Oroville Earthquakes of August 1, 1975
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The first earthquake, as reported by the University of California in Berkeley at 9:27:17.6 a.m. local time was 5.0 Richter (R) magnitude, with epicenter at 39° 28.0' north latitude and 121° 37.09' west longitude which was about five miles southwest of Oroville at a depth of about 7km. Dishes were reported broken. It was felt by a few people in Sacramento. It was also felt in western Sierra County, Butte County and many Auburn residents felt it. Two aftershocks occurred, the maximum was 3.0 magnitude.

At 1:20:04.3 p.m. a stronger shock occurred. UCB reported it at 5.7 R, Cal Tech at 6.4 and Golden, Colorado and Menlo Park USGS at 6.0. The epicenter was 39° 27.1 north latitude, and 121° 35.6 west longitude or about five and one half miles southwest of Oroville at a depth of about 5km. This was rather strongly felt throughout Sacramento. The press reported it was felt in Fresno, Tahoe and San Francisco.

By 4:00 p.m. an EERI/DMG information clearinghouse was established at the Oroville Division of Forestry Office which is also a firehouse with 24 hour telephone service.

Early press reports considerable damage throughout Oroville and Thermalito.

Visits were made to the area the following day Saturday, August 2, on August 5, and on August 7, 1975.

The first stop on August 2 was at the Clearinghouse, but all doors were locked at the time of the visit which was about 7:15 a.m. The next stop was at the local firehouse in the center of Oroville where the various schools, hospital and other points were located and a map of the area was obtained.

OROVILLE ELEMENTARY SCHOOL (Currently called Bird Street School) - Built 1867 and rebuilt in 1912

Two Corinthian column capital decorations of clay tiles were dislodged from the top of the columns, one of which was directly over the main entrance as shown in Figure 1. Two windows were broken which may have been the result of the earthquake.

There was considerable plaster damage to the walls and ceiling throughout the building. It was obvious that the walls and ceilings moved separately as evidenced by the continuous cracks in the ceilings adjacent to the walls as shown in Figure 2. Pieces of ceiling plaster fell in the auditorium, basement stair ceilings and second floor classroom ceilings shown in Figure 3. Earthquake motion at this site was not sufficient to throw books from the shelves in the storage room on the first floor as shown in Figure 4,
however, a wash bowl was thrown off the wall in the cafeteria building as shown in Figure 5. The exterior plaster on the walls cracked in several locations.

BURBANK SCHOOL
During the first visit on August 2, the east wall of this one-story brick pre-Field Act school building built in 1925 was observed to be seriously damaged.

This brick wall shown in Figure 6 bulged dangerously outward several inches for a length of about 10' in the center at the level of the roof. During the second visit on August 5, the east wall appeared to have moved out a bit further and a portion of the north wall was bulging in a similar manner. The east wall was separating between the brick wythes although they were tied with metal strips as shown in Figure 7. A 5.9 magnitude earthquake occurred on August 7 and knocked off several bricks as shown in Figure 8 taken during the August 8 visit. This wall was anchored to the roof trusses with the type of wall anchor as shown in Figure 9.

Ceiling plaster fell in the corridor as shown in Figure 10.

A decorative ornament fell from the west gable end wall between the August 2 visit and the August 5 visit.

The damage in a post-Field Act wood frame school constructed in 1947 at this site consisted of only very minimal plaster cracks and several concentric ring light fixtures were tilted and hanging with one or two wires. One such ring fell to the floor. Damage of this type can be prevented simply by twisting the wire hangers as usually shown on the approved drawings but are frequently bent back to remove the rings for cleaning.

EASTSIDE SCHOOL
A pre-Field Act school building also built in 1925 here sustained nominal plaster damage in the corners of the walls and at the junction of the wall and ceiling in several locations. One light fixture grill was hanging vertically suspended with the wiring as shown in Figure 11. This building was of somewhat similar design as that of the Burbank School. In fact, both were built by the same contractor under the same contract fifty years ago. Post-Field Act buildings on this site sustained no damages except possibly some very light plaster cracks.

CENTER SCHOOL
All buildings on this site were of post-Field Act construction. The only observed damage was several concentric ring light fixtures which were tilted and hanging with one or two hanger wires instead of three. None had fallen to the floor. Some light exterior plaster cracking was noted at several corners of the buildings and the contents of several storage shelves were spilled to the floor.
A new concrete block masonry building had just been constructed and will open in this fall semester. No damage of any kind could be found.

LAS PLUMAS HIGH SCHOOL
This is a rather large recently constructed complex. The four inch wide plastic light fixture lens were dropped to the floor throughout the site and at least two light tubes fell to the floor. Seismic expansion joints throughout the site did not indicate any movement. Two glass panes were broken in the Auto Shop and the two sets of rod bracing in the north wall may have worked to the extent that the paint was scuffed for a length of about 6" to 8" at their intersection, although no damage could be found here.

