June 28, 2017

Ms. Kelly Hubbard
Emergency Services Manager
WATER EMERGENCY RESPONSE ORGANIZATION OF ORANGE COUNTY
18700 Ward Street
Fountain Valley, CA 92708

Subject: ***Seismic Assessment of the South Emergency Operations Center***
26081 Via Pera, Mission Viejo, CA 92691
IDS Job Number: 17S020

Dear Ms. Hubbard:

Per your request, IDS Group, Inc. (IDS) has performed a seismic assessment of the South Emergency Operations Center (EOC) for the Water Emergency Response Organization of Orange County (WEROC) located at 26081 Via Pera in Mission Viejo, California. This letter presents our opinions, observations, and conclusions based upon our assessment.

Background

We understand that WEROC has been preparing a thorough assessment of their (EOC) facilities and that the requested seismic assessment is part of that program.

The South EOC building has been designated by WEROC as a Risk Category IV facility. The EOC's principal function is to provide an office space to host emergency water resources personnel during critical events. This space is intended to be used as a communications and resource coordination hub.

Purpose

The purpose of this project is to provide a seismic assessment of the WEROC South EOC, and make recommendations, as needed. We understand that their primary concerns are the:

1) Life-safety protections of employees or volunteers working at the facility.

2) Ability of the facility to continue serving as an EOC following anticipated shaking.

Scope

Our scope of services involved the following:

1. Visit the site to verify building framing conformance with available record drawings, document the condition of the building including identifying areas of obvious damage, corrosion, cracking or settlement.

2. Prepare calculations, as needed, for various structural elements in relation to the seismic force requirements of the 2016 California Building Code.

3. Prepare this building assessment letter report recommending seismic modifications/ retrofits, as required per the 2016 California Building Code and prepare simple structural drawings as needed for the recommended seismic retrofit, (if any).

Building Description

The EOC building is a one-story manufactured steel building with overall dimensions of 24 feet by 100 feet in plan and 12 feet in height at its eave [Photos 1 to 6]. The available record drawings [Ref. 1], and placards on the building indicate that it was manufactured by Soule Buildings. Based on these record drawings, the building was designed in 1977. Based on information provided by WEROC, it was constructed in 1981. The building is partitioned into two distinct areas; an unfinished garage area is located in the south third of the building and the EOC and office areas with interior finishes are located at the northern two-thirds of the building [Figure 1]. A concrete masonry vault structure exists in the northwest corner of the building. The building sits on a level pad at the base of a low hill to the south with a small valley for a water storage tank to the east. Several other buildings are located on this site but are located across an asphalt paved drive aisle from this building.

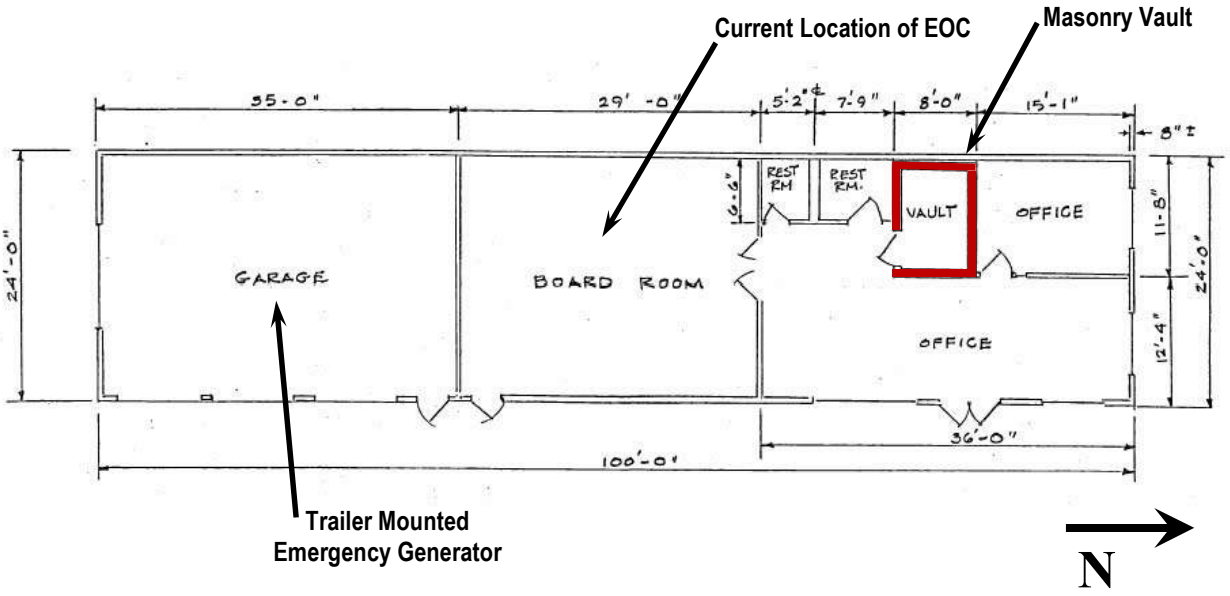

Figure 1: Basic Building Layout Plan

The vertical load resisting system of the building relies on metal deck roofing spanning to 7-inch deep, 16 gauge, z-purlins typically spaced at approximately 5 feet on center. The z-purlins span to steel rigid frames that are aligned across the short direction of the building and typically spaced at 20 feet on center. No frame exists at the south end of the building, instead, this wall line is framed with steel channel posts and wind girts. The building sits atop a concrete slab on grade which serves as the building's floor and foundation transferring the building weight to the site soils.

The building's lateral force resisting system [shown in Figure 2] includes one bay of horizontal tension-only rod bracing at the middle of the building for resisting forces in the longitudinal direction. That bracing is intended to collect lateral forces from building elements and transfer them to the east and west sides of the building where vertical tension-only strap bracing is connected to the building's frame columns. This strap bracing then transfers the lateral forces down to anchor bolt connections at the bases of rigid frame columns for transfer to the concrete slab on grade foundation. In the transverse direction of the building, five regularly spaced rigid frames serve to collect and resist the building's lateral forces. These rigid frames have bolted beam to column connections and pin-based columns with anchor bolts that transfer the lateral forces to the concrete slab on grade foundation.

