building seismic performance as desired or planned, and are there improvements that need to be made to the design code? What fragility relationships may be derived from structures based on past performance during earthquakes?

Describe, in a step-wise fashion, how you might envision using the PIMS to answer the question.

(1) Select an event of interest and zoom to the affected area.
(2) Identify all building stock of interest.
(3) Overlay hazard map (ground shaking intensity).
(4) Identify building structures in a hazard zone level of interest.
(5) Generate a listing of the selected building structures that provides

a. The year of construction and design (thus providing the applicable design code)

b. Building performance (using an appropriate metrics such as residual drift, maximum drift, and failed components)

(6) Compare performance to applicable design code and make conclusions

(7) Relate building performance (quantified by residual drift, maximum drift, interstory drifts, damage/failure, or etc.) to imposed hazard level (peak ground parameters, intensity measures, etc.) to develop fragility relationships for classes of structures. It is important to define performance levels (or failure) clearly such that you can evaluate which structures failed and which did not. To do this, data must be available that describes damage or lack of damage in the same components in the same class of structures.

Please list the tools that would you expect to have in extracting information from PIMS? Or, describe how the information in PIMS should best be presented. (for example, use of screening attributes to identify relevant entries, tabular summaries, data files for GIS representation of location and attributes)

Interactively screen attributes to identify relevant data entries in a database format

Generate tabular summaries with information categorized by selected attributes that can be exported to common tools such as Excel

Interactive mapping representation of the location of the observation and with the ability to interactively select additional information (e.g., peak spectral acceleration, soil classification) and structure attributes (perhaps similar to the clickable overlays in Google Earth)

An ability to easily pull up design drawings, extract detailed information and add/append this information to table or database generated by screening more general attributes.

Please identify the top 5 to 10 most important items of information that would be required to answer your question using PIMS in the manner you described above. For each information item, please evaluate whether this information already exists before a field investigation is performed, describe who owns the information, and explain how and when this information should be collected for use in PIMS.

INFORMATION ITEM	EXISTS	OWNER	HOW & WHEN TO COLLECT
hazard overlays	yes	USGS	Auto-download into PIMS
Basic building information (location, type, year of construction)	Yes	Public domain (tax assessments)	Collect before or after event
Building structural system	No	Field Investigator	Collect right after event
Non-structural materials affecting structural response	No	Field Investigator	Collect right after event
Overall building performance (residual drift, interstory drift, etc.)	No	Field investigator	Collect right after event
Structural components damage or failure reports	No	Field investigator	Collect right after event
Non-structural components damage or failure reports	No	Field investigator	Collect right after event
Post-event building functionality (normal use, limited use, no use, etc.)	No	Field investigator	Collect right after event
Repairs (list, costs)	No	Building owner	Collect after the event
Structure downtime	No	Building owner	Collect well after event

List of Use Case Entries

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Use Case 17

Use Case Title: Building Performance for Insurance Industry

Author Name: Rose Grant

Email:

Phone:

Explain the background situation and indicate why your question cannot be answered through currently available means.

Little high-quality information exists on the overall performance of buildings during earthquakes and other hazards that may be used to evaluate the affects of building attributes (architectural design / floor plan, type of construction material, lateral-resistance system, cladding, etc.) on the structure's performance. Evaluation of the performance would aid in improving future performance of buildings and evaluating insurance rates for buildings with different attributes.

State, succinctly, the specific question to be answered.

How do specific building attributes (especially those associated with single family residential structures) affect performance?

Describe, in a step-wise fashion, how you might envision using the PIMS to answer the question.

1) Select building stock of interest and divide into groups based on attributes, such as
   - a. Design/floor plan (especially newer single family homes with open floor plans, 2 story spaces, taller floor-to-ceiling heights, walkout basements, cripple walls, etc.)
   - b. Material
   - c. Type of construction (stick-built wood, masonry, reinforced concrete, steel, tilt-up, etc.)
   - d. Year of construction / building code under which it was built or designed
   - e. Type of lateral-resistance system (moment frame, shear wall, bracing, etc.)
   - f. Type of cladding (siding, bricks, etc.)

g. Windows (percent of wall area)

h. Doors / garage doors (especially garage door wall plane details)

i. Roof / roof shape /complexity of roof design (dormers) / stick framed vs. truss

j. Building Appurtenances (porches, decks, lanais, etc.)

2) For each group with the same attributes, obtain information to quantify the severity of the imposed hazard, such as

a. Ground shaking intensity (MM scale, PGA, PGV, etc.)

b. Ground movement potential (e.g., subsidence potential, landslide potential)

c. Max wind speed

d. Run-up heights for floods

e. Wildfire exposure

f. Etc.

3) For each group with the same attributes, obtain information to quantity the building's performance, such as reports on

a. structure collapse

b. structural component failure

c. roof damage

d. cladding damage

e. window/door damage

f. foundation damage or settlement

g. building functionality

h. required repairs

i. fire damage (following earthquake)

4) Export the data from (2) and (3) and compare building performance to the imposed hazards. Do this for the various groups of buildings with the same attributes. Make conclusions on the affect of building attributes on performance.

Please list the tools that would you expect to have in extracting information from PIMS? Or, describe how the information in PIMS should best be presented. (for example, use of screening attributes to identify relevant entries, tabular summaries, data files for GIS representation of location and attributes)

Interactively screen attributes to identify relevant data entries in a database format

Generate tabular summaries with information categorized by selected attributes that can be exported to common tools such as Excel

Interactive mapping representation of the location of the observation and with the ability to interactively select additional information (e.g., peak spectral acceleration, soil classification) and structure attributes (perhaps similar to the clickable overlays in Google Earth)

An ability to easily pull up design drawings, extract detailed information and add/append this information to table or database generated by screening more general attributes.

Please identify the top 5 to 10 most important items of information that would be required to answer your question using PIMS in the manner you described above. For each information item, please evaluate whether this information already exists before a field investigation is performed, describe who owns the information, and explain how and when this information should be collected for use in PIMS.

INFORMATION ITEM	EXISTS	OWNER	HOW & WHEN TO COLLECT
hazard overlays (multi-hazard)	yes	USGS /ASCE-7 / Building Code / FEMA FIRM	Auto-download into PIMS
Basic building information (location, type, year of construction)	Yes	Public domain (tax assessments)	Collect before or after event
Building structural system	No	Field Investigator	Collect right after event
Non-structural materials affecting structural response	No	Field Investigator	Collect right after event
Overall building performance (residual drift, interstory drift, etc.)	No	Field investigator	Collect right after event
Structural components damage or failure reports	No	Field investigator	Collect right after event
Non-structural components damage or failure reports	No	Field investigator	Collect right after event
Post-event building functionality (normal use, limited use, no use, etc.)	No	Field investigator	Collect right after event
Building Code in force at time of construction	Maybe	ISO Database or field investigator	Location dependant

Use Case 19

Use Case Title: Resiliency Assessment of Structures in Hurricanes

Author Name: John Pine

Email: jpine@lsu.edu

Phone: 225 578-1075

Explain the background situation and indicate why your question cannot be answered through currently available means.

Assessments of the performance of structures during hurricanes (wind and water action) have been made prior to hurricane to estimate the resiliency of structures (i.e., potential for damage or loss). We wish to gain knowledge to improve these assessments.

State, succinctly, the specific question to be answered.

What is the relationship between the imposed actions on structures (wind and water) and the performance of those structures?

Describe, in a step-wise fashion, how you might envision using the PIMS to answer the question.

(1) Zoom to region and event of interest. (2) Overlay imposed hazard quantifications a. Water run-up levels b. Peak wind speeds c. Others? (3) Select structures of interest a. Houses b. Low or medium rise structures c. Bridges d. Etc. (4) Generate a listing of basic structure information a. Type b. Use c. Structural system d. Date of design and construction (5) Generate a listing of damage or loss of the selected structures a. Light damage, moderate damage, complete destruction b. Usability after event c. Downtime d. Repair costs (6) Correlate the imposed hazards levels with the reports of damage

Please list the tools that would you expect to have in extracting information from PIMS? Or, describe how the information in PIMS should best be presented. (for

example, use of screening attributes to identify relevant entries, tabular summaries, data files for GIS representation of location and attributes)

Interactively screen attributes to identify relevant data entries in a database format

Generate tabular summaries with information categorized by selected attributes that can be exported to common tools such as Excel

Interactive mapping representation of the location of the observation and with the ability to interactively select additional information (e.g., peak spectral acceleration, soil classification) and structure attributes (perhaps similar to the clickable overlays in Google Earth)

An ability to easily pull up design drawings, extract detailed information and add/append this information to table or database generated by screening more general attributes.

Please identify the top 5 to 10 most important items of information that would be required to answer your question using PIMS in the manner you described above. For each information item, please evaluate whether this information already exists before a field investigation is performed, describe who owns the information, and explain how and when this information should be collected for use in PIMS.

INFORMATION ITEM	EXISTS	OWNER	HOW & WHEN TO COLLECT
water run-up levels	no	field invesitgation	collect right after event
peak wind speeds	yes	weather agency	auto-download into PIMS after event
structure inventories	yes	public (tax assessment records); other inventories (DHS for example)	collect before or after event
structure type, use, year of design/construction	public (tax assessment records);	yes	collect before or after event
structural system	yes	owner – design drawings	collect before or after event
reports of damage	no	field investigation	collect right after event
reports of downtime	no	owner	collect right after event
repair costs	no	owner	collect as available

Family 2: Evaluation of geotechnical and geological failures

Use Case 20

Use Case Title: Geological and Geotechnical Ground Failures

Author Name: Ed Harp

Email:

Phone:

Explain the background situation and indicate why your question cannot be answered through currently available means.

Ed: Is there a means out there now to do something like this?

State, succinctly, the specific question to be answered.

What are the types and distributions of ground failures (landslides, liquefaction, ground rupture, etc.) that occurred? How do the ground failures relate to underlying causative parameters (soil type, geology, soil moisture, ground shaking, etc.)?

Describe, in a step-wise fashion, how you might envision using the PIMS to answer the question.

(1) Select an event of interest and zoom to the affected area. (2) Overlay ground failure distributions. a. Liquefaction b. Landslide c. Ground rupture (3) Overlay causative parameter maps. a. Ground shaking b. Soil type and characteristics c. Soil moisture (does this exist?) d. Geologic maps e. Topographic maps, or slope maps, or digital elevation models f. Hydrographic maps g. Others? (4) For select ground failures of interest, extract further information such as a. Ground displacements b. Velocity vectors c. Others? (5) Export information from (2), (3), and (4) for further analysis

Please list the tools that would you expect to have in extracting information from PIMS? Or, describe how the information in PIMS should best be presented. (for example, use of screening attributes to identify relevant entries, tabular summaries, data files for GIS representation of location and attributes)

Interactively screen attributes to identify relevant data entries in a database format

Generate tabular summaries with information categorized by selected attributes that can be exported to common tools such as Excel

Interactive mapping representation of the location of the observation and with the ability to interactively select additional information (e.g., peak spectral acceleration, soil classification) and structure attributes (perhaps similar to the clickable overlays in Google Earth)

An ability to easily pull up design drawings, extract detailed information and add/append this information to table or database generated by screening more general attributes.

Please identify the top 5 to 10 most important items of information that would be required to answer your question using PIMS in the manner you described above. For each information item, please evaluate whether this information already exists before a field investigation is performed, describe who owns the information, and explain how and when this information should be collected for use in PIMS.

INFORMATION ITEM	EXISTS	OWNER	HOW & WHEN TO COLLECT
hazard overlays	yes	USGS	Auto-download into PIMS
soil maps	Yes	public soil surveys	Auto-download into PIMS
soil moisture maps	Yes?	public soil surveys? meteorologists?	Auto-download into PIMS
geologic maps	Yes	Geologic surveys	Auto-download into PIMS
topographic maps	Yes	Publicly available	Auto-download into PIMS
hydrographic maps	Yes	Publicly available	Auto-download into PIMS
Ground failure features and reports	No	Field investigator	Collect right after event

List of Use Case Entries

Do not delete me: INAA

Use Case 8

Use Case Title: Loss Assessment Validation

Author Name: Ron Eguchi

Email: rte@imagecatinc.com

Phone: 562.628.1675

Explain the background situation and indicate why your question cannot be answered through currently available means.

PIMS should be able to be used to obtain information and data to validate post-event loss estimates.

State, succinctly, the specific question to be answered.

What were the actual losses from the event, based on using simulation models such as HAZUS-MH

Describe, in a step-wise fashion, how you might envision using the PIMS to answer the question.

1. Collect near real-time field data from sensor networks, e.g., ShakeCast 2. Import this ground motion information into loss estimation model, such as HAZUS-MH 3. Collect post-event data from remote sensing (satellite imagery; aerial and field photos or video) 4. Use post-event data to either refine or corroborate loss estimates from simulation model. 5. Display information via internet, e.g., GoogleEarth.

Please list the tools that would you expect to have in extracting information from PIMS? Or, describe how the information in PIMS should best be presented. (for example, use of screening attributes to identify relevant entries, tabular summaries, data files for GIS representation of location and attributes)

Use an internet-based system, e.g., GoogleEarth.

Allow for tabular summaries of damage and impacts by area.

Ensure that the system is geospatial in that all information can be traced back to a specific site or location. Also, the more interactive you can make it, the more useful it will be for observers and users.

Please identify the top 5 to 10 most important items of information that would be required to answer your question using PIMS in the manner you described above. For each information item, please evaluate whether this information already exists before a field investigation is performed, describe who owns the information, and explain how and when this information should be collected for use in PIMS.

1. GIS layers showing specific exposure information on buildings, lifelines, essential facilities and human resources.

2. Up-to-date information on the event, e.g., size, area of impact, intensity zones, etc.

3. Remote sensing information that includes “before” and “after” imagery. Imagery can by optical (passive) and radar or lidar (active).

4. Loss estimates by area which are generated from loss estimation programs, such as HAZUS-MH

5. Field information (preferably geo-referenced) from reconnaissance teams.

INFORMATION ITEM	EXISTS	OWNER	HOW & WHEN TO COLLECT
hazard maps	yes	USGS	auto download from USGA
Entity (bldg/bridge/lifeline/etc) inventories	Yes	Various	Harvest before event or rapidly post-event
design information for entities	Yes	entity owner	harvest before event or rapidly post-event
occupancy information for entities	Maybe		harvest before event or rapidly post-event
aerial photos/satellite imagery (pre and post-event)	Yes		harvest rapidly post-event
Field information regarding damage and loss of structures	No	Field investigator	Harvest following the event
loss estimates by area generates by HAZUS-MH	No		Process rapidly after event
Your Response	Your Response	Your Response	Your Response

Use Case 9

Use Case Title: Post-Earthquake Loss Assessment

Author Name: Ron Eguchi

Email: rte@imagecatinc.com

Phone: 562.628.1675

Explain the background situation and indicate why your question cannot be answered through currently available means.

Current reconnaissance systems cannot rapidly collect, process or transfer field information back to central sites, or disseminate processed information to a broad audience such as the public.

State, succinctly, the specific question to be answered.

What impacts resulted from this event? Which areas were impacted the most? Are there areas which are hazardous to the public, e.g., fire-following, hazardous material sites, nearby dams or reservoirs.

Describe, in a step-wise fashion, how you might envision using the PIMS to answer the question.

