DESCRIPTIONS OF PHOTOGRAPHS

INDEX MAP

1. Index map of photographic sites

I. SAN FRANCISCO

2. Cars crushed by collapsing brick facade near Fifth and Townsend Streets. At this locality, five people were killed while leaving from work. [C.E. Meyer, U.S. Geological Survey]

3. Crushed car near the intersection of Fifth and Townsend Streets, South of Market. [C.E. Meyer, U.S. Geological Survey]

4. Aerial view of collapsed buildings and burned-out section at Beach and Divisadero Streets, Marina District. [C.E. Meyer, U.S. Geological Survey]

5. Demolition of collapsed building and watering down of burned area, October 18, 1989, Beach and Divisadero Streets, Marina District. [C.E. Meyer, U.S. Geological Survey]

6. Ground view of collapsed building and burned area shown in photot 3, Beach and Divisadero Streets, Marina District. [C.E. Meyer, U.S. Geological Survey]

7. Absence of adequate shear walls on the garage level exacerbated damage to this structure at the corner of Beach and Divisadero Streets, Marina District. [J.K. Nakata, U.S. Geological Survey]

8. Entrance and garage level of a Beach Street apartment complex in danger of collapse, Marina District. [C.E. Meyer, U.S. Geological Survey]

9. An automobile lies crushed under the third story of this apartment building in the Marina District. The ground levels are no longer visible because of structural failure and sinking due to liquefaction. [J.K. Nakata, U.S. Geological Survey]

10. Collapsed brickwork from a corner apartment building, Marina District. [C.E. Meyer, U.S. Geological Survey]

11. Smoldering remains of the apartment complex at the corner of Beach and Divisadero Streets, the Marina District. [J.K. Nakata, U.S. Geological Survey]

12. A search-and-rescue team in the Marina District wait for a building to be buttressed before entering the structure. [J.K. Nakata, U.S. Geological Survey]

13. Tom Brokaw of NBC News prepares script for a live broadcast from the Marina District. [J.K. Nakata, U.S. Geological Survey]

14. Electric wires being removed from unstable towers by city utility workers. Arresting sparks from broken wires was a priority in those areas with broken gas mains. [J.K. Nakata, U.S. Geological Survey]

II. BAY BRIDGE

15. Aerial view of roadbed collapse near the interface of the cantilever and truss sections of the San Francisco-Oakland Bay Bridge. View northwestward. [C.E. Meyer, U.S. Geological Survey]

16. Aerial view of the collapsed section of the San Francisco-Oakland Bay Bridge. View westward. [C.E. Meyer, U.S. Geological Survey]

17. ÒSand boilÓ or sand volcano measuring 2 m (6.6 ft) in length erupted in median of Interstate Highway 80 west of the Bay Bridge toll plaza when ground shaking transformed loose water-saturated deposit of subsurface sand into a sand-water slurry (liquefaction). Vented sand contains-marine shell fragments. [J.C. Tinsley, U.S. Geological Survey]

III. OAKLAND

18. Aerial view of collapsed sections of the Cypress viaduct of Interstate Highway 880. [H.G. Wilshire, U.S. Geological Survey]

19. Aerial view of collapsed sections of the Cypress viaduct of Interstate Highway 880. [H.G. Wilshire, U.S. Geological Survey]

20. Reinforcement bars exposed at the base of the Cypress viaduct near 14th Street. [J.K. Nakata, U.S. Geological Survey]

21. Remnant portion of the north- and south-bound Cypress viaduct exposing box girders near 14th Street. [J.K. Nakata, U.S. Geological Survey]

22. Side view of support-column failure and collapsed upper deck, Cypress viaduct. [H.G. Wilshire, U.S. Geological Survey]

23. Support-column failure and collapsed upper deck, Cypress viaduct. [H.G. Wilshire, U.S. Geological Survey]

24. Bent reinforcement bars in failed support column, Cypress viaduct. [H.G. Wilshire, U.S. Geological Survey]

25. Closeup of damaged reinforcement bars from a Cypress viaduct support column. [H.G. Wilshire, U.S. Geological Survey]

26. Pancaked upper deck, Cypress viaduct. Guard rail at right is on lower deck. [H.G. Wilshire, U.S. Geological Survey]

27. Sheared reinforcement bar, Cypress viaduct. [H.G. Wilshire, U.S. Geological Survey]

28. Temporary support structures emplaced to prevent further collapse, Cypress viaduct. [H.G. Wilshire, U.S. Geological Survey]