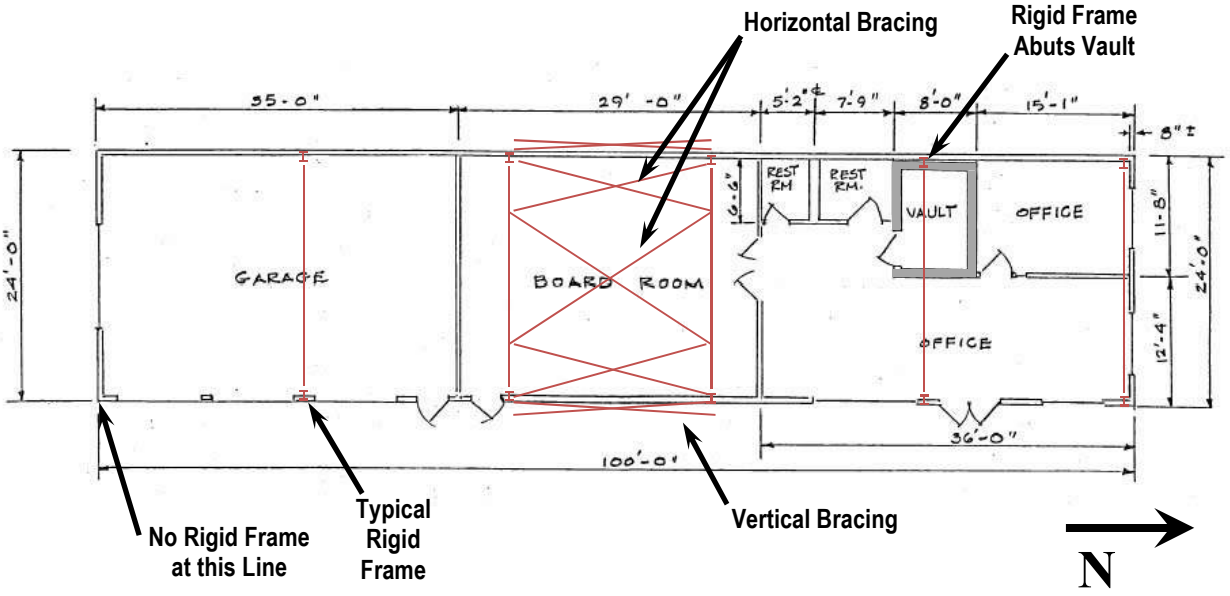

Figure 2: Layout of Lateral Force Resisting System

Summary of Site Observations

David Pomerleau, structural engineer of IDS visited the site on June 6, 2017 and performed a visual observation of the readily accessible areas of the building. No testing or destructive investigation was conducted during this visit. In general, the building appears to be consistent with the available plans. In the office areas, the structural elements were generally not visible due to the finishes present. Overall, the building appears to be in good condition. The following items were noted during our site visit:

- Roof Panel Deterioration – Several locations of roof panel deterioration and damage were observed. At the south end of the building, six areas of apparent prior repairs were observed [Photos 4 and 7 to 10]. These areas are regularly spaced toward the outside edges of the building and are approximately 3 feet by 4 feet in size. Additionally, several locations toward the northwest corner of the building were observed having small areas of efflorescence and corrosion on the underside of the roof panels [Photo 21]. The efflorescence and corrosion areas in these locations were generally smaller than 1 foot square.

- Non-compliant Ceiling – The ceilings were observed to be supported and braced with undersized wires (0.0625-inch diameter instead of 0.106-inch diameter), to not have compression bracing, and to have wires without proper connections or wrapping. Perimeter ceiling support angles were also observed to be too small and irregularly anchored to

properly support the ceiling grid [Photos 19, 22 to 24]. The grid near the south exterior door to the EOC room was also observed to have several panels that were loose close to falling from the grid [Photo 27].

- Light Fixture Supplemental Support Wires Non-compliant – The light fixtures in the ceiling system were generally observed to have supplemental support wires at opposite corners of each fixture, but the wires were undersized (similar to the ceiling support wires) and were often improperly installed (also similar to the ceiling) [Photos 25 and 26].

- Interior Partition Bracing – Interior partitions were observed to have steep bracing to z-purlin members at locations without blocking or stability bracing. [Photos 28 and 29]. Along the perimeter of the building, the partitions appeared to be anchored and braced at their mid-height to the exterior wall wind girt members [Photo 30]. These partitions did not appear to have bracing at their top.

- Computer Equipment Not Anchored – Computer equipment presumed critical to the emergency operations was generally observed to have no seismic restraint or seismic straps and anchors that were not engaged [Photo 30]. Other equipment was also found to have no anchors or straps [Photos 31 to 35].

- Contents Not Anchored – A tall and narrow book case was observed to not be anchored although restraint angles were present at its top [Photos 35 and 36]. Several maps in the EOC room were observed to have support clips without sufficient seismic restraint [Photo 37].

- Exterior Mechanical Equipment Not Anchored – A single mechanical unit exists on the west side of the building [Photos 13 and 14]. This unit is resting on two 4x4 sleepers, and has a flexible natural gas line, but is inadequately anchored for seismic forces.

- Cracking of Vault Concrete Lid – Nearly linear and relatively minor cracks, 0.026 inches wide, were observed at the underside of the vault lid. These cracks are generally unremarkable and consistent with typical shrinkage related cracking in concrete slabs of this type.

- Concrete Slab Damage – The majority of the concrete slab on grade was covered by carpeting or other floor finishes and so was not open to view. However, the slab in the garage area at the south end of the building was bare and open to view. In this area, we observed some linear cracking that did not appear unusual for slabs of this type with its existing joint spacing [Photo 15]. We also observed one location at the front of the garage where the concrete slab has cracked between the door jamb anchors and the slab edge [Photo 12]. A small area (approximately 2 feet long) of deterioration of an exposed slab edge on the west side of the building was also observed. The corner of the concrete in this area appears to

have eroded away, however the exposed aggregate appeared to be firmly embedded and the concrete paste appeared sound [Photo 11].

