

REPORT OF BUILDING INSPECTIONS TECOLUCA, EL SALVADOR

Prepared by:
Global Village Engineers

23 JANUARY, 2001

23 January 2001

Senor Carlos Cortez Hernandez
Alcaldia Municipal de Tecoluca
San Vicente, El Salvador

REPORT OF BUILDING INSPECTIONS

Dear Señor Hernandez:

Global Village Engineers is pleased to submit this report of selected building evaluations. The municipal offices, market, and church and parochial school were evaluated for visible damage caused by the earthquake of 13 January, 2001. Our intent was to identify the most severely damaged structures that could present a potential immediate danger to inhabitants. This evaluation should not be used in lieu of a more detailed professional structural evaluation. Our recommendations regarding the condition of the structures are included at the end of each inspection report.

Should you have any questions or require additional information, please do not hesitate to contact us. Thank you for the opportunity to be of service to the Town of Tecoluca.

Sincerely,

M. Christopher Shimklin
Executive Director

c: S. Stowell (SHARE)
W. Callendar (Voices on the Border)
M. Shimkin

SITE: **MUNICIPAL BUILDING**
Tecoluca, El Salvador

BUILDING DESCRIPTION:

The Tecoluca Municipal Building is a two-level structure, with a rear section lower due to topography. Both levels are single story, constructed on a concrete slab on-grade with masonry brick exterior walls and interior partitions. Walls and partitions are finished with plaster. Steel truss rafters and stringers support a suspended ceiling and peaked tile roof on the main upper level. The building is reportedly approximately 16 years old (constructed circa 1984).

The building location is 13° 22.91 N; 88° 45.19 W.

OBSERVATIONS:

In general, the structure did not appear to be severely damaged by the earthquake nor an immediate danger to inhabitants. Damage to adjoining structures may present a danger in one area of the building. The suspended ceiling in the main front portion of the building had been removed. All door frames appear straight and plumb throughout. One pane of glass fell out from the window under the bent rafter near the main door (see Area 7 below). The floor slab and tiles were not observed to be cracked. None of the walls were observed to have cracks with an offset, in which two pieces of the same wall had separated. Several roof tiles were missing.

The building is currently being used for normal business operations.

The following specific observations were made, as shown on **Figure 1**:

Area 1: Small cracks in the interior wall plaster, < 1mm wide.

Area 2: Small crack ~1mm wide, from top of partition ~1m toward floor.

Area 3: Crack between floor slab and wall, ~1cm wide. Apparently caused by differential movement between slab on backfill, and wall which has a footing on native soil at the lower level.

