

About HAZUS

Historical Development of HAZUS - Earthquake

The Earthquake Loss Estimation Methodology Study was conducted by the National Institute of Building Sciences and sponsored by FEMA as part of its leadership role under the National Earthquake Hazards Reduction Program (NEHRP). The NEHRP is the Federal government's program to address the nation's earthquake threat. Under the program, the government seeks to answer two basic questions: how earthquakes will affect the nation and how best to apply our resources to reduce earthquake's impacts.

Features of the HazUS MH Earthquake Module:

- The new (September 2002) National Hazard Maps.
- Project '02 attenuation functions.
- Updated historical earthquake catalog (magnitude 5 or greater).
- New Advanced Engineering Building Module for single and group building mitigation analysis.

HAZUS Preview Hurricane/Wind Loss Estimation Model

The HAZUS Preview Hurricane Wind Loss Estimation Model gives users in the Atlantic and Gulf Coast regions the ability to estimate potential damage and loss to residential, commercial, and industrial buildings. It also allows users to estimate direct economic loss, post-storm shelter needs and building debris. In the future, the model will include the capability to estimate wind effects in island territories, storm surge, indirect economic losses, casualties, and impacts to utility and transportation lifelines and agriculture. Loss models for other severe wind hazards will be included in the future.

HAZUS Flood Loss Estimation Model

The HAZUS Flood Loss Estimation Model allows users to determine flood depths, estimate damages and losses, and define floods of varying magnitudes. Users may also assess riverine, coastal and alluvial fan flooding, and estimate potential damages to buildings, essential facilities, transportation and utility lifelines, and agricultural areas. The HAZUS Flood Loss Estimation Model also addresses debris generation and shelter requirements and can estimate direct losses based on physical damage to structures, contents, and building interiors. Finally, it allows users to simulate the effects of a disaster and determine the level and type of damage and economic loss people may suffer.

HazUs Information On-Line: www.fema.gov/hazus/

To order HazUS MH, download form at www.fema.gov/hazus/pdf/order_form_mh.pdf

Requirements for HAZUS99 SR2

Operating Systems:

Windows2000 (SP2 Version)
WindowsNT (SP6 Version)
Windows98 (SE Version)

GIS Platforms:

MapInfo 6.0 and 6.5
ArcView 3.2a

Requirements for HAZUS-MH (Expected)

MINIMAL

Pentium III 700 MHz 128 MB RAM - Allows moderately fast analysis of small communities only. 4 GB allows installation of HAZUS and storage of three scenarios for a medium-sized community. DVD drive, graphics card with 800x600 minimum resolution. Mouse, keyboard and monitor (color recommended). Windows 2000 SP2, ArcGIS 8.3, Spatial Analyst extension required for the Flood Model.

MODERATE

Pentium III 800 MHz 256 MB RAM allows fast analysis of medium-sized communities and real-time analysis for small communities. 10 GB allows installation of HAZUS and storage of three scenarios for large urban areas. DVD drive, graphics card with 800x600 minimum resolution. Mouse, keyboard and monitor (color recommended). Windows 2000 SP2, ArcGIS 8.3, Spatial Analyst extension required for the Flood Model.

RECOMMENDED

Pentium IV 2.5 GHz (or better) 512+ MB RAM allows fast analysis of large urban areas and real-time analysis for all communities. 80 GB allows installation of HAZUS and storage of 25 or more scenarios for large urban areas. DVD drive, graphics card with 800x600 minimum resolution. Mouse, keyboard and monitor (color recommended). Windows 2000 SP2, ArcGIS 8.3, Spatial Analyst extension required for the Flood Model.

*The Flood Information Tool will also operate properly if user has ArcEditor 8.1.2 and ArcInfo 8.1.2 with Spatial Analyst extension.

Peak Ground
Acceleration (g)

<0017 g

LEVEL	DESCRIPTION
I	Not felt except by a very few under especially favorable circumstances.
II .0017 g	Felt only by a few persons at rest, especially on upper floors of buildings. Delicately suspended objects may swing.
III .014 g	Felt quite noticeably indoors, especially on upper of buildings, but many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibration like passing of truck. Duration estimated.
IV .014 g to .039 g	During the day felt indoors by many, outdoors by few. At night some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
V .039 g to .092 g	Felt by nearly everyone, many awakened. Some dishes, windows, etc., broken; a few instances of cracked plaster; unstable objects overturned. Disturbances of trees, poles, and other tall objects sometimes noticed. Pendulum clocks may stop.
VI .092 g to .18 g	Felt by all, many frightened and run indoors. Some heavy furniture moved; a few instances of fallen plaster or damaged chimneys. Damage slight.
VII .18 g to .34 g	Everybody runs outdoors. Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable in poorly built or badly designed structures; some chimneys broken. Noticed by persons driving motor cars.
VIII .34 g to .65 g	Damage slight in specially designed structures; considerable in ordinary substantial buildings, with partial collapse; great in poorly built structures. Panel walls thrown out of frame structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned. Sand and mud ejected in small amounts. Changes in well water. Persons driving motor cars disturbed.
IX .65 g to 1.24 g	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb; great in substantial buildings, with partial collapse. Buildings shifted off foundations. Ground cracked conspicuously. Underground pipes broken.
X > 1.24 g	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations; ground badly cracked. Rail bent. Landslides considerable from river banks and steep slopes. Shifted sand and mud. Water splashed (slopped) over banks.
XI	Few, if any, (masonry) structures remain standing. Bridges destroyed. Broad fissures in ground. Underground pipelines completely out of service. Earth slumps and land slips in soft ground. Rails bent greatly.
XII	Damage total. Practically all works of construction are damaged greatly or destroyed. Waves seen of ground surface. Lines of sight and level are distorted. Objects are thrown into the air.