(1) Zoom in on area of interest. (2) Overlay hazard map (ground shaking intensity, for example) (3) Overlay entities with damage or loss potential a. Buildings b. Bridges c. Lifelines d. Critical structures (hospitals, etc) (4) Query information on entities to further characterize possibility of damage/failure a. Structure type b. Date of construction c. Occupancy (5) Overlay post-event aerial photos or satellite imagery to either validate damage estimates or add new information to fill in gaps. (6) Release information to the public.

Please list the tools that would you expect to have in extracting information from PIMS? Or, describe how the information in PIMS should best be presented. (for example, use of screening attributes to identify relevant entries, tabular summaries, data files for GIS representation of location and attributes)

Online dissemination tools♣

Tools to intelligently fuse different datasets to “triangulate” in an♣ assessment of impacts.

GIS software♣

Remote sensing analysis tools to incorporate satellite images.♣

Please identify the top 5 to 10 most important items of information that would be required to answer your question using PIMS in the manner you described above. For each information item, please evaluate whether this information already exists before a field investigation is performed, describe who owns the information, and explain how and when this information should be collected for use in PIMS.

Same as this Use Case.

INFORMATION ITEM	EXISTS	OWNER	HOW & WHEN TO COLLECT
hazard maps	yes	USGS	auto download from USGA
entity bldg/bridge/lifeline/etc) inventories	Yes	Various	Harvest before event or rapidly post-event
design information for entities	Yes	entity owner	harvest before event or rapidly post-event
occupancy information for entities	Maybe		harvest before event or rapidly post-event
aerial photos/satellite imagery	Yes		harvest rapidly post-event
Your Response	Your Response	Your Response	Your Response
Your Response	Your Response	Your Response	Your Response
Your Response	Your Response	Your Response	Your Response
Your Response	Your Response	Your Response	Your Response
Your Response	Your Response	Your Response	Your Response

Family 3: Lifeline network response to hazards

Use Case 12

Use Case Title: MacArthur Maze Fire, Oakland CA April 2007

Use Case Author Name: Susan Tubbesing

Email: skt@eeri.org

Phone: (510) 451-0905

Explain the background situation and indicate why your question cannot be answered through currently available means. Data following MacArthur Maze Fire were compiled by Caltrans, but were not readily available for further assessment and evaluation

State, succinctly, the specific question to be answered. What was the impact of the fire on post-event traffic flows during various days after event (availability of post-event traffic data for comparison against pre-event data)? What traffic managment methods were taken to alleviate congestion after the event? How rapidly after the event were they implemented? How effective were these methods?

Describe, in a step-wise fashion, how you might envision using the PIMS to answer the question.

Please list the tools that would you expect to have in extracting information from PIMS? Or, describe how the information in PIMS should best be presented. (for

example, use of screening attributes to identify relevant entries, tabular summaries, data files for GIS representation of location and attributes)

Please identify the top 5 to 10 most important items of information that would be required to answer your question using PIMS in the manner you described above. For each information item, please evaluate whether this information already exists before a field investigation is performed, describe who owns the information, and explain how and when this information should be collected for use in PIMS.

DATA NAME	EXISTS	OWNER	HOW & WHEN TO COLLECT
[Enter data here]	[Enter data here]	[Enter data here]	[Enter data here]
[Enter data here]	[Enter data here]	[Enter data here]	[Enter data here]
[Enter data here]	[Enter data here]	[Enter data here]	[Enter data here]
[Enter data here]	[Enter data here]	[Enter data here]	[Enter data here]
[Enter data here]	[Enter data here]	[Enter data here]	[Enter data here]
[Enter data here]	[Enter data here]	[Enter data here]	[Enter data here]
[Enter data here]	[Enter data here]	[Enter data here]	[Enter data here]
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[Enter data here]	[Enter data here]	[Enter data here]	[Enter data here]

Use Case 13

Use Case Title: Natural Gas Distribution Pipeline and Service Line Performance in Earthquakes

Use Case Author Name: William Savage

Email: wusavage@usgs.gov

Phone: 650-329-4852, 702-794-1361

Explain the background situation and indicate why your question cannot be answered through currently available means.

Earthquakes have caused moderate to extensive damage to buried natural gas distribution systems (moderate to low pressure distribution piping and connections to service lines). Recent examples include Loma Prieta 1989, Northridge 1994, Kobe 1999, and Taiwan 1999. In general, the amount and type of information collected following each of these earthquakes is not sufficient to provide a useful understanding of the relationship between the severity of ground shaking (PGA, PGV, time history of shaking), the response of the soil in which the pipes are buried (dynamic amplification of shaking in soft soils, liquefaction, lurching or other transient or permant ground displacement), the mode of failure of the pipe body or joint/connector, and the response of adjacent structures that could have affected the failure of the gas system (e.g., displacement of nearby structural foundations or impact of adjacent buried utilities). In general and in all the earthquake cases noted above, utility response to the damage has been effective in restoring utility service as fast as possible. In this speedy response, generally little attention has been paid to documenting all aspects of the gas system failure at each repaired location. Thus the ability to improve gas system design is impaired by not having robust data on the factors (shaking level, site conditions, pipe characteristics, joint characteristics, and other factors) contributing to damage.

State, succinctly, the specific question to be answered.

What is the relationship between the earthquake hazards (strong shaking, soil response and failue) and gas distribution/service pipeline performance in earthquakes so that specifications for new or upgrades utility equipment can be developed and implemented such that the new installations can have improved performance.

Describe, in a step-wise fashion, how you might envision using the PIMS to answer the question.

1. For each earthquake, compile from the PIMS database specific locality observations about gas distribution system damage, the soil and other conditions at the site, and the earthquake hazard data for the site

- physical characteristics of pipe body and connections for each type of pipe involved at the damage locality
- physical damage to the pipe (leak at joint or connection, fracture of pipe body, fracture of joint, bending of pipe, etc)
- soil description/classification at the locality, nature of backfill if different than native soil.
- earthquake hazard at the site during the earthquake (strong shaking characteristics (PGA, PGV, response spectral peaks, time histories) either from local measurements or interpolated from ShakeMap.

3. For each earthquake with multiple cases of damage to gas distribution system components, obtain maps at the same scale for the following:

- street-level distribution-system maps and identify the location of pipe damage identified in (1).
- soil characteristics in the covering the same region in which distribution system damage occurred.
- maps of liquefaction and landslide hazard covering the above same region
- contour maps of earthquake strong shaking for PGA, PGV

4. Using the maps and the specific cases of damage for each earthquake, develop the following:

- how much pipe of each type was exposed to earthquake hazards at or greater than those hazard levels that are associted with damage?
- identify specific cases of pre-earthquake pipe conditions that may have led to damage a lower hazard leves (e.g., corrosion, pre-existing fracture of pipe or joint without any leaking)

from the observations of damage and non-damage, develop a fragility model for each type of pipe and joint as a function of seismic hazard level, with uncertainties explicitly incorporated.

5. Identify any guidance to future PIMS users on any needed changes in the guidance for collecting field observations of damage in future earthquakes.

Please list the tools that would you expect to have in extracting information from PIMS? Or, describe how the information in PIMS should best be presented. (for example, use of screening attributes to identify relevant entries, tabular summaries, data files for GIS representation of location and attributes)

Tool to search tabulated instances of localities with pipeline damage data and select by pipe type, soil conditions, pipe material,

Tool to compile localities by coordinates and damage attributes as data entries in a database format

Tool to generate tabular summaries with information categorized by selected attributes that can be exported to common tools such as Excel

Tool for interactive mapping representation of the location of the observation and with the ability to interactively select additional information (e.g., peak ground velocity, soil classification) and pipe/joint attributes (perhaps similar to the clickable overlays in Google Earth)

Tool to register multiple maps to the same coordiant system and add attributes from multiple maps to the database of damage statistics.

Please identify the top 5 to 10 most important items of information that would be required to answer your question using PIMS in the manner you described above. For each information item, please evaluate whether this information already exists before a field investigation is performed, describe who owns the information, and explain how and when this information should be collected for use in PIMS.

DATA NAME	EXISTS	OWNER	HOW & WHEN TO COLLECT define perishable and non-perishable

gas distribution system map	yes	gas utility company	likely non-perishable; within 1-2 years after earthquake unless system upgrades are being made as a result of earthquake
soil classification map	likely yes	county, state, USGS	non-perishable; whenever needed
earthquake ShakeMap	likely yes	USGS	non-perishable; whenever needed
detailed damage location (coordinates)	yes	gas utility company	non-perishable; establish working relationship with owner; collect within 1-2 years of event from private records and recollections of field crews
specifics of damage at each location	possibly yes	gas utility company	perishable if not collected at time of repairs; establish working relationship with owner; collect within 1 year of event
site-specific soils data	likely no	gas utility company or city	non-perishable; 1-2 years after earthquake
Enter data here	Enter data here	Enter data here	Enter data here
Enter data here	Enter data here	Enter data here	Enter data here
Enter data here	Enter data here	Enter data here	Enter data here
Enter data here	Enter data here	Enter data here	Enter data here
Enter data here	Enter data here	Enter data here	Enter data here

Click Here for List of Use Case Entries: INAA

Use Case 14

Use Case Title: Buried Pipeline Damage Rates

Author Name: Doug Honegger

Email: dghconsult@aol.com

Phone: 805-473-0856

Explain the background situation and indicate why your question cannot be answered through currently available means.

Damage rates for buried pipelines are currently based upon empirical correlations between post-earthquake pipe repairs and estimates of ground motion or permanent ground displacement. Most of the available correlations are based upon damage to water pipelines from ground shaking and the extension to oil and gas pipelines and other buried conduits is questionable. Existing relationships for ground shaking damage can not account for differences in pipe diameter, wall thickness, pipe material, depth of burial, or soil conditions, as this information has not been collected in a systematic fashion. As a result, the uncertainty in damage estimates is very high (85% confidence bounds captured by more than plus or minus a factor of 2 on the mean estimate). Relationships for damage from ground displacement are even more crude as they do not account for the direction of ground displacement relative to the pipeline. Neither the existing ground shaking or ground displacement relationships provide a means to gauge the severity of pipe damage (e.g., minor leak vs. full break).

State, succinctly, the specific question to be answered.

How do common pipeline design parameters such as diameter, wall thickness, burial depth, and backfill conditions affect the level of damage experienced by buried pipelines.

Describe, in a step-wise fashion, how you might envision using the PIMS to answer the question.

Improved relationships could be developed by overlaying a pipeline system with critical pipeline attributes with ground motion maps (either actual motions or estimated motions that account for local soil conditions such as SHAKEMAP) and documented locations of pipeline damage and damage severity. With these overlays, a database can be extracted that is suitable for regression analyses.

Please list the tools that would you expect to have in extracting information from PIMS? Or, describe how the information in PIMS should best be presented. (for

example, use of screening attributes to identify relevant entries, tabular summaries, data files for GIS representation of location and attributes)

Ability to readily incorporate pipeline company digital alignment information into a GIS

Ability to upload additional GIS overlays related to ground motion, topography, soils conditions, etc.

Ability to georeference repair information that may be stated in terms of street addresses

Generate tabular summaries with information categorized by selected attributes within a GIS platform that can be exported to common tools such as Excel

Please identify the top 5 to 10 most important items of information that would be required to answer your question using PIMS in the manner you described above. For each information item, please evaluate whether this information already exists before a field investigation is performed, describe who owns the information, and explain how and when this information should be collected for use in PIMS.

INFORMATION ITEM	EXISTS	OWNER	HOW & WHEN TO COLLECT
Pipeline Alignment	YES	Pipeline Owner	Non-perishible; can be collected with 2 yrs after event
Pipeline Design Data	YES	Pipeline Owner	Non-perishible; can be collected with 2 yrs after event
Pipe Damage Location	YES	Pipeline Owner	Non-perishible; can be collected with 2 yrs after event
Pipe Failure Mode	NO		Perishible; must be collected prior to repair
Permanent Ground Displacement	NO		Perishible; location, amount and direction of ground displacement must be collected immediately after earthquake
Your Response	Your Response	Your Response	Your Response
Your Response	Your Response	Your Response	Your Response
Your Response	Your Response	Your Response	Your Response
Your Response	Your Response	Your Response	Your Response
Your Response	Your Response	Your Response	Your Response

Use Case 26

Information Needs and Applications Title: Post-Earthquake Operability of Lifeline Systems and Equipment

Author Name: Clive Alexander

Email: calexander@arescorporation.com

Phone: 416-557-4237

Explain the background situation and indicate why your question cannot be answered through currently available means.

EPRI Seismic Qualification Utility Group (SQUG) maintains an earthquake experience database of post-earthquake performance of mechanical, electrical, instrumentation and control equipment commonly present in commercial, institutional and industrial facilities as well as electric power generating facilities. This equipment (piping, cable tray, HVAC distribution system components, valves, pumps, diesel generators, fans, motor control centers, batteries, switchgear, relays and switches, etc.) occurs in emergency power systems in hospitals and other facilities required to perform functions following extreme events. SQUG would use PIMS data to verify the existing earthquake experience database used by power utilities, and expand its scope to include newer technology equipment and experience from recent earthquakes. This PIMS information would also be directly useable for evaluation and seismic qualification of equipment in lifeline systems as well as for design standards.

State, succinctly, the specific question to be answered.

What are the seismic performance characteristics of mechanical, electrical, instrumentation and control equipment commonly present in commercial, institutional and industrial facilities?

Describe, in a step-wise fashion, how you might envision using the PIMS to answer the question.

From the PIMS database, identify structures and facilities containing subject equipment and quantify general site and building/support structure information and site ground motion levels. Categorize equipment in each structure and facility using the SQUG equipment classification and evaluate equipment performance.

Please list the tools that you would expect to have in extracting information from PIMS? Or, describe how the information in PIMS should best be presented. (for example, use of screening attributes to identify relevant entries, tabular summaries, data files for GIS representation of location and attributes)

Key areas of interest for SQUG are the ground motion levels at the structure or facility site (in order to characterize seismic input motion to the equipment), and documentation of equipment performance. Hence PIMS equipment data collection templates aligned with SQUG equipment class databases would be most useful. PIMS database search (on equipment type/class, manufacturer, etc.) and data extraction capabilities should facilitate data extraction.

Please identify the top 5 to 10 most important items of information that would be required to answer your question using PIMS in the manner you described above. For each information item, please evaluate whether this information already exists before a field investigation is performed, describe who owns the information, and explain how and when this information should be collected for use in PIMS.

INFORMATION ITEM	EXISTS	OWNER	HOW & WHEN TO COLLECT
Ground motions at site	partially	Various owners depending on location (e.g., USGS, state Geological Surveys, universities, private organizations)	Non-perishable, likely requires processing to extrapolate to equipment location and site soil conditions
Photographs of equipment, anchorage, damage	unknown	Equipment owner, field investigator	Collect right after event
Equipment performance evaluation	no	Field investigator	Collect right after event
Equipment specifications	Likely yes	Equipment owner	Collect after event

Family 4: Loss assessment, risk-assessment, and planning:

Use Case 6

Use Case Title: Use Case from Fred Turner

Author Name: Fred Turner

Email:

Phone:

Explain the background situation and indicate why your question cannot be answered through currently available means.

State, succinctly, the specific question to be answered.

Systematic data that correlates recorded ground motions with observations of the performance of social, structural and nonstructural systems that are located within a reasonably small distance of the recording stations are needed to calibrate performance-based earthquake engineering and other risk management practices.

