

PURPOSE

This memo report presents our findings based on our visual inspection and on-site structural damage assessment for the above subject schools in view of the aftermath of the earthquake which occurred on **August 08, 1993**.

SCOPE OF WORK

The scope of our investigation work performed for this structural assessment is based upon the following.

1. Assessments are based on visual inspection. An initial "walk-through" site visit was performed for the purpose of orientation and to obtain a general impression of the building structures.
2. Due to the limited time frame allowed, no detailed analysis and evaluation of the structural system was performed.
3. Our preliminary assessment provides a qualitative evaluation in comparing between the pre-earthquake and post-earthquake load resisting capacity of the existing structures. The identification of structural deficiencies in the buildings with reference to governing present codes are not within the scope of this report.

SUMMARY

In general, there are no major structural damages observed on the main structural elements of the buildings. Based on our visual inspections we are of the opinion that the overall structural framing system of the buildings showed no visible signs of structural failure, or indications of any possibility of an impending collapse.

FINDINGS AND RECOMMENDATIONS

The findings and recommendations of our structural assessment for each of the individual schools listed under the above subject are found in the attachments to this report.

CONCLUSION

Although some of the buildings has sustained damages, we may conclude from our observations that the lateral load resisting elements of the building have not been significantly affected. Structural repairs as recommended should start immediately in order to restore the structural integrity of the buildings to its pre-earthquake condition.

LIMITATIONS

The findings and recommendations presented herein are based on limited information and visual observation obtained from assessment of existing site conditions.

Our services consist only of preliminary visual on-site assessment and engineering judgement made in accordance with standard engineering principles and practices.



SCHOOL:
YIGO ELEMENTARY SCHOOL
Yigo, Guam

FINDINGS

1. Cracks at C.M.U. walls
Wing "Y" Room no. 7 Wing "O" Boys bathroom
Wing "G" Room no. 24.
2. Hairline cracks at Concrete floor slab
Wing "Y" Room no. 7 & 8.
3. Damaged floor tiles, Wing "Y" Room no. 7 & 8.
4. Cracks at roof slab Wing "I" Room no. 14 Wing "G" Room nos. 18, 19, 20 & 21.
5. Plaster ceiling of pathway.
6. Damaged fixed glass windows Wing "G" Room nos. 19, 20 & 21.

RECOMMENDATIONS

1. All classrooms are usable; with the exception of four (4) classrooms which require minimal crack repair work.
2. Remove and replace damaged floor tiles.
3. Remove and replace damaged fixed glass windows at locations indicated.
4. Remove loose particles of plaster where occurs.
5. Paint all surface as required.

ESTIMATED COST OF REPAIRS

\$50,000.00



SCHOOL:
F.B. LEON GUERRERO MIDDLE SCHOOL
Yigo, Guam

FINDINGS

1. Cracks at interim C.M.U. wall on one (1) classroom.
2. No other major damages are observed.
3. Cracks at seismic joints at cafeteria and main walkway.
4. Cracked floor tiles at boy's locker room.

RECOMMENDATIONS

1. All classrooms are usable pending completion of minor crack repair work.

ESTIMATED COST OF REPAIRS \$10,000.00



SCHOOL:
UPI ELEMENTARY SCHOOL
Andersen Air Force Base Guam

FINDINGS

1. Large chipped-off portion of exterior C.M.U. walls along the longitudinal portion of the buildings, rooms 32-35, 41-45, & room 25.
2. Cracks at C.M.U. walls
3. Hairline cracks at exterior concrete floor slab.
4. Cracks at intersection of perimeter beam and longitudinal beam at new wing.

RECOMMENDATIONS

1. All classrooms are usable except for seven (7) classrooms which require major structural repair work to be completed in two (2) weeks.
2. Demolish cracked portion of damaged C.M.U. wall. Provide reinforcing steel as sketched and erect new 8" C.M.U. walls at locations identified.
3. Repair cracks at C.M.U. walls.
4. Repair cracks at concrete floor using a two component type epoxy resin system.
5. Repair cracks at beams where occurs.
6. Paint surfaces as required.

ESTIMATED COST OF REPAIRS

\$300,000.00

SCHOOL:
DEDEDO MIDDLE SCHOOL
Dededo, Guam

FINDINGS

NEW BUILDING

1. Hairline cracks along walls of rooms, stair wall, and slab.
2. Cracks at cold joints (at window openings).
3. Cracks at intersection of bond beam and glass blocks at stair.

WING "A" BUILDING

1. Transverse cracks along slab at hallway (slab on grade).
2. Crack separating beam floor wall (about 1/32").
3. Seismic gap filler popped out in some areas (vertical & horizontal).
4. Old cracks at roof "reappeared", thus water leaks.

COVERED WALKWAY

1. Roof slab at end portion (adjacent to building "A") spalled, exposing rebars at areas beam column.
2. Pipe railing scratched, showing sign of movement.

RECOMMENDATIONS

1. All damage are exterior only. All classrooms are usable.
2. Reconstruct seismic joint at roof slab end and concrete walkway canopy.
3. Repair cracks at cold joints (window openings).
4. Repair hairline cracks at locations indicated.



5. Remove loose particles of concrete of existing wall or column.
6. Paint surfaces as required.

ESTIMATED COST OF REPAIRS

\$25,000.00

SCHOOL:
WETTENGEL ELEMENTARY SCHOOL
Dededo, Guam

FINDINGS

1. Large concrete crack/concrete spalls along pavilion column.
2. Hairline cracks at columns room 31.
3. Cracks at canopies rooms 31, 32 & 33.
4. Resealing of construction joints.
5. Cracks at C.M.U. wall at room 19.
6. Building "H" C.M.U. wall cracks.

RECOMMENDATIONS

1. Damages occurred primarily on the pavilion. All classrooms are usable.
2. Rope off pavilion area. Restrict access until structural repairs are completed.
3. Structural repairs at column base and column/roof connections.
4. Repair hairline crack at column
5. Reseal all construction joints.
6. Repair cracks at C.M.U. walls.
7. Paint surfaces as required.