Figure 3-13

Source: Naeim. *The Seismic Design Handbook*, 1989.

RICHTER	TNT ENERGY	EXAMPLE
1.0	6 ounces	Small blast at a construction site
1.5	2 pounds	
2.0	13 pounds	
2.5	63 pounds	
3.0	397 pounds	
3.5	1,000 pounds	
4.0	6 tons	Small atomic bomb
4.5	32 tons	Average tornado
5.0	199 tons	
5.5	500 tons	Massena, NY, quake, 1944
6.0	6,270 tons	
6.5	31,550 tons	Coalinga, CA, quake, 1983
7.0	199,000 tons	Hebgen Lake, MT, quake, 1954
7.5	1,000,000 tons	
8.0	6,270,000 tons	San Francisco, CA, quake, 1906
8.5	31,550,000 tons	Anchorage, AK, quake, 1964
9.0	199,999,000 tons	

Figure 3-14

Source: FEMA 159. Earthquakes. Produced by
The National Science Teachers Association, 1992.

Bay City Department of Publicworks Project # One

Objective:

This practice exercise is designed to familiarize the applicant with the following:

- Assembling cost documentation
- Eligibility determinations
- Work category
- Description of Damage
- Scope of Work
- Special Considerations (if any)
- Preparing FEMA forms, 90-91 (Project Worksheet) and 90-120 (Special Considerations Questions)

Scenario:

During the event, crews working their regular shift and overtime, were used perform the following tasks:

- Citywide debris removal from storm drains, streets, and sidewalks.
- Place warning signs and safety barriers.

Exercise materials:

- Spreadsheets for documenting, force account labor, equipment and material costs.
- FEMA Forms (90-91 Project Worksheet, 90-120 Special Considerations Questions)

Note: *Because of time limitations, the labor, equipment, and material spreadsheets have been completed. The participants will utilize these sheets to prepare a "Project Worksheet".*

PROJECT WORKSHEET

PAPERWORK BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 30 minutes. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing and submitting the forms. You are not required to respond to this collection of information unless a valid OMB control number is displayed in the upper right corner of the forms. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing the burden to: Information Collections Management, Federal Emergency Management Agency, 500 C Street, SW, Washington, DC 20472. Paperwork Reduction Project (3067-0151). **NOTE:** Do not send your completed form to this address.

DECLARATION NO. FEMA- <u>1046-DR-</u> <u>Ca</u>	PROJECT NO. PW -1	FIPS NO. 123-00000	DATE February 5, 1999	CATEGORY A
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DAMAGED FACILITY Various locations throughout city	WORK COMPLETE AS OF: <u>2/5/99</u> : <u>100</u> %
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APPLICANT Bay City	COUNTY San Mateo
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LOCATION City Wide	LATITUDE	LONGITUDE
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DAMAGE DESCRIPTION AND DIMENSIONS
High winds and heavy rainfall deposited debris throughout the city. This resulted in clogged storm drains, tree debris in streets and on sidewalks, minor mud slides onto roadways and streets.

SCOPE OF WORK
Remove storm generated debris, clean debris from storm drains, remove slide material from roadways and streets, post warning signs where needed.

Does the Scope of Work change the pre-disaster conditions at the site? Yes No
 Special Considerations issues included? Yes No Hazard Mitigation proposal included? Yes No
 Is there insurance coverage on this facility? Yes No

PROJECT COST					
ITEM	CODE	NARRATIVE	QUANTITY/UNIT	UNIT PRICE	COST
1	9007	Labor, with benefits	/ LS	\$4,180.88	\$4,181.00
2	9008	Equipment	/ LS	\$3,582.00	\$3,582.00
			/		
			/		
			/		
			/		
			/		
			/		
			/		
				TOTAL COST	\$7,763.00

PREPARED BY: Harold Whipcracker	TITLE: Supervisor, Bay City Department of public works
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**FEDERAL EMERGENCY MANAGEMENT AGENCY
SPECIAL CONSIDERATIONS QUESTIONS**

1. APPLICANT'S NAME Bay City	2. FIPS NUMBER 123-00000	3. DATE 2/5/99
4. PROJECT NAME Debris Removal	5. LOCATION City Wide	

Form must be filled out—for each project.

1. Does the damaged facility or item of work have insurance and/or is it an insurable risk? (e.g., buildings, equipment, vehicles, etc.)