Describe, in a step-wise fashion, how you might envision using the PIMS to answer the question.

Please list the tools that would you expect to have in extracting information from PIMS? Or, describe how the information in PIMS should best be presented. (for example, use of screening attributes to identify relevant entries, tabular summaries, data files for GIS representation of location and attributes)

Please identify the top 5 to 10 most important items of information that would be required to answer your question using PIMS in the manner you described above. For each information item, please evaluate whether this information already exists before a field investigation is performed, describe who owns the information, and explain how and when this information should be collected for use in PIMS.

INFORMATION ITEM	EXISTS	OWNER	HOW & WHEN TO COLLECT
Your Response	Your Response	Your Response	Your Response
Your Response	Your Response	Your Response	Your Response
Your Response	Your Response	Your Response	Your Response
Your Response	Your Response	Your Response	Your Response
Your Response	Your Response	Your Response	Your Response
Your Response	Your Response	Your Response	Your Response
Your Response	Your Response	Your Response	Your Response
Your Response	Your Response	Your Response	Your Response
Your Response	Your Response	Your Response	Your Response
Your Response	Your Response	Your Response	Your Response

List of Use Case Entries

Do not delete me: INAA

Use Case 7

Use Case Title: Loss Assessment

Author Name: Chris Poland

Email: cpoland@degenkolb.com

Phone: 415.354.6551

Explain the background situation and indicate why your question cannot be answered through currently available means.

PIMS shall contain information that will enable users to assess the actual losses due to a hazard event.

State, succinctly, the specific question to be answered.

What were the actual losses (economic, social, etc.) from the event?

Describe, in a step-wise fashion, how you might envision using the PIMS to answer the question.

(1) Zoom in on area of interest. (2) In the area of interest, generate listings of a. Reports of damage that affected a structure's usability b. Reports of structure downtime c. Estimates of the costs of downtime d. Quantification of repair costs e. Quantification of displaced residents f. Casualty reports

Please list the tools that would you expect to have in extracting information from PIMS? Or, describe how the information in PIMS should best be presented. (for example, use of screening attributes to identify relevant entries, tabular summaries, data files for GIS representation of location and attributes)

Interactively screen attributes to identify relevant data entries in a database format

Generate tabular summaries with information categorized by selected attributes that can be exported to common tools such as Excel

Interactive mapping representation of the location of the observation and with the ability to interactively select additional information (e.g., peak spectral acceleration, soil classification) and tank attributes (perhaps similar to the clickable overlays in Google Earth)

An ability to easily pull up design drawings, extract detailed information and add/append this information to table or database generated by screening more general attributes.

Please identify the top 5 to 10 most important items of information that would be required to answer your question using PIMS in the manner you described above. For each information item, please evaluate whether this information already exists before a field investigation is performed, describe who owns the information, and explain how and when this information should be collected for use in PIMS.

INFORMATION ITEM	EXISTS	OWNER	HOW & WHEN TO COLLECT
damage reports	no	field investigation or remote sensing	collect right after the event
reports of structure downtime	no	owner	collect as available after the event
estimates of downtime costs	no	owner	collect as available after the event
repair costs	no	owner	collect as available after the event
displaced residents	no	emergency management agencies	collect as available after the event
casualty reports	no	emergency management agencies or local hospitals	collect as available after the event

List of Use Case Entries

Do not delete me: INAA

Use Case 8

Use Case Title: Loss Assessment Validation

Author Name: Ron Eguchi

Email: rte@imagecatinc.com

Phone: 562.628.1675

Explain the background situation and indicate why your question cannot be answered through currently available means.

PIMS should be able to be used to obtain information and data to validate post-event loss estimates.

State, succinctly, the specific question to be answered.

What were the actual losses from the event, based on using simulation models such as HAZUS-MH

Describe, in a step-wise fashion, how you might envision using the PIMS to answer the question.

1. Collect near real-time field data from sensor networks, e.g., ShakeCast 2. Import this ground motion information into loss estimation model, such as HAZUS-MH 3. Collect post-event data from remote sensing (satellite imagery; aerial and field photos or video) 4. Use post-event data to either refine or corroborate loss estimates from simulation model. 5. Display information via internet, e.g., GoogleEarth.

Please list the tools that would you expect to have in extracting information from PIMS? Or, describe how the information in PIMS should best be presented. (for example, use of screening attributes to identify relevant entries, tabular summaries, data files for GIS representation of location and attributes)

Use an internet-based system, e.g., GoogleEarth.

Allow for tabular summaries of damage and impacts by area.

Ensure that the system is geospatial in that all information can be traced back to a specific site or location. Also, the more interactive you can make it, the more useful it will be for observers and users.

Please identify the top 5 to 10 most important items of information that would be required to answer your question using PIMS in the manner you described above. For each information item, please evaluate whether this information already exists before a field investigation is performed, describe who owns the information, and explain how and when this information should be collected for use in PIMS.

1. GIS layers showing specific exposure information on buildings, lifelines, essential facilities and human resources.

2. Up-to-date information on the event, e.g., size, area of impact, intensity zones, etc.

3. Remote sensing information that includes “before” and “after” imagery. Imagery can by optical (passive) and radar or lidar (active).

4. Loss estimates by area which are generated from loss estimation programs, such as HAZUS-MH

5. Field information (preferably geo-referenced) from reconnaissance teams.

INFORMATION ITEM	EXISTS	OWNER	HOW & WHEN TO COLLECT
hazard maps	yes	USGS	auto download from USGA
Entity (bldg/bridge/lifeline/etc) inventories	Yes	Various	Harvest before event or rapidly post-event
design information for entities	Yes	entity owner	harvest before event or rapidly post-event
occupancy information for entities	Maybe		harvest before event or rapidly post-event
aerial photos/satellite imagery (pre and post-event)	Yes		harvest rapidly post-event
Field information regarding damage and loss of structures	No	Field investigator	Harvest following the event
loss estimates by area generates by HAZUS-MH	No		Process rapidly after event
Your Response	Your Response	Your Response	Your Response

Use Case 22

Use Case Title: Post-Event Loss Assessment Validation

Author Name: Theresa Jefferson

Email: tjeff@vt.edu

Phone: 301-801-9990

Explain the background situation and indicate why your question cannot be answered through currently available means.

PIMS should be able to be used to obtain information and data to validate and refine post-event loss estimates as well as to improve and validate existing modeling tools such as HAZUS-MH. HAZUS-MH utilizes default values based on the San Francisco Bay Area or national averages. Utilizing data captured immediately following an event provides a mechanism to tailor modeling parameters for specific areas within the US.

State, succinctly, the specific question to be answered.

How do actual losses and social impacts due to a hazard event compare to those predicted by HAZUS-MH? These actual losses, damage assessments, and social impacts should be used to calibrate and improve existing models.

Describe, in a step-wise fashion, how you might envision using the PIMS to answer the question.

1. Collect near real-time field data from sensor networks, e.g., ShakeCast

2. Import this ground motion information into loss estimation model, such as HAZUS-MH

3. Collect post-event data from remote sensing (satellite imagery; aerial and field photos or video) and other methods such as casualty reports, displaced and sheltering populations and demographics.

4. Use post-event data to either refine or corroborate loss estimates from simulation model.

5. Display information via internet, e.g., GoogleEarth.

Please list the tools that would you expect to have in extracting information from PIMS? Or, describe how the information in PIMS should best be presented. (for example, use of screening attributes to identify relevant entries, tabular summaries, data files for GIS representation of location and attributes)

Use an internet-based system, e.g., GoogleEarth.

Allow for tabular summaries of damage and impacts by area.

Ensure that the system is geospatial in that all information can be traced back to a specific site or location. Also, the more interactive you can make it, the more useful it will be for observers and users.

Please identify the top 5 to 10 most important items of information that would be required to answer your question using PIMS in the manner you described above. For each information item, please evaluate whether this information already exists before a field investigation is performed, describe who owns the information, and explain how and when this information should be collected for use in PIMS.

1. GIS layers showing specific exposure information on buildings, lifelines, essential facilities and human resources.

2. Up-to-date information on the event, e.g., size, area of impact, intensity zones, etc.

3. Remote sensing information that includes "before" and "after" imagery. Imagery can by optical (passive) and radar or lidar (active).

4. Loss estimates by area which are generated from loss estimation programs, such as HAZUS-MH

5. Field information (preferably geo-referenced) from reconnaissance teams.

INFORMATION ITEM	EXISTS	OWNER	HOW & WHEN TO COLLECT
hazard maps	yes	USGS	auto download from USGA
Entity (bldg/bridge/lifeline/etc) inventories	Yes	Various	Harvest before event or rapidly post-event
design information for entities	Yes	entity owner	harvest before event or rapidly post-event
occupancy information for entities	Maybe		harvest before event or rapidly

			post-event
aerial photos/satellite imagery (pre and post-event)	Yes		harvest rapidly post-event
Field information regarding damage and loss of structures	No	Field investigator	Harvest following the event
loss estimates by area generated by HAZUS-MH	No		Process rapidly after event
Casualty reports	Maybe	Various	Harvest post-event
Displaced and Sheltering Population Demographics	Maybe	Various	Harvest post-event

Use Case 25

Use Case Title: Social Science Archive

Author Name: Kathleen Smarick and Richard Legault

Email: kjsmarick@start.umd.edu, rlegault@start.umd.edu

Phone: 301-405-6739 (Kathleen), 301-405-6821 (Richard)

Explain the background situation and indicate why your question cannot be answered through currently available means.

The purpose of this INA is to show how one would use PIMS to extract and use social science data. It is based on a tutorial developed by Richard Legault which describes how to download social science data from the Terrorism and Preparedness Data Resource Center (TPDRC) (http://www.icpsr.umich.edu/TPDRC/).

State, succinctly, the specific question to be answered.

We wish to use PIMS to search for and extract social science data for past hazard events.

Describe, in a step-wise fashion, how you might envision using the PIMS to answer the question.

(1) Login to PIMS with username and password if required for access-restricted data

(2) Search for data based on

    a. Study Classification

        i. study title

        ii. study number

        iii. investigator

        iv. subject topic

        v. associated hazard

    b. Topic Area (e.g., bioterrorism, bombing attacks, earthquakes, September 11, etc.)

c. Geography
    i. Use PIMS GIS-type interface to navigate to search area
    ii. Overlay all general-information type entities described in other use cases (e.g, boundary data, roads, critical structures, etc.)
    iii. Query system to display geo-coded social science data and studies
    iv. Scroll over interested geographic areas and activate pop-up boxes which describe the applicable studies or data
    v. Select studies/data for download
d. Metadata – use text-based searches to identify specific values and descriptions in metadata (e.g., employment, age, etc.)

(3) Select datasets of interest brought up during search and put them in a "download basket"

(4) Download the entire selected datasets or portions of the dataset and export to common formats
  a. MS Excel
  b. MS Access
  c. Typical statistical packages

Please list the tools that would you expect to have in extracting information from PIMS? Or, describe how the information in PIMS should best be presented. (for example, use of screening attributes to identify relevant entries, tabular summaries, data files for GIS representation of location and attributes)

(1) Database search tools that allow search by Study Classification, Topic Area, and Metadata (described above)

(2) GIS-type system described in other use cases to query and select geo-coded data as described above

Please identify the top 5 to 10 most important items of information that would be required to answer your question using PIMS in the manner you described above.

For each information item, please evaluate whether this information already exists before a field investigation is performed, describe who owns the information, and explain how and when this information should be collected for use in PIMS.

INFORMATION ITEM	EXISTS	OWNER	HOW & WHEN TO COLLECT
Displaced population	No	Surveyors	Harvest from survey organizations following the event
Demographics	Yes	US Census	Harvest pre-event from US Census datasets
More			

Family 5: Inform post-event response and emergency management:

Use Case 18

Use Case Title: PIMS to Inform Post-Event Response and Investigations

Author Name: John Filson

Email: jfilson@usgs.gov

Phone: 703-648-6785

Explain the background situation and indicate why your question cannot be answered through currently available means.

Currently, there is no single source of information collected in post-earthquake investigations that is easily accessible and searchable.

State, succinctly, the specific question to be answered.

Data from PIMS shall be able to be used to inform post-event response and research efforts and investigations. This data shall include both pre-event-available information (such as inventories and maps) and real-time data that is collected following the event (such as damage reports).

Describe, in a step-wise fashion, how you might envision using the PIMS to answer the question.

(1) Zoom to hazard area of interest

(2) Overlay quantification of hazard intensity to allow inference into possible instances of damage/disruption

(3) Overlay remote sensing data (aerial photos, satellite imagery, etc.) for pre-event and post-event conditions to allow inference into possible instances of damage/disruption

(4) Identify reports of damage to structures by

   a. Structure type

b. Damage state

c. Casualty reports

d. Investigation team

(5) Identify reports of damage to lifelines by

a. Lifeline type

b. Reports of damage and disruption

c. Casualty reports d. Investigation team

(6) Organize information uploaded to PIMS by the field investigation team that made the observations and uploaded the data

(7) Review a list of accounted for individuals (i.e., people in affected areas who have signed-in to a PIMS-supported system and have communicated that they do not need assistance)

Please list the tools that would you expect to have in extracting information from PIMS? Or, describe how the information in PIMS should best be presented. (for example, use of screening attributes to identify relevant entries, tabular summaries, data files for GIS representation of location and attributes)

Interactively screen attributes to identify relevant data entries in a database format

Generate tabular summaries with information categorized by selected attributes that can be exported to common tools such as Excel

Interactive mapping representation of the location of the observation and with the ability to interactively select additional information (e.g., peak spectral acceleration, soil classification) and structure attributes (perhaps similar to the clickable overlays in Google Earth)

Please identify the top 5 to 10 most important items of information that would be required to answer your question using PIMS in the manner you described above. For each information item, please evaluate whether this information already exists before a field investigation is performed, describe who owns the information, and explain how and when this information should be collected for use in PIMS.

INFORMATION ITEM	EXISTS	OWNER	HOW & WHEN TO COLLECT

Reports of earthquake faulting and other ground failures, liquefaction and landslides.	no	field investigation	collect rapidly post-event
Detailed reports of the distribution and severity of ground shaking as a function of distance and azimuth from the epicenter, and regional and local geology and soil conditions.	no	field investigation or utility agency	collect rapidly post-event
Summary of the seismology of the earthquake:, location, magnitude, moment tensor, fault slip distribution, and seismic recordings.	no	NEIC and ANSS	collect rapidly post-event
Strong motion recordings in the free-field and in structures.	yes	USGS, COSMOS	auto-download into PIMS

List of Use Case Entries

Do not delete me: INAA

Use Case 23

Use Case Title: Post-Event Emergency Management

Author Name: John Pine

Email: jpine@lsu.edu

Phone: 225 578-1075

Explain the background situation and indicate why your question cannot be answered through currently available means.

Currently, information regarding the state of the built environment, reports of casualties, and reports of accounted for individuals is not collected well or is not stored in a centrally-accessible location/format such that emergency managers can utilize the information to respond most effectively.

State, succinctly, the specific question to be answered.

Data from PIMS shall be able to be used to inform post-event emergency management decisions.

Describe, in a step-wise fashion, how you might envision using the PIMS to answer the question.