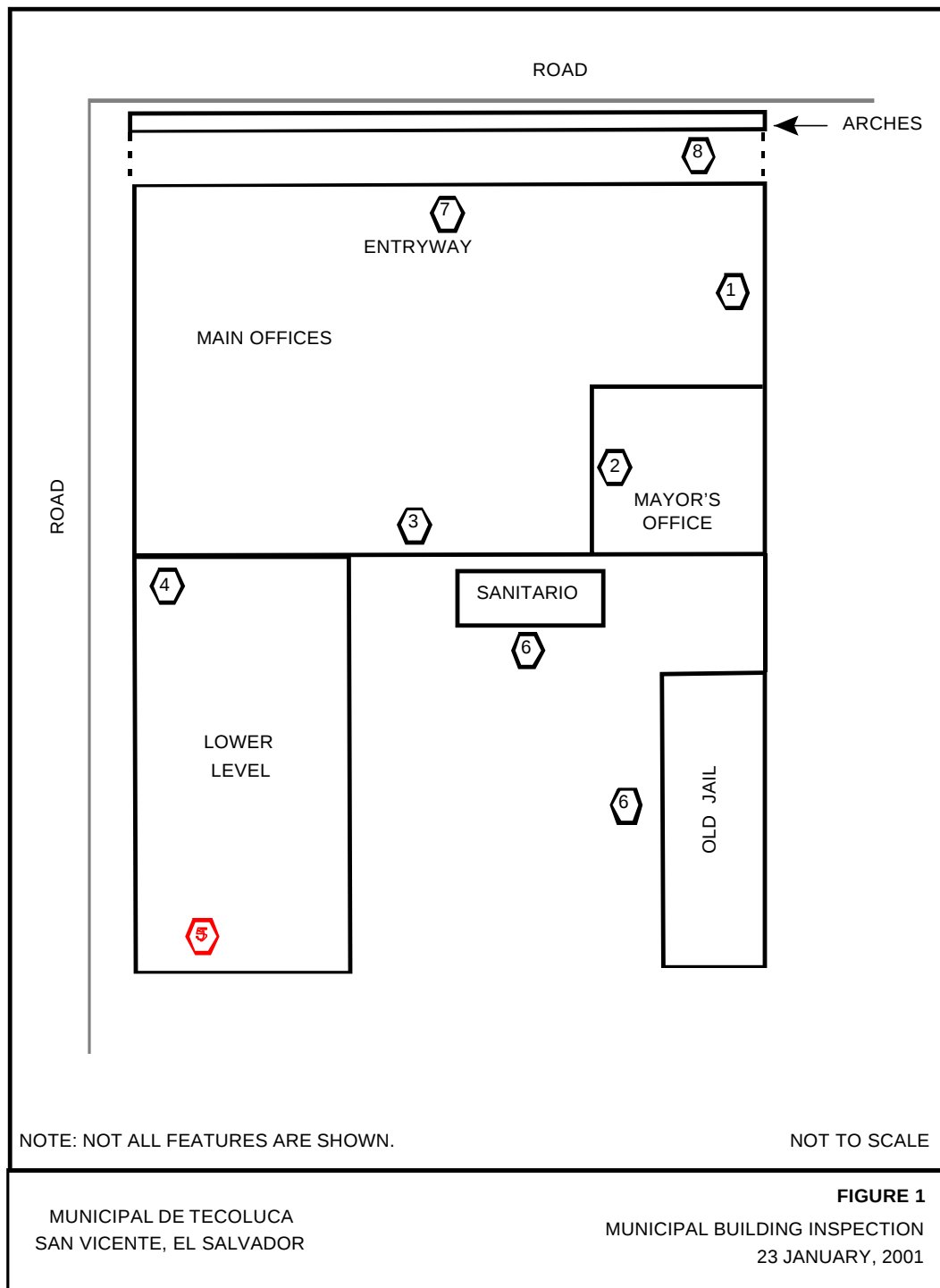
Area 4: Corner crack, from floor to top of wall, visible from interior and exterior. This is apparently a separation of the interior wall from the exterior wall.

Area 5: Small vertical cracks on the interior wall from floor to top of wall are apparently due to the collapse of the adjacent adobe brick building onto the exterior of this wall. **This room should not be inhabited until the collapsed building can be removed from contact with the exterior wall.**

- Area 6: In the rear courtyard, the sanitario and old jail buildings were damaged. These structures were not connected to the municipal building, and are scheduled to be removed. They are not impacting the municipal building.
- Area 7: In the main entryway and waiting area of the municipal building, one of the roof steel truss rafters was apparently bent by the earthquake. Both the top and bottom members of the rafter are bent, as well as the truss ties near the exterior wall. This rafter did not appear to be close to failure and the other roof support members were apparently not damaged.
- Area 8: The concrete arches supporting the front sidewalk roof had small cracks ~1-2mm wide across the middle of each column and at the peak of each archway. The arch wall appeared straight and plumb to the eye.

RECOMMENDATIONS:

1. [Figure 1, Area 5] The rear room should not be inhabited until the collapsed building can be removed from contact with the exterior wall.
2. The bent rafter in the main room should be removed and replaced before the permanent roof tiles and suspended ceiling are replaced. In the interim, steel laminate roofing which is lighter should be used to keep out weather.
3. [Figure 1, Area 4] The corner crack should be sealed from the exterior to prevent rainwater from entering the structure.
4. The plaster should be removed from all small cracks to allow an inspection of damage underneath. Loose mortar should be removed and the bricks re-mortared before replastering and painting. This applies to the building walls and the front arches. Note: more significant damage may become apparent after the plaster is removed, such as crushed bricks. In that event, an additional inspection by an engineer or brick mason experienced in building construction should be conducted to determine if more extensive repairs are needed.
5. The exterior sanitario and old jail should be removed as planned.