Yes No Unsure Comments _____

2. Is the damaged facility located within a floodplain or coastal high hazard area, or does it have an impact on a floodplain or wetland?

Yes No Unsure Comments _____

3. Is the damaged facility or item of work located within or adjacent to a Coastal Barrier Resource System Unit or an Otherwise Protected Area?

Yes No Unsure Comments _____

4. Will the proposed facility repairs/reconstruction change the pre-disaster condition? (e.g., footprint, material, location, capacity, use or function)

Yes No Unsure Comments _____

5. Does the applicant have a hazard mitigation proposal or would the applicant like technical assistance for a hazard mitigation proposal?

Yes No Unsure Comments _____

6. Is the damaged facility on the National Register of Historic Places or the state historic listing? Is it older than 50 years? Are there more, similar buildings near the site?

Yes No Unsure Comments _____

7. Are there any pristine or undisturbed areas on, or near, the project site? Are there large tracts of forestland?

Yes No Unsure Comments _____

8. Are there any hazardous materials at or adjacent to the damaged facility and/or item of work?

Yes No Unsure Comments _____

9. Are there any other environmentally or controversial issues associated with the damaged facility and/or item of work?

Yes No Unsure Comments _____

Bay City DPW Labor Record

Bay City DPW Employee/Title	date 1/8	date 1/9	date 1/10	date 1/11	Total Reg	Total O.T	Hourly Pay Rate	O.T.Hourly Pay Rate	Pay W/O Benefits	Reg Benefit Rate	O.T Benefit Rate	Total Reg Benefit Cost	Total O.T. Benefit Cost	Total Regular Cost	Total O.T. Cost.
James, O.	Reg 8 4	8 4	8 5	8 5	32	18	14.32		458.24	5.16		165.12		\$623.36	
Labor	O.T.							21.48	386.64		3.22		57.96		\$444.60
Jenkins, T	Reg 8 4	8 4	8 5	8 5	32	18	14.32	21.48	458.24	5.16		165.12		\$623.36	
Labor	O.T.								386.64		3.22		57.96		\$444.60
Harris	Reg 8 4	8 4	8 5	8 5	32	18	14.32	21.48	458.24	5.16		165.12		\$623.36	
Labor	O.T.								386.64		3.22		57.96		\$444.60
Aurthor, J	Reg 8 4	8 4	8 5	8 5	32	18	14.32	21.48	458.24	5.16		165.12		\$623.36	
Labor	O.T.								386.64		3.22		57.96		\$444.60
Carl, M	Reg 8 4	8 4	8 5	8 5	32	18	14.32	21.48	458.24	5.16		165.12		\$623.36	
Labor	O.T.								386.64		3.22		57.96		\$444.60
Otto, P,	Reg 8 4	8 4	8 5	8 5	32	18	17.68	26.52	565.76	6.36		203.52	71.64	\$769.28	
Equip. Oper.	O.T.								477.36		3.98		71.64		\$549.00
Gentry, W.	Reg 8 4	8 4	8 5	8 5	32	18	17.68	26.52	565.76	6.36		203.52	71.64	\$769.28	
Equip. Oper.	O.T.								477.36		3.98		71.64		\$549.00
Bellows, L.	Reg 8 6	8 6	8 6	8 6	32	24	20.79	31.19	665.28	7.48		239.36	112.32	\$904.64	
Foremen	O.T.								747.56		4.68				\$859.88
	Reg				0										
	O.T.					0									
	Reg														
	O.T.														
Totals					256	150			7,723.48			1,472.00	545.40	\$5,560.00	\$4,180.88

Bay City DPW Equipment List

Vehicle Type		Equipment Code Number	Operator's Name	Dates and Hours used each day					Costs		
Make Model	Date			1/8	1/9	1/10	1/11	Total Hours	Equipment Rate	Total Cost	
Ford		PW1	James, O.	Hours	12	12	13	13	50	\$9.50	\$475.00
3/4 P/U											
Ford		PW2	Jenkins, T.	Hours	12	12	13	13	50	\$9.50	\$475.00
3/4 P/U											
Ford		PW3	Bellows, L.	Hours	14	14	14	14	56	\$9.50	\$532.00
3/4 P/U											
Ford		PW4	Otto, P.	Hours	12	12	13	13	50	\$22.75	\$1,137.50
5 Yd. Dump											
John Deere		PW125	Gentry, W.	Hours	12	12	13	13	50	\$19.25	\$962.50
Back hoe											
				Hours							
				Hours							
				Hours							
				Hours							
Totals									256		\$3,582.00

Bay City Department of Public Works Project # Two

Objectives:

This practice exercise is designed to familiarize the applicant with the following:

- Assembling cost documentation
- Eligibility determinations
- Work category
- Description of Damage
- Scope of Work
- Special Considerations (if any)
- Preparing FEMA forms, 90-91 (Project Worksheet) and 90-120 (Special Considerations Questions)

Scenario:

Heavy rains generated excessive runoff, which resulted in the 12" culvert under Walnut Street, to become clogged with debris. This action caused the water to overtop the street, resulting in scouring to the surface course and sub-base of the roadway. A small gully was also scoured on the downhill side of the street, washing out the existing riprap designed to dissipate water flowing from the culvert. The following is the dimensions of the damaged area:

- 22 ft. roadway (2" asphalt with 6" base) 2 ft. wide shoulders each side.
Damage was, 6' Wide x 4' Deep
- Plugged culvert, 12" CMP x 28' Long
- Washed out rip-rap, 6' Long x 6' Wide x 3' Deep
- Eroded gully, 8' Long x 20' Wide x 10' Deep

The repairs were made using DPW labor and equipment. The asphalt and culvert was purchased from local firms. All other materials were taken from stock on hand.