Summary of Structural Review

IDS reviewed the available record drawings in reference to the building's seismic force resisting system and performed preliminary calculations based on the seismic force requirements of the current 2016 CBC. We also reviewed the Seismic Hazard Zones map for this area [Ref. 4], and determined that the site is not located within an identified liquefaction zone or an earthquake induced landslide zone.

IDS also used the Tier 1 Checklists from the ASCE Standard 41-13 [Ref. 5] to provide a basic screening for seismic deficiencies. ASCE 41 is a national standard document widely used for the seismic evaluation of structures. It's Tier 1 procedure is a screening type of methodology intended to quickly identify potential seismic deficiencies of various structural systems and non-structural elements.

The following issues were identified through our review:

- Incomplete Lateral Force Resisting System – The building framing and structure does not provide a complete system for collecting and resisting lateral forces. In the longitudinal direction, horizontal bracing is only provided across one bay. For both directions, there is no complete means of collecting the seismic forces from the various building elements and conducting those forces to the elements of the lateral force resisting system. At the south end of the building, there is no rigid frame for resisting forces in the transverse direction. The lack of this frame is anticipated to lead to greater damage at the building's south end as well as at its southernmost rigid frame.

- Insufficient Lateral Force Resisting System – Nearly all the lateral force resisting system elements provided are insufficient to resist the anticipated lateral forces required by the current Code. This statement encompasses the entire load path from the horizontal and vertical braces to the rigid frames as well as the system connections.

- Adjacent Structures– The concrete masonry vault structure inside the building is located adjacent to the first interior frame from the building's north end. There is insufficient gap between these two elements to prevent unintended interaction [Photo 18].

- Non-compliant Finishes and Fixture Support and Bracing – In the office portion of the building, the suspended ceilings, lights, mechanical registers, and projector were identified to have non-compliant installation due to improper and undersized suspension and bracing wires, as well as lack of compression posts and proper edge detailing. These features are anticipated to lead to damage of these systems possibly including falling ceiling panels, lights, and fixtures.

- Interaction Between the Building Structure and Interior Finishes – In the office portion of the building, the interior gypsum board partitions including those forming the building entry doors and windows are anticipated to be initially more rigid than the overall manufactured building system. Because of this, increased damage of the interior finishes, doorways, windows and ceilings is anticipated as the building system deflects farther in a seismic event than those elements will initially allow. The interior finishes will likely act to resist building movements until they crack, or otherwise become damaged and allow the movement that the surrounding building requires. The masonry vault is also anticipated to have almost no movement relative to the surrounding building framing, so damage of the building framing and interior finishes surrounding the vault structure is anticipated. The effects of this damage are likely to include racked door frames that could pinch the doors and restrict their operation, broken glass or window glazing as well as fallen ceiling panels and light fixtures. The roll-up doors in the garage portion of the building may also be affected similarly by the overall building movement and potential permanent building displacement.

- Emergency Power Dependent on Roll-up Door Function – Since the trailer mounted emergency generator is located within the garage at the south end of the building, its use and operation depend on the functionality of the roll up doors. If building movements bind or otherwise disable the roll-up doors, use of the emergency generator may be impaired.

Conclusions and Recommendations

In general, the building was found to be in relatively good condition for its age and structural system although some damage and deterioration were identified. Based on our site visit and visual review of the building as well as preliminary calculations conducted, the WEROC EOC building is insufficient to provide immediate occupancy performance following a major earthquake. While some occupant injuries might occur during the earthquake, the overall risk of life-threatening injury as a result of structural damage is expected to be low. While the EOC building has several beneficial features that will contribute to better performance such as light weight, single story, and simple structural system; it also has many features that detract from its ability to serve as an essential facility as desired by WEROC.

The current Building Code does not require upgrade of the existing seismic force resisting system unless alterations are considered such as change of occupancy, increase of building mass or size, modifications of the existing lateral force resisting system. However, in its current configuration, we do not believe that the existing building will meet the structural and non-structural performance objectives desired by WEROC.

In order for this building to serve as an essential facility serving critical functions following a major earthquake, the following items at a minimum would be necessary:

1. Complete the Seismic Force Resisting System – Many new seismic force resisting system elements including a diaphragm, collectors, and connections would need to be added.
2. Strengthen the Seismic Force Resisting System – Weak or insufficient elements of the existing system would need to be strengthened to resist current code forces.
3. Provide Seismic Separation at Masonry Vault – The masonry vault is a rigid element that will have almost no seismic movement relative to the surrounding building frame. Adequate separation of these elements is necessary to prevent damage to the building frame system.
4. Anchor Non-Structural Elements and Equipment – Anchorage and bracing of non-structural elements and equipment is necessary to prevent or reduce falling objects and potential damage to equipment necessary for emergency operations.
5. Repair Damaged or Deteriorated Building Elements – Where damage or deterioration exists, we recommend repairing the elements to prevent or reduce future or ongoing damage and deterioration.

Since these issues are so substantial and extensive and affect so many of the building's existing structural elements, equipment and finishes, plans identifying specific structural and non-structural improvements have not been prepared.

References

1. Soule Buildings; "El Toro Water District, 26081 Via Pera, M.V.;" Sheets 1 to 12; Contract Number 5-1-987; Dated 1/3/77.
2. El Toro Water District; "El Toro Water District, 26081 Via Pera, M.V., Contract Prints;" Sheets A-1 to A-3, E-1, and U-1; Dated 6/25/82.
3. El Toro Water District; "Board Room Office Layout Drawing;" 1 sheet, Not Dated.
4. State of California Division of Mines and Geology; "State of California, Seismic Hazard Zones – El Toro Quadrangle;" released January 17, 2001.
5. American Society of Civil Engineers (ASCE); "Seismic Evaluation and Retrofit of Existing Buildings (ASCE/SEI 41-13)."