The gymnasium is a post-Field Act building with a west wall added later to close in the end of the building. This wall is of wood stud construction, plastered on each side and is not a structural wall. The plaster was cracked but appeared to have had been cracked prior to the earthquake because the cracks were both horizontal and vertical. The plaster appeared to have bulged about 1/8" at mid-height opposite the control joints. Several windows were flipped out hanging by the operating device as shown in Figure 12.

OROVILLE HIGH SCHOOL
Several plastic light fixture lenses fell to the floor or desk tops in the classrooms.

A fluorescent light tube fell to the floor in the shop. It was noted that the suspension system for the overhead door in the shop was very similar to that which fell in the Palermo Firehouse. The school officials advised that they would place some braces on the overhead track to prevent their spreading during future seismic disturbances.

Plastic light fixture lenses fell to the floor in several portable buildings on this site as shown in Figure 13. The T-bar ceilings were also displaced in several of these portable classrooms.

The Maintenance Building, a non-school purpose building and not constructed under the provisions of the Field Act, had several cracks in the masonry walls. Some were old and others were probably the result of the earthquakes. School officials indicated that the building would be demolished in the near future.

OAKDALE HEIGHTS SCHOOL
This site is just down the street a short distance from the Las Plumas High School and is also quite new. No light lens damage occurred here probably because they were not installed. One window was broken probably the result of the earthquake. No damage of any other kind could be found here.

PALERMO ELEMENTARY SCHOOL
This is a post-Field Act school located in Palermo which is about four or five miles due south of Oroville and is within
a mile of the epicenter of the largest shock. A window was
possibly broken here due to the quake. Several light fixtures
were damaged. It is understood that the light fixtures had
been replaced by the school district without OAC approval
under the $10,000 exemption.

Plaster was cracked all around the junction of the walls and
ceiling of the multipurpose platform. This building was built
in 1951. The roof diaphragm of the platform is of diagonal
sheathing and has a span/depth ratio of about 3:1. Currently
the span/depth ratio allowed in Title 21 California Adminis-
trative Code is limited to a maximum of 2:1 because of its
flexibility as a result of tests made in the early 1950's.

ST. THOMAS CHURCH AND SCHOOL  (Not under OAC supervision)
No damage was found in the school. Sport trophies, similar
to those that fell at the Rio Dell Elementary School, from
the June 7, 1975, Fortuna earthquake were not dislodged.

Several bricks were dislodged from the church bell tower
and the upper portions of the wall were cracked. The upper
portion of the unreinforced brick chimney was knocked off.

COURTHOUSE  (Downtown)
The old portion of the courthouse and jail was cracked rather
heavily and was vacated. The walls of this building appeared
to be stuccoed masonry construction.

No damage was observed in the new portion of the courthouse
probably built 5 to 10 years ago.

SUPERNOR COURT BUILDING
This building was very recently constructed. Books were
thrown to the floor and the bookcases were damaged. The
concealed T-bar ceiling was damaged as shown in Figure 14 in
several locations. Most of the T-bar ceiling damage occurred
around the perimeters in several of the rooms.

DOWNTOWN OROVILLE
A few, perhaps 5% to 10%, of the window panes were broken
in the store fronts. T-bar ceilings were damaged particularly
around the perimeters of the rooms. A lady narrowly missed
being hit by a falling T-bar in a clothing store. Pictures
on the walls were askew or fell to the floor. Merchandise
was thrown to the floor from shelves. Masonry walls were
cracked in several buildings. Unanchored brick veneer was
dislodged and on the verge of falling, however, in general
the damage was rather light.

SHOPPING CENTERS
Invariably the T-bar ceilings were rather heavily damaged,
usually around the perimeters of the rooms, that is, at the
intersection of the walls and ceilings. Several had diagonal
bracing wires installed within the system. In a department
store the hangers became disconnected allowing the ceiling
to bulge or drop downward in several places. In one instance
the nail anchoring the hanger wire pulled out, in other
instances it appeared that the kinks or bends formed in the
hanger wire to level the ceiling had straightened out.

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MEDICAL CENTER HOSPITAL
This is basically a one-story hospital but a portion on a side hill was two story. The Hospital Administrator, Mr. Paul R. Hoff, was very well pleased with the performance of the portion of the hospital emergency wing constructed under the provision of 1973 Alquist Hospital Act. The only damage in that portion consisted of several husks or escutcheons around the sprinkler heads, which are merely held by friction, fell to the floor and a crack in the hall ceiling plaster. No other damage could be found.

Nonstructural plaster damage occurred in several areas throughout the older portion of this hospital, the oldest of which was probably not more than 10 years old. In the pharmacies and storage areas many bottle containers and other medications were damaged when they were thrown to the floor. Strips of adhesive tape were placed on the front of these shelves to prevent further loss as shown in Figure 15. Mr. Hoff strongly suggested that regulations be adopted which will require some means of retaining critically needed drugs and medications on the shelves in hospitals.