Exercise materials:

- Spreadsheets for documenting force account labor, equipment and material costs.
- FEMA Forms (90-91 Project Worksheet, 90-120 Special Considerations Questions)

Please prepare a Project Worksheet (with all attachments) using the above information and the attached spreadsheets.

Note: *Because of time limitations, the labor, equipment, and material spreadsheets have been completed. The participants will utilize these sheets to prepare a "Project Worksheet".*

PROJECT WORKSHEET

PAPERWORK BURDEN DISCLOSURE NOTICE

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DECLARATION NO. FEMA- <u>1046</u> -DR- <u>Ca</u>	PROJECT NO. PW-2	FIPS NO. 123-00000	DATE February 5, 1999	CATEGORY C
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DAMAGED FACILITY Walnut Steet	WORK COMPLETE AS OF: <u>2/5/99</u> : <u>100</u> %
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APPLICANT Bay City	COUNTY San Mateo
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LOCATION Walnut St. between Howe and Alpine Avenues	LATITUDE	LONGITUDE
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DAMAGE DESCRIPTION AND DIMENSIONS
Dimensions: Roadway (2" AC over 6" AB) Damage = 26'x6'x4' , plugged culvert = 12" CMPx28", washed out rip rap = 6'x6'x3', flood water scoured gully = 8'x20'x10'

Description Of Damage: As the result of a plugged culvert, flood water overtopped the roadway and eroding away the surface course, sub-base (22'x6'x4'), and the rip rap (6'x6'x3'), placed underneath the culvert on the downhill side of the street. Flood waters also scoured a gully(8'x20'x10') on the downhill side of the street

SCOPE OF WORK
Remove and replace existing 12" CMP with 18' CMP(see haz. mit. proposal) , backfill roadway, replace suface course(2"AC over 6"AB). Fill gully to pre-disaster design with unclassified fill, replace rip rap.

Hazard Mitigation Proposal: Replace 12' CMP with 18' CMP and add 18' "debris screen"

Does the Scope of Work change the pre-disaster conditions at the site? Yes No

Special Considerations issues included? Yes No Hazard Mitigation proposal included? Yes No

Is there insurance coverage on this facility? Yes No

PROJECT COST					
ITEM	CODE	NARRATIVE	QUANTITY/UNIT	UNIT PRICE	COST
1	9007	Labor with benefits	1 / Ls	\$2,780.00	\$2,780.00
2	9008	Equipment	1 / LS	\$3,582.00	\$3,582.00
3	9009	Materials	1 / Ls	\$1,302.91	\$1,303.00
			/		
4	9999	Hazard Mitigation proposal - increase culvert from 12" to 18" and cover culvert inlet with debris screen	1 / LS	\$203.00	\$203.00
			/		
			/		
			/		
			/		
				TOTAL COST	\$7,868.00

PREPARED BY: Ido Noitall TITLE: Public Works Superintendant for life

**FEDERAL EMERGENCY MANAGEMENT AGENCY
SPECIAL CONSIDERATIONS QUESTIONS**

1. APPLICANT'S NAME Bay City - Department of Public Work	2. FIPS NUMBER 123-00000	3. DATE 2/5/99
4. PROJECT NAME Roadway repair & culvert replacement	5. LOCATION Walnut St.	

Form must be filled out—for each project.

1. Does the damaged facility or item of work have insurance and/or is it an insurable risk? (e.g., buildings, equipment, vehicles, etc.)

Yes No Unsure Comments _____

2. Is the damaged facility located within a floodplain or coastal high hazard area, or does it have an impact on a floodplain or wetland?

Yes No Unsure Comments _____

3. Is the damaged facility or item of work located within or adjacent to a Coastal Barrier Resource System Unit or an Otherwise Protected Area?

Yes No Unsure Comments _____

4. Will the proposed facility repairs/reconstruction change the pre-disaster condition? (e.g., footprint, material, location, capacity, use or function)

Yes No Unsure Comments _____

5. Does the applicant have a hazard mitigation proposal or would the applicant like technical assistance for a hazard mitigation proposal?

Yes No Unsure Comments Replace 12' CMP with 18' CMP and add "debris screen"

6. Is the damaged facility on the National Register of Historic Places or the state historic listing? Is it older than 50 years? Are there more, similar buildings near the site?