ESTIMATED COST OF REPAIRS

\$25,000.00

SCHOOL:
FINEGAYAN ELEMENTARY SCHOOL
Finegayan, Guam

FINDINGS

1. Hairline cracks at second floor beams at outside rooms.
2. Hairline cracks at roof beams.
3. Hairline cracks at second floor slab.
4. Hairline cracks at roof slab.
5. Cracked C.M.U. wall at rooms 125, 126, 129 and 219.
6. Cracks along concrete parapet.
7. Hairline cracks at ground floor slab and tile at room no. 105, cafeteria and walkways.

RECOMMENDATIONS

1. All classrooms are usable pending completion of minor repair cracks for rooms 125, 126, 129, & 219.
2. Repair hairline cracks at identified locations.
3. Replace damaged C.M.U. walls.
4. Repair cracks at C.M.U. walls.
5. Paint/retouch existing surface as required.

ESTIMATED COST OF REPAIRS

\$25,000.00



SCHOOL:
PRICE ELEMENTARY SCHOOL
Mangilao, Guam

FINDINGS

1. Cracks at C.M.U. walls at various locations.
Room no. A7 A-Wing, Room no. 102 E-Wing, Room no. 202 E-Wing,
Room no. C5, C-Wing.
2. Misaligned and dislocated pre-cast concrete parapet.
3. Cracks at joint of parapet and floor slab.
4. Cracks at joint at roof beams and roof slab at room no. C1.
5. Cracks at Centerline beam and column connection at porch area.

RECOMMENDATIONS

1. All classrooms are usable. Damage which occurred to rooms A7, 102, 202 and C5 are mostly exterior and require minor crack repair work.
2. Repair cracks at C.M.U. wall.
3. Realign precast concrete parapet and reseal construction joints.
4. Resealing all joint.
5. Repair concrete spalls and remove loose particles of concrete.
6. Paint surfaces as required.

ESTIMATED COST OF REPAIRS

\$25,000.00



SCHOOL:
MARIA ULLOA ELEMENTARY SCHOOL
Y-SengSong Dededo, Guam

FINDINGS

1. Cracks at beam-column connections at overhang.
2. Cracks at C.M.U. walls.
3. Concrete spalls at columns.
4. Room nos. 1, 2 3, & 4, cracks on roof slab and beams exterior walkway.

RECOMMENDATIONS

1. All classrooms are usable. A majority of the damages are on the exterior of the building. Only minor non-structural crack repair work required.
2. Repair all concrete spalls.
3. Repair all cracks at beam-column intersections.
4. Repair cracks at C.M.U. walls.

ESTIMATED COST OF REPAIRS

\$20,000.00

SCHOOL:
F.Q. SANCHEZ ELEMENTARY SCHOOL
Umatac, Guam

FINDINGS

1. Concrete spalls at underside of slab overhang.
2. Hairline cracks at walls.
3. Cracks at concrete beams.
4. Corroded rebars at exposed areas.
5. Cracks at concrete floors.

RECOMMENDATIONS

1. All classrooms are usable. Minor patchwork and crack repair work is required.
2. Remove any loose particles of concrete within the vicinity.
3. Repair cracks at walls and beams.
4. Clean/wirebrush corroded exposed rebars.

ESTIMATED COST OF REPAIRS \$35,000.00

WINZLER & KELLY CONSULTING ENGINEERS

Louis copy

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**EARTHQUAKE DAMAGE ASSESSMENT
for the
DEPARTMENT OF EDUCATION
PUBLIC SCHOOLS**

for

**The Honorable Governor Joseph F. Ada
Governor of Guam**

**Mr. Benigno Palomo
Director of Public Works**

**Dr. Franklin J. A. Quitigua
Director of Education**

**Job No. 93-600-B00
AUGUST 20, 1993**

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August 20, 1993

The Honorable Governor Joseph F. Ada
Governor of Guam

Re: Earthquake Damage Assessment for D.O.E. public schools

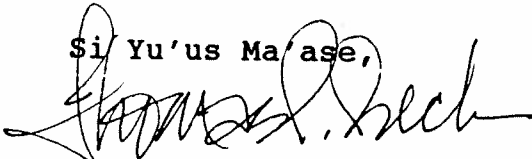
Hafa Adai Governor:

We are pleased to submit the attached visual assessments of the 17 D.O.E. public schools per your request. After your review and approval, we recommend distribution of these assessments to all relevant interested parties. Our assessment team and I are available if you wish to discuss our findings in more detail.

If you require additional assistance regarding these schools or other public facilities, we are prepared to provide more detailed and comprehensive review and analysis for any of the public facilities you deem necessary. Please keep in mind that our visual assessments are preliminary in nature, and more detailed analysis and design repairs will be required to implement any mitigation measures contemplated in our assessments for the long term viability of Guam's public schools.

We thank you for the opportunity to assist you in protecting the children and the future of Guam.

Si Yu'us Ma'ase,



Thomas P. Beck
Pacific Region Manager

cc: Mr. Benigno Palomo
Dr. Franklin J. A. Quitigua

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fix

By : BWS Date: 12AUG93 Client : DOE, GUAM
Project : Earthquake Damage Assessment

Sheet No. 1 of 17
Job No. 93-600-B00

Damage Assessment for : OCEANVIEW H.S., AGAT

Executive Summary

1. This structure has been inspected and no apparent structural hazard due to earthquake damage has been found, except as noted below. All classroom areas appear usable relative to pre-earthquake conditions.
2. Rope off area around spalled column on walkway between F wing and G wing until repairs have been completed. This structure has been damaged and its safety is questionable. Enter only at own risk. Aftershocks or other events may result in death or injury.
3. Restrict use of E wing to essential activities only until temporary repairs are completed.
4. A comprehensive inventory of all damage sustained and a complete and prioritized listing of all necessary repairs should be developed.
5. Preliminary cost estimate of permanent repairs = \$100,000.
6. A fully detailed structural evaluation should be made to determine long-term usability of this facility.
7. Report any unsafe conditions to local authorities; reinspection may be required.