Limitations

This letter report is intended for the sole use of Water Emergency Response Organization of Orange County in its evaluation of the subject property. It is not intended for use by other parties, and may not contain sufficient information for purposes of other parties or other uses. This letter report is based on our visual observations of readily observable areas, review of available drawings, rough engineering calculations related to the building's lateral force resisting system and our engineering judgment and experience. Our assessment is limited to the buildings' primary structural systems. Evaluation of site related seismic hazards such as liquefaction and slope stability is limited to a review of available regional hazard documentation. Evaluation of nonstructural items such as architectural elements, furnishings and interior equipment, and electrical, mechanical, and plumbing systems are not considered in this evaluation. Evaluation of site utilities serving the building is excluded. Testing, destructive or otherwise, was not performed. Our limited investigation should not be considered a review of the design, nor an inspection of latent conditions that have not manifested damage to date. Other conditions affecting the structure that were not inspected, anticipated, or accessible including all public safety issues, are beyond the scope of this report. Our professional services have been performed with the degree of care and skill ordinarily exercised, under similar circumstances, by reputable consultants practicing in this field at this time.

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Thank you for allowing us this opportunity to be of service on this project. If you have any questions regarding this letter report, please do not hesitate to contact us.

Sincerely,

IDS Group, Inc.

David Pomerleau, SE
Project Manager

Said Hilmy, Ph.D., SE, LEED AP
Principal

Photo 1: East Side of Building (View from North End)

Photo 2: North End of Building

Photo 3: West Side of Building (North End)

Photo 4: West Side of Building (View toward South End)

Photo 5: South End of Building

Photo 6: East Side of Building (View from South End)

Photo 7: West Side of Building (View Toward South End)

