

COLORADO GEOLOGICAL SURVEY

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Preliminary Damage Report of the August 22, 2011 Mw 5.3 Earthquake near Trinidad, Colorado

The purpose of this publication is to provide basic information and on-the-ground documentation concerning a significant contemporary seismic event that took place in south-central Colorado in 2011.

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The front of this brick building collapsed, sending debris onto State Highway 12. Note the crushed mailbox. Segundo, CO.

At 11:46 PM MDT on August 22, 2011, a Mw 5.3 earthquake was recorded by U.S. Geological Survey seismometers, locating the epicenter approximately 9 miles (+/- 7.8 miles) WSW of Trinidad, Colorado. Early reports by local news media indicated that significant damage to buildings had occurred in the towns of Segundo and Valdez, 15 miles west of Trinidad on Colorado State Highway 12. Prior to the Mw 5.3 event, three smaller events were also recorded in the same vicinity, the largest being an Mw 4.6 event at 5:30 PM MDT.

On the morning of August 23rd, the Colorado Geological Survey dispatched geologists to the area to document the damage related to this, the largest earthquake in Colorado within the last 44 years. Locations

with observed structural damage included (from most severe to least): Segundo, Valdez, Cokedale, and Trinidad. The following sections highlight the damage and witness testimonies documented by the CGS at each area.

Segundo

An adobe building from early 20th century had its front façade displaced horizontally. Part of the façade crumbled and adobe fragments were scattered on the front porch roof (Figure 1). Two-foot-long rock blocks from the façade fell 10 feet through the front porch roof (Figure 2). The front wall of the building moved 1" horizontally (north) (Figure 3). The floor within the house dropped 1-2" as measured from the base of the internal doors that closed before the event. The floor was visibly heaved and down-dropped in areas. 6-foot-high bookcases within the house were knocked over (Figure 4) and cupboards were left in shambles (Figure 5). The resident reported being thrown onto his wife while sleeping. Damage to the outside walls was clearly visible as cracks and missing plaster (Figure 6). In the backyard, the fence was displaced 2 feet horizontally (S-N). The outside chimney was displaced 2" (Figure 7). The local fire department recommended the residents evacuate the house until it could be reviewed for structural damage.

On State Highway 12, the front of an early 20th century brick building collapsed. Numerous bricks spilled onto the highway (Figure 8). The resident's mailbox was crushed by the falling debris. Nearby, a chimney was toppled and bricks were tossed onto the highway (Figure 9).

Liquor bottles in Ringo's Market were thrown from the shelves. Cracked plaster inside and outside of the building was evident (Figure 10). The clerk reported "collector-style" decanters were thrown from shelves and shattered.

Rockfalls covered State Highway 12 approximately 1 mile east of Segundo-Valdez. These were quickly removed from the highway by CDOT. Large rock fragments were in excess of 6 feet (Figure 11).

A home was reportedly condemned due to extensive damage. The residents wished to remain anonymous and thus, this report was not verified.

Several residents had plaster and brick damage; internal chimneys were pulled from the walls (Figures 12, 13, 14). Glassware, pictures, and other wall displays were thrown onto the floor. A paneled roof collapsed in one residence (Figure 15). Chimneys were displaced.

Residents said it "sounded like a train coming" and the ground seemed to "rotate". This "rotation" was reported by the resident with the most severe damage to his residence where his floor was heaved and down-dropped (liquefaction?). He also said the earthquake lasted for "about a minute". Cats and dogs were running around, frantically.

Valdez

The Big 4 General Store, built in 2006, had a 5-foot-long crack in the porch pavement that had approximately 0.5" of offset (Figure 16). The east side of the building had a 7-foot-long horizontal crack in the plaster (Figure 17).

Several buildings had cracked plaster and damaged brickwork (Figure 18).

The Wilson building reportedly had internal damage.

A woman from Raton, NM stated that "it shook (her) bed" and "cracked the plaster" of her house.

A report of a water main break in Valdez circulated among residents; however this report could not be substantiated.

Cokedale

The town mayor reported "no significant damage to" the residences in the area. However, she reported a few pieces of glassware fell to the floor and cabinet doors rattled. The post office/town hall had a 10-foot-

long vertical crack that buckled 2" from the face of the wall (Figure 19, 20). The crack was visible internally and externally. A 10" fragment of plaster was missing from the crack on the outside of the building (Figure 21).

The post office attendant, who lives about 1 mile north of Cokedale, reported south-north shaking. She said she heard a "sonic boom" and then the "ground shook". The mayor said the earthquake sounded like a "rumble", she felt "tremors" and thought something "hit her house".

Trinidad

The "What a Grind" coffee shop had plaster and metal siding fall from the front of the building (Figure 22). A resident reported hearing a "freight train" coming "from the west". The resident also stated the event started slow, gained in strength, and fell off sharply and "my dogs howled".

The residents of Segundo and Valdez were visibly shaken by the events. As the Mw 5.3 event occurred they "ran" from their houses and gathered outside. Many said they will not be sleeping in their houses for a "few days". They were very concerned about the structural integrity of their homes and how they were going to pay for the damage, since none were covered by earthquake insurance. Damage to the structures in the area will likely exceed \$100,000. There were numerous questions from the citizens about earthquake and fault dynamics. The CGS was able to provide needed scientific information for communities affected by these events.

Figures



Figure 1. Highly damaged residence in Segundo where the façade has crumbled and pulled away from the main structure.



Figure 2. Two-foot-long rock blocks from the façade that fell 10 feet through the front porch roof. Segundo, CO.



Figure 3. The exterior wall pulled away approximately 1" from the interior wall. Segundo, CO.



Figure 4. Large bookcases were toppled over from the shaking. The resident reported S-N movement. Segundo, CO.