29. Demolition of Cypress structure near 14th Street. [J.K. Nakata, U.S. Geological Survey]

30. A downtown building at the corner of Alice and 13th Streets lost part of its unreinforced facade and brick masonry. [J.K. Nakata, U.S. Geological Survey]

IV. SAN FRANCISCO AND SAN MATEO COUNTY COAST

31. Cliff failure just south of San Gregorio Beach. Slide is 18.3 meters (60 ft) high and displaces approximately 6881 cubic meters (9,000 cubic yards) of material. Large boulders are 1 m (3 ft) across. [D.M. Peterson, U.S. Geological Survey]

32. Cliff failure north of Tunitas Creek. This face continued to slide for a few days after the earthquake. The event in progress exposed dark cliff material. [D.M. Peterson, U.S. Geological Survey]

33. Landslide north of Fort Funston. Slide mass contains approximately 2,830 cubic meters (3,700 cubic yards) and is 30 m (100 ft) high. Photo 35 provides an aerial view of this slide. [D.M. Peterson, U.S. Geological Survey]

34. Head scarp of small slide at Redondo Beach. Scale is provided by the red-handled rock hammer, which is 30.5 cm (12 in.) long. [D.M. Peterson, U.S. Geological Survey]

35. Aerial view of large slides north of Fort Funston. A ground perspective of this slide is shown in photo 33. [S.D. Ellen, U.S. Geological Survey]

36. Aerial view of slide at Daly City. This is the largest slide triggered by the earthquake in San Mateo County, displacing approximately 36,700 cubic meters (48,000 cubic yards) of material. The base is about 152 me (500 ft) across at its widest point. [S.D. Ellen, U.S. Geological Survey]

V. FREMONT BAYLANDS

37. KGO radio transmission towers, built on bay mud in a salt-evaporation pond used by the Leslie Salt Company. Note progressively less damage to towers away from viewer. [H.G. Wilshire, U.S. Geological Survey]

38. KGO radio transmission towers. [H.G. Wilshire, U.S. Geological Survey]

VI. MENLO PARK

39. Unfastened bookcases in an office building fell during the primary shock. [J.K. Nakata, U.S. Geological Survey]

40. Books and air-conditioning duct were dislodged during the earthquake. [J.K. Nakata, U.S. Geological Survey]

41. Seismographs at the U.S. Geological Survey record (1) north-south horizontal, (2) east-west horizontal, and (3) vertical

components of the earthquake. [J.K. Nakata, U.S. Geological Survey]

VII. LOS ALTOS

42. Aerial view of collapsed five-story tower, St. JosephÕs Seminary. One person working in tower was killed. [H.G. Wilshire, U.S. Geological Survey]

43. Aerial view of collapsed five-story tower, St. JosephÕs Seminary. [H.G. Wilshire, U.S. Geological Survey]

44. Nontectonic surface rupture across Highway 280 at the interface of a roadcut and fill area 2.5 km (1.5 mi) north of Foothill Expressway. [J.K. Nakata, U.S. Geological Survey]

45. The cement retaining walls along Highway 280 deformed in accordion-like pattern as a result of lateral compression. [J.K. Nakata, U.S. Geological Survey]

VIII. LOS GATOS

46. Failure of unreinforced brick masonry caused collapse of the upper floor in downtown Los Gatos. [J.K. Nakata, U.S. Geological Survey]

47. Photograph taken in a ceramics shop during an aftershock. [J.K. Nakata, U.S. Geological Survey]

48. Books lie scattered in aisles of a downtown bookstore. [J.K. Nakata, U.S. Geological Survey]

49. Many residents camped in their yards after the earthquake. [J.K. Nakata, U.S. Geological Survey]

50. Personal messages posted on van at Emergency Center. [C.E. Meyer, U.S. Geological Survey]

51. Vehicle crushed by collapse of unreinforced-brick masonry. [C.E. Meyer, U.S. Geological Survey]

52. Failure of porch on frame house. [H.G. Wilshire, U.S. Geological Survey]

53. Drain grating shows the effects of lateral compression. [R.A. Haugerud, U.S. Geological Survey]

54. Downtown sidewalk buckled due to compression. [J.K. Nakata, U.S. Geological Survey]

IX. SUMMIT ROAD AREA, SANTA CRUZ MOUNTAINS

55. Crack system with 1.2 m (4 ft) of vertical displacement across a clay tennis court; fracture passes across retaining wall and up slope beyond view. West of Summit Road, southeast of Highway 17. [H.G. Wilshire, U.S. Geological Survey]