SITE: **MUNICIPAL MARKET**
Tecoluca, El Salvador

BUILDING DESCRIPTION:

The Tecoluca Market building is a single-level structure, constructed on a concrete slab on-grade with masonry brick exterior walls and interior partitions. Interior concrete/steel reinforced columns and beams support the roof system, including a rectangular roof drainage sluice box ~1m wide. Walls and partitions are finished with plaster. Steel truss rafters and stringers support a peaked tile roof. There are stone masonry walls adjacent to the building on the exterior, and one penetrating the middle of the building (perhaps part of an earlier footprint that was expanded).

OBSERVATIONS:

In general, the structure did not appear to be severely damaged by the earthquake nor an immediate danger to inhabitants, except as noted below in one area. The floor slab and tiles were not observed to be cracked. Several roof tiles were missing.

The building is currently not in use for normal business operations.

The following specific observations were made, as shown on **Figure 2**:

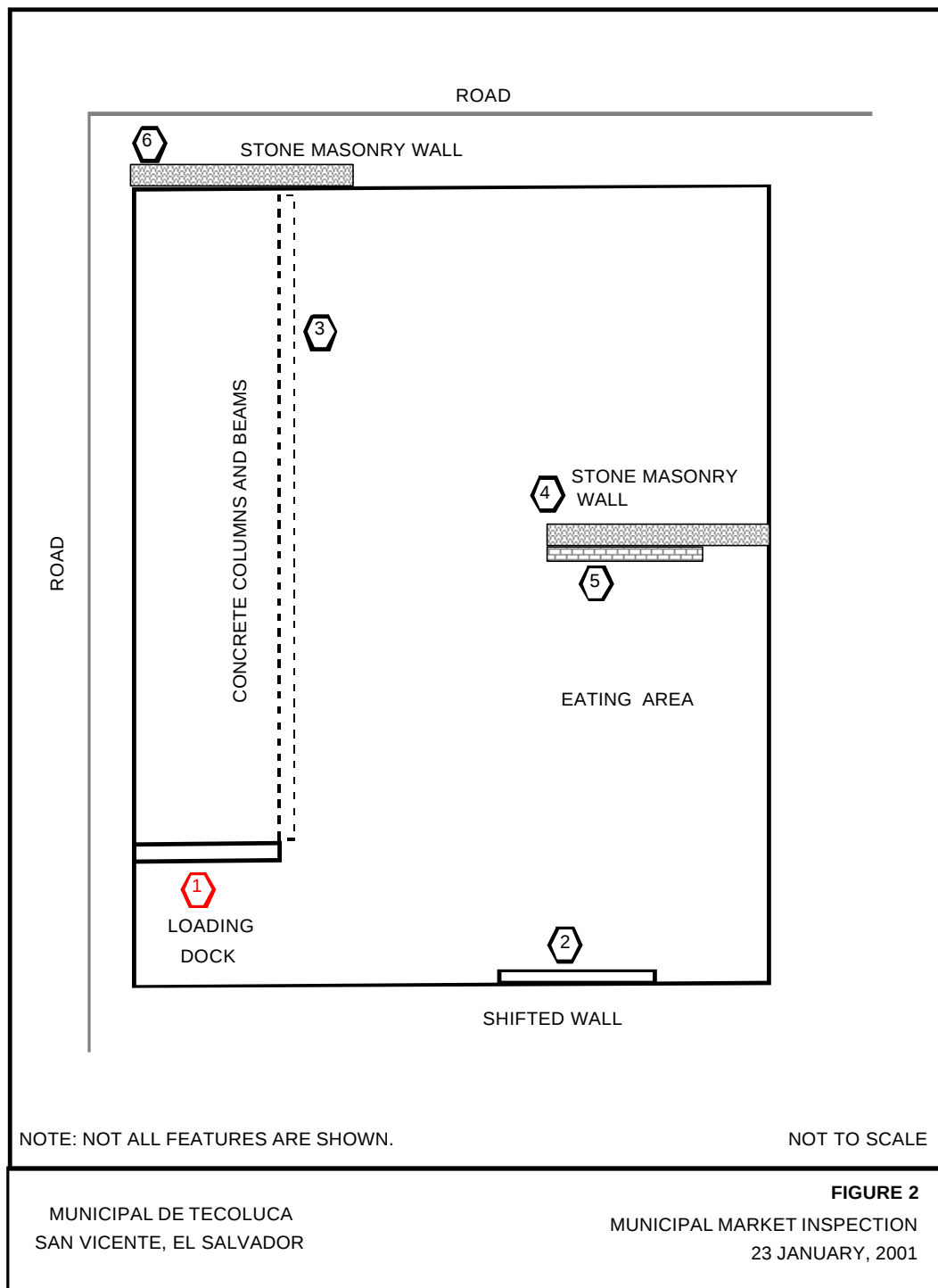
- Area 1: The inside wall adjacent to the loading dock apparently moved significantly during the earthquake. The wall has separated from supporting sidewalls and columns, and is leaning toward the loading dock area. The only apparent support for the wall is a steel truss extending between the loading dock walls, that also supports the dock doors. **This wall represents a dangerous condition, and should be removed. All access to the loading dock should be restricted until the wall is removed.**
- Area 2: A portion of exterior wall above the supporting sill has shifted out. The shifted piece is attached to steel stringers that support roof tiles, so further shifting may cause roof damage.
- Area 3: One of the concrete beams supporting the drainage box had a horizontal crack along the middle of the beam. This crack appeared to be minor (<1mm wide), and not a structural problem.
- Area 4: The stone masonry wall that penetrates the middle of the building (adjacent to the eating area) extends above the roofline. Several of the large stones at the top of the wall came loose during the earthquake, and fell through the tile roof. It appears that other stones at the top of the wall may be loose. The wall should be repaired to keep more stones from falling. The wall as a whole appears stable.

