Docket No. SA-534

Exhibit No. 5-A

NATIONAL TRANSPORTATION SAFETY BOARD

Washington, D.C.

Fire Scene

Factual Report

(13 Pages)

National Transportation Safety Board
Office of Research and Engineering
Washington, D.C. 20594
Fire Scene Factual Report 11-002
1-31-2010

A. Accident Information

Date of Accident:	September 9, 2010
Time of Accident:	6:11 pm (PDT)
Location:	San Bruno, California
NTSB No.:	DCA10MP008
Vehicle:	Natural gas transmission pipeline

Group member

Nancy B. McAtee
Fire and Explosion Specialist
NTSB

B. Accident Description

On September 9, 2010, at approximately 6:11 p.m. Pacific Daylight Time, a 30-inch diameter section of a multi-diameter intra-state natural gas transmission pipeline (Line 132) owned and operated by Pacific Gas & Electric Company (PG&E) ruptured in a residential area in San Bruno, California. The rupture occurred at approximately mile point (MP) 39.28, at the intersection of Earl Avenue and Glenview Drive in the city of San Bruno. PG&E estimated that 47.6 million standard cubic feet (MMSCF) of natural gas were released as a result of the rupture. The rupture created a crater approximately 72 feet long by 26 feet wide. A pipe segment approximately 28 feet long was found about 100 feet south of the crater. The released natural gas was ignited sometime after the rupture; the resulting fire destroyed 38 homes and damaged 63. Eight people were killed, numerous individuals were injured, and many more were evacuated from the area. On September 10, the NTSB launched a team to California to investigate this tragedy.

Line 132 is regulated by the California Public Utilities Commission (CPUC). According to the PG&E survey sheets, the ruptured pipe (part of Segment 180 that is approximately 1,742-feet long) was constructed from 30-inch diameter seamless steel pipe (API 5LX) Grade X42 with 0.375-inch thick wall. The pipeline was coated with hot applied asphalt, and was cathodically protected. The ruptured pipeline segment was installed circa 1956. The specified maximum operating pressure (MOP) for the ruptured pipeline was 375 pounds per square inch gauge (psig). According to PG&E, the maximum allowable operating pressure (MAOP) for the line was 400 psig. Just before the accident, PG&E was working on their uninterruptable power supply (UPS) system at Milpitas Terminal, which is located about 39.28 miles southeast of the accident site.

C. Fire Scene Examination

The blast crater was located near the northwest corner of Earl Avenue and Glenview Drive. The crater, prior to excavation, was approximately 59 feet (north to south) by 26 feet (east to west). The crater was excavated to enhance safety for those removing the pipe samples from the trench. An aerial photograph of the scene is below in Figure 1. The blast crater[1] is circled in red. Street level views near accident area are shown in Figures 2 and 3.

Figure 1. Aerial photograph of accident scene.

[1] The geographical location of the center of the blast crater was 37° 37’ 21.03” N, 122° 26’ 31.05” W, elevation 360 feet.

Figure 2. Photograph of area near blast crater facing north down Glenview Drive.

Figure 3. Photograph of the east side of Glenview Drive.

Damage to the surrounding houses, vehicles and land extended approximately 600 feet from the blast center with most of the damage radiating out in a northwest direction away from the center of the crater. Figure 4 shows the extent of the damage highlighted in red.

Figure 4. Area of damage

The City of San Bruno building inspection reports were reviewed to assess the level of damage done to the houses in the affected area. The damage ranged from minor physical and/or thermal damage to complete destruction. Of the 376 houses affected, 38 houses were completely destroyed during the accident such as those shown in Figure 5. Seventeen (17) houses were determined to have severe[2] to moderate damage and 46 sustained minor damage. A list of damaged houses is found in the table below.