(1) Zoom to hazard area of interest. (2) Overlay quantification of hazard intensity to allow inference into possible instances of damage/disruption (3) Overlay remote sensing data (aerial photos, satellite imagery, etc.) for pre-event and post-event conditions to allow inference into possible instances of damage/disruption (4) Identify reports of damage to structures by a. Structure type b. Damage state c. Casualty reports (5) Identify reports of damage to lifelines by a. Lifeline type b. Reports of damage and disruption c. Casualty reports (6) Review a list of accounted for individuals (i.e. people in affected areas who have signed-in to a PIMS-supported system and have communicated that they do not need assistance)

Please list the tools that would you expect to have in extracting information from PIMS? Or, describe how the information in PIMS should best be presented. (for example, use of screening attributes to identify relevant entries, tabular summaries, data files for GIS representation of location and attributes)

Interactively screen attributes to identify relevant data entries in a database format

Generate tabular summaries with information categorized by selected attributes that can be exported to common tools such as Excel

Interactive mapping representation of the location of the observation and with the ability to interactively select additional information (e.g., peak spectral acceleration, soil classification) and structure attributes (perhaps similar to the clickable overlays in Google Earth)

Please identify the top 5 to 10 most important items of information that would be required to answer your question using PIMS in the manner you described above. For each information item, please evaluate whether this information already exists before a field investigation is performed, describe who owns the information, and explain how and when this information should be collected for use in PIMS.

INFORMATION ITEM	EXISTS	OWNER	HOW & WHEN TO COLLECT
reports of damage to structures	no	field investigation	collect rapidly post-event
reports of damage/disruption to lifelines	no	field investigation or utility agency	collect rapidly post-event
casualty reports	no	emergency management agencies, hospitals	collect rapidly post-event
accounted for individual list	yes	website	auto-download into PIMS
hazard overlays	yes	USGS, COSMOS	auto-download into PIMS
aerial/satellite photos (pre-event)	yes	public and fee-based-sources	auto-download into PIMS pre- or post-event
aerial/satellite photos (post-event)	no	fee-based-sources	hire an organization to gather the info and then download it into PIMS

List of Use Case Entries

Do not delete me: INAA

Use Case 24

Use Case Title: Use of PIMS in Clearinghouse

Author Name: Bob Bauer

Email: rabauer@illinois.edu

Phone: 217-244-2394

Explain the background situation and indicate why your question cannot be answered through currently available means.

The state geological surveys in the Central US have been working on their post-earthquake response plans for the past 2 years. Part of the plans is the establishment of a clearinghouse near the forward command operations of the states' emergency management agency. We have been looking at hardware, facilities and data requirements for such an operation. PIMS could fill the electronic (software) function of the clearinghouse for data storage/compilation.

State, succinctly, the specific question to be answered.

Describe, in a step-wise fashion, how you might envision using the PIMS to answer the question.

Please list the tools that would you expect to have in extracting information from PIMS? Or, describe how the information in PIMS should best be presented. (for example, use of screening attributes to identify relevant entries, tabular summaries, data files for GIS representation of location and attributes)

Since we are suggesting use in a fast pace situation, pull down menus for required metadata would save time and provide consistent representation. Also all the state geological surveys and some of their emergency management agencies use GIS and have extensive spatial databases available. These require location usually by latitude and longitude and be exportable into a dbf format – which is now relatively simple from many software programs.

Please identify the top 5 to 10 most important items of information that would be required to answer your question using PIMS in the manner you described above. For each information item, please evaluate whether this information already exists before a field investigation is performed, describe who owns the information, and explain how and when this information should be collected for use in PIMS.

INFORMATION ITEM	EXISTS	OWNER	HOW & WHEN TO COLLECT

Family 6: Information exchange among databases:

Use Case 21

Use Case Title: PIMS to Facilitate Data Exchange between Databases

Author Name: Theresa Jefferson, Jim Wilkinson, Norm Hester

Email: tjeff@vt.edu, jwilkinson@cusec.org, nhester@cusec.org

Phone: 301-801-9990

Explain the background situation and indicate why your question cannot be answered through currently available means.

Currently, databases that contain post-hazard data may not be able to share information with each other due to lack of standardization. This could include event specific databases such as state technical clearinghouses and multi-state technical clearinghouses as well as databases for independent events.

State, succinctly, the specific question to be answered.

PIMS should facilitate the sharing of data between databases that would otherwise not be able to exchange information. Using pre-established formats, would facilitate the establishment of technical information clearinghouses immediately following an event as well as allowing data to be immediately transferrable between independent systems.

Describe, in a step-wise fashion, how you might envision using the PIMS to answer the question.

Current efforts of the Central US Earthquake Consortium (CUSEC) are focused on partnering with universities and other organizations to expedite potential site selection process for establishing state technical information clearinghouses (STIC) immediately following a seismic event. All candidate organizations would be required to either utilize distributed PIMS-based systems or to conform to PIMS data formats and standards.

The multi-state technical clearinghouse (MSTIC) would also utilize PIMS and act as a central hub to manage information exchange between databases as well as facilitating data sharing and information dissemination.

Utilizing a distributed-based PIMS and/or PIMS formats will allow for the transfer of the information into PIMS for archival.

Please list the tools that would you expect to have in extracting information from PIMS? Or, describe how the information in PIMS should best be presented. (for example, use of screening attributes to identify relevant entries, tabular summaries, data files for GIS representation of location and attributes)

It is not yet determined whether or not this use case will involve direct user interface with PIMS. The development and specifications of an MSTIC and its role in collaborating and coordinating between STICs is still in the conceptual stage.

If utilizing PIMS for direct user interface the focus would be on allowing direct input from researchers in the field. For example, allow for more efficient data collection, through use of geo-referenced personal digital assistance, digital video cameras with GPS capability, and other modern tools.

PIMS should support the following for the MSTIC functions: monitor the collection of perishable data throughout the impacted area, facilitate the management of field investigations, disseminate field observations to emergency management, and develop detailed maps.

Data dissemination needs to allow different levels of data access and use, to protect sensitive information. PIMS should provide tools that allow users to selectively access geospatial data tailored to their needs as well as integrate it with other GIS programs. The system should provide summaries, and reports, as well as web-based GIS tools to select information layers.

Please identify the top 5 to 10 most important items of information that would be required to answer your question using PIMS in the manner you described above. For each information item, please evaluate whether this information already exists before a field investigation is performed, describe who owns the information, and explain how and when this information should be collected for use in PIMS.

INFORMATION ITEM	EXISTS	OWNER	HOW & WHEN TO COLLECT
Field Team Mgt.	Yes/no	EERI-NEHRP	NEHRP -Pre / Post
Collections of perishable data	Yes	NEHRP-Various	Coordination of subject area / Post
Data Mgt.	Yes/no	NEHRP-Various	Coordinated / Pre/Post
Investigation subject tracking	No	MSTIC/STIC/NEHRP	Oversight function of MSTIC/NEHRP

Your Response	Your Response	Your Response	Your Response
Your Response	Your Response	Your Response	Your Response
Your Response	Your Response	Your Response	Your Response

List of Use Case Entries

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Family 7: General hazard event information source:

APPENDIX E: DATABASE OF SYSTEM REQUIREMENTS AND ISSUES ENTRIES

Table E-1 below summarizes the database of system requirements and issues entries, organized by author. Individual entries are presented following the table.

Table E-1: System Requirements and Issues Entry Summary

ID	Author/Title
1	Bill Steele
2	Brent Woodworth
3	Chris Poland
4	Dan Dolan
5	Fred Turner
6	Chris Rojahn
7	Carl Stepp
8	Phil Schneider
9	Tim Reinhold
10	Keith Porter
11	Summary of PIMS Issues from Existing Sources
12	Bob Bachman
13	SEAOC Post-Disaster Performance Observation Committee
14	Determination of Fragility Curves from Field Observations (Amr Elnashai)
15	Loren Turner
16	Dave Wald
17	Rose Grant
18	Ron Eguchi
19	PIMS as Post-Event Information Provider (Jim Myers)
20	Mark Fitzgerald
21	John Hooper
22	John Filson
23	Jim Wilkinson
24	DHS (Dan Cotter)
25	Bob Bauer
26	Ed Harp
27	Jim Dewey
28	Sofia Tangalos
29	Havidan Rodriguez
30	Harvesting data from IRIS Data Management Center (Jian Li)
31	Jack Harrald
32	Steve French
33	Laurie Johnson

System Requirements and Issues Entry 1

System Requirements and Issues Entry Title: System Requirements and Issues Entry Bill Steele
Author Name: Bill Steele
Email: bill@geophys.washington.edu

Phone: 206-685-5880

Please list and describe your system issues **or roadblocks here:**

Please list and describe your system requirements **here:**

(1) The PIMS shall have the ability to incorporate the most advanced hazard quantification tools available. These may include basic shakemaps, advanced shakemaps (such as the one produced by the University of Washington PLEASE DESRIBE OR LINK), ground motion recording station location and data, what else?

(2) Plans for data collection and sharing shall be developed and adopted before an event occurs.

These plans should specify

• what is to be collected right after an event, such that highly ephemeral data is not lost before it is collected, • who is to do the field investigations, • what forms/standards are to be used, • where data is to be stored or uploaded, • memorandums of understanding (MOU) that delineate sharing agreements between PIMS, the public sector, governmental sector, and private sector.

The USGS and EERI, and probably others, have published plans for post-EQ investigation and data collection that can be used as models for plan development.

The MOU will clearly outline what data is to be share and how to surmount deal with privacy issues (for example, removing names and addresses from data, etc.).

Forms developed shall have enough standardization to facilitate data collection and synthesis but not so much that to limit the response of the investigators significantly (i.e., the forms should have sections for open response, notes, and personal descriptions).

If you listed system requirements above, please list the top 1 to 10 most important items of information that the PIMS would need to have in order to be able to satisfy your listed system requirements. For each information item, please evaluate whether this information item already exists before a field investigation is performed, describe who owns the information, and explain how and when should this information be collected for use in PIMS.

INFORMATION ITEM	EXISTS	OWNER	HOW & WHEN TO COLLECT
hazard maps	Yes	USGS	Auto-download into PIMS
advanced hazard maps	Yes	??	Auto-download into PIMS
strong motion recording station info and data	Yes	USGS, COSMOS	Auto-download into PIMS
Your Response	Your Response	Your Response	Your Response
Your Response	Your Response	Your Response	Your Response
Your Response	Your Response	Your Response	Your Response
Your Response	Your Response	Your Response	Your Response
Your Response	Your Response	Your Response	Your Response
Your Response	Your Response	Your Response	Your Response
Your Response	Your Response	Your Response	Your Response

List of System Requirements and Issues Entry

Do not delete me: SRI:SRIA

System Requirements and Issues Entry 2

Author: Brent Woodworth

(1) Data collection difficulties due to privacy and sensitivity issues: Both private, public, and business owners of structures may be hesitant to provide data for PIMS because of privacy and sensitivity issues. Business may not want to release information that causes them to lose their competitive advantage. Public entities may fear security concerns; and private owners may be sensitive to letting others know how their structure performed.

(2) Delineation of public versus non-public information: Optimally, as much information as possible should be publicly accessible; however, there will inevitably some information for which restricted access must be enforced (security issues).

(3) Determining information regarding data that might be used in PIMS: Where is it kept? Who manages it? Who updates it?

System Requirements and Issues Entry 3

Author: Chris Poland

Bldg owner doesn't want you to tell anybody that his building has been damaged or that it might collapse.

PIMS shall persist for the years between significant hazard events.

System Requirements and Issues Entry 4

System Requirements and Issues Entry Title: System Requirements and Issues Entry Dan Dolan

Author Name: Dan Dolan

Email: jddolan@wsu.edu

Phone: (509) 335-7849

Please list and describe your system issues or roadblocks here:

(1) Getting information about buildings from public or private sources.

The big issues is that DHS will not allow design drawings for public buildings to be publicly available; what about data accessibility post-event?

In the private building realm, data availability depends on the privacy concerns of the owners; will they make pre-event bldg information available to the public? post-event, the data should be more easily available.

What about getting this information from design drawings? For building licenses, the drawings are reviewed by public entities; however, they're not necessarily maintained by these entities.

It's ten times worse getting information from industry, due to their process secrecy concerns.

Industry might provide access to their info on a restricted basis under agreement that they will review all publications that are created from that information.

(2) Qualification for post-EQ investigators: People must be able to identify structural elements of a building correctly. One must be able to read the lateral-force resisting system and see what contributes to it. There is some level of knowledge necessary, but it's teachable to field investigators in a relative short period of time.

Please list and describe your system requirements here:

System Requirements and Issues Entry 5

System Requirements and Issues Entry Title: Fred Turner's System Requirements and Issues Entry

Author Name: Fred Turner

Please list and describe your system issues or roadblocks here:

The lack of a pre-disaster, computer-based filing system has not been a significant impediment after past earthquakes. Much larger impediments are: 1) The lack of consensus and motivation among potential data collectors, sharers and the owners of the information regarding the purpose, priorities, training, and the importance of uniform, consistent levels of detail in data collection practices; 2) Legal impediments, resulting in the fear of, or threats of lawsuits, the lack of clear policies for rights to access and limits for the sharing of information, some of which may be proprietary or otherwise sensitive, and the lack of protocols for aggregating raw data so as to protect the interests of individuals while still yielding valuable, meaningful data; 3) The transition from anecdotal data collection practices to more systematic collection practices requires a far greater commitment in terms of time and funding from the earthquake engineering community than currently exists; 4) Due to Homeland Security concerns, access to the most heavily damaged regions will be restricted unless pre-disaster credentialing of a trained Disaster Volunteer Corps with a pre-defined mission of data collection is developed and maintained.

There are several prior attempts at setting up electronic templates to accommodate observations used in the past with disappointing results. I was involved in efforts after the Northridge Earthquake to catalogue such data. Electronic files from that earthquake still exist. Fewer than 10 percent of damage observers chose to populate the Northridge database.

The CA-OES Post-Earthquake Information Clearinghouse has tried several computer systems in mock trial field exercises and found that no single system can meet all the needs of a variety of disciplines. Proposed data forms and data entry systems have not been embraced by many in the earthquake engineering professions for a variety of valid reasons. Observations after past earthquakes appear to be disjointed, serendipitous and non-systematic such that form-filling and data entry by PDA or laptop for recording the data is not compatible with intelligence gathering in the field. Handwritten notes and digital voice recorders are hard to beat compared to other more sophisticated systems. Transcribing and generating data in the evenings after a day in the field may still be a preferable approach for most observers. Patterns in damage observations may not emerge from individual observers, but can emerge later after aggregating with many other observers. So it can be discouraging for individual observers to patiently collect data without any real assurance that it will produce meaningful results. Widespread consensus among a large number of volunteers trained in advance and the removal of other impediments described above may encourage greater numbers of data collectors to contribute.

In short, the challenges are not the lack of a computer aid, but personnel management, consensus-building and resources challenges. In the interim, it appears that a more organic approach to data collection that allows each discipline to develop its own techniques that adapt to unique circumstances and priorities emerging from each disaster may prove more productive than a Federal, top-down approach. Attempts at State-government top-down approaches have not been successful due to these impediments delineated above.

In the few days or weeks following disasters, the desire to volunteer to collect data for the public's benefit may be sufficient motivation for a considerable amount of effort. However, coordination of such volunteers including pre-disaster planning, training and post-disaster deployment as well as follow-ups, quality assurance, data refinement and aggregation in the ensuing weeks and months after disasters will likely need to be funded efforts to be effective.