56. A crack system destroys driveway adjacent to summit road 0.8 km (1/2 mi) southeast of Highway 17. [J.K. Nakata, U.S. Geological Survey]

57. A geologist traces surface cracks in a corral adjacent to summit road approximately 1.6 km (1 mi) southeast of Highway 17. [J.K. Nakata, U.S. Geological Survey]

58. Northwest-trending extensional crack where dam fill settled about 0.6 m (2 ft) and pulled away from concrete spillway and north abutment of Austrian Dam. [R.J. McLaughlin, U.S. Geological Survey]

59. Prominent N. 15o W.-trending extensional cracks up to 12 cm (4.7 in.) wide in concrete spillway to Austrian Dam, north abutment. [G.R. Fisher, U.S. Geological Survey]

X. REDWOOD GROVE, SANTA CRUZ MOUNTAINS

60. Geologist exchanging information with rescue personnel. [J.K. Nakata, U.S. Geological Survey]

61. Bedroom showing effects of the earthquake. [J.K. Nakata, U.S. Geological Survey]

62. House destroyed by failure of downslope support piers. [J.K. Nakata, U.S. Geological Survey]

63. House moved laterally off cement foundation. [J.K. Nakata, U.S. Geological Survey]

XI. BOULDER CREEK, SANTA CRUZ MOUNTAINS

64. Collapsed garage built on fill. [J.K. Nakata, U.S. Geological Survey]

65. Construction on fill and the absence of adequate shear walls contributed to the failure of this structure. [J.K. Nakata, U.S. Geological Survey]

66. House torn off its foundation by the main shock. [J.K. Nakata, U.S. Geological Survey]

XII. HIGHWAY 17, SANTA CRUZ MOUNTAINS

67. Landslide debris blocks both eastbound lanes of Highway 17 near Summit Road. [C.E. Meyer, U.S. Geological Survey]

68. Landslide debris blocks both eastbound lanes of Highway 17 near Summit Road. Foreground material is damaged lane separators. [C.E. Meyer, U.S. Geological Survey]

69. This roadcut near Summit Road failed during the initial earthquake and subsequent aftershocks. To mitigate further sliding, Caltrans decreased the slope angle. [J.K. Nakata, U.S. Geological Survey]

70. Damaged lane separators, Highway 17. [C.E. Meyer, U.S. Geological Survey]

71. Broken concrete divider near the intersection of Summit Road and Highway 17. [R.A. Haugerud, U.S. Geological Survey]

XIII. SANTA CRUZ AREA

72. Clock tower near north end of Pacific Garden Mall. Not known if clock was fast or if it ran for about 6 minutes after the earthquake. [J.C. Tinsley, U.S. Geological Survey]

73. Bicycles crushed by falling unreinforced brick facade, Pacific Garden Mall. [C.E. Meyer, U.S. Geological Survey]

74. Collapsed unreinforced-brick facade, Pacific Garden Mall. [C.E. Meyer, U.S. Geological Survey]

75. Rescue efforts, Pacific Garden Mall. [C.E. Meyer, U.S. Geological Survey]

76. Removal of debris while searching for victims, Pacific Garden Mall. [C.E. Meyer, U.S. Geological Survey]

77. Searching for victims at collapsed department store, Pacific Garden Mall. [C.E. Meyer, U.S. Geological Survey]

78. Storefront damage, Pacific Garden Mall. [C.E. Meyer, U.S. Geological Survey]

79. ÒUnsafe to occupy" signs were posted by the Governor's Office of Emergency Services. [J.K. Nakata, U.S. Geological Survey]

80. Collapsed outer wall of the Medico Dental Building, Pacific Garden Mall. [J.K. Nakata, U.S. Geological Survey]

81. Close-up of collapsed wall of unreinforced masonry, Medico Dental Building in the Pacific Garden Mall. [H.G. Wilshire, U.S. Geological Survey]

82. Liquefaction in recent deposits of San Lorenzo River caused cracking and differential settling of river levee southeast of Riverside Avenue Bridge. Bridge piers and the north abutment area were also damaged by liquefaction. [J.C. Tinsley, U.S. Geological Survey]