[2] The damage categories that the City of San Bruno used in classifying the structural damage found on-scene were defined as follows: Severe: Not safe to occupy, most likely need to be demolished or completely renovated prior to occupancy; Moderate: Substantial damage, repairs necessary prior occupancy; and Minor: Least amount of damage can be legally occupied while repairs are being made.

Figure 5. A row of four destroyed houses on Claremont Avenue.

Destroyed

Number	Street	Description
1621	Claremont	Destroyed
1631	Claremont	Destroyed
1641	Claremont	Destroyed
1642	Claremont	Destroyed
1645	Claremont	Destroyed
1646	Claremont	Destroyed
1650	Claremont	Destroyed
1651	Claremont	Destroyed
1655	Claremont	Destroyed
1660	Claremont	Destroyed
1661	Claremont	Destroyed
1670	Claremont	Destroyed
1680	Claremont	Destroyed
1690	Claremont	Destroyed

Number	Street	Description
1700	Claremont	Destroyed
1701	Claremont	Initially classified as “severe” damage; Further inspection determined that extensive structural damage made repair infeasible.
1710	Claremont	Destroyed
2725	Concord	Initially classified as “severe” damage; Further inspection determined that extensive structural damage made repair infeasible.
2731	Concord	Destroyed
2735	Concord	Destroyed
2741	Concord	Destroyed
1701	Earl	Destroyed
1711	Earl	Destroyed
1721	Earl	Destroyed
1101	Fairmont	Destroyed
1106	Fairmont	Destroyed
1110	Fairmont	Destroyed
1115	Fairmont	Destroyed
1121	Fairmont	Destroyed
951	Glenview	Destroyed
960	Glenview	Initially classified as “severe” damage; Further inspection determined that extensive structural damage made repair infeasible.
970	Glenview	Destroyed
981	Glenview	Destroyed
991	Glenview	Destroyed
1100	Glenview	Initially classified as “severe” damage; Further inspection determined that extensive structural damage made repair infeasible.
1110	Glenview	Initially classified as “severe” damage; Further inspection determined that extensive structural damage made repair infeasible.
1115	Glenview	Initially classified as “severe” damage; Further inspection determined that extensive structural damage made repair infeasible.
1127	Glenview	Initially classified as “severe” damage; Further inspection determined that extensive structural damage made repair infeasible.

Severe (*) to Moderate damage

Number	Street	Description
1611	Claremont	Roof damage including rafters; Heat damage to exterior.
1636	Claremont	Roof damage including rafters; Siding and window damage.
*1720	Claremont	Rear 2/3 of home completely destroyed; Unsafe to occupy.
1730	Claremont	Roof including rafters destroyed; Electrical system and drywall damage in rear portion of house.
1740	Claremont	Entire roof destroyed
1750	Claremont	Roof, ceiling joists and rafters destroyed; Windows and stucco also destroyed.
1730	Earl	Roof damage; Interior damage in kitchen area; Damaged electrical system; Windows and doors destroyed; Stucco, deck and insulation damage.
1731	Earl	Retaining wall and roof damage.
1741	Earl	Roof destroyed; Deck, door, window, stucco and siding damage; Electrical system destroyed throughout; Drywall damage throughout.
1771	Earl	Roof damage; Structural damage to the floor.
1120	Fairmont	Garage badly damaged; Exterior and window damage.
1127	Fairmont	Damaged windows, exterior siding, and roof; Repair needed to electrical & plumbing throughout
941	Glenview	Roof Destroyed
971	Glenview	Substantial amount of damage to stucco, drywall, windows, doors, flooring, roof and insulation.
1120	Glenview	Destroyed Room; Initially listed as minor damage, follow-up inspections revealed more extensive damage which made the home uninhabitable until repairs were made.
1121	Glenview	Interior Fire Damage; Initially listed as minor damage, follow-up inspections revealed more extensive damage which made the home uninhabitable until repairs were made.
*1720	Earl	Severe heat damage throughout; Unsafe to occupy until detailed interior inspection has been conducted.