The PIMS scoping document report should focus on culture and labor-force issues, drawing lessons from past efforts. California's Clearinghouse could be used as a test bed to incrementally improve practices in cooperation with a variety of organizations that participate in the Clearinghouse. It could then be expanded to include the Western States Seismic Policy Council stakeholders, and then other regions with more moderate seismic risk.

The vast majority of post-earthquake data currently is not geo- or time-referenced.

Examine a phased development of PIMS where beginning efforts start with anecdotal data collection and progress to detailed, comprehensive data collection. SEAOC's PDPOC recommended strategy of selecting a few representative structures to investigate in more detail from a larger number of initial observations may be one technique of enhancing the data without overwhelming the resources available.

PIMS should initially be able to accommodate both technology-savvy and non-savvy people. One possibility is that, initially, tech-savvy people (say graduate students) staff data entry/exist point of PIMS and act as intermediaries between PIMS and non-tech-savvy individuals.

NIST should develop legal assurances, privacy-protection and data-sharing policies with DHS and participating organizations that are collecting and using the data.

Please list and describe your system requirements here:

A Wiki will likely not be effective unless a regional consensus to develop a broad commitment among earthquake engineers and funding institutions to collect and share data systematically is generated prior to the disaster. A simple, GIS interface such as Google Earth that can be accessed and populated with data by users not trained in GIS will be most effective.

System Requirements and Issues Entry 6

Author: Chris Rojahn

Sensitivity issues relating to documentation of the performance of structures with private owners; One way to get around it is to not refer to the structure using its recognizable name.

Systematic data should be gathered for all varieties of structures, not just buildings.

Investigators should be qualified based on the data they collect. For example, licensed engineers may be required to gather data regarding the structural system of the building and its performance, while lay people are qualified to take pictures of structures.

System Requirements and Issues Entry 7

System Requirements and Issues Entry Title: System Requirements and Issues Entry Carl Stepp

Author Name: Carl Stepp

Email:

Phone:

Please list and describe your system issues or roadblocks here:

Please list and describe your system requirements here:

(1) SIMPLE USER INTERFACE: Being able to develop this system in a common exchange format that would then be accessible by users. The users need relatively simplified access interface. In our experience with the strong-motion and geotechnical virtual data system, users will not spend the time to get through a complex-structured data systems. They want to go there, put in a vector of attributes, and find the information quickly. Building a relatively user-friendly interface is important here.

Google maps/Earth interface works pretty well.

(2) DATA STRUCTURE TO ACCOMMODATE VARIETY OF DATA Data catalogues Data standards Data exchange format – cover all the various data types

(3) METADATA: The metadata has to be extensive enough such that the user can use the data with confidence.

System Requirements and Issues Entry 8

System Requirements and Issues Entry Title: Phil Schneider

Author Name: Phil Schneider

Email: Your email address

Phone: Your phone number

Please list and describe your system issues or roadblocks here:

Please list and describe your system requirements here:

(1) A standardized method for collecting post disaster data is needed to provide a knowledge base for planning mitigation, emergency management and response and recovery. For example, after the Northridge Earthquake, it was believed that a great amount of useful data would have been collected. Instead, data was collected in different formats that were not comparable, or else needed data was left uncollected.

(2) PIMS should collect/store/manage data that will be useful for Federal, state and local HAZUS users conducting Level 2 loss estimation studies.

System Requirements and Issues Entry 9

Author: Tim Reinhold

(1) ATC-20 and ATC-45 are simply geared to "are the buildings safe for occupancy," not to quantifying damage in detail. We can leverage the people that perform these surveys by increasing the number of questions that they answer. They look at EVERY structure.

(2) Handhelds should have built-in GPS and camera.

(3) Need internet access in the field for real-time syncing. Otherwise, you can run out of storage space during the day. However, if you buy a big enough storage card, this might not be a problem. Also, the battery life is not substantial enough for a full day.

(4) Put up towers that measure wind before the storm. Then, collect information about structure damage close to towers.

System Requirements and Issues Entry 10

Author: Keith Porter

(1) **Getting the academic community to contribute**: People in academia need some way of getting academic credit for contributing data. You motivate professors by either (1) giving them money or (2) by giving them attribution that they can use for their professional development. In general, people get credit for peer-reviewed journals only. Thus there needs to be some way to count the number of downloads etc. such that contributors could use this info to support their tenure application. Or, somehow get credit for contributing data to the system such that it looked as if the contributions were peer-reviewed.

(2) **Creating good standardized forms is impossible:** The issue is here that standardized forms are very difficult to perfect. You get caught between designing an all-inclusive form and keeping the form short enough such that people will actually fill it out. In addition, regardless of the length of the form, users will find it incomplete in certain aspects.

System Requirements and Issues Entry 11

Author: Existing Documentation [1,2,3]

Mechanisms and Procedures for Post-Disaster Investigations

Data Collection

Data collection efforts should include coordination with organizations that monitor the behavior of structures during earthquakes (sensors on significant bridges, for example).

The general consensus is currently that, while PIMS may not necessarily coordinate investigations itself, it should be able to control those organizations that perform the investigations (in terms of data standards, etc.) by controlling the funding that supplies the organizations. This is a significant issue that warrants further discussion.

PIMS data collection shall utilize the latest technology. Optimally, investigators should use a tool(s) that is (are) capable of digital video, digital pictures, digital note taking, time stamping, GPS locating, and wireless communication. Other possible tools to use include satellite imagery (both before and after earthquakes) and LIDAR.

Investigation teams should have access to all sites affected by the hazard.

There needs to be a predefined data collection forms and standards. These standards can be constructed based on existing standards such as ATC-38 or EERI Investigation forms. These should be converted into electronic form to be completed on a PDA or the like.

Data collection should also include interviews with survivors, non-structural damage, and indirect damage, such as fire, debris, economic loss, etc.

All data collected should be both spatially and chronologically referenced. Individuals from all pertinent disciplines should be asked what data needs to be collected and how (this is our Use Case form).

Protocols shall specify who collects what data.

Aerial photos should be taken after the earthquake.

Existing Resources

Advanced National Seismograph System ALA Matrix of Standards and Guidelines for Natural Hazards ATC-20 Postearthquake Safety Evaluation of Buildings ATC-38 Forms

EERI Post-Earthquake Investigation Field Guide EERI Reconnaissance Forms FEMA 154: Rapid Visual Screening of Buildings MAE Center

Funding Investigations

While funding may be provided for initial investigations, the funding for the more detailed investigations to create PIMS data is not necessarily available. Should these funds be obtained from NEHRP agencies, directly from the government, or a private source?

Inventory Data

Inventory data should be available at the beginning of post-disaster data collection. Types of data include:

- Number and types of structures affected by strong ground motion (overlay ANSS information on GIS database)
- Important structures and lifelines, such as those specifically designed to resist earthquakes or those outfitted with sensors
- Soil maps
- Aerial photos before earthquake

How will this inventory data be compiled? The MAE Center has tools for this.

Investigation coordination and phasing

Following an earthquake, [2] recommends the establishment an event website, a field technical clearinghouse, and designation of an Investigations Coordinator (IC). The event website should be directly linked to PIMS for uploading data. Also, the technical clearinghouse would be the place to coordinate PIMS investigations and store equipment for the investigations.

In general, the investigations that follow an earthquake or other natural hazard shall be phased because information that can be gathered varies with time (for example, some data is perishable and must be collected immediately, while other data (such as economic loss data) does not become visible until some time after the earthquake. [2] identified three possible phases:

Phase 1: Immediate response (first few days) – the purpose here is to obtain an overview of the situation in order to inform future data gathering.

Phase 2: Perishable data gathering (first few weeks) – collect all data that is perishable. Questions here include what and how much data to gather.

Phase 3: Non-perishable data gathering (months to years) – this may include secondary source data (such as lifeline inventories, etc.). Here, it must also be decided what and how much data to gather.

Three types of surveys have been identified:

(1)Initial "big picture" survey to decide what should be investigated (similar to Phase 1 above).

(2)Broad interdisciplinary survey to gather a minimum amount of information to support the most users (aggregate-type data). This may be parts of Phase 2 and Phase 3.

(3)Detailed disciplinary surveys; likely part of Phase 2.

Investigators

Each investigator shall have some sort of identification mechanism that relates them to PIMS. Should investigators be trained?

Who should be allowed to investigate? Possible investigators include students, representatives from both the earthquake engineering research and education and earth science centers, representatives of state and Federal agencies, personnel from professional organizations, and groups from engineering and other private firms.

The actual (field investigation) surveys could be conducted by a contract with engineering organizations, such as American Society of Civil Engineers (ASCE), National Council of Structural Engineers Association (NCSEA), and ATC under the supervision of FEMA and NIST [2].

Another possibility is giving the responsibility for investigations to the state emergency management agency. Then their federal funding could be tied to performing the investigations.

The collection of nonperishable data (e.g., building inventory, engineering drawings, and repair costs) requires staffing commitments that may extend several months, if not years, following the event.

Cooperation among Public and Private Organizations

Coordination with Government Agencies

Coordination with governmental agencies is critical in gaining access to the damage and inventory information necessary to assess performance.

Coordination with Private Organizations

To obtain private-sector cooperation, it will be necessary to implement clearly defined agreements and memoranda of understanding (MOUs) prior to a natural disaster. These agreements should identify the types of data to be shared, how the data are to be used, what restrictions will be placed on access and use of the data, and what benefits will accrue to the private entity for supplying the data.

A prerequisite for improving cooperation between the public and private sectors is to have a clearly defined set of information gaps that the private sector may be able to assist in filling. Defining the mutual interest in filling information gaps may improve cooperative efforts.

Furthermore, government agencies should be used to require private organizations to provide their data (such as insurance companies).

Grant money for researchers should be linked to posting of investigation data to encourage the researchers to provide their data.

Finally, PIMS should be coordinated with existing technical organizations.

Existing Resources

NEHRP Agencies (FEMA, NIST, NSF, USGS) ASCE SEAs Western Disaster Center

Privacy Issues

Privacy issues are significant (as instituted by The Privacy Act). Possible solutions include: removing personal identifiers from data and providing only aggregate, non-individual, data.

Information Technology (IT) Framework for Data Archiving and Exchange

Data Access

To what data should open access be provided?

Data Protocols

These should be simple enough such that untrained people can perform the investigation and data logging.

Data structure should be layered – start broad and then become more detailed.

Involve social sciences and library science expertise.

Build from existing protocols, such as ATC-20: Procedures for Postearthquake Safety Evaluation of Buildings.

Types of Protocols:

Identification protocols—what kinds of data, including statistical, graphical, audio, ethnographic, etc.?

Collection protocols—the best ways to collect the various types of data, including standardized forms, interview protocols, sketches, images, etc. Templates that can be used with handheld devices or laptop computers will also be appropriate for many of the research disciplines.

Document protocols—how will data be aggregated or integrated and interpreted?

Dissemination protocols—what format will data be distributed in, who has access?

Timeline—when will data be needed or most useful?

The PIMS systems should be flexible to allow for future expansion into storage of non-earthquake hazards information.

Data Repositories

There are a few options for data repositories. The best two seem to be (1) various virtual repositories spread throughout the U.S. that are linked via the internet; and (2) a central virtual repository with a backup.

Possible locations for a central virtual repository include NEES, NISEE, DLESE, NSDL.

Data Storage

What data should be stored?

How do we handle outdated data – do we delete it?

Separation of primary data gathered by investigation vs. secondary source data (inventories, etc.)?

Storage format should allow for access using future technology.

Existing Resources

CalTrans DLESE EERI Virtual Clearinghouse Federal Geographic Data Committee FEMA Multihazard Mapping Initiative HAZUS Library of Congress NCSA NEESit NISEE NOAA NSDL Shakemap U.S. Army Corps of Engineers Cold Regions Research Engineering Laboratory USGS COSMOS MAEViz (Earthquake Risk Management, Decision Support) Observatory Data Pipeline (Secure data streaming over Enterprise Service Bus) TRECC (Digital Synthesis Framework to enable Virtual Observatories) Upper Mississippi River Basin Observatory Hydrology Synthesis Center IACAT Advanced Information Systems Theme/Environmental Sustainability OOI (Sensor Streaming, security, event-triggered processing) CLEANER à WATERS – National Office, CI Planning LEAD, LSST, DES BP BioFuels? DataNet? CDIs?

Uploading Data

A simple website should be created where investigators and others can upload their data into the virtual archive. Who should be allowed to upload?

Will there be a technical review before data is allowed to upload?

[edit]

Long-Term Administration of a Performance Data Archive

Administration

Continuity for long-term administration may require that PIMS be administered within the federal government.

Ideally, the administrative oversight for a national performance data archive should be provided by a consortium of representatives from federal and state agencies with missions that directly or indirectly include collecting and evaluating natural disaster performance data.

The administrative body should have a separate budget and some level of authority to compel federal agencies that collect post-disaster performance data to comply with data collection protocols, data exchange standards, and other requirements established to support the archiving and exchange of data.

Existing Resources NEHRP Agencies

Funding

Long-term funding at a dedicated data clearinghouse is necessary to ensure an adequate level of preparedness to learn from future disasters.

Funding options include (1) small percentage of the funds of various NEHRP agencies, (2) a dedicated NEHRP fund that would be renewed when the general budget of NEHRP is renewed, (3) a separate fund directly from the federal government, (4) Stafford

Act funds (the Act would have to be amended), and (5) a private source of funding such as subscription fees for PIMS users.

Obstacles

Three primary obstacles to achieving the vision were cited: cost, disincentives to coordination among existing federal agencies, and indifference.

Performance Testing

Multiple case studies or demonstration projects could be carried out using data collected from past disasters such as hurricane Katrina.

Time Frame

PIMS should be implemented in phases and made functional as soon as possible such that it may be used when the next earthquake occurs.

The time frame for use of PIMS should be a minimal of 100 years.

REFERENCES

[1] American Lifelines Alliance Workshop on Unified Data Collection. October 2007.

[2] USGS Circular 1242.

[3] EERI Collection and Management of Earthquake Data: Defining Issues for an Action Plan.

System Requirements and Issues Entry 12

Author: Bob Bachman

(1) Challenges with post-EQ investigation
   a. Need an army of people to respond
   b. Local engineers in great demand (because they know the situation, possible structures for damage, etc.)
   c. How do you know what is there (structures that may be damaged)?
   d. What areas have been hardest hit?
   e. Do you follow news reports?
   f. How do you decide where you are going to go?
   g. Access to damaged areas.
   h. Access to buildings.
   i. Access to industrial facilities.
   j. Pre-planning the investigation.

(2) Data necessary to inform post-EQ investigations
   a. hazard quantification
   b. topographic and road maps
   c. Locations of epicenter
   d. Building locations
   e. structure types
   f. structure uses
   g. date of construction
   h. foundations
   i. soil

(3) PIMS data must be usable to develop a set of damage states that are observed that relate to statistical analysis (see ATC-58). These should include an attached visual description. The damage states would relate to global damage indicators (interstory drift, etc.)

(4) Field collection devices
   a. minimum writing
   b. wireless
   c. photos
   d. time stamping
   e. geo-locating

(5) Obtaining data that is not accessible for legal reasons (tied-up in lawsuits, etc.)
   a. Privacy
   b. Aggregating data

(6) I consider PIMS to be a piece in the overall larger puzzle. There needs to be someone in charge of developing the overall strategy including implementation for obtaining useful data in post-EQ investigations.