Yes No Unsure Comments _____

7. Are there any pristine or undisturbed areas on, or near, the project site? Are there large tracts of forestland?

Yes No Unsure Comments _____

8. Are there any hazardous materials at or adjacent to the damaged facility and/or item of work?

Yes No Unsure Comments _____

9. Are there any other environmentally or controversial issues associated with the damaged facility and/or item of work?

Yes No Unsure Comments _____

Bay City Department of public works

The following is a listing of the Department of public works personnel and labor rates:

Employee	Position	Pay Rate	Benefits
Smith, J	Labor	\$11.75	\$5.41
Cobb, B	Labor	\$11.75	\$5.41
Stump, A	Labor	\$11.75	\$5.41
Reed, W	Labor	\$11.75	\$5.41
Cripps, H	Labor	\$11.75	\$5.41
Jones, V	Labor	\$11.75	\$5.41
Daniels, F	Labor	\$11.75	\$5.41
	Labor	\$11.75	\$5.41
Bishop, A	Equipment Oper.	\$14.35	\$6.60
McKinney, D	Equipment Oper.	\$14.35	\$6.60
Sally, J	Equipment Oper.	\$14.35	\$6.60
Graham, G	Equipment Oper.	\$14.35	\$6.60
Whipsnapper, K	Supervisor	\$18.07	\$8.31
Whatstakingsolong, O.	Supervisor	\$18.07	\$8.31

Equipment Description	Equip. #
5 ton dump truck	317
5 ton dump truck	318
5 ton dump truck	319
5 ton dump truck	320
3/4 ton pick-up	410
3/4 ton pick-up	411
3/4 ton pick-up	412
3/4 ton pick-up	413
Backhoe	221
Backhoe trailer	400
Excavator	500
Excavator (bobcat)	501
Asphalt roller	600
Asphalt trailer	601
Asphalt compactor	111

Bay City DPW Labor Record

Bay City DPW Employee/Title	date	date	date	date	Total Reg	Total O.T.	Hourly Pay Rate	O.T.Hourly Pay Rate	Pay W/O Benefits	Reg Benefit Rate	O.T. Benefit Rate	Total Reg Benefit Cost	Total O.T. Benefit Cost	Total Regular Cost	Total O.T. Cost
James, O. Labor	1/12	8	8	1/13	16	0	14.32		229.12	5.16		82.56		\$311.68	
Jenkins, T Labor	8	8			16	0	14.32		229.12	5.16		82.56		\$311.68	
Harris Labor	8	8			16	0	14.32		229.12	5.16		82.56		\$311.68	
Aurthor, J Labor	8	8			16	0	14.32		229.12	5.16		82.56		\$311.68	
Carl, M Labor	8	8			16	0	14.32		229.12	5.16		82.56		\$311.68	
Otto, P, Equip. Oper.	8	8			16	0	17.68		282.88	6.36		101.76		\$384.64	
Gentry, W. Equip. Oper.	8	8			16	0	17.68		282.88	6.36		101.76		\$384.64	
Bellows, L. Foremen	8	8			16	0	20.79		332.64	7.48		119.68		\$452.32	
Reg					0										
O.T.					0										
Reg															
O.T.															
Totals					128	0			2,044.00			736.00	0.00	\$2,780.00	\$0.00

Bay City Department of Public Works Project # Four

Objective:

This practice exercise is designed to familiarize the applicant with the following:

- Assembling cost documentation
- Eligibility determinations
- Work category
- Description of Damage
- Scope of Work
- Special Considerations (if any)
- Preparing FEMA forms, 90-91 (Project Worksheet) and 90-120 (Special Considerations Questions)

Scenario:

During the event, high winds blew the roof off a vehicle storage garage. The garage is closed on two sides, and open at each end. This allows access from two directions. The building dimensions are 25' x 65'. It was determined that the building was constructed in 1924, requiring FEMA to perform a historic review before funding the project. Upon inspection of the facility, it was discovered there was a steam pipe attached to the rafters, traversed the building. The steam pipe was installed in the 1940's, therefore the pipe lagging was suspected of containing asbestos. Test results confirmed the presents of asbestos.

Conclusion:

DPW engineers determined the most cost effective means of repairs was to utilize DPW employees and equipment to demolish the roof and haul the debris to a landfill.

It was also decided to contract; the removal and disposal of asbestos steam pipe lagging and replace with non- hazardous materials. A specialty contractor with a current Asbestos Abatement Certificate will perform this portion of the work.

The roof truss system and sheathing will be contracted out to a "general" building contractor and the installation of the asphalt roofing material will be contracted out to a roofing contractor.

The city engineer designed and prepared the drawings/specifications for this project, upon his review of current building codes and standards, it was determined that addition strengthening the roof structure was not necessary,

Insurance:

Bay City has an "All Hazard" insurance policy covering the structures at the Cities "corporate yard". The declaration page states there is a deductible of \$5,000.

Contracts:

Although it was estimated that all proposed contracts would not exceed the City's limitations for awarding work to qualified contractors, it was decided to solicit bids for each phase of the required work. It was found that because of the specialized nature of work, asbestos testing and removal, only one bid was received.

Exercise materials:

- Spreadsheets for documenting force account labor, equipment and material costs.
- FEMA Forms (90-91 Project Worksheet, 90-120 Special Considerations Questions)

Please prepare a Project Worksheet (with all attachments) using the above information and the attached spreadsheets.