Areas and Description of Significant Earthquake Damage (in order of repair priority)

1. Column on walkway between F wing and G wing badly spalled at base.
2. E wing west side, northeast corner, room E507

West side - main columns cracked and spalled, CMU piers cracked and spalled, separation between structural frame and CMU infill panels.

Room E507 - Large separation between roof beam and south wall, north wall column cracked and spalled

Northeast Corner - CMU pier and wall cracked

Areas of Minor Earthquake Damage

A, B, F, & G wings and the Library

(minor damage is typically minor cracking of beams, columns, infill panels and partitions)

No other areas of damage were observed.

Please note that an analysis of the primary framing system was not performed. We are, therefore, unable to give an opinion on the conformance of the structure with requirements of the current building code.

Our evaluation was limited to an assessment of the structural systems only and did not include the mechanical, plumbing or electrical systems.

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By : BWS Date: 12AUG93 Client : DOE, GUAM
Project : Earthquake Damage Assessment

Sheet No. 2 of 17
Job No. 93-600-B00

Damage Assessment for : HARRY S TRUMAN ELEMENTARY SCHOOL, AGAT

Executive Summary

1. This structure has been inspected and no apparent structural hazard due to earthquake damage has been found. All classroom areas appear usable relative to pre-earthquake conditions.
2. Minor non-structural damage only.
3. Preliminary cost estimate of permanent repairs = \$5,000.
4. A comprehensive inventory of all damage sustained and a complete and prioritized listing of all necessary repairs should be developed.
5. A fully detailed structural evaluation should be made to determine long-term usability of this facility.
6. Report any unsafe conditions to local authorities; reinspection may be required.

Areas and Description of Significant Earthquake Damage

None

Areas of Minor Earthquake Damage

Rooms 7 through 12 - several cracked windows, minor cracks in roof slabs.

No other areas of damage were observed.

Please note that an analysis of the primary framing system was not performed. We are, therefore, unable to give an opinion on the conformance of the structure with requirements of the current building code.

Our evaluation was limited to an assessment of the structural systems only and did not include the mechanical, plumbing or electrical systems.

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*Black
Construct*

By : BWS Date: 12AUG93 Client : DOE, GUAM
Project : Earthquake Damage Assessment

Sheet No. 3 of 17
Job No. 93-600-B00

Damage Assessment for : C.L. TAITANO ELEMENTARY SCHOOL, SINAJANA

Executive Summary

1. This structure has been inspected and no apparent structural hazard due to earthquake damage has been found, except as noted below. All classroom areas appear usable relative to pre-earthquake conditions.
2. Close first floor of 3rd & 4th grade wing, excluding the cafeteria and kitchen, until temporary repairs are completed. This structure has been damaged and its safety is questionable. Enter only at own risk. Aftershocks or other events may result in death or injury.
3. A comprehensive inventory of all damage sustained and a complete and prioritized listing of all necessary repairs should be developed.
4. Preliminary cost estimate of permanent repairs = \$150,000.
5. A fully detailed structural evaluation should be made to determine long-term usability of this facility.
6. Report any unsafe conditions to local authorities; reinspection may be required.

Areas and Description of Significant Earthquake Damage

1. First floor of 3rd & 4th grade wing

Cracking of structural CMU column at southwest corner

Severe cracking and spalling of numerous CMU infill panels

Areas of Minor Earthquake Damage

(minor damage is typically minor cracking of beams, columns, infill panels and partitions)

Exterior stair towers, 1st & 2nd grade wing, temporary-permanent wing.

No other areas of damage were observed.

Please note that an analysis of the primary framing system was not performed. We are, therefore, unable to give an opinion on the conformance of the structure with requirements of the current building code.

Our evaluation was limited to an assessment of the structural systems only and did not include the mechanical, plumbing or electrical systems.

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2 hours

By : BWS Date: 12AUG93 Client : DOE, GUAM Sheet No. 4 of 17
Project : Earthquake Damage Assessment Job No. 93-600-B00

Damage Assessment for : AGUEDA JOHNSTON MIDDLE SCHOOL, ORDOT

Executive Summary

1. This structure has been inspected and no apparent structural hazard due to earthquake damage has been found. All classroom areas appear usable relative to pre-earthquake conditions.
2. A comprehensive inventory of all damage sustained and a complete and prioritized listing of all necessary repairs should be developed.
3. Preliminary cost estimate of permanent repairs = \$1,000.
4. A fully detailed structural evaluation should be made to determine long-term usability of this facility.
5. Report any unsafe conditions to local authorities; reinspection may be required.

Areas and Description of Significant Earthquake Damage

None

Areas of Minor Earthquake Damage

Quad Building Walkway - cracked CMU wall

No other areas of damage were observed.

Please note that an analysis of the primary framing system was not performed. We are, therefore, unable to give an opinion on the conformance of the structure with requirements of the current building code.

Our evaluation was limited to an assessment of the structural systems only and did not include the mechanical, plumbing or electrical systems.

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By : BWS Date: 13AUG93 Client : DOE, GUAM
Project : Earthquake Damage Assessment

Sheet No. 5 of 17
Job No. 93-600-B00

Damage Assessment for : ORDOT/CHALAN PAGO ELEMENTARY SCHOOL

Executive Summary

1. This structure has been inspected and structural hazards due to earthquake damage have been found, as noted below. Classrooms Nos. 1 through 5 and Nos. 14 through 20, as well as the main office/library building appear usable relative to pre-earthquake conditions.
2. Remaining areas in the facility, including classrooms Nos. 6a through 13, and Nos. 21 through 28, have been damaged and safety is questionable. Enter only at own risk. Aftershocks or other events may result in injury or death.
3. Restrict use of the cafeteria to essential activities only until temporary repairs are completed.
4. A comprehensive inventory of all damage sustained and a complete and prioritized listing of all necessary repairs should be developed.
5. Preliminary cost estimate of permanent repairs = \$800,000.
6. A fully detailed structural evaluation should be made to determine long-term usability of this facility.
7. Report any unsafe conditions to local authorities; reinspection may be required.