System Requirements and Issues Entry 13

System Requirements and Issues Entry Title: System Requirements and Issues Entry from the SEAOC Post-Disaster Performance Observation Committee

Author Name: SEAOC Post-Disaster Performance Observation Committee

Email:

Phone:

Please list and describe your system issues here:

FROM THE SEAOC Post-Disaster Performance Observation Committee Report:

....

It is obvious that many hurdles and considerations have yet to be addressed. For example, how can SEAOC best help without duplicating or jeopardizing those that are seeking funding for similar activities? How can SEAOC members obtain access to building drawings and report on building performance while avoiding the potential for liability? If observations on a statistically significant sample of buildings can be obtained in Phase I, but lack of funding and volunteerism restricts SEAOC's efforts to far fewer buildings in more detailed studies during Phases II and III, how can information remain useful or be stored for later use? How can SEAOC ensure that data collected in the near term will remain accessible and most useful for generations to come? So as you read these next few pages, please take into consideration the preliminary nature of the Committee's work so far.

....

Please list and describe your system requirements here:

System Requirements and Issues Entry 14

System Requirements and Issues Entry Title: Determination of Fragility Curves from Field Observations

Author Name: Amr Elnashai c/o Blake Andrews

Email:

Phone:

Please list and describe your system issues here:

Please list and describe your system requirements here:

Users of PIMS shall be able to develop fragility curves for structures, lifelines, etc. using PIMS or data from PIMS.

If you listed system requirements above, please list the top 1 to 10 most important items of information that the PIMS would need to have in order to be able to satisfy your listed system requirements. For each information item, please evaluate whether this information item already exists before a field investigation is performed, describe who owns the information, and explain how and when should this information be collected for use in PIMS.

INFORMATION ITEM	EXISTS	OWNER	HOW & WHEN TO COLLECT
Hazard quantification (peak ground parameters, etc.)	Yes	USGS	Whenever
Statistically significant number of reports of structure damage/performance	No	Field investigator	Collect right after the event
Your Response	Your Response	Your Response	Your Response

System Requirements and Issues Entry 15

System Requirements and Issues Entry Title: System Requirements and Issues Entry Loren Turner

Author Name: L. Turner

Please list and describe your system issues or roadblocks here:

Owners and operators of facilities and infrastructure have different needs from the scientific and engineering communities. In the hours, days, and even weeks following an earthquake, the owners and operators are concerned primarily with life-safety, damage assessment, and service restoration. By contrast, the scientific and engineering communities are usually focused on "lessons learned" type studies that result in design or other improvements. Both needs are important in different contexts. The effective management and compilation of this information is critical to coordinate post-event efforts in the immediate term.

Please list and describe your system requirements here:

One potential product of PIMS could be a data model (e.g., XML schema) by which data can be uniformly captured. This standardized data may serve the operator in the immediate term scenario, particularly if the data model builds from standards (e.g. GML) that can be consumed, or transformed (e.g., via XSLT to KML), by widely available commercial and open source software. This type of data standard would be useful for both cases.

System Requirements and Issues Entry 16

System Requirements and Issues Entry Title: System Requirements and Issues Entry Dave Wald

Author Name: Dave Wald

Email: wald@usgs.gov

Phone:

Please list and describe your system issues or roadblocks here:

Please list and describe your system requirements here:

PIMS might try to include historical earthquake data; however, it is much more difficult to obtain historical data, because standards are not available. There is archived hazards data available via USGS. In general, data quality diminishes with age.

ShakeCAST Data: It should be archived for an event. However, this data is proprietary to the organizations that use the application, unlike, for example, ShakeMap data. Click here for more info.

Did You Feel It: Most of this data is publicly available, but some personal information needs to be removed. Click here for more info.

PIMS should include damage percentages: We need to document both WHAT WAS DAMAGED and WHAT WAS NOT DAMAGED in same structure types subject to similar hazard levels. This allows us to calculate the percentage of damage to structures of similar type, which allows creation of fragility curves.

If you listed system requirements above, please list the top 1 to 10 most important items of information that the PIMS would need to have in order to be able to satisfy your listed system requirements. For each information item, please evaluate whether this information item already exists before a field investigation is performed,

describe who owns the information, and explain how and when should this information be collected for use in PIMS.

INFORMATION ITEM	EXISTS	OWNER	HOW & WHEN TO COLLECT
archived hazards data (shakemaps, did you feel it, epicenter, magnitude, etc.)	yes	USGS	download pre-event
Your Response	Your Response	Your Response	Your Response
Your Response			

System Requirements and Issues Entry 17

Requirements and Issues Entry Title: Rose Grant

Author Name: Rose Grant

Do you view yourself as a data source for a system such as PIMS or a user of PIMS? What would be the technical and organizations issues?

It would be easier for us to be a consumer rather than a provider because of privacy issues. We would use data from PIMS for research purposes, such as analyzing performance of structures. For example, what can we learn about building attributes that affect performance? How do new building configurations affect performance? In addition, underwriters and actuaries could develop guidelines based on this information.

What types of data do you collect?

When writing the insurance policy for a structure, we gather very general data on a structure general attributes, such as:

a. construction type (frame, masonry, masonry veneer, etc.)
b. cladding material (occasionally)
c. user (single-family owner occupied or rental, multi-family, condominium, etc.)
d. square footage
e. photo (typically at least one of the front façade)

We also struggle (from a research perspective) with the issue of getting building inventory from tax assessment records.

The post-hazard deployments from the Institute for Business and Home Safety (IBHS), of which organization we are a member, focus on building attributes that contribute to building performance. Thus they assess the performance of the main components/attributes of the building (e.g., number of windows damaged, number of shingles damage, structural collapse, etc.)

Do you share data with people if they fill out agreements?

This has been done on a very limited basis; we have shared information with modeling companies to improve their models; then we use their models to understand our risks.

Do you have datasets that are researchable?

Yes, we conduct our own internal loss studies and; we've had researchers come into our office, do their work, and then give us the output under contract. But, the results are confidential and proprietary and generally they don't get to share this information afterward with anyone else. An exception to this is our sharing of data with IBHS.

What are best practices for privacy and security?

The best practices are aggregation of data from a number of large insurance companies or and the signing a non-disclosure/privacy agreement.

Security/Privacy Issues State Farm cannot share information about individual policies or homes, even if we remove the name and address. The only way to share data is to aggregate it. For example, we can state that 10 houses in a specific zip code were damaged, but we cannot mention a specific house or its exact location.

Our perspective at State Farm is from that of the largest insurance company. Thus we are able to do things that other companies cannot, such as look at our data for research purposes. Many other insurance companies belong to a group called ISO (we don't); they send their collected information to ISO to aggregate it, and then it is sent back to the individual company so that they can use the larger database of information from all companies who belong to ISO. As such, some of the other insurance companies are more comfortable with sharing their information via ISO.

Issue: Different insurance companies have different forms/standards.

Earthquakes are not covered by homeowners insurance: Only a small proportion of people have earthquake insurance (it's not required for a mortgage). In California, perhaps 12 to 15% or so carry earthquake insurance [12% in 2006, for details please see http://www.iii.org/media/hottopics/insurance/earthquake/]. Thus, after an earthquake, an insurance company may still put a team together to look at damage, but they will have fewer structures to look at. Also, some non-insurance organizations cover earthquake damage in California.

System Requirements and Issues Entry 18

System Requirements and Issues Entry Title: Ron Eguchi Recommendations

Author Name: Ron Eguchi

Email: rte@imagecatinc.com

Phone: 562.628.1675

Please list and describe your system issues or roadblocks here:

(1) Getting data from private organizations.

(2) Convincing people with valuable data sets to give up their data, such as those organizations that charge license fees. One possible solution is for PIMS pay these companies who charge money for their data with profits obtained from license fees for using PIMS. PIMS charges no-fee on certain data but charges fees for the data that has a costs associated with it.

(3) It will be very difficult to get data form heavily competitive industries, such as the insurance industry. The same solution as above might work.

(4) Maintaining the quality of the data over time – data evolution.

(5) Standardization of data; How do you reconcile the differences in data from different forms or standards? You need standard data collection methods.

(6) How do you maintain data quality and integrity? If you mix good and bad data, how do you sort it out? PIMS users need to understand the differences in data quality. For example, consider the differences in remote-sensed data versus data from inspections. Also, consider the differences in data quality between people surveys and field inspection. We need to have standards for his (metadata).

Please list and describe your system requirements here:

(1) PIMS shall act as a clearinghouse where various groups can send/store their disparate data sets.

(2) A PIMS user should be able to answer the most basic questions for free. These include, for example: (1) What areas have been heavily damaged in an event that citizens should avoid? (2) Those people in the affected area at the time of the event may be able to “check-in” with PIMS to indicate that they are alright and do not need assistance.

If you listed system requirements above, please list the top 1 to 10 most important items of information that the PIMS would need to have in order to be able to satisfy your listed system requirements. For each information item, please evaluate whether this information item already exists before a field investigation is performed, describe who owns the information, and explain how and when should this information be collected for use in PIMS.

Field information
Remotely sensed data
Reconnaissance reports
Photos and video (all geo-referenced)
Route maps of field teams

INFORMATION ITEM	EXISTS	OWNER	HOW & WHEN TO COLLECT
Field information	No	Field investigation teams	Collect after the event
Remote sensing data (photos, pre and post-event	Yes	Private companies	Purchase quickly after the event
Photos and videos from the field (geo-referenced)	No	Field investigation	Collect after the event
Route map of field teams	No	Field investigation coordinator	Collect after the event
Your Response	Your Response	Your Response	Your Response

System Requirements and Issues Entry 19

System Requirements and Issues Entry Title: PIMS as Post-Event Information Provider

Author Name: Jim Myers (based on conversation with Mark Fitzgerald)

Email:

Phone:

Please list and describe your system issues or roadblocks here:

Please list and describe your system requirements here:

PIMS should point to organizations that do real-time data collection post-event; it should describe their capabilities and data standards. This would provide a service to users that would encourage community buy-in, but would not require a lot of costs/effort.

System Requirements and Issues Entry 20

System Requirements and Issues Entry Title: System Requirements and Issues Entry Mark Fitzgerald

Author Name: Mark Fitzgerald

Email: mark.fitzgerald@noaa.gov

Phone: (301) 427-2002

Please list and describe your system issues or roadblocks here:

Please list and describe your system requirements here:

The Katrina-size clearinghouse, which is 20 TB, is a good indication of the current data volume requirements for a large hazard event.

From my perspective, a primary purpose of PIMS is to make data from a variety of sources accessible from one place.

In general, I believe that PIMS should provide access to data, but does not need to provide analytical tools for further analysis of the data. Leave the analysis to users with their own specific tools with which they are most comfortable. That being said, some raw data sets need processing before they are ready for export and further analysis. However, we do not envision that PIMS will need to be capable of that processing. Each agency has that processing capability now.

System Requirements and Issues Entry 21

Author: John Hooper

In general, in post-earthquake reconnaissance, significant amounts of data get collected, but not often developed so that it can be used for the future.

Challenge 1: Mining existing data.

> USGS hazard data may be easy to obtain, but
> Loss data is very difficult to obtain.

Challenge 2: Obtaining data from public, private, and governmental sources. Confidentiality must be guaranteed to before privates sources provide their data.

System Requirements and Issues Entry 22

Author Name: John Filson

Please list and describe your system issues or roadblocks here:

Please list and describe your system requirements here:

PIMS shall try to incorporate information from existing documentation of past post-earthquake studies. This may include electronically-collected information for more recent earthquakes or scanned information of the impacts of events that occurred further in the past (for example, 1906 San Francisco earthquake).

If you listed system requirements above, please list the top 1 to 10 most important items of information that the PIMS would need to have in order to be able to satisfy your listed system requirements. For each information item, please evaluate whether this information item already exists before a field investigation is performed, describe who owns the information, and explain how and when should this information be collected for use in PIMS.

INFORMATION ITEM	EXISTS	OWNER	HOW & WHEN TO COLLECT
Descriptions and analyses of the impacts of historic earthquakes	Yes	USGS	Auto-download historic data
Reports for historic post-earthquakes investigations	Yes	Libraries	Scan and download into PIMS

System Requirements and Issues Entry 23

Author: Jim Wilkinson

Requirement: PIMS, for us, comes into play as a means to provide information flow from state clearinghouses to the multi-state technical clearinghouse.

Challenge: The concept process of a clearinghouse has evolved out of the earthquake program (mitigation) side of FEMA. The funding mechanism comes from a different side of FEMA (response). We need to bridge the gap between the mitigation and response sides. PIMS as a tool to help inform post-event response (both emergency and research responses) will help PIMS be valuable to the response side of FEMA. Thus, PIMS should not be restricted to program boundaries in FEMA, and PIMS should try to get funding and support both from the mitigation and response sides of FEMA.

USGS Circular 1242 should be updated and PIMS included in that update.

System Requirements and Issues Entry 24

System Requirements and Issues Entry Title: System Requirements and Issues Entry DHS

Author Name: Dan Cotter, Travis Hardy

Email: travis.hardy@associates.dhs.gov

Phone: 202.447.3750

Please list and describe your system issues or roadblocks here:

These are the biggest PIMS issues/roadblocks as viewed by the DHS:

(1) System security (certification, accreditation, etc.)

(2) Working with and obtaining data from local governments and other sources We work quite a bit with the national infrastructure program. One solution is the use of ACAMS (Automated Critical Asset Management System). PIMS system architecture must be designed to interface with local governments and other sources of data.

(3) Information from multiple domains You will have both proprietary and publicly distributable data from certain entities; you need to be able to integrate this data but maintain security and privacy; for example, for a certain entity, certain information may be publicly available, but proprietary information must not be shown.

(4) Semantics and taxonomy – data architecture – Use of the NIEM format would help with this.

Please list and describe your system requirements here:

System Requirements and Issues Entry 25

System Requirements and Issues Entry Title: Bob Bauer

Author Name: Bob Bauer

System Requirements and Challenges

Data privacy and security

CUSEC thinks that states will be in charge of credentialing people to perform post-event investigations and contribute data.

System Requirements and Issues Entry 26

Author: Ed Harp

Challenge: It is very challenging to obtain aerial photos of large sites affected by earthquake shaking and landslides. This occurs because high-flight aircraft are no longer used to obtain these photos.

Challenge: It is very difficult and expensive to obtain aerial photos for metropolitan areas. This occurs because only certain planes are permitted to fly over metro areas, and there are very little planes now available to do this. Moreover, often these plans are not stationed near the affected area. In the end, it becomes very expensive to obtain comprehensive aerial photos of metropolitan areas following earthquakes. Also, while there are many private companies that could do this, they still must abide by the requirements to fly certain planes; thus they have the same problems.

Challenge: Satellite photography cannot be obtained when there is cloud cover over the affected area. (Aerial photos, however, may still be obtained because the plans can fly under the clouds.)

Requirement: Aerial photos are preferred over satellite imagery.

Requirement: Photos of the following scales (or larger) are needed:
1:6000 for ground rupture mapping and 1:20000 or better for landslides mapping

System Requirements and Issues Entry 27

System Requirements and Issues Entry Title: Jim Dewey

Author Name: Jim Dewey

Please list and describe your system issues or roadblocks here:

Please list and describe your system requirements here:

It would be nice to have 1930's era topographic maps of urban areas. This allows you to see the change in land use (cut and fill) if you compare old with new topographic maps. This data could be used to investigate how cut/fill areas affect shaking intensity.