Minor damage

Number	Street	Description
1331	Claremont	Damaged roof (rear) observed during follow-up inspection.
1401	Claremont	Damaged windows and doors observed during follow up inspection.
1581	Claremont	Damaged roof observed during follow up inspection.
1591	Claremont	Damaged windows observed during follow up inspection.
1601	Claremont	Damaged windows and roof observed during follow-up inspection.
1620	Claremont	Damaged roof observed during follow up inspection.
1630	Claremont	Damage to roof, drywall, windows, doors, ceiling insulation floor insulation observed during follow-up inspection.
1721	Claremont	Damage to siding, roof, windows and electrical system during follow-up inspection.
1760	Claremont	Damage to roof (including rafters) and window damage observed during follow-up inspection.
1771	Claremont	Damage to windows and doors observed during follow-up inspection.
1811	Claremont	Damaged chimney and chimney foundation observed during follow-up inspection.
2720	Concord	Damaged windows.
2721	Concord	Damaged windows
2726	Concord	Damaged windows.
2730	Concord	Damaged windows.
2736	Concord	Damaged windows.
2740	Concord	Damaged windows.
2746	Concord	Damaged windows.
2750	Concord	Damaged windows.
2751	Concord	Damaged windows.
2756	Concord	Damaged windows.
2760	Concord	Damaged roof and windows.
2761	Concord	Damaged deck, roof, windows and insulation.
2770	Concord	Damaged windows. as indicated in inspection report.
2771	Concord	Damaged roof.
2780	Concord	Damaged windows.
2781	Concord	Damaged windows, drywall and roof.
2790	Concord	Damaged windows, roof & skylight.

Number	Street	Description
2791	Concord	Damaged windows, heat damage to exterior.
2796	Concord	Damaged roof, windows & doors.
1740	Earl	Damaged roof.
1751	Earl	Damaged windows.
1761	Earl	Damaged roof.
1791	Earl	Damaged roof.
1131	Fairmont	Damaged windows and skylight.
1140	Fairmont	Damaged windows, stucco, siding, and attic insulation.
1141	Fairmont	Damaged stucco and doors.
930	Glenview	Damaged roof.
940	Glenview	Damaged windows, roof, drywall, interior flooring damage and heating system.
950	Glenview	Damaged roof, stucco, drywall, insulation & windows.
1126	Glenview	Damaged windows, stucco, doors.
1130	Glenview	Damaged windows.
1131	Glenview	Damaged windows, roof & stucco.
1110	Vermont	Damaged roof, windows & doors.
1115	Vermont	Damaged roof, windows, siding and door.
1120	Vermont	Damaged siding, windows & roof.

74 vehicles[3] were also damaged or destroyed in the explosion and resulting fire. An example of a damaged vehicle is show in Figure 6.

Figure 6. Damaged vehicle located on Claremont Avenue near the intersection of Glenview Drive.

A park (Glenview Park), with woodlands located on the east side of the crater, exhibited heavy explosion and fire damage as shown in Figure 7. The trees were blackened with almost all of their smaller limbs and branches missing. The playground equipment in the park was completely destroyed. The fire damage extended down into the canyon south of the park.

[3] A vehicle was accounted for if the vehicle was inoperable due to damage received during the explosion and resulting fire, such as mechanical damage from falling debris, thermal damage from the explosion/fire, etc.

Figure 7. Photograph of Glenview Park facing northwest.

Twelve pieces of identifiable debris of significant size (several inches in diameter), mostly concrete and asphalt pieces, from the crater were found throughout the neighborhood. An example is show in Figure 8. From the center of the crater, the extent of the debris field was approximately 300 feet to the north of the crater, 200 feet to the south, 300 feet to the east, and 60 feet to the west. The canyon below the park was not searched for debris.

Figure 8. Picture of asphalt debris (highlighted with a red arrow) that penetrated the roof of a house near the accident site.