Areas and Description of Significant Earthquake Damage (in order of repair priority)

1. 5th grade wing (rooms 25 through 28) most seriously damaged. Large cracks and spalls primary structural members.
2. 4th grade wing (rooms 21 through 24), 3rd grade (rooms 9 through 13) and Special Ed (rooms 8A & 8B) and cafeteria wings also structurally damaged with similar cracks and spalls primary structural members.

Areas of Minor Earthquake Damage

(minor damage is typically cracking of beams, columns, infill panels and partitions and separation cracks between structural frame and non-structural elements)

5th grade, 4th grade, 3rd grade and Special Ed, cafeteria wings

No other areas of damage were observed.

Please note that an analysis of the primary framing system was not performed. We are therefore, unable to give an opinion on the conformance of the structure with the requirements of the current building code.

The evaluation was limited to an assessment of the structural systems only and does not include the mechanical, plumbing or electrical systems.

by DOE
Room 5 needs to be fixed - 1 day job
then can be used ...

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done ✓
DPW

By : BWS Date: 09AUG93 Client : DOE, GUAM Sheet No. 6 of 17
Project : Earthquake Damage Assessment Job No. 93-600-B00

Damage Assessment for : TAMUNING ELEMENTARY SCHOOL

Executive Summary

1. This structure has been inspected and no structural hazards due to earthquake damage have been found, except as noted below. All classrooms appear usable relative to pre-earthquake conditions, upon completion of minor temporary repairs.
2. The concrete walkway between buildings "E" and "F" has been damaged and safety is questionable. Enter only at own risk. Aftershocks or other events may result in injury or death.
3. A broken waterline near the cafeteria should be repaired immediately.
4. A comprehensive inventory of all damage sustained and a complete and prioritized listing of all necessary repairs should be developed.
5. Preliminary cost estimate of permanent repairs = \$100,000.
6. The recommendations of a previously submitted fully detailed structural evaluation of this facility should be implemented as soon as possible.
7. Report any unsafe conditions to local authorities; reinspection may be required.

Areas and Description of Significant Earthquake Damage (in order of repair priority)

1. Concrete columns of walkway between buildings "E" and "F" are structurally damaged.
2. Buildings "E" and "F" are damaged with similar cracks and spalls primary structural members, particularly at beam/column connections.

Areas of Minor Earthquake Damage

(minor damage is typically cracking of beams, columns, infill panels and partitions and separation cracks between structural frame and non-structural elements)

All concrete buildings

No other areas of damage were observed.

Please note that an analysis of the primary framing system was not performed. We are, therefore, unable to give an opinion on the conformance of the structure with requirements of the current building code.

Our evaluation was limited to an assessment of the structural systems only and did not include the mechanical, plumbing or electrical systems.

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By : BWS Date: 09AUG93 Client : DOE, GUAM
Project : Earthquake Damage Assessment

Sheet No. 7 of 17
Job No. 93-600-B00

Damage Assessment for : J.P. TORRES ELEMENTARY SCHOOL

Executive Summary

1. This structure has been inspected and no structural hazards due to earthquake damage have been found. All classrooms appear usable relative to pre-earthquake conditions, upon completion of minor temporary repairs.
2. A comprehensive inventory of all damage sustained and a complete and prioritized listing of all necessary repairs should be developed.
3. Preliminary cost estimate of permanent repairs = \$50,000.
4. A detailed structural evaluation of this facility should be made to determine the long-term usability of this facility.
5. Report any unsafe conditions to local authorities; reinspection may be required.

Areas and Description of Significant Earthquake Damage (in order of repair priority)

None

Areas of Minor Earthquake Damage

(minor damage is typically cracking of beams, columns, infill panels and partitions and separation cracks between structural frame and non-structural elements)

All concrete buildings - most outside, some inside

No other areas of damage were observed.

Please note that an analysis of the primary framing system was not performed. We are, therefore, unable to give an opinion on the conformance of the structure with requirements of the current building code.

Our evaluation was limited to an assessment of the structural systems only and did not include the mechanical, plumbing or electrical systems.

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DOE

4

By : BWS Date: 09AUG93 Client : DOE, GUAM Sheet No. 8 of 17
Project : Earthquake Damage Assessment Job No. 93-600-B00

Damage Assessment for : AGANA HEIGHTS ELEMENTARY SCHOOL

Executive Summary

1. This structure has been inspected and no structural hazards due to earthquake damage have been found. All classrooms appear usable relative to pre-earthquake conditions, upon completion of minor temporary repairs.
2. A comprehensive inventory of all damage sustained and a complete and prioritized listing of all necessary repairs should be developed.
3. Preliminary cost estimate of permanent repairs = \$50,000.
4. A detailed structural evaluation of this facility should be made to determine the long-term usability of this facility.
5. Report any unsafe conditions to local authorities; reinspection may be required.

Areas and Description of Significant Earthquake Damage

Building No. 7 column and beam cracks

Areas of Minor Earthquake Damage

(minor damage is typically cracking of beams, columns, infill panels and partitions and separation cracks between structural frame and non-structural elements)

All concrete buildings

No other areas of damage were observed.

Please note that an analysis of the primary framing system was not performed. We are, therefore, unable to give an opinion on the conformance of the structure with requirements of the current building code.

Our evaluation was limited to an assessment of the structural systems only and did not include the mechanical, plumbing or electrical systems.