Note: *Because of time limitations, the labor, equipment, and material spreadsheets have been completed. The participants will utilize these sheets to prepare a "Project Worksheet".*

PROJECT WORKSHEET

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DECLARATION NO. FEMA- <u>1046-DR- Ca.</u>	PROJECT NO. PW - 4	FIPS NO. 123-00000	DATE 3/9/99	CATEGORY E	
DAMAGED FACILITY Vehicle Garage			WORK COMPLETE AS OF: <u>3/9/99</u> : <u>100</u> %		
APPLICANT Bay City		COUNTY San Mateo			
LOCATION 148 Gear Dr.			LATITUDE	LONGITUDE	
DAMAGE DESCRIPTION AND DIMENSIONS Dimensions: Damaged Roof – 25' x 65' Description of Damage: High winds blew the roof off of a vehicle-parking garage located in the Department of Public Works yard. The garage is 25' x 65'.					
SCOPE OF WORK Remove debris generated as a result of the roof being blown off. Prepare blueprints and specifications. It was also decided to contract; the removal and disposal of asbestos steam pipe lagging and replace with non- hazardous materials. Rebuild truss system and cover with plywood. Apply 3-tab asphalt shingles to plywood sheathing. Inspect construction for compliance with building codes and contract specifications.					
Does the Scope of Work change the pre-disaster conditions at the site? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No					
Special Considerations issues included? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		Hazard Mitigation proposal included? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			
Is there insurance coverage on this facility? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No					
PROJECT COST					
ITEM	CODE	NARRATIVE	QUANTITY/UNIT	UNIT PRICE	COST
1	9007	Labor, w/benefits	LS	\$1,748	\$1,748.00
2	9008	Equipment	LS	\$336	\$336.00
3	9999	Contracts	LS	\$30,452	\$30,452.00
			/		\$0.00
4	9999	Insurance Recovery	1 / LS	(\$27,536)	(\$27,536)
			/		\$0.00
			/		\$0.00
			/		\$0.00
			/		\$0.00
			/		\$0.00
				TOTAL COST	\$ 5,000 0.00
PREPARED BY: Harold Whipcracker			TITLE: Supervisor, Bay City DPW		

**FEDERAL EMERGENCY MANAGEMENT AGENCY
SPECIAL CONSIDERATIONS QUESTIONS**

1. APPLICANT'S NAME
Bay City - DPW 3

2. FIPS NUMBER
123-00000

3. DATE
3/9/99

4. PROJECT NAME
Garage Repair

5. LOCATION
148 Gear Dr.

Form must be filled out—for each project.

1. Does the damaged facility or item of work have insurance and/or is it an insurable risk? (e.g., buildings, equipment, vehicles, etc.)
 Yes No Unsure Comments Structure is covered by "All Hazard " insurance, see policy
On file with FEMA, Region IX

2. Is the damaged facility located within a floodplain or coastal high hazard area, or does it have an impact on a floodplain or wetland?
 Yes No Unsure Comments _____

3. Is the damaged facility or item of work located within or adjacent to a Coastal Barrier Resource System Unit or an Otherwise Protected Area?
 Yes No Unsure Comments _____

4. Will the proposed facility repairs/reconstruction change the pre-disaster condition? (e.g., footprint, material, location, capacity, use or function)
 Yes No Unsure Comments _____

5. Does the applicant have a hazard mitigation proposal or would the applicant like technical assistance for a hazard mitigation proposal?
 Yes No Unsure Comments Current codes and standards meet wind load requirements.

6. Is the damaged facility on the National Register of Historic Places or the state historic listing? Is it older than 50 years? Are there more, similar buildings near the site?
 Yes No Unsure Comments Building was constructed in 1924

7. Are there any pristine or undisturbed areas on, or near, the project site? Are there large tracts of forestland?
 Yes No Unsure Comments _____

8. Are there any hazardous materials at or adjacent to the damaged facility and/or item of work?
 Yes No Unsure Comments Asbestos insulation on steam pipe. The Removal Contractor must have a
valid Asbestos Abatement Certificate

9. Are there any other environmentally or controversial issues associated with the damaged facility and/or item of work?
 Yes No Unsure Comments _____

**Bay City DPW bid results for
garage repairs**

Project	Contractor	Bid	Qualified	Comments
	Bay City Framing	21,789.79	yes	
Roof framing and plywood sheeting	K & B Construction	20,634.00	yes	Non-Union Contractor
	All State Const.	17,792.00	no	Non-licensed contractor
	Bilt-Rite Const	22,243.00	yes	Union Contractor
	Jim-Bob Roofing	7,693.00	yes	Qualified Contractor
Roofing	Bay City Roofing	9,247.00	yes	Qualified Contractor
	Bob's Roofing	6,067.00	no	Dis-barred Contractor
Asbestos Removal				
re-cover steam pipe	Cal's Pipe Service	2,125.00	yes	Only bidder

*Draw Below - use of money (6)
not for financing
not*

Bay City Department of Public Works Project # Two

Objectives:

This practice exercise is designed to familiarize the applicant with the following:

- Assembling cost documentation
- Eligibility determinations
- Work category
- Description of Damage
- Scope of Work
- Special Considerations (if any)
- Preparing FEMA forms, 90-91 (Project Worksheet) and 90-120 (Special Considerations Questions)

Scenario:

Heavy rains generated excessive runoff, which resulted in the 12" culvert under Walnut Street, to become clogged with debris. This action caused the water to overtop the street, resulting in scouring to the surface course and sub-base of the roadway. A small gully was also scoured on the downhill side of the street, washing out the existing riprap designed to dissipate water flowing from the culvert. The following is the dimensions of the damaged area:

- 22 ft. roadway (2" asphalt with 6" base) 2 ft. wide shoulders each side.
Damage was, 6' Wide x 4' Deep
- Plugged culvert, 12" CMP x 28' Long
- Washed out rip-rap, 6' Long x 6' Wide x 3' Deep
- Eroded gully, 8' Long x 20' Wide x 10' Deep

The repairs were made using DPW labor and equipment. The asphalt and culvert was purchased from local firms. All other materials were taken from stock on hand.

Exercise materials:

- Spreadsheets for documenting force account labor, equipment and material costs.
- FEMA Forms (90-91 Project Worksheet, 90-120 Special Considerations Questions)

Please prepare a Project Worksheet (with all attachments) using the above information and the attached spreadsheets.

Note: *Because of time limitations, the labor, equipment, and material spreadsheets have been completed. The participants will utilize these sheets to prepare a "Project Worksheet".*

FEDERAL EMERGENCY MANAGEMENT AGENCY
PROJECT WORKSHEET

O.M.B. No. 3067-0151
 Expires April 30, 2001

PAPERWORK BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 30 minutes. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing and submitting the forms. You are not required to respond to this collection of information unless a valid OMB control number is displayed in the upper right corner of the forms. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing the burden to: Information Collections Management, Federal Emergency Management Agency, 500 C Street, SW, Washington, DC 20472, Paperwork Reduction Project (3067-0151). **NOTE:** Do not send your completed form to this address.

DECLARATION NO. FEMA- <u>1046</u> -DR- <u>Ca</u>	PROJECT NO. PW-2	FIPS NO. 123-00000	DATE February 5, 1999	CATEGORY C
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DAMAGED FACILITY Walnut Steet	WORK COMPLETE AS OF: <u>2/5/99</u> : <u>100</u> %
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APPLICANT Bay City	COUNTY San Mateo
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LOCATION Walnut St. between Howe and Alpine Avenues	LATITUDE	LONGITUDE
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DAMAGE DESCRIPTION AND DIMENSIONS
 Dimensions: Roadway (2" AC over 6" AB) Damage = 26'x6'x4', plugged culvert = 12" CMPx28", washed out rip rap = 6'x6'x3', flood water scoured gully = 8'x20'x10'

Description Of Damage: As the result of a plugged culvert, flood water overtopped the roadway and eroding away the surface course, sub-base (22'x6'x4'), and the rip rap (6'x6'x3'), placed underneath the culvert on the downhill side of the street. Flood waters also scoured a gully(8'x20'x10') on the downhill side of the street

SCOPE OF WORK
 Remove and replace existing 12" CMP with 18' CMP(see haz. mit. proposal) , backfill roadway, replace surface course(2"AC over 6"AB). Fill gully to pre-disaster design with unclassified fill, replace rip rap.

Hazard Mitigation Proposal: Replace 12' CMP with 18' CMP and add 18' "debris screen"

Does the Scope of Work change the pre-disaster conditions at the site? Yes No
 Special Considerations issues included? Yes No Hazard Mitigation proposal included? Yes No
 Is there insurance coverage on this facility? Yes No

PROJECT COST					
ITEM	CODE	NARRATIVE	QUANTITY/UNIT	UNIT PRICE	COST
1	9007	Labor with benefits	1 / Ls	\$2,780.00	\$2,780.00
2	9008	Equipment	1 / LS	\$3,582.00	\$3,582.00
3	9009	Materials	1 / Ls	\$1,302.91	\$1,303.00
			/		
4	9999	Hazard Mitigation proposal - increase culvert from 12" to 18" and cover culvert inlet with debris screen	1 / LS	\$203.00	\$203.00
			/		
			/		
			/		
			/		
				TOTAL COST	\$7,868.00

PREPARED BY: Ido Noitall TITLE: Public Works Superintendant for life

**FEDERAL EMERGENCY MANAGEMENT AGENCY
SPECIAL CONSIDERATIONS QUESTIONS**

1. APPLICANT'S NAME Bay City - Department of Public Work	2. FIPS NUMBER 123-00000	3. DATE 2/5/99
4. PROJECT NAME Roadway repair & culvert replacement	5. LOCATION Wainut St.	

Form must be filled out—for each project.

1. Does the damaged facility or item of work have insurance and/or is it an insurable risk? (e.g., buildings, equipment, vehicles, etc.)