Figure 5. Cupboard contents thrown from the shelves. Segundo, CO.



Figure 6. Cracked and missing plaster was pervasive. Segundo, CO.



Figure 7. Chimney displaced approximately 2". Segundo, CO.



Figure 8. The front of this brick building collapsed, sending debris onto State Highway 12. Note the crushed mailbox. Segundo, CO.



Figure 9. The earthquake toppled this chimney sending a few bricks onto State Highway 12. Segundo, CO.



Figure 10. Cracked plaster on Ringo's Market in Segundo, CO. All of the liquor bottles inside were thrown to the floor and walls were cracked.



Figure 11. Rockfall events along Highway 12, east of Valdez, temporarily closed the highway. Some boulders were in excess of 6 feet across. CDOT quickly cleaned up the roadway.



Figure 12. An old adobe building in Segundo with cracked and displaced plaster.



Figure 13. Major plaster and brick damage to a home in Segundo, CO.



Figure 14. Chimney from a stove was pulled from the wall. Segundo, CO.



Figure 15. A ceiling panel collapsed sending debris on the resident's bed. Segundo, CO.



Figure 16. A five-foot-long crack in the concrete at the Big 4 Country Store in Valdez, CO.



Figure 17. Cracked plaster at the Big 4 Country Store in Valdez, CO.



Figure 18. A severely damaged garage in Valdez, CO.



Figure 19. A 10 foot long vertical crack in the upstairs floor of the Cokedale post office/city hall.



Figure 20. A few inches of buckling along the same crack in Figure 19. Cokedale, CO.



Figure 21. A large piece of plaster missing from an external crack on the Cokedale post office.

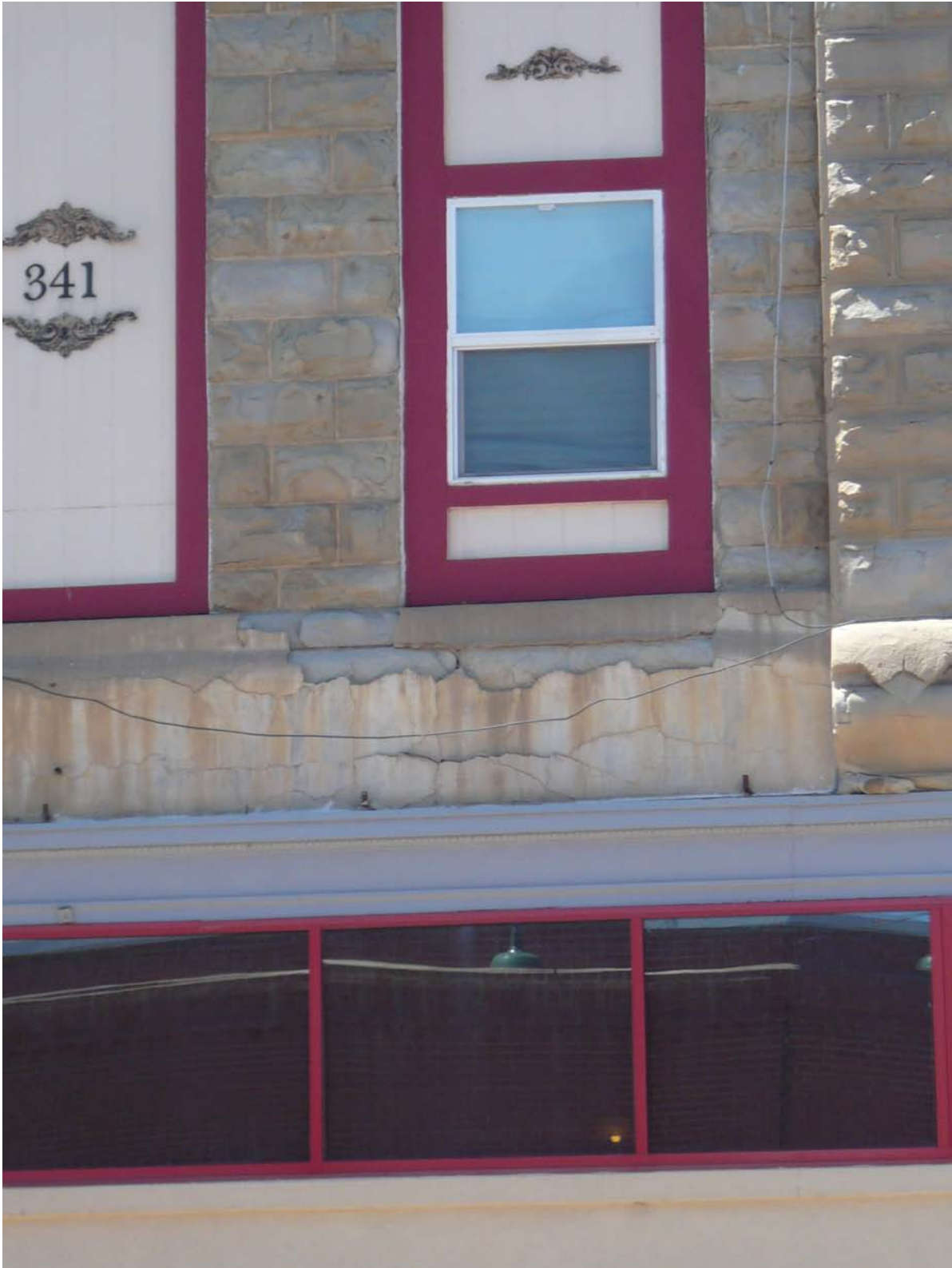


Figure 22. Plaster and metal fell from the outside of the "What a Grind" coffee shop in Trinidad, CO.