Area 5: A brick/plaster wall against the stone wall (adjacent to the eating area) has two long diagonal cracks. These appear to be due to loosened mortar between bricks. The wall otherwise appears straight and plumb.

Area 6: An exterior stone masonry wall, adjacent to but not part of the market building wall, is tilted out toward the sidewalk and street. This wall may continue to fall out.

RECOMMENDATIONS:

1. [Figure 2, Area 1] The loading dock entrance should be closed immediately. The damaged wall should be replaced entirely and not repaired in-place.
2. [Figure 2, Area 2] The portion of shifted exterior wall should be repaired, but does not appear to be an immediate danger. This portion of wall could be removed and replaced, or possibly pushed back into place and secured from further movement by steel or concrete support installed on the exterior.
3. [Figure 2, Area 4] The top of the middle stone masonry should be repaired before inhabitants are allowed in this area of the building.
4. [Figure 2, Area 5] The eating area brick wall plaster should be removed from the cracks to allow an inspection of damage underneath. Loose mortar should be removed and the bricks re-mortared before replastering and painting. Note: more significant damage may become apparent after the plaster is removed, such as crushed bricks. In that event, an additional inspection by an engineer or brick mason experienced in building construction should be conducted to determine if more extensive repairs are needed.
5. [Figure 2, Area 6] The exterior stone masonry wall should be removed, with access restricted next to the wall until this occurs.



SITE: **CHURCH AND PAROCHIAL SCHOOL BUILDING**
Tecoluca, El Salvador

BUILDING DESCRIPTION:

The Church building complex includes a two-story high sanctuary with two front towers, and single story school and office rooms. The sanctuary and newer rooms and offices are constructed on a concrete slab on-grade with masonry brick exterior walls and interior partitions. An older section of unused rooms is constructed of adobe bricks and plaster. A free-standing Sunday School structure extends from the sanctuary, and walls ~3m high define a courtyard next to the sanctuary and Sunday School. Building walls and partitions are finished with plaster. Steel truss rafters and stringers support peaked tile roofs on the sanctuary, and on the newer buildings also which have suspended ceilings. The Sunday School has a steel laminate roof.