System Requirements and Issues Entry 28

System Requirements and Issues Entry Title: Sofia Tangalos

Author Name: Sofia Tangalos

Please list and describe your system issues or roadblocks here:

Issue 1: How is the information going to be submitted? Will it be tagged? How is it going to be vetted?

Issue 2: Usability testing is critical to ensure that PIMS is designed to best meet user needs.

Issue 3: When trying to convince individuals to provide more detailed information to PIMS, convey that they receive a direct benefit from the information that they contribute (i.e., they are both a contributor and a user).

Issue 4: In developing PIMS, make sure that user needs drive the development process, not data and technology.

Please list and describe your system requirements here:

Requirement 1: PIMS users should be identified such that the system can be designed to meet their specific needs. Currently, two user groups have been identified: (1) Core Users: Engineers, Researchers, and Planners, and (2) the public. PIMS should have a separate interface for each group; for example, PIMS might have a map-based tool for the core users and simply a website for the public.

Requirement 2: The information that is directly ingested into PIMS must be reviewed for quality, format, etc. This might be accomplished by having a designated person or team that acts as an editor, curator, etc. Also, pre-qualifying individuals to submit data to PIMS would serve this purpose.

Requirement 3: PIMS development shall be phased and the architecture shall be scaleable

System Requirements and Issues Entry 29

Author: Havidan Rodriguez

System Requirement 1: User groups should be explicitly targeted and a user interface created or calibrated for each group.

System Requirement 2: System requirements should be driven by user needs, not, for example, by technological capabilities.

Issue/Challenge 1: User needs for one user or user group may conflict with the needs of other users or user groups.

System Requirements and Issues Entry 30

System Requirements and Issues Entry Title: Harvesting data from IRIS Data Management Center

Author Name: Jian Li

Email: jianli3@illinois.edu

Two kinds of continuous data are currently provided by IRIS data management center (DMC):

1. BUD: near real-time, not quality controlled, partial data sets Some data streams into the DMC in near real-time into an online buffer called BUD (Buffer of Uniform Data). Data in BUD is not quality controlled. The data in BUD is continuous miniSEED data organized by channel day. BUD data should be useful to the person interested in doing their own time windowing of near real-time data. Here is more information about the BUD system.

2. Archived Data: delayed, quality controlled, full data sets A customized data set from the archive is defined by the user. The DMC has several tens of terabytes of waveform data. Customized requests allow anyone to request any subset of this large archive.

Request Tools:

The DMC offers several tools for making customized data requests. The tool you choose to use will depend on what type of request you wish to make and/or the complexity of your request.

BUD Data can be retrieved by BUD Interface, a web interface for searching and requesting data from the near real-time BUD system. Data is delivered in miniSEED format. BUD data can be accessed by the BUD Web interface, LISS client, or DHI client. One can itemize primary functions, view waveforms, check latency, continuity, request data, etc.

Archived Data can be accessed by BREQ_FAST, which is an e-mail request format. Breq_fast is the most common format for making a request because no special tool is needed to format a request. After the email is sent to IRIS DMC, miniSEED format files will be uploaded to FTP server for users to download.

Steps for obtaining data from IRIS for use in PIMS:

1. Retrieve miniSEED format data (just the data) from IRIS DMC by either BUD interface or BREQ_FAST.
2. Download Dataless SEED file (just the headers) for a specific station from IRIS web.
3. Convert Mini-SEED volume into Waveform data using RDSEED.
4. Get the Channel Transfer Function using EVALRESP and deconvolve the waveform data into physical unit.

Challenges:

1. The archived data, which is most commonly used, is requested through email and downloaded from FTP. It is a challenge to automatize this process.
2. For the data conversion, two programs, RDSEED and EVALRESP, are running only on UNIX OS.

Jian, does IRIS provide structure acceleration data, for example, or just seismographic records of ground shaking only?

For the Bill Emerson Memorial Bridge (Station NO: NP7405), since accelerometers are installed both on the structure and free field, the IRIS database has both structure acceleration data and seismographic records of ground shaking.

System Requirements and Issues Entry 31

Jack Harrald

INA 2: Overlay of infrastructure effects (for example, overlay transportation and water network impacts to find most damaged areas). (This is similar to INA 1 above and will be incorporated into it.

Issue 1: No lifeline performance data available. Possible reason why: Too busy repairing lifelines with now time to document performance.

System Requirements and Issues Entry 32

Steve French

Issue 1: Set up framework for how you name, call, and collect data (such as the one promulgated by the FGDC (Federal Geographic Data Committee). The problem with damage data is that it's collected on an ad-hoc basis and does not necessarily follow a framework such as this.

Requirement 1: PRIMARY TASK: Defining common metrics for post-event damage inspection and data collection.

Requirement 2: Be able to select data by time frame, location and/or event magnitude.

Requirement 3: Location precision: must be better than aggregate-type information (e.g. census tract);

Requirement 4: Need to have information about the number and type of structures subjected to hazard so that we can understand the percentage of structure damaged out of all that were affected

System Requirements and Issues Entry 33

Laurie Johnson

PIMS should be used provide an accurate and comprehensive picture of the damage and losses (e.g. regional and across jurisdictions) early in the recovery effort. This information will be very useful to FEMA, state emergency managers, and local officials who need to develop a comprehensive loss assessment and federal and state funding requests within days following a disaster.

Data in PIMS should be able to evolve in time, and users of PIMS should be able to see how the data changes (i.e., track the provenance and evolution of the data). All previous instances of the data should remain in the system and not be overwritten or deleted.

Communities/disaster managers needs tools that help track and manage post-disaster information into recovery. Some suggested capabilities are: integrated tracking of utility and building repairs over time, and ability to consider mitigation options and track their implementation over time.

PIMS should strive to be a daily tool/application to maximize user/community adoption, not just to be used sparingly before and after disaster events.

APPENDIX F: DATABASE OF EXISTING RESOURCE ENTRIES

Table F-1 summarizes the existing resource entries created from stakeholder input. Individual entries are presented below the table.

Table F-1: Existing Resource Entry Summary

ID	Author
1	Chris Rojahn
2	Chris Poland
3	Dan Dolan
4	Fred Turner
5	Ron Eguchi
6	DHS (Dan Cotter)
7	Brent Woodworth
8	Bill Steele
9	Bob Bauer
10	Jim Wilkinson
11	John Filson
12	Rose Grant
13	Ed Harp
14	Jim Dewey
15	Robert Wible (L.A. Basin Project)
16	Sofia Tangalos
17	Steve French
18	Ron Risty
19	Dennis Mileti
20	Kathie Smarick
21	Laurie Johnson

Existing Resource Entry 1

Author: Chris Rojahn

Parallel Issue with PIMS: We have a project head by Charlie Scawthorn where the idea is to translate EQ results into practice; developing recommendations or planning a post-EQ information database. Contact Charlie Scawthorn at Kyoto University. Charlie has been looking at this issue and developing a database of EQ photos at Kyoto. He has experience with developing databases.

ATC-38 Database

ATC will promote systematic data collection.

Existing Resource Entry 2

Author: Chris Poland

Old-Style Post-EQ Data Collection

- collected for earthquakes in the 1960’s and 1970’s
- published detailed volumes of information about the earthquake;
- published 5 or so years after the event
- currently out-of print but located in libraries across the nation

During Northridge, data was gathered systematically for buildings very close to strong motion recording sensors. Unfortunately, actual building behavior and performance as observed in the field did not correlate with the quantified imposed hazards. This occurred because the data collection efforts were not sufficiently detailed to provide the required level of information.

Existing Resource Entry 3

Author: Dan Dolan

Many communities have implemented public-record storage of building information, particularly building location. This information could be uploaded to PIMS pre-event.

ASCE, EERI, SEAOC, Washington State Structural Engineering Association, Los Angeles County >> These are the primary organizations that have developed forms for post-EQ evaluation. ASCE is just trying to put national standard together.

The California Strong Motion Network has many buildings instrumented for acceleration.

Existing Resource Entry 4

Author: Fred Turner

EERI practices
TCLEE practices
Earthquake Engineering Research Libraries at UC-Berkeley and Cal Tech.
NISEE
ATC-38
SEAOC PDPOC Operations Manual
GEER practices
www.strongmotioncenter.org
Recent clearinghouses/databases for Wells NV, Niigata, Peru, etc.

Existing Resource Entry 5

Author: Ron Eguchi

Systems Similar to PIMS

AGORA – Alliance for Global Open Risk Analysis (Keith Porter) – open source software to provide solutions to certain problems – group led by University of Colorado (Porter) and Kyoto University (Charles Scawthorn)

GEM: Global earthquake model; see Ross Stein at USGS

REDARS (for Risks due to Earthquake DAmage to Roadway Systems): http://mceer.buffalo.edu/research/redars/ A public-domain software package that accounts for how earthquake damage affects post-event traffic flows and travel times, and estimates losses from these travel-time and traffic-flow impacts.

Sources of Data for PIMS

For building stock for HAZUS, tax assessor records are a common tool.

HAZUS has databases for buildings, lifelines and essential facilities

USGS has earthquake hazard information

CGS (California Geologic Survey) has specific hazard information related to California

Forms/Standards

Earthquake: EERI, ATC

Hurricane/Wind: ASCE 7

Flood: FEMA (see HAZUS-MH)

Resource Organizations

Texas Tech University Wind Center

Multidisciplinary Center for Earthquake Engineering Research (MCEER)

Hurricane Center at LSU – Marc Levitan, Director or John Pine (head of clearinghouse initiative after Hurricane Katrina)

Existing Resource Entry 6

Author: DHS (Dan Cotter and Travis Hardy)

Automated Critical Asset Management System (ACAMS)
>> Web-based tool enabling collection of infrastructure and risk information from Owners/operators, law enforcement and first responders at State and Local level

ACAMS Tools and Capabilities
A core asset management system that implements a database for critical asset information focusing on the unique requirements and information needs of first responders

Vulnerability and consequence scoring tools that aid the user's subjective analysis of criticality

An integrated information portal, Constellation, tying together critical assets data and reporting about the current threat environment

A complete reporting capability to answer both local and national-level data calls on critical assets

Automated generation of Buffer Zone Protection Plans (BZPPs)

Automated generation of pre-incident operational plans for local police and first responders

Electronically available resources for first responders, such as the Field Operations Guide (FOG) and the Response Information Folder (RIF)

Integrated Geospatial Information System for use in collection process and analysis

See http://www.cpmra.muohio.edu/TRI-EMAD/Downloads/ACAM.pdf

National Information Exchange Model (NIEM)
* Website: http://www.niem.gov/whatIsNiem.php

The National Information Exchange Model (NIEM) is a Federal, State, Local and Tribal interagency initiative providing a foundation for seamless information exchange. NIEM is a framework to:

- Bring stakeholders and Communities of Interest together to identify information sharing requirements in day-to-day operational and emergency situations;
- Develop standards, a common lexicon and an on-line repository of information exchange package documents to support information sharing;

- Provide technical tools to support development, discovery, dissemination and re-use of exchange documents; and
- Provide training, technical assistance and implementation support services for enterprise-wide information exchange.

Homeland Security Infrastructure Program (HSIP):

- A unified homeland infrastructure geospatial data inventory assembled by NGA in partnership with the DHS for common use by the HLS/HD Community
- Compilation of best available license-free Federal government and commercial proprietary data
- The HSIP is available to free for all federal agencies
- Also, DHS is working with NGA to break-out licensed data and replace it with un-licensed data – it's being called HSIP Freedom. We can provide you a complete list of data available, architecture diagrams, etc.

ESRI Software Agreement
We have fully funded license agreement with ESRI. It applies to contractors and sub-contractors. The DHS could provide ESRI GIS software for PIMS (the Google-Earth-like user interface) through Ed Laatsch.

Geospatial Information Infrastructure (GII)
DHS has a number of data centers; we currently have 80 TB data store where the national map and HSIP data is stored. Perhaps the architecture of GII can inform the design of PIMS architecture.

LandScan
The LandScanTM Dataset comprises a worldwide population database compiled on a 30" X 30" latitude/longitude grid. Census counts (at sub-national level) were apportioned to each grid cell based on likelihood coefficients, which are based on proximity to roads, slope, land cover, nighttime lights, and other information. LandScan has been developed as part of the Oak Ridge National Laboratory (ORNL) Global Population Project for estimating ambient populations at risk.

Existing Resource Entry 7

Author: Brent Woodworth

Post-EQ photos from drone planes (high-detail).

SAHANA: crisis management system for governments; currently being used by 17 countries, including FEMA, NYC; used after Peru earthquake; a great model of how to keep it simple and have open fields for data entry; can be modified quickly; very easy to support.

City of LA is trying a pilot program where businesses, NGOs, government organizations, etc. sign Memorandum of Understanding to share post-event information.

Natural Hazards Research Center at University of Colorado, Boulder.

ImageCAT is possible the best software for detailed loss assessment analysis

Existing Resource Entry 8

Author: Bill Steele

CIIM (community internet intensity map): An online form that people fill out after an earthquake that calculates a MM intensity. We should definitely incorporate this into PIMS; there are some privacy things that need to be done to make this a public product – removal of names and addresses. You can ground-truth the shakemaps with this technology.

Did you Feel It: same as CIIM

Existing Resource Entry 9

Author: Bob Bauer

State Clearinghouse

- Gateway for researchers to coordinate, collect, store, and find information
- Helps take workload away from the Unified Area Command (UAC) (forward state emergency operations)
- Aids in processing people in/out of the hazard area & credentialing
- Usually associated with and utilizes the facilities/resources of local universities or colleges
- Located near but not at the same location as the UAC (forward state emergency operations)

- Data collected
- Geological/geotechnical perishable information
- Portable seismological recordings
- Potential for information sharing with PIMS

USGS/CERI
State EMAs
CUSEC

Existing Resource Entry 10

Author: Jim Wilkinson

PETIC Paper
MSTIC Paper
MSC CUSEC Plan

There may be some avenues through the MAE Center to pull additional resources on the response side.

CUSEC may be a test pilot project for PIMS because it fits in this EM planning effort we're involved in; also, we have this test project in 2011.

Existing Resource Entry 11

Author: John Filson

Although many reports of post earthquake investigations exist in the literature, three stand out as excellent examples and should serve as models, or at least reference documents, for the PIMS development effort. These studies are:

Investigation of 1906 San Francisco Earthquake
1964 Alaska Earthquake
1971 San Fernando Earthquake

These describe the geological, seismological, engineering aspects of major earthquakes in the United States. They include analyses of the impacts of the earthquakes and their causes. .

Existing Resource Entry 12

Author: Rose Grant

ISO (most other insurance companies are members)
Building Code Enforcement Ratings System: They send reps around the country and ask them about their building codes, who are your inspectors, training, types of inspector, when they started to enforce code, etc.; can use this info for PIMS; then they grade the building code enforcement; knowing this grade would give the PIMS database a way to check performance against code adoption;

IBHS (State Farm is a member)
State Farm belongs to IBHS, which has recently gone to deploying teams for hurricanes; they have PDAs for data gathering with geo-location and photos. IBHS is an umbrella agency for insurance companies; it is possible that their information could be shared because they don't represent a particular company. IBHS might also be able to do a data pull from particular insurers; this only works if you have enough source companies such that a specific insurer is not exposed;

IBHS developed a great PDA tool – talk to IBHS about it.

Existing Resource Entry 13

Author: Ed Harp

PAST: We used to sketch in landslides on a topographic map given aerial photos and satellites photos with stereo (3D) information.