83. Landslide-displaced trees reflect earthquake-triggered slope failure along coastal bluff, New Brighton Beach area, Santa Cruz County. [J.C. Tinsley, U.S. Geological Survey]

XIV. WATSONVILLE AREA

84. Liquefaction in recent deposits of the Pajaro River formed these sand volcanoes along extensional fissures in a field prepared for autumn planting near Pajaro, across the Pajaro River from Watsonville. Furrows are spaced about 1.2 m (4 ft) apart. [J.C. Tinsley, U.S. Geological Survey]

85. Vent of sand volcano produced by liquefaction is about 4 ft across in strawberry field near Watsonville. Strip spanning vent

is conduit for drip irrigation system. Furrow spacing is about 1.2 m (4 ft) on center. [J.C. Tinsley, U.S. Geological Survey]

86. Liquefaction in recent deposits of the Pajaro River formed sand volcanoes along a fissure 6-7 m (19.7-23 ft) long. Variation in grain size and partial erosion of the conical deposits of sand show that venting of the slurry of sand and water was a complex series of depositional and erosional events triggered by the main shock and renewed in some instances by principal aftershocks. [J.C. Tinsley, U.S. Geological Survey]

87. Ground shaking triggered liquefaction in a subsurface layer of sand, producing differential lateral and vertical movement in a overlying carapace of unliquified sand and silt, which moved from right to left toward the Pajaro River. This mode of ground failure, termed Òlateral spreading," is a principal cause of liquefaction-related earthquake damage. [S.D. Ellen, U.S. Geological Survey]

88. Crack down front of FordÕs Department Store, downtown Watsonville. Although this fracture appears minor, the building was significantly damaged. [H.G. Wilshire, U.S. Geological Survey]

89. Houses not bolted down securely were easily dislodged from their foundations in downtown Watsonville. [J.K. Nakata, U.S. Geological Survey]

90. Many homeowners buttressed their foundations to prevent further damage from aftershocks in downtown Watsonville. [J.K. Nakata, U.S. Geological Survey]

91. Broken utility lines in house that shifted off its foundation, downtown Watsonville. [H.G. Wilshire, U.S. Geological Survey]

92. Collapsed porch, downtown Watsonville. [J.K. Nakata, U.S. Geological Survey]

93. This house was dislodged from its foundation and moved 0.75 m (2.5 ft) from the cement stairway, downtown Watsonville. [J.K. Nakata, U.S. Geological Survey]

94. Structural failure of twin bridges carrying Highway 1 across Struve Slough near Watsonville. [J.C. Tinsley, U.S. Geological Survey]

95. Closeup of collapsed bridge section on Highway 1 at Struve Slough. [J.K. Nakata, U.S. Geological Survey]

96. Failure at joist/columns interface contributed to the collapse of elevated roadbed on Highway 1. [J.K. Nakata, U.S. Geological Survey]

97. Support columns of Highway 1 bridge across Struve Slough protrude through roadbed. This resulted from collapse of the roadbed after the effects of lateral shaking shown in photo 98. [H.G. Wilshire, U.S. Geological Survey]

98. Support column of bridge across Struve Slough, Highway 1. Enlargement of hole where support enters the ground is an effect of lateral shaking, which caused the concrete to break up where the column joined the bridge and was instrumental in the roadbed collapse. [H.G. Wilshire, U.S. Geological Survey]

99. A fracture cuts the roadbed, curbs, and railings on the collapsed section of Highway 1 at Struve Slough. [J.K. Nakata, U.S. Geological Survey]

XV. MOSS LANDING

100. Liquefaction and subsequent strong tidal action destroyed a causeway carrying the Moss Beach access road across tidewater basin near Moss Landing. [J.C. Tinsley, U.S. Geological Survey]

101. Ground cracking and differential settlement dueg to liquefaction of beach and Salinas River deposits damaged approach and abutment of bridge linking Moss Landing spit to the mainland, near Moss Landing Marine Laboratory. [J.C. Tinsley, U.S. Geological Survey]

102. Differential settlement due to liquefaction caused cracking of paved road on Pauls Island. [S.D. Ellen, U.S. Geological Survey]

XVI. SALINAS

103. Partially razed earthquake-damaged unreinforced-masonry buildings in Old Town historical district, City of Salinas. [J.C. Tinsley, U.S. Geological Survey]