The building location is 13° 32.27 N; 88° 46.90 W.

OBSERVATIONS:

The sanctuary structure and old adobe buildings appeared the most damaged by the earthquake. However, except for the adobe buildings, none of the walls were observed to have cracks with an offset, in which two pieces of the same wall had separated. All door frames appear straight and plumb throughout. The floor slabs and tiles were not observed to be cracked. Several roof tiles were missing.

The building is not currently being used for normal operations. The school classes are scheduled to resume on 29 January, 2001.

The following specific observations were made, as shown on **Figure 3**:

- Area 1: Small vertical cracks on the interior wall of the secretarial office from floor to top of wall are apparently due to the collapse of the adjacent adobe brick building onto the exterior of this wall. **This room should not be inhabited until the collapsed building can be removed from contact with the exterior wall.**
- Area 2: The old adobe buildings next to the sanctuary appeared severely damaged. They do not appear to be impacting the other buildings.
- Area 3: The Sunday School structure had concrete missing from the top of the wall where steel roof rafters attach. This condition does not appear to be a structural problem.

Area 4: The following was observed in the main entranceway of the sanctuary:

- a. The entire rear section appeared structurally detached from the sanctuary sidewalls. Cracks 1-5mm wide from floor to top of wall were observed in both corners between the sanctuary walls and the columns of the rear section. These cracks extended from the interior through to the exterior, indicating full separation.
- b. The interior rear wall had areas where plaster and portions of brick and mortar were missing, particularly at the peak of the arch over the main doors. Similar damage occurred on the exterior of the wall over the arch peak. Large sections of plaster had fallen from the exterior of the rear wall.
- c. The concrete beams on the interior of the rear section had damage along the bottom of the beam, where concrete had come off revealing the steel reinforcement.
- d. Small cracks <1mm wide were evident between the stairs to the towers and the side wall.

Area 5: In the front of the sanctuary, the entire altar had shifted 5-10 cm to the front toward the wall. The tiled raised step behind the altar was damaged around its edges. The front wall had a long horizontal crack 1-2 cm wide, extending from the top of the sidewall. This wall showed no evidence of cracking or movement when viewed from the exterior.

Area 6: On the courtyard side of the sanctuary there are two attached alcoves that open into the sanctuary. The foundations of these alcoves were damaged.

RECOMMENDATIONS:

1. [Figure 3, Area 1] The secretarial room should not be inhabited until the adjoined collapsed building can be removed from contact with the exterior wall.
2. [Figure 3, Area 2] The old adobe buildings should be removed and should not be used or inhabited.
3. [Figure 3, Area 3] The concrete on the top of the Sunday School walls should be repaired; however, there does not appear to be immediate danger from this condition.
4. [Figure 3, Area 4] The main entranceway of the sanctuary should not be used until a more detailed assessment can be made by an engineer or contractor experienced in church building construction. Churches in other towns with the same design suffered major damage to this part of the building, and there is concern that further aftershocks could result in additional significant damage to this church. The church officials that accompanied the inspection indicated that a side entrance could be used for services.

5. [Figure 3, Area 5] The front wall of the church should have the plaster removed from the cracks to allow an inspection of damage underneath. Loose mortar should be removed and the bricks re-mortared before replastering and painting. Note: more significant damage may become apparent after the plaster is removed, such as crushed bricks. In that event, an additional inspection by an engineer or brick mason experienced in building construction should be conducted to determine if more extensive repairs are needed.
6. The raised step to the altar should be repaired before the altar is repositioned.
7. [Figure 3, Area 6] The exterior foundations under the sanctuary alcoves should be repaired to prevent separation of the alcoves from the sanctuary wall.