CURRENT: Now we rely on all satellite data. The best satellites now are IKONUS and QUICKBIRD (which provide color photographs at 4 m resolution and black and white photos at 1 m resolution); this becomes useful for mapping the entire distribution; it doesn't come in stereo; so, we have to view the ortho-rectified image from satellite over a digital elevation model; we view 3d models (using DEM) and flat imagery next to each other; then we digitize on the flat image; unable to be computer automated; color helps a lot; true color is better infrared color;

USGS can usually afford to do relatively small areas with aerial photos;

Existing Resource Entry 14

Author: Jim Dewey

Historic EQ reports can be found in USGS library.
Old topo maps (1930's era) -- Jim is not sure where these might be.

Existing Resource Entry 15

L.A. Basin Project

Author: Robert Wible

The purpose of the project is to develop protocols for the linking of disparate hardware and software systems (PDAs, laptops, cell phones, etc.) used by local building officials to develop an interoperable network to gather and disseminate damage assessment and other field inspection data in the wake of a major natural or human-caused disaster. Use of these protocols would rapidly speed damage assessment surveys and provide for efficient methods to transfer information to clearinghouses for storage and possibly directly to PIMS.

Future planners and builders of PIMS should be aware of the recommendations and protocols that result from the L.A. Basin project, as use of these protocols by PIMS would increase the efficiency of ingesting field-collected data. The recommendations from this project are intended to be completed by October, 2008.

Existing Resource Entry 16

Author: Sofia Tangalos

OpenURL/Link Resolution: Source Code or Technique that allows sharing of data between databases. Check out this site for more details http://en.wikipedia.org/wiki/OpenURL

Existing Resource Entry 17

Steve French

SHIELDUS: Univ. South Carolina, Susan Cutter, closest thing to PIMS right now; http://www.cas.sc.edu/geog/hrl/SHELDUS.html ; It is run by Susan Cutter of University of South Carolina and provides property losses, crop losses, injuries, and fatalities by county. Funded by NSF.

You may also want to talk with Charles Huyck [ckh@imagecatinc.com]. He is a VP with ImageCat and worked with OES after the Northridge earthqauke3 on their post-event GIS database.

MCEER did study for FL hurricane (2 to 3 years ago) which used remote sensing. Published in MCEER newsletter.

Most widely used template after EQ seems to be ATC-21.

EERI did study which compiled tax assessor database records to provide information about the structures subjected to hazards. During post-event investigations, wireless access to this database was provided so that field investigators could relate their damage investigations to the building stock.

Talk to Josh (Jerome Hagarr's student at UIUC) about the Memphis MAEViz building inventory dataset, which uses neural network techniques to create building inventory from incomplete information.

David Frost; GTECH; mobile technology data collection method applied to geotech data

Tax Assessors: 60% to 70% in digital form; ubiquitous; will be available; most comprehensive source for getting building stock data.

Georgia GIS Data Clearinghouse (http://gis.state.ga.us): Intended to be data sharing tool; contains significant amount of GIS information for Georgia (soils, floodplains, slope maps, etc.) ; majority of states probably have a database like this one.   An interesting model for making data sets available with a query front end.

Existing Resource Entry 18

Ron Risty

USGS/EROS Center
Emergency Operations Liaison
Sioux Falls, SD 57198

risty@usgs.gov
(w) 605-594-6969
(c) 605-321-3698

USGS/EROS Center is FEMA's executive agent for providing pre- and post-event remotely-sensed data (aerial and satellite imagery) to aid first-responders in support of disasters (declared and non-declared). The USGS/EROS Center houses the national archive of remotely sensed data.

- They work closely with FEMA (response).
    - We have USGS State liaisons in each state.
    - We work closely with FEMA's 10 regional offices.
    - Facilitate collaboration between USGS state liaisons and regional FEMA offices.
- Have established standardized requirement plans for the data collection in support of a disaster for remotely sensed data. Selected vendors provide data to USGS/EROS following these standards.

Existing Resource Entry 19

Dennis Mileti

UCLA Social Science Archive

http://www.sscnet.ucla.edu/issr/da/earthquake/erthqkstudies2.index.htm
Archive of quantitative social science data for EARTHQUAKES online
Very rich online archive
1971 San Fernando EQ through 1994 NR Earthquake
Data from 4 different researchers

DHS Science and Technology Directorate

Research Arm of DHS
One Center of Excellence is the National Consortium for the Study of Terrorism and Responses to Terrorism (START),
One part of their research deals with Societal Responses to Terrorist Threats and Attacks

DHS Study (in START)

Very richly funded study
Goal is to create a database on social sciences for ALL HAZARDS
They will start by harvesting data from the UCLA Archive

Existing Resource Entry 20

Kathleen Smarick and Richard Legault
Study of Terrorism and Response to Terrorism (START)
8-18-08

- http://www.start.umd.edu/
- ABOUT: The National Consortium for the Study of Terrorism and Responses to Terror (START) is a U.S. Department of Homeland Security Center of Excellence, tasked by the Department of Homeland Security's Science and Technology Directorate with using state-of-the-art theories, methods, and data from the social and behavioral sciences to improve understanding of the origins, dynamics, and social and psychological impacts of terrorism. START, based at the University of Maryland, College Park, aims to provide timely guidance on how to disrupt terrorist networks, reduce the incidence of terrorism, and enhance the resilience of U.S. society in the face of the terrorist threat.

- Executive Director is Kathleen Smarick
  301-405-6739
  kjsmarick@start.umd.edu
- Some purposes of the center are to act as an ARCHIVE for social science-type data and as a RESEARCH CENTER.
- ARCHIVE: Terrorism and Preparedness Data Resource Center (TPDRC)
  - The Terrorism & Preparedness Data Resource Center (TPDRC) is housed at the University of Michigan's Inter-university Consortium for Political and Social Research (ICPSR). TPDRC archives and distributes data collected by government agencies, non-governmental organizations (NGOs), and researchers about the nature of intra- (domestic) and international terrorism incidents, organizations, perpetrators, and victims; governmental and nongovernmental responses to terror, including primary, secondary, and tertiary interventions; and citizen's attitudes towards terrorism, terror incidents, and the response to terror. It also organizes and streamlines access to extant research and administrative data from across the world that are relevant to the study of terrorism and the response to terrorism for descriptive and scientific analysis by academics and researchers.
  - The goal of the archive is to support long-term research and learning.
  - Started in 2006
  - The archive is operational, and they are in the process of adding data.
  - Kathie and Richard's data is publically-available, but some data in TPDRC is access-controlled.
  - The archive includes mostly quantitative social-science data.
    - Some data is geo-coded and some is not (because geo-coding this type of data is difficult).
  - The users of the archive are mainly researchers and media outlets.
  - ICPSR already has security protocols in place to access-control the data.
- RESEARCH: The research of the START center is divided among three thematic working groups. Within each of these groups, an array of integrated research projects are underway. As projects are completed, START will post to this Web site reports and findings resulting from the research.
  - WG1: Terrorist Group Formation and Recruitment
  - WG2: Terrorist Group Persistence and Dynamics
  - WG3: Societal Responses to Terrorist Threats and Attacks

Existing Resource Entry 21

Laurie Johnson

Public Entity Risk Institute (http://www.riskinstitute.org/peri/)

PERI Data Exchange

Gerard J. Hoetmer
PERI Executive Director

National Emergency Management Network (NEMN) - PERI and the International City/County Management Association (ICMA) are working together to build a national network of communities, businesses, and nonprofit organizations that are willing to share resources with stricken areas, and with each other in the event of a disaster. NEMN is supported by software technologies and educational resources, including a comprehensive database of human and physical resources available for emergency response and recovery efforts and a geo-mapping and situational awareness tool to identify, select, activate, track, and manage response/recovery assets.
(https://www.riskinstitute.org/peri/content/view/620/80/)

APPENDIX G: REQUIREMENTS TRACEABILITY MATRIX

	Design Strategy						System Architecture										Policies and Procedures			Community Adoption of PIMS	Development, Operations, and Oversight
	Serive-Oriented Architecture	Conctent Management	Workflow and Provenance	Virtual Organization-based Security and Configuration	Semantics	Virtual Machine Implementation	Content Repository	Workflow and Provenance	Data Curation	Data Preservation	User Interfaces	Data Ingestion	Data Discovery/Export	Analysis and Visualization	Security	System Administration	Data Standards and Provenance	Data Privacy and Security	Persistence of Data		
System Component ID	1	2	3	4	5	6	8	9	10	11	12	13	14	15	16	17	19	20	21	22	23
Data Collection, Organization, and Storage																					
Assure that information is organized to enable reasonable response times to user queries		✓	✓										✓								✓
Collect data only at the level of detail required by users												✓					✓				
Harvest directly from MAEViz and HAZUS data sources	✓											✓									
Incorporate redundant storage mechanisms						✓				✓									✓		✓
Obtain data necessary to satisfy information requirements											✓										
Obtain metadata sufficient to provide for full use and evolution of data			✓						✓								✓				
Perform harvesting operation to obtain data from electronic databases												✓									
Perform rapid ingestion of data for response, recovery, and research operations												✓									
Provide a service for entering metadata when uploading to PIMS	✓											✓									✓
Provide a web-service for uploading data	✓											✓									✓

System Component ID	1	2	3	4	5	6	8	9	10	11	12	13	14	15	16	17	19	20	21	22	23
Provide means for system reliability in the face of power outages, communication outages, etc.										✓									✓		✓
Provide storage space for data, metadata, and ancillary information many large hazard events						✓				✓						✓					✓
Retrieve data from laptops												✓									
Retrieve data from mobile devices												✓									
Retrieve data from web folders												✓									
Serve as the collection point for information provided by 'citizen scientists'												✓								✓	
Serve as the primary collection point for information not covered by other systems												✓								✓	
Support electronic notes, forms, reports, audio, and visual		✓										✓									
Support GIS and other similar file formats		✓					✓	✓				✓									
Support scanned notes, forms, and reports		✓										✓									
Utilize accepted standards, methods, and protocols for data collection and storage		✓			✓												✓				
Provide pull-down menus or similar functionality for fast specification of metadata												✓	✓								
Data Curation and Quality Assurance																					
Ensure that data meets quality and formatting standards.									✓								✓				
Ensure that metadata meets quality standards									✓								✓				
Metadata shall delineate to users the differences in data quality									✓												
Metadata shall describe data provenance					✓			✓	✓												
Perform rapid data curation and archiving for short-term data needs			✓					✓	✓			✓									✓
Perform slow, more thorough data curation for long-term information			✓					✓	✓			✓									✓

System Component ID	1	2	3	4	5	6	8	9	10	11	12	13	14	15	16	17	19	20	21	22	23
Provide mechanisms for quality assurance testing			✓						✓								✓				
Translate street addresses to geo-coordinates								✓					✓								
Information Presentation, Discovery, and Retrieval																					
Identify specific user groups and create/calibrate interface for each				✓							✓										✓
Perform pilot projects																				✓	
Perform usability studies																				✓	✓
Professional Interface											✓										
Full data access											✓										
Access to all tools											✓										
Map-based											✓			✓							
Interactively screen and select entities such that entities may be selected based on location, overlay values, and entity attributes, etc.											✓		✓	✓							
List entity attributes both graphically (with the ability to highlight an entry and bring up all additional information about it) and in a tabular format											✓		✓								
Display maps, photos, and other overlays on top of entities											✓		✓	✓							
Perform searches by event, by location, by structure type, by structure component, etc.											✓		✓	✓							
Public Interface											✓										
Restricted data access											✓				✓			✓			✓
Limited tools											✓										✓
Common interface such as website											✓									✓	✓

System Component ID	1	2	3	4	5	6	8	9	10	11	12	13	14	15	16	17	19	20	21	22	23
Notification of hazardous areas											✓									✓	✓
Links to websites to organizations that are managing and performing post-event investigations											✓									✓	✓
Links to website where people can indicate if they do not need assistance from emergency personnel											✓									✓	✓
Links to PIMS tools used to directly ingest data											✓										✓
Pre-sorted datasets to display common information, such as hazard quantification maps, damage indication maps, etc.											✓		✓	✓						✓	✓
Privacy and Security																					
Manage data access rights and restrict access to data															✓			✓			✓
Perform data aggregation									✓						✓			✓			✓
Remove identification information (or personal information) from data									✓						✓			✓			✓
Long-Term Data Preservation																					
Maintain access to data as technology evolves	✓	✓	✓	✓	✓	✓				✓									✓		✓
Review data quality and repair or remove data as necessary		✓	✓		✓				✓	✓									✓		✓
Data Standardization																					
Be a leader in standards development																	✓			✓	
Create policies which specify which existing standards meet PIMS quality requirements																	✓				
Data shall be adequately described by metadata to allow for complete use and evolution of that data		✓			✓				✓								✓				
Metadata									✓								✓				
Collection protocols : Field investigation team or individual identifier, time of collection, area investigated, notes regarding collection process									✓								✓				

System Component ID	1	2	3	4	5	6	8	9	10	11	12	13	14	15	16	17	19	20	21	22	23
Data Access: To whom full access to the data may be provided				✓					✓								✓				
Data Protocols: Descriptions of the data structure – how the data is organized									✓								✓				
Data Storage: How the data should best be stored; when the data will become outdated and what to do with the data when it becomes outdated									✓								✓				
Dissemination protocols: How to best to disseminate the data									✓								✓				
Document protocols: How to aggregate or interpret the data									✓								✓				
Identification protocols: The type of data, such as statistical, graphical, audio, ethnographic, etc.?									✓								✓				
Timeline: A description of when data should be used									✓								✓				
Support developed standards tailoring PIMS tools to those standards									✓								✓				
System Evolution and Change Management																					
Develop and maintain plans or methods for change management and system evolution		✓	✓	✓	✓	✓				✓									✓		✓
Incorporate other hazard information with time		✓														✓					✓
PIMS shall be operational for 50 to 100 years	✓									✓									✓		✓
Provide for ability to enter additional metadata with time		✓			✓		✓		✓												
Coordination/Data Sharing with Public, Private, and Governmental Sources																					
Abide by data sharing plans developed by controlling organizations				✓													✓			✓	
Develop the technical means, agreements, and standards for interoperation												✓					✓			✓	
Government sources												✓					✓				
Public sources												✓					✓				

System Component ID	1	2	3	4	5	6	8	9	10	11	12	13	14	15	16	17	19	20	21	22	23
Non-government organizations												✓					✓				
Private organizations and industry												✓					✓				
Facilitate data sharing between state technical clearinghouses and multi-state technical clearinghouses.							✓	✓					✓				✓				
Facilitate data sharing among information provider databases							✓	✓					✓				✓				
Maintain data ownership and copyright information							✓		✓						✓			✓			✓
Provide data backup services										✓											✓
Provide means to track use and distribution of data							✓	✓			✓									✓	✓
To provide credit to data provider							✓	✓												✓	✓
To inform provider of usefulness of data							✓	✓												✓	✓
Provide primary location for data storage										✓											✓
Utilize social-political approaches/solutions for coordination																				✓	
Community Adoption of PIMS																					✓
Buy-in of users, data providers, and administrators											✓									✓	
Consensus-building efforts																				✓	
Outreach efforts																				✓	
Pilot projects																				✓	

APPENDIX H: STAKEHOLDER LIST

Last Name	First Name	Organization	Attended Workshop	Email Address	Telephone
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