Photo 8: Close-up of Roof Repair at West Side

Photo 9: Close-up of Flashing at South End of Roof

Photo 10: Interior View at Repaired Roof Panel

Photo 11: View Along West Side of Building

Photo 12: Damaged Concrete at Slab Edge

Photo 13: Mechanical Equipment at West Side

Photo 14: Close-up of Mechanical Equipment Attachment

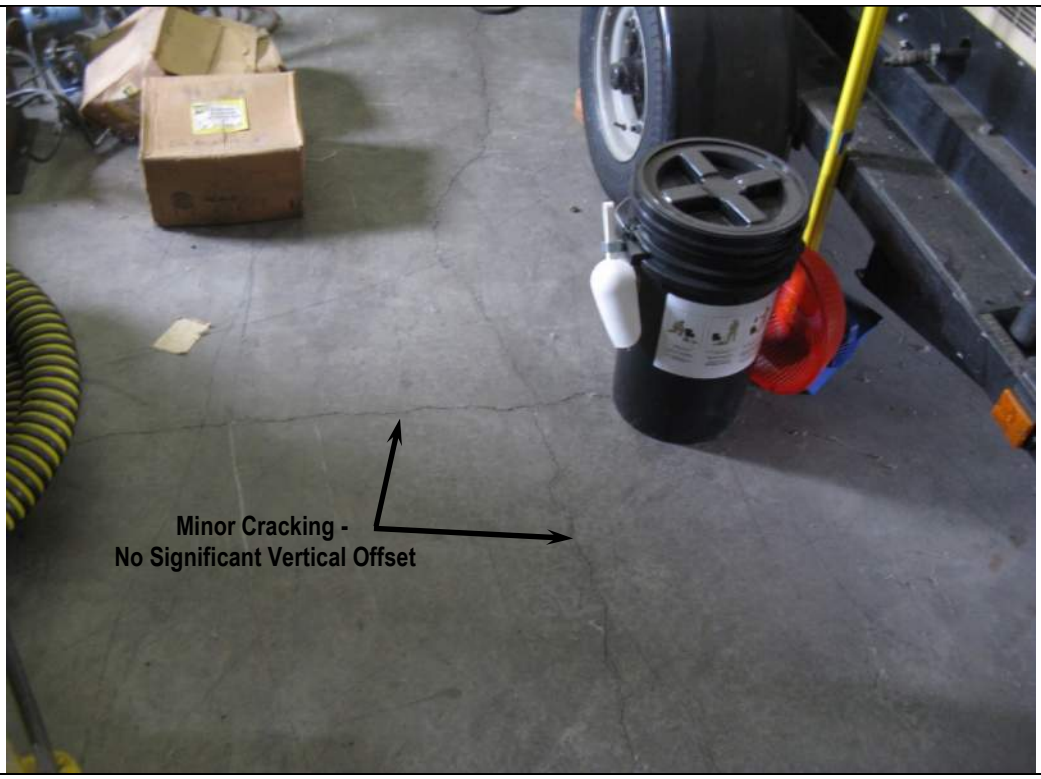

Photo 15: Cracking at Concrete Slab in Garage

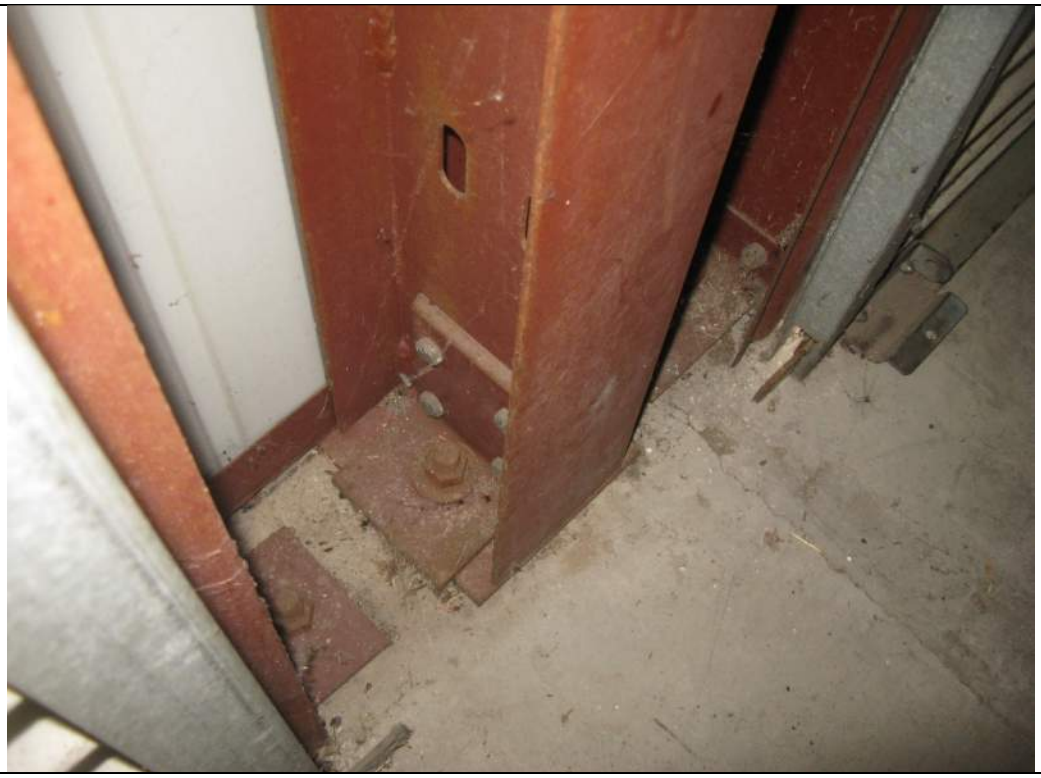