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1/2 day job

By : BWS Date: 11AUG93 Client : DOE, GUAM
Project : Earthquake Damage Assessment

Sheet No. 11 of 17
Job No. 93-600-B00

Damage Assessment for : TALOFOFO ELEMENTARY SCHOOL

Executive Summary

1. This structure has been inspected and no structural hazards due to earthquake damage have been found. All classrooms appear usable relative to pre-earthquake conditions, upon completion of minor temporary repairs.
2. A comprehensive inventory of all damage sustained and a complete and prioritized listing of all necessary repairs should be developed.
3. Preliminary cost estimate of permanent repairs = \$20,000.
4. A detailed structural evaluation of this facility should be made to determine the long-term usability of this facility.
5. Report any unsafe conditions to local authorities; reinspection may be required.

Areas and Description of Significant Earthquake Damage (in order of repair priority)

none

Areas of Minor Earthquake Damage

(minor damage is typically cracking of beams, columns, infill panels and partitions and separation cracks between structural frame and non-structural elements)

Primary wing, intermediate wing, kindergarten wing (classroom No. 6), girls bathroom, cafeteria/office wing, library

No other areas of damage were observed.

Please note that an analysis of the primary framing system was not performed. We are, therefore, unable to give an opinion on the conformance of the structure with requirements of the current building code.

Our evaluation was limited to an assessment of the structural systems only and did not include the mechanical, plumbing or electrical systems.

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DOE

- need help
in landings
1-2 days

By : BWS Date: 09AUG93 Client : DOE, GUAM
Project : Earthquake Damage Assessment

Sheet No. 9 of 17
Job No. 93-600-B00

Damage Assessment for : INARAJAN MIDDLE AND ELEMENTARY SCHOOL

5

POE -
concrete
sections
main

Executive Summary

1. This structure has been inspected and no structural hazards due to earthquake damage have been found. All classrooms appear usable relative to pre-earthquake conditions, upon completion of minor temporary repairs.
2. A comprehensive inventory of all damage sustained and a complete and prioritized listing of all necessary repairs should be developed.
3. Preliminary cost estimate of permanent repairs = \$50,000.
4. A detailed structural evaluation of this facility should be made to determine the long-term usability of this facility.
5. Report any unsafe conditions to local authorities; reinspection may be required.

Areas and Description of Significant Earthquake Damage
(in order of repair priority)

none

Areas of Minor Earthquake Damage

(minor damage is typically cracking of beams, columns, infill panels and partitions and separation cracks between structural frame and non-structural elements)

1. All concrete buildings
2. Some wooden beams in covered walkways are cracked

No other areas of damage were observed.

Please note that an analysis of the primary framing system was not performed. We are, therefore, unable to give an opinion on the conformance of the structure with requirements of the current building code.

Our evaluation was limited to an assessment of the structural systems only and did not include the mechanical, plumbing or electrical systems.

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less than
1/2 dg

By : BWS Date: 11AUG93 Client : DOE, GUAM
Project : Earthquake Damage Assessment

Sheet No. 10 of 17
Job No. 93-600-B00

Damage Assessment for : MERIZO ELEMENTARY SCHOOL

Executive Summary

1. This structure has been inspected and no structural hazards due to earthquake damage have been found. All classrooms appear usable relative to pre-earthquake conditions, upon completion of minor temporary repairs.
2. A comprehensive inventory of all damage sustained and a complete and prioritized listing of all necessary repairs should be developed.
3. Preliminary cost estimate of permanent repairs = \$15,000.
4. A detailed structural evaluation of this facility should be made to determine the long-term usability of this facility.
5. Report any unsafe conditions to local authorities; reinspection may be required.

Areas and Description of Significant Earthquake Damage (in order of repair priority)

none

Areas of Minor Earthquake Damage

(minor damage is typically cracking of beams, columns, infill panels and partitions and separation cracks between structural frame and non-structural elements)

"C" wing, "E" wing, office building

No other areas of damage were observed.

Please note that an analysis of the primary framing system was not performed. We are, therefore, unable to give an opinion on the conformance of the structure with requirements of the current building code.

Our evaluation was limited to an assessment of the structural systems only and did not include the mechanical, plumbing or electrical systems.

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By : BWS Date: 20AUG93 Client : DOE, GUAM
Project : Earthquake Damage Assessment

Sheet No.16 of 17
Job No. 93-600-B00

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Damage Assessment for : CARBULLIDO ELEMENTARY SCHOOL, BARRIGADA

Executive Summary

1. This structure has been inspected and structural hazards due to earthquake damage have been found, as noted below.
2. Structural elements in classrooms 16, 17, 18 & 19 have been damaged and safety is questionable. Do not use these areas until repairs have been made.
3. Preliminary cost estimate of repairs = \$25,000.
4. A fully detailed structural evaluation should be made to determine long-term usability of this facility.
5. Report any unsafe conditions to local authorities; reinspection may be required.

Areas and Description of Significant Earthquake Damage (in order of repair priority)

1. East and west sides of the block containing rooms 15 thru 20. Large cracks and spalls primary structural members.
2. South side of the block containing rooms 11 thru 14. Large crack and spall in walkway roof beam at building column.

Areas of Minor Earthquake Damage

(minor damage is typically minor cracking of beams, columns, infill panels, partitions, sidewalks and floors, and separation cracks between structural frame and non-structural elements)

1. Top of party wall between rooms 3 & 4.

No other areas of damage were observed.

Please note that an analysis of the primary framing system was not performed. We are, therefore, unable to give an opinion on the conformance of the structure with requirements of the current building code.

Our evaluation was limited to an assessment of the structural systems only and did not include the mechanical, plumbing or electrical systems.

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*less than
1 day*

By : BWS Date: 19AUG93 Client : DOE, GUAM Sheet No. 15 of 17
Project : Earthquake Damage Assessment Job No. 93-600-B00

4 g/r

Damage Assessment for : M. U. LUJAN ELEMENTARY SCHOOL

Executive Summary

1. This structure has been inspected and no structural hazards due to earthquake damage have been found, except as noted below. All classrooms appear usable relative to pre-earthquake conditions, upon completion of minor temporary repairs.
2. A comprehensive inventory of all damage sustained and a complete and prioritized listing of all necessary repairs should be developed.
3. Preliminary cost estimate of permanent repairs = \$5,000.
4. A detailed structural evaluation of this facility should be made to determine the long-term usability of this facility.
5. Report any unsafe conditions to local authorities; reinspection may be required.