This hospital has two basic exterior sources of electricity and the administrators considered requesting a waiver for the requirement of an emergency generator. During this earthquake both sources were knocked out of service and their emergency generator operated for about two hours due to intermittent electrical service. This generator was mounted on the top of steel channels placed on a slab or grade. No anchor bolts were provided into the slab. Mr. Hoff indicated they would add some anchor bolts in a few days.

The oxygen tank, about 4' diameter and about 12' high, became displaced. The tank was supported by three legs and the anchor bolts were about 5/8" diameter. Two such anchor bolts were pulled out of the concrete but appeared to penetrate the concrete only about an inch as shown in Figure 16. One of the anchors held and the other two pulled out, thus allowing the tank to rotate about 1/2". Mr. Hoff took immediate steps to anchor the tank as there had been many aftershocks.

Mr. Hoff estimated that only one or two patients were treated at this hospital from earthquake related injuries.

PALERMO FIREHOUSE
This Division of Forestry firehouse was of rather new construction - probably not over 3 or 4 years old. Walls were tilt-up concrete and were lightly cracked over one pass-through doorway and a horizontal crack occurred in mid-span of the wall.

Two overhead doors fell out of their tracks on top of the fire engines. The 3' long axles supporting the door on the horizontal overhead track came out of their housing as there was no retainer at the rear end of the axle and the track was free
to deflect laterally, thus allowing the doors to fall on top of the fire engines.

BULLARDS BAR DAM

A fisherman reported, while in his boat on the reservoir behind Bullards Bar Dam, a single wave about a foot in height crossed the lake about 9:30 a.m. There was no wind and the water smooth; the fisherman was certain there had been an earthquake.

OROVILLE RESERVOIR

The ranger at the Visitors Center reported that most of the people on the lake at the time of the earthquakes were not aware of any special wave action or that an earthquake had occurred. One person did, however, report he noticed an unusual wave - perhaps about a foot high - at the time of the afternoon shake. He had just launched his boat and pushed off when the wave came by. He first thought a large boat passed but there were none nearby.

GENERAL

At the end of the day on August 2 a phone call was placed to the clearinghouse. Mr. Roger W. Sherburne of the Division of Mines and Geology was contacted and a brief report was given to him.

OBSERVATIONS

(1) Once again it was clearly shown that Structural Safety Section enforcement of the Field Act requirements reduces the likelihood of structural damage to public school buildings in the event of an earthquake.

(2) Prior to the earthquake the Oroville City Elementary School District applied for permission to continue the use of the pre-Field Act school buildings at Bird Street, Burbank and Eastside Schools until June 30, 1977 as allowed under Section 15516 of the Education Code. After the earthquake the school board withdrew their application and elected not to allow students or teachers in these buildings.

(3) This earthquake was the first test of the effectiveness of the Alquist Hospital Act as evidenced by the successful performance of the addition constructed under its provisions at the Medical Center Hospital.

(4) Current methods of installing T-bar ceiling systems do not perform adequately in earthquakes. This has been demonstrated repeatedly.

(5) Consideration should be given to the effect of vertical and horizontal acceleration on all overhead items such as light fixtures, lenses, grilles, etc. Glass installed conforming to the provisions of Chapter 54 of the 1973 Uniform Building Code should reduce glass damage.

JFM/sem

9/5/75
Figure 1. Bird Street School

Portion of Corinthian column in the foreground fell at entry

Figure 2. Bird Street School

Second floor classroom ceiling damage indicates wall pulled away from roof framing
Figure 3. Bird Street School

Portions of ceiling plaster fell on stairway.

Figure 4. Bird Street School

Earthquake movement on the first floor was not sufficient to throw the books from the shelves.
East wall bulged.

The washbowl fell off the wall.

Figure 5. Bird Street School

Figure 6. Burbank School

East wall bulged. Photo taken August 2.
Figure 7. Burbank School

Ties between the wythes of brick did not hold wall together. Photo taken August 5.

Figure 8. Burbank School

Several bricks fell from wall during an aftershock.
Photo taken August 8.
Figure 9. Burbank School

Wall to roof anchors used at this site were spaced 6 to 8 feet apart.

Figure 10. Burbank School

Ceiling plaster fell in the corridor
Figure 11. Eastside School
Light fixture grille would have fallen to the floor except that one of the safety chains held.

Figure 12. Las Plumas High School
Several windows were hanging by their operating devices.
Figure 13. Oroville High School

Light fixture lenses fell and some ceiling tiles were displaced in these portable buildings.

Figure 14. Superior Court Building

Concealed T-bar ceiling damage
Figure 15. Medical Center Hospital
Pharmaceutical and bottle goods were thrown to the floor. Tap was added to the shelves to prevent further loss.

Figure 17. Medical Center Hospital
Oxygen tank anchor failed.