Photo 16: Rigid Frame Base Anchorage in Garage Area

Photo 17: View of Rigid Frame Connection at Roof

Photo 18: Rigid Frame Abutting Masonry Vault

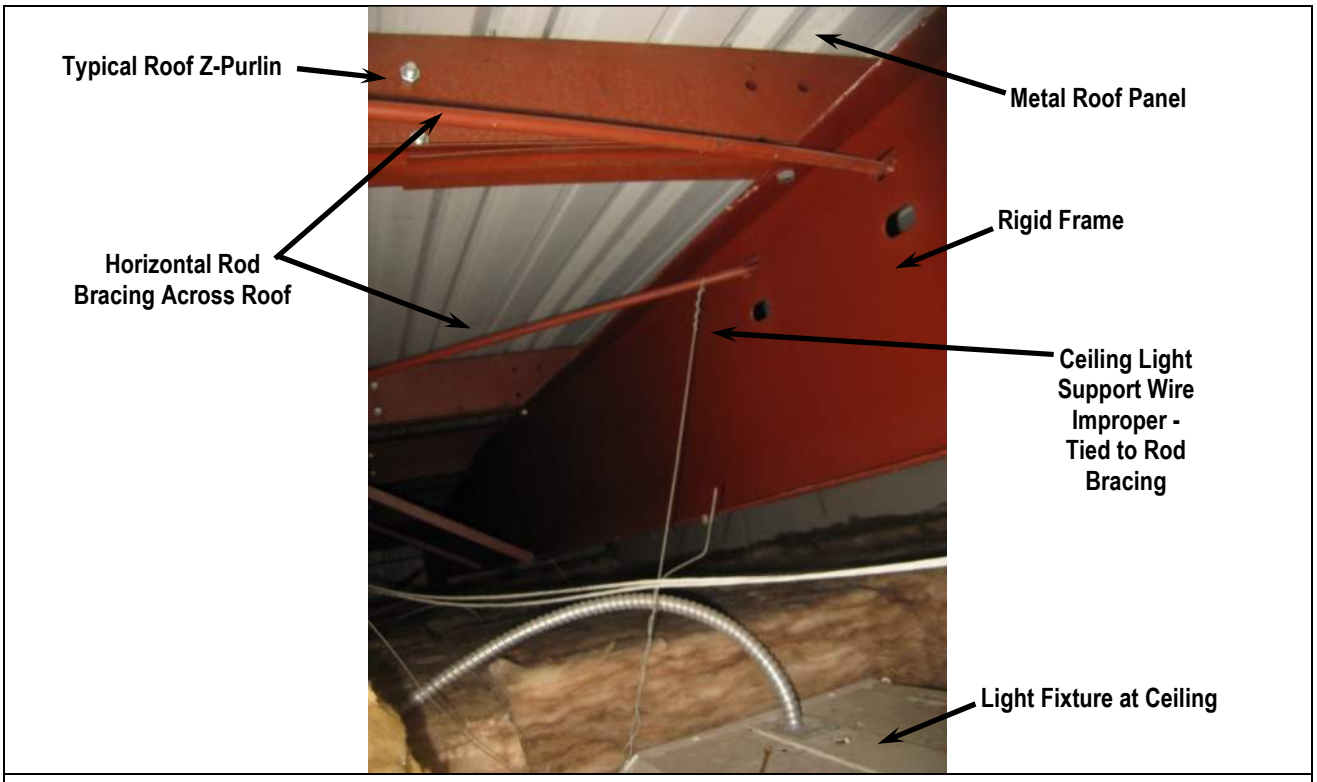

Photo 19: View of Above Ceiling

Photo 20: Close-up of Horizontal Rod Bracing Connections

Photo 21: Typical View of Above Ceiling

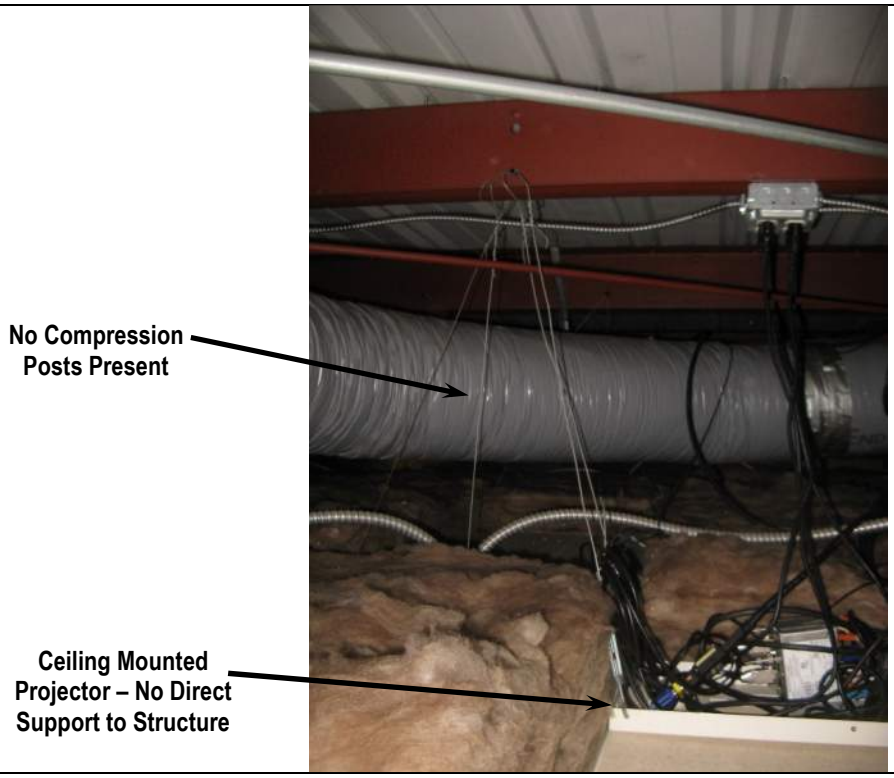

Photo 22: Ceiling at EOC Projector

Photo 23: View of Ceiling Support Wire