Areas and Description of Significant Earthquake Damage (in order of repair priority)

None

Areas of Minor Earthquake Damage

(minor damage is typically minor cracking of beams, columns, infill panels, partitions, sidewalks and floors, and separation cracks between structural frame and non-structural elements)

- ① 1. Columns and beams in the cafeteria. These should be repaired to avoid subsequent spalling of concrete. *4 g/r*
2. Column concrete spalling and joint damage at walkway from cafeteria.
3. Sidewalk cracks outside classrooms 124/125
4. Cracks CMU walls in classrooms 106 through 115 ... *need to be fixed*
5. Surface cracks in interior roof beams of the library. *trim*
hairline

No other areas of damage were observed.

Please note that an analysis of the primary framing system was not performed. We are, therefore, unable to give an opinion on the conformance of the structure with requirements of the current building code.

Our evaluation was limited to an assessment of the structural systems only and did not include the mechanical, plumbing or electrical systems.

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By : BWS Date: 10AUG93 Client : DOE, GUAM
Project : Earthquake Damage Assessment

Sheet No. 12 of 17
Job No. 93-600-B00

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Damage Assessment for : AGAT ELEMENTARY SCHOOL

Executive Summary

1. This structure has been inspected and no structural hazards due to earthquake damage have been found, except as noted below. All classrooms appear usable relative to pre-earthquake conditions, upon completion of minor temporary repairs.
2. The walkway from the cafeteria has been damaged and its safety is questionable. Enter only at own risk. Aftershocks or other events may result in death or injury. Support columns appear to be repairable and should be repaired as soon as possible.
2. A comprehensive inventory of all damage sustained and a complete and prioritized listing of all necessary repairs should be developed.
3. Preliminary cost estimate of permanent repairs = \$30,000.
4. A detailed structural evaluation of this facility should be made to determine the long-term usability of this facility.
5. Report any unsafe conditions to local authorities; reinspection may be required.

Areas and Description of Significant Earthquake Damage (in order of repair priority)

Walkway roof from cafeteria

Areas of Minor Earthquake Damage

(minor damage is typically cracking of beams, columns, infill panels and partitions and separation cracks between structural frame and non-structural elements)

Intermediate wing, floor/ceiling cracks in classrooms Nos. 111 and 112, library, computer room, outdoor stage, fixture damage to metal buildings

No other areas of damage were observed.

Please note that an analysis of the primary framing system was not performed. We are, therefore, unable to give an opinion on the conformance of the structure with requirements of the current building code.

Our evaluation was limited to an assessment of the structural systems only and did not include the mechanical, plumbing or electrical systems.

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By : BWS Date: 10AUG93 Client : DOE, GUAM
Project : Earthquake Damage Assessment

Sheet No. 13 of 17
Job No. 93-600-B00

Damage Assessment for : INARAJAN HIGH SCHOOL

*DOE to
homicide*

Executive Summary

1. This structure has been inspected and structural hazards due to earthquake damage have been found, as noted below. All classrooms and other facilities, with the exception of the gymnasium and the eight classrooms of the "B" wing building appear usable relative to pre-earthquake conditions.
2. The gymnasium has been damaged and its safety is questionable. Enter only at own risk. Aftershocks or other events may result in injury or death.
3. The "B" wing next to the gymnasium has been seriously damaged and is unsafe. Enter only at own risk. Aftershocks or other events may result in injury or death.
4. A comprehensive inventory of all damage sustained and a complete and prioritized listing of all necessary repairs should be developed.
5. Preliminary cost estimate of permanent reconstruction and repairs = \$4,100,000.
6. A fully detailed structural evaluation should be made to determine long-term usability of this facility.
7. Report any unsafe conditions to local authorities; reinspection may be required.

Areas and Description of Significant Earthquake Damage (in order of repair priority)

1. The "B" wing has significant structural damage on both the first and second floors to all structural components, stairwells, and the elevator.
2. The gymnasium has significant structural damage to all 24 supporting columns and to the roof.

Areas of Minor Earthquake Damage

(minor damage is typically cracking of beams, columns, infill panels and partitions and separation cracks between structural frame and non-structural elements)

Library
Library, cafeteria, "D" wing first and second floors, "E" wing, "G" wing, gymnasium locker room, gymnasium annex, and main office

No other areas of damage were observed.

Please note that an analysis of the primary framing system was not performed. We are, therefore, unable to give an opinion on the conformance of the structure with requirements of the current building code.

Our evaluation was limited to an assessment of the structural systems only and did not include the mechanical, plumbing or electrical systems.

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By : BWS Date: 19AUG93 Client : DOE, GUAM
Project : Earthquake Damage Assessment

Sheet No. 14 of 17
Job No. 93-600-B00

Damage Assessment for : PITI MIDDLE SCHOOL

Executive Summary

1. This structure has been inspected and no structural hazards due to earthquake damage have been found. All classrooms appear usable relative to pre-earthquake conditions, upon completion of minor temporary repairs.
2. A comprehensive inventory of all damage sustained and a complete and prioritized listing of all necessary repairs should be developed.
3. Preliminary cost estimate of permanent repairs = \$20,000.
4. A detailed structural evaluation of this facility should be made to determine the long-term usability of this facility.
5. Report any unsafe conditions to local authorities; reinspection may be required.

Areas and Description of Significant Earthquake Damage
(in order of repair priority)

none

Areas of Minor Earthquake Damage

(minor damage is typically minor cracking of beams, columns, infill panels, partitions, sidewalks and floors, and separation cracks between structural frame and non-structural elements)

Sidewalk of building G00451, bathroom of building G00454, buildings G00455, G00456, G00457, building west of G00457, columns, roof and sidewalk of walkway from G00451 to cafeteria, ramp of building T3, sidewalk of Voyagers building and industrial arts building,

No other areas of damage were observed.