Yes No Unsure Comments _____

2. Is the damaged facility located within a floodplain or coastal high hazard area, or does it have an impact on a floodplain or wetland?

Yes No Unsure Comments _____

3. Is the damaged facility or item of work located within or adjacent to a Coastal Barrier Resource System Unit or an Otherwise Protected Area?

Yes No Unsure Comments _____

4. Will the proposed facility repairs/reconstruction change the pre-disaster condition? (e.g., footprint, material, location, capacity, use or function)

Yes No Unsure Comments _____

5. Does the applicant have a hazard mitigation proposal or would the applicant like technical assistance for a hazard mitigation proposal?

Yes No Unsure Comments Replace 12' CMP with 18' CMP and add "debris screen"

6. Is the damaged facility on the National Register of Historic Places or the state historic listing? Is it older than 50 years? Are there more, similar buildings near the site?

Yes No Unsure Comments _____

7. Are there any pristine or undisturbed areas on, or near, the project site? Are there large tracts of forestland?

Yes No Unsure Comments _____

8. Are there any hazardous materials at or adjacent to the damaged facility and/or item of work?

Yes No Unsure Comments _____

9. Are there any other environmentally or controversial issues associated with the damaged facility and/or item of work?

Yes No Unsure Comments _____

Bay City Department of public works

The following is a listing of the Department of public works personnel and labor rates:

Employee	Position	Pay Rate	Benefits
Smith, J	Labor	\$11.75	\$5.41
Cobb, B	Labor	\$11.75	\$5.41
Stump, A	Labor	\$11.75	\$5.41
Reed, W	Labor	\$11.75	\$5.41
Cripps, H	Labor	\$11.75	\$5.41
Jones, V	Labor	\$11.75	\$5.41
Daniels, F	Labor	\$11.75	\$5.41
	Labor	\$11.75	\$5.41
Bishop, A	Equipment Oper.	\$14.35	\$6.60
McKinney, D	Equipment Oper.	\$14.35	\$6.60
Sally, J	Equipment Oper.	\$14.35	\$6.60
Graham, G	Equipment Oper.	\$14.35	\$6.60
Whipsnapper, K	Supervisor	\$18.07	\$8.31
Whatstakingsolong, O.	Supervisor	\$18.07	\$8.31

Equipment Description	Equip. #
5 ton dump truck	317
5 ton dump truck	318
5 ton dump truck	319
5 ton dump truck	320
3/4 ton pick-up	410
3/4 ton pick-up	411
3/4 ton pick-up	412
3/4 ton pick-up	413
Backhoe	221
Backhoe trailer	400
Excavator	500
Excavator (bobcat)	501
Asphalt roller	600
Asphalt trailer	601
Asphalt compactor	111

Bay City DPW Equipment List

Vehicle Type		Equipment Code Number	Operator's Name	Dates and Hours used each day						Costs	
Make Model	Date			1/8	1/9	1/10	1/11	Total Hours	Equipment Rate	Total Cost	
Ford 3/4 P/U		PW1	James, O.	Hours	12	12	13	13	50	\$9.50	\$475.00
Ford 3/4 P/U		PW2	Jenkins, T.	Hours	12	12	13	13	50	\$9.50	\$475.00
Ford 3/4 P/U		PW3	Bellows, L.	Hours	14	14	14	14	56	\$9.50	\$532.00
Ford 5 Yd. Dump		PW4	Otto, P.	Hours	12	12	13	13	50	\$22.75	\$1,137.50
John Deere Back hoe		PW125	Gentry, W.	Hours	12	12	13	13	50	\$19.25	\$962.50
				Hours							
				Hours							
				Hours							
				Hours							
Totals									256		\$3,582.00

Bay City DPW Labor Record

Bay City DPW Employee/Title	date		date	date	Total Reg	Total O.T.	Hourly Pay Rate	O.T.Hourly Pay Rate	Pay W/O Benefits	Reg Benefit Rate	O.T. Benefit Rate	Total Reg Benefit Cost	Total O.T. Benefit Cost	Total Regular Cost	Total O.T. Cost
	1/12	1/13													
James, O.	8	8			16	0	14.32		229.12	5.16		82.56		\$311.68	
Labor															
Jenkins, T	8	8			16	0	14.32		229.12	5.16		82.56		\$311.68	
Labor															
Harris	8	8			16	0	14.32		229.12	5.16		82.56		\$311.68	
Labor															
Aurthor, J	8	8			16	0	14.32		229.12	5.16		82.56		\$311.68	
Labor															
Carl, M	8	8			16	0	14.32		229.12	5.16		82.56		\$311.68	
Labor															
Otto, P,	8	8			16	0	17.68		282.88	6.36		101.76		\$384.64	
Equip. Oper.															
Gentry, W.	8	8			16	0	17.68		282.88	6.36		101.76		\$384.64	
Equip. Oper.															
Bellows, L.	8	8			16	0	20.79		332.64	7.48		119.68		\$452.32	
Foremen															
Reg					0										
O.T.															
Reg															
O.T.															
Totals					128	0			2,044.00			736.00	0.00	\$2,780.00	\$0.00