Photo 24: View of Improper Ceiling Support Wire

Photo 25: View of Improper Light Support Wire

Photo 26: View of Improper Light Support Wire

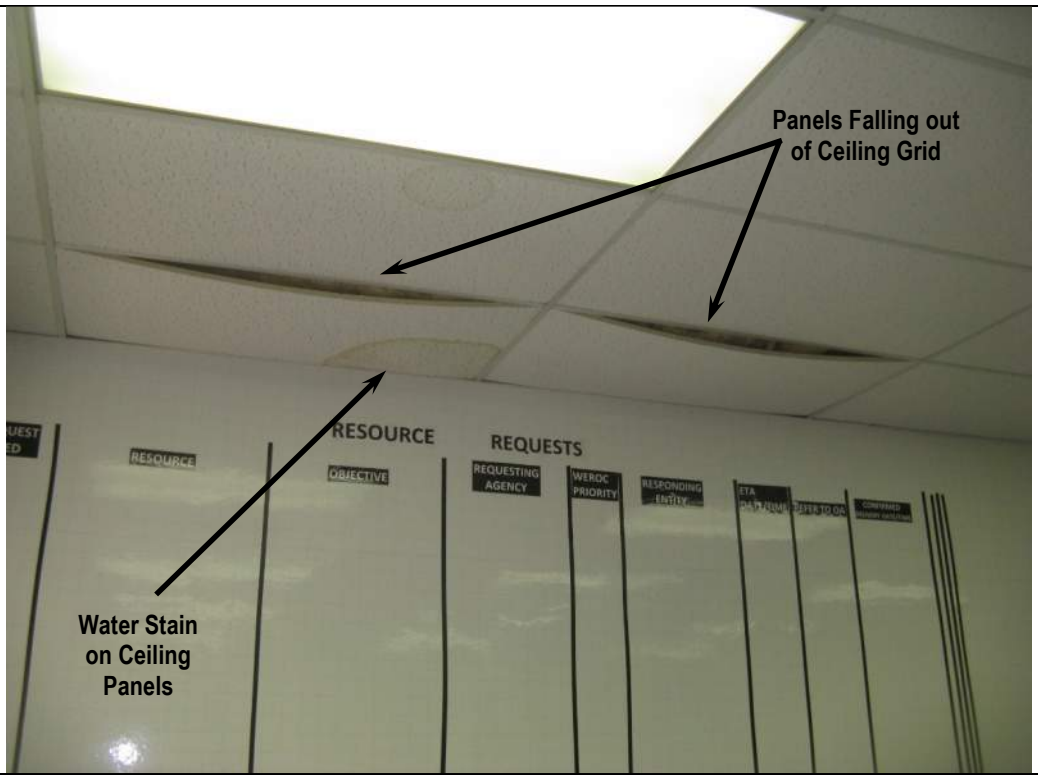

Photo 27: Damage and Falling Panels Near Entrance/Exit

Photo 28: Typical View within Ceiling Space

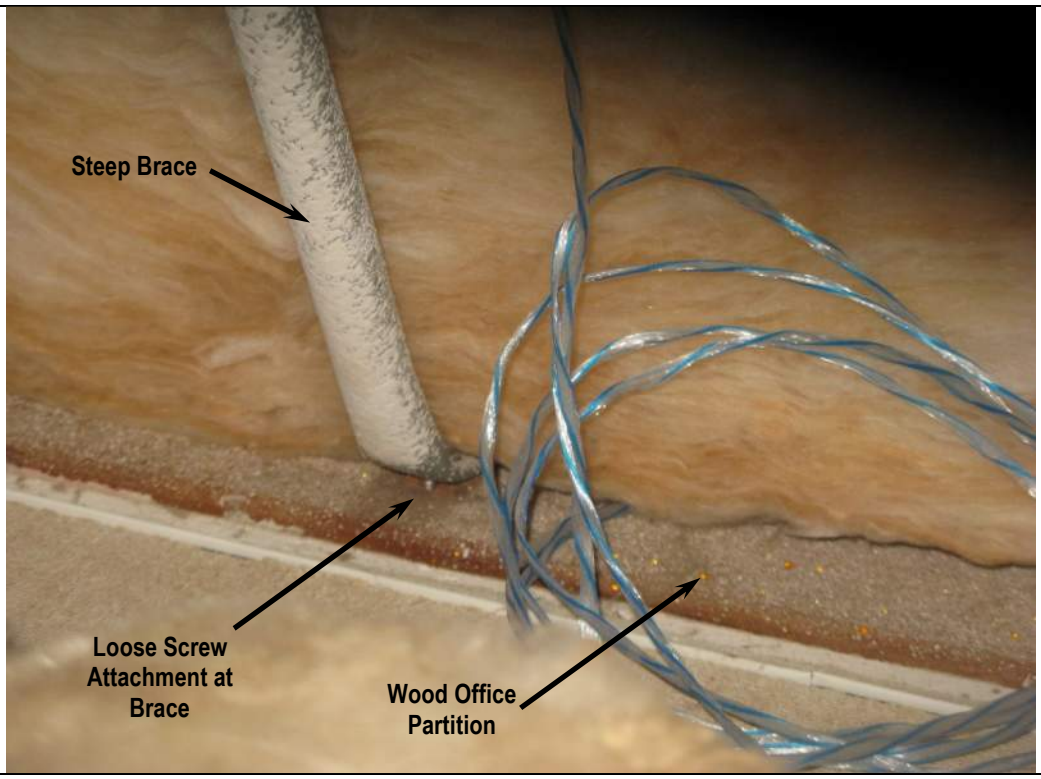

Photo 29: Loose Attachment of Partition Braces

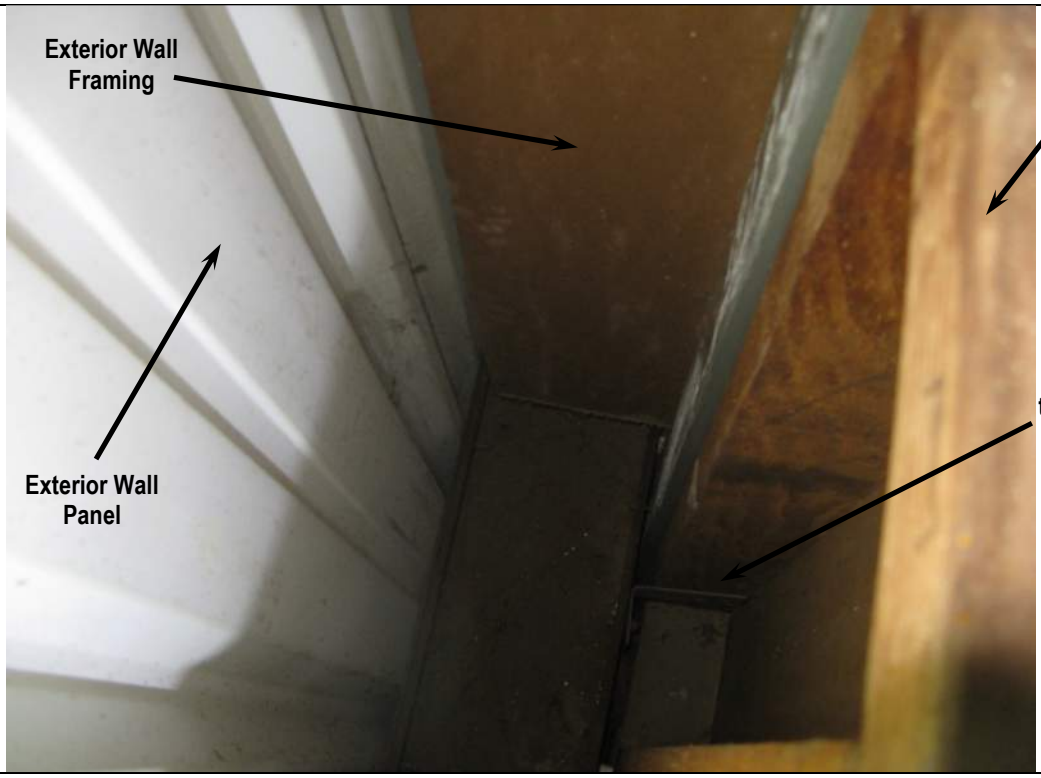

Photo 30: View of Perimeter Partition Attachment (Looking Down)