Please note that an analysis of the primary framing system was not performed. We are, therefore, unable to give an opinion on the conformance of the structure with requirements of the current building code.

Our evaluation was limited to an assessment of the structural systems only and did not include the mechanical, plumbing or electrical systems.

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By : BWS Date: 20AUG93 Client : DOE, GUAM
Project : Earthquake Damage Assessment

Sheet No.17 of 17
Job No. 93-600-B00

Damage Assessment for : LBJ ELEMENTARY SCHOOL, TAMUNING

Executive Summary

1. This structure has been inspected and no structural hazards due to earthquake damage have been found. All classrooms appear usable relative to pre-earthquake conditions.
2. A fully detailed structural evaluation should be made to determine long-term usability of this facility.
3. Report any unsafe conditions to local authorities; reinspection may be required.

Areas and Description of Significant Earthquake Damage

None

Areas of Minor Earthquake Damage

None

Please note that an analysis of the primary framing system was not performed. We are, therefore, unable to give an opinion on the conformance of the structure with requirements of the current building code.

Our evaluation was limited to an assessment of the structural systems only and did not include the mechanical, plumbing or electrical systems.



inc.

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~~Dean Gillham, President~~

August 22, 1993

Department of Education
P.O. Box DE
Agana, Guam 96910

Attention: Dr. Franklin Quitugua

Subject: J.Q. San Miguel Elementary School
Assessment of damages due to Earthquake of August 8, 1993

Dear Dr. Quitugua:

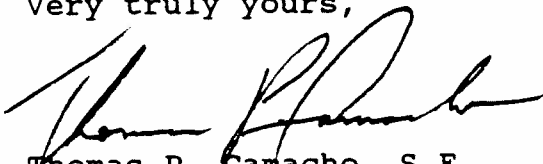
Our summary of the earthquake damage and assessment during our inspection on August 20 and 21 are as follows:

1. The structures sustained very minor earthquake damage. The observed damage had negligible effect on the ability of the primary structural system to resist vertical and horizontal loads. We did not observe any damage that poses a hazard to the occupants.
2. We observed hairline cracks in the beams, roof slab and masonry wall joints. Most of the cracks were existent prior to the earthquake as evidenced by dark mildew and water stains around the cracks.

We have not made a structural analysis of the structural system and therefore have no opinion on the ability of the structural system to resist Code specified horizontal and vertical loading (either before or after the earthquake). Our opinion is limited to a comparison of the load resisting capabilities before and after the referenced earthquake.

Repairs should be made using materials specifically recommended by the manufacturer for use in the repair of structural concrete. The repair work should be performed by skilled workmen. The repair procedures should be approved, and monitored by a professional engineer.

Very truly yours,



Thomas P. Camacho, S.E.
Vice President

TPC/sjc



inc.

consulting
engineers

~~Dear Gillham, President~~

August 22, 1993

Department of Education
P.O. Box DE
Agana, Guam 96910

Attention: Dr. Franklin Quitugua

Subject: Harmon Loop Elementary School
Assessment of damages due to Earthquake of August 8, 1993

Dear Dr. Quitugua:

Our summary of the earthquake damage assessment during our inspection on August 20, 1993 are as follows:

The structure sustained minor earthquake damage. The observed damage had negligible effect on the ability of the primary structural system to resist vertical and horizontal loads.

The damages we observed are as follows:

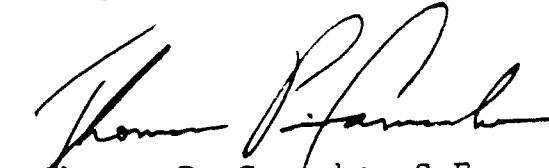
1. Wall cracks were observed at the Office Building, Library and Classrooms. These are minor cracks and majority appear to have existed before the referenced earthquake. Also minor vertical cracks were observed in the Cafeteria Bathroom walls.
2. Cracks on top of masonry columns supporting beams along the hallway.
3. Spalled upper roof deck due to rebar corrosion (non-earthquake related).
4. Temporary wood structures slightly shifted laterally from the masonry foundation. No distress to the structure was observed.

We have not made a structural analysis of the structural system and therefore have no opinion on the ability of the structural system to resist Code specified horizontal and vertical loading (either before or after the earthquake). Our opinion is limited to a comparison of the load resisting capabilities before and after the referenced earthquake.

August 22, 1993
Dr. Franklin Quitugua
Page 2

Repairs should be made using materials specifically recommended by the manufacturer for use in the repair of structural concrete. The repair work should be performed by skilled workmen. The repair procedures should be approved, and monitored by a professional engineer.

Very truly yours,



Thomas P. Camacho, S.E.
Vice President

TPC/sjc



consulting
engineers

Dean Gillham, President

August 22, 1993

Department of Education
P.O. Box DE
Agana, Guam 96910

Attention: Dr. Franklin Quitugua

Subject: George Washington High School
Assessment of damages due to Earthquake of August 8, 1993

Dear Dr. Quitugua:

Our summary of the earthquake damage assessment during our inspection on August 20 is as follows:

1. Overall, the campus structures sustained very slight damage as a result of the August 8 earthquake. Except for the items listed below, the damage we observed is not, in our opinion, significant enough to impair the structures' abilities to withstand vertical and horizontal (earthquake/typhoon) loading.
2. Loose fragments of spalled concrete and masonry were observed at numerous locations throughout the campus. Access to these areas should be restricted until this loose material, which represents a falling debris hazard, can be removed and repaired.
3. Four areas of concern are:
 - a. The corner column between Rooms B100 and B101. Cracks observed below the beam column joint on the exterior and interior faces of the column. The loose concrete should be removed to allow a closer inspection of the column prior to repair.
 - b. The corner column outside Room A105. Cracks were observed on the exterior and interior faces of the column, below the beam column joint, and concrete has spalled at the cracks. We recommend that the beam be shored, and the loose concrete removed to allow a close inspection of the column prior to repair.

- c. The corner column outside of Room A109, and the walkway slab outside of Room A208 above. Cracks were observed on the exterior and interior faces of the column, below the beam column joint, and concrete has spalled at the cracks. A diagonal crack, portions of which were present before the earthquake, was observed on the top of the 2nd floor walkway slab. We recommend that the beams framing into the column, and the slab, be shored, and the loose concrete removed to allow a close inspection of the column prior to repair. The crack in the slab should also be investigated to determine its depth, prior to repair. The hallways between the restrooms and A109, as well as above between the restrooms and A208, should be restricted from access. In addition, the CMU shear wall outside of Room A109 displayed a horizontal shear crack down its length under the top course of blockwork. This crack should be repaired immediately.
- d. The exterior wall outside of the guidance office. This is a CMU infill wall, which does not have adequate connection to the beam above. A permanent displacement of over an inch was observed at the top of the wall, indicating that the wall moved freely during the earthquake. No damage to the wall was observed. We recommend that the wall be attached to the beam above using an appropriate detail, to provide adequate bracing in the event of future earthquakes.

The damage we observed in the rest of the structures is as follows:

1. Most of the cracks we observed were between the concrete framing and the CMU infill walls. These cracks do not significantly affect the structure. However, they should be repaired immediately, as they may cause concern among the occupants of the structures, and because they allow water to enter the walls with exterior exposure. The encroaching moisture can cause the embedded rebar to rust, leading to spalling and further corrosion, resulting in more damage.
2. Some minor cracking was observed in some of the frame members, notably in the overhanging walkways and outdoor walkway canopies. These should also be repaired for the reasons stated in item #1 above.
3. Cracking and spalling was observed at many of the expansion joints, which was the result of the structures butting against each other during the earthquake. This damage should also be repaired immediately to prevent corrosion problems.

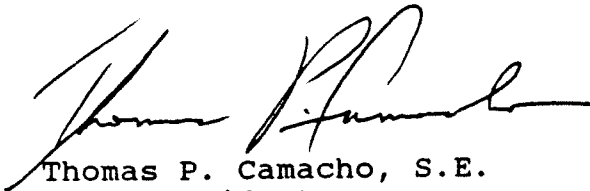
August 22, 1993
Dr. Franklin Quitugua
Page 3

4. Some loose blockwork was observed in the CMU walls in the gymnasium locker room and offices. These loose pieces should be removed immediately, as they are a falling debris hazard. We recommend that access to these areas be restricted until the removal of debris is completed.

We have not made a structural analysis of the structural system and therefore have no opinion on the ability of the structural system to resist Code specified horizontal and vertical loading (either before or after the earthquake). Our opinion is limited to a comparison of the load resisting capabilities before and after the referenced earthquake.

Repairs should be made using materials specifically recommended by the manufacturer for use in the repair of structural concrete. The repair work should be performed by skilled workmen. The repair procedures should be approved, and monitored by a professional engineer.

Very truly yours,



Thomas P. Camacho, S.E.
Vice President

TPC/sjc

August 22, 1993

Department of Education
P.O. Box DE
Agana, Guam 96910

Attention: Dr. Franklin Quitugua

Subject: P.C. Lujan Elementary School
Assessment of damages due to Earthquake of August 8, 1993

Dear Dr. Quitugua:

Our summary of the earthquake damage assessment during our inspection on August 20 are as follows:

1. The structures sustained minor earthquake damage. The observed damage had negligible effect on the ability of the primary structural system to resist vertical and horizontal loads. Areas or items that pose a hazard to the occupants are noted below.
2. Loose fragments of concrete or masonry should be removed. Restrict use of areas where loose fragments occur until repairs are completed.
3. The entrance walkway from the parking lot to the cafeteria had been cordoned off prior to our inspection due to the spalling plaster on the CMU walls. Keep the area secured. Although damage is minor and repairable, the stability of the original structure is questionable. Further structural investigation will be required and proper repair procedures determined.

The damages we observed are as follows:

1. Spalls in the main office walls and construction joint cracks in the CMU walls.
2. Spalls on the concrete roof slab, at the expansion joints.
3. Spalls on the concrete roof slab bottom around the pipe columns of covered walkway.
4. Adjacent to Room 5 over the walkway, a portion of masonry infill panel between the walkway roof and main roof shattered leaving a hole approximately 8" x 18". This damage occurred

August 22, 1993
Dr. Franklin Quitugua
Page 2

because the infill was constructed continuously across an expansion joint. No reinforcing was visible in the damaged portion of the infill.

5. In the classrooms, cracks were observed at masonry wall corners, horizontal vertical joints, and window sills. Spalls were observed in the masonry, usually at the column joints. These are typical of damage all throughout the building between Rooms 1 through 24. Roof slab cracks were observed in several classrooms but these are old cracks not related to the referenced earthquake.
6. Hairline cracks were observed at the exterior wall/beam joint of Room 28 and interior walls/beam of Room 30.
7. Masonry wall corner cracks and exterior masonry spalls were observed at the Library and adjacent classrooms. Several of the cracks have loose fragments of masonry blocks.
8. Diagonal shear cracks in the masonry walls were observed on Room 102/103 and joint cracks in stepped diagonal pattern were observed in Rooms 105/106.

We have not made a structural analysis of the structural system and therefore have no opinion on the ability of the structural system to resist Code specified horizontal and vertical loading (either before or after the earthquake). Our opinion is limited to a comparison of the load resisting capabilities before and after the referenced earthquake.

Repairs should be made using materials specifically recommended by the manufacturer for use in the repair of structural concrete. The repair work should be performed by skilled workmen. The repair procedures should be approved, and monitored by a professional engineer.

Very truly yours,



Thomas P. Camacho, S.E.
Vice President

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