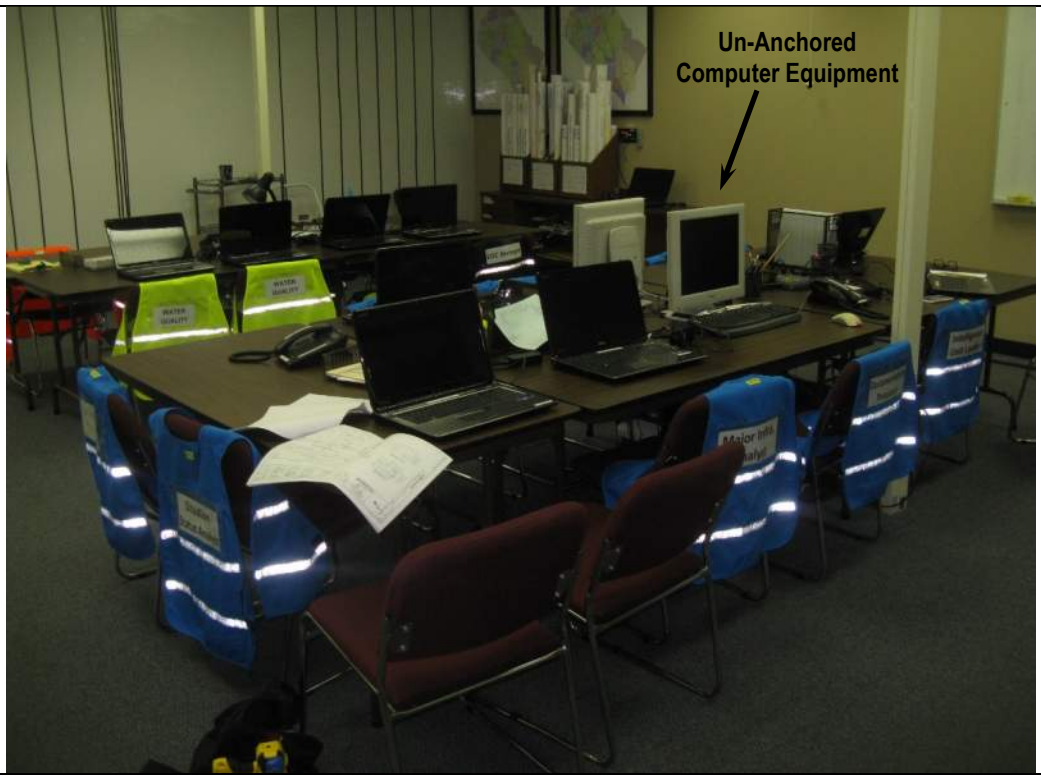

Photo 31: View of EOC Desks and Computers

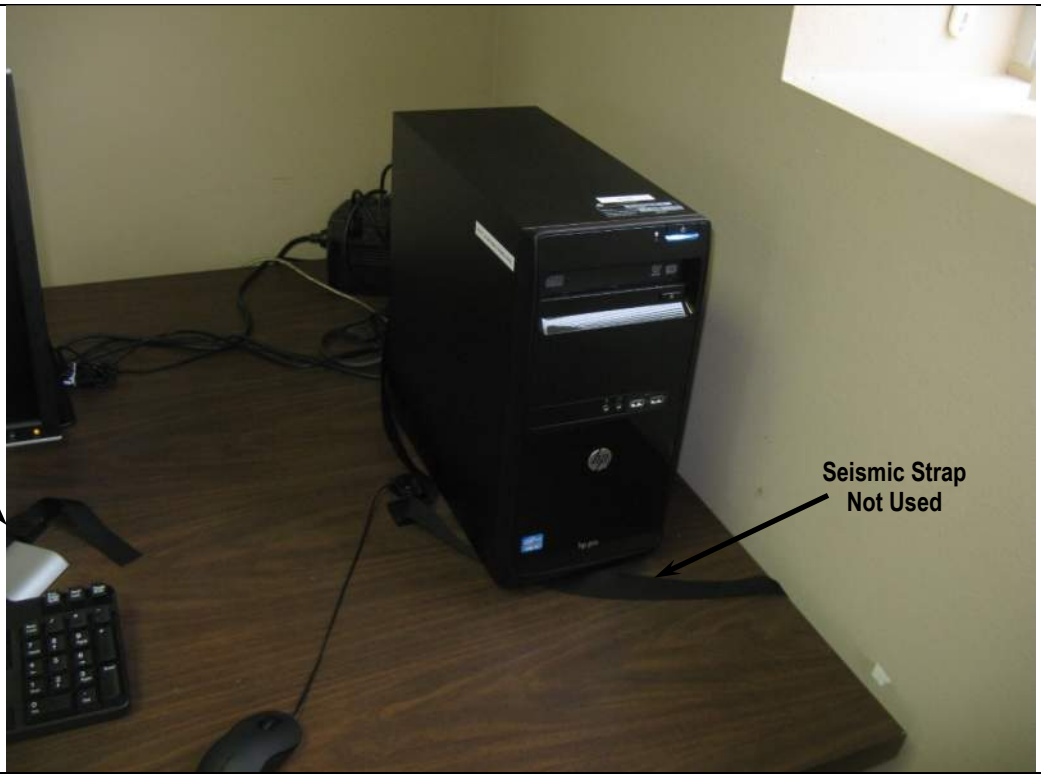

Photo 32: Unanchored Computer Equipment

Photo 33: Unanchored Computer Equipment

Photo 34: Unanchored Computer Equipment & Documents

Photo 35: View at Office Area

Photo 36: View of East Side of Building at the North End

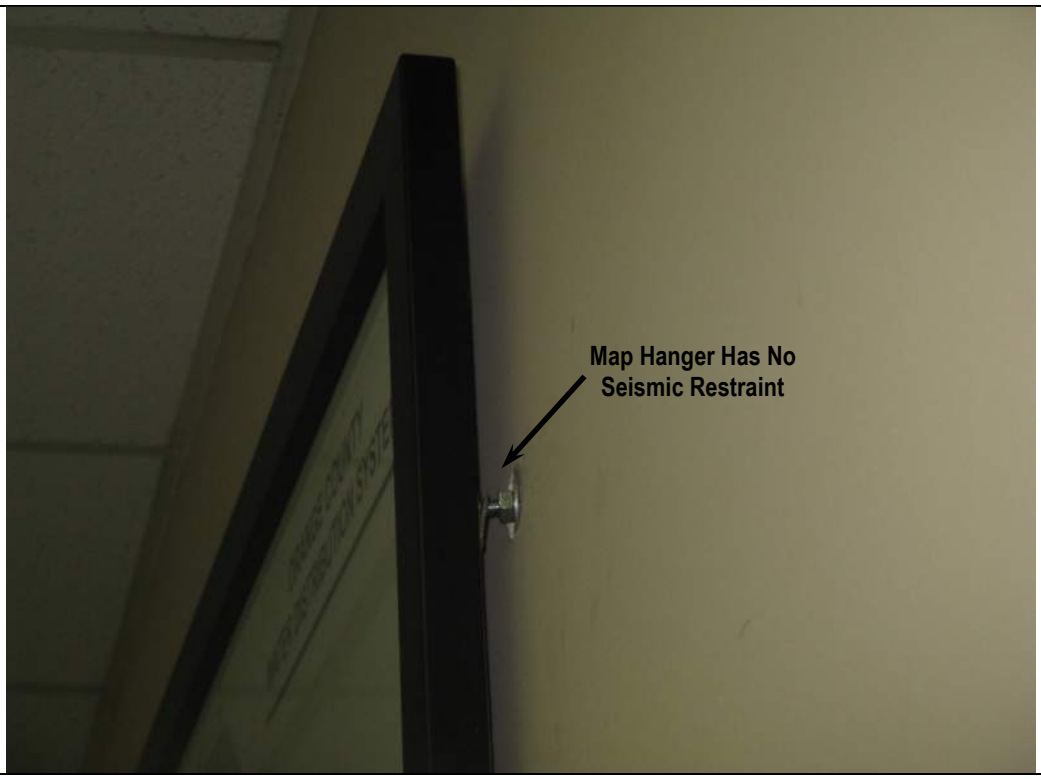

Photo 37: Map Support Hanger in EOC

Photo 38: Emergency Generator Trailer in Garage