Fig. 7.18. Damage at the base of the tower support structure was repaired. Note the massive waveguide that drooped down below the tower support structure

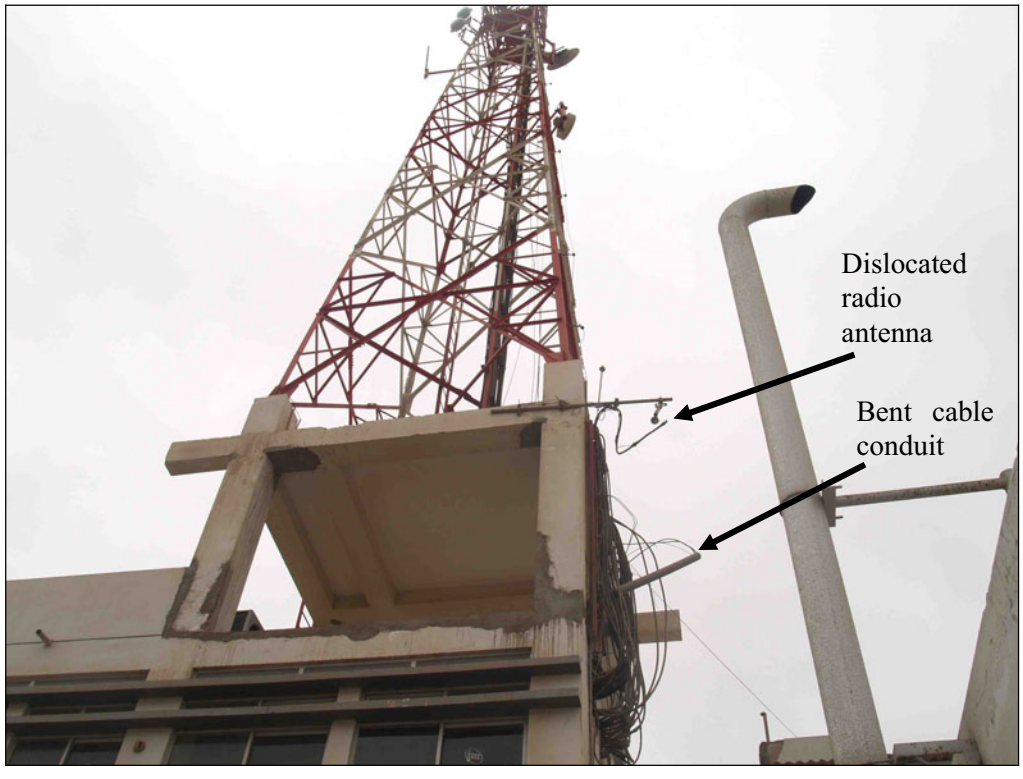

Fig. 7.19. Damage viewed from the bottom of the structure in the yard of the CO facility

Fig. 7.20. Repaired top of the building at the back of the Telefónica CO

Fig. 7.21. Material for repairing damage in the yard of this CO. Note the repaired cracks on the walls.

Fig. 7.22. More repair material in the CO yard, note repair on the column

Fig. 7.23. Free telephone call service provided by Telefónica in Pisco

Claro, Pisco, Cell Site (S13.7103, W76.2045)

This cell site is on the roof of the eight-storey Hotel Candelobra building, which was closed due to extensive damage. There is a public phone in the hotel lobby (Fig. 7. 24), which seems to be a rare item in Pisco.

Fig. 7.24. Public phone in the lobby of Hotel Candelobra, Pisco

Claro personnel indicated the power outage exceeded five days at this site. Power generators were brought in to restore service to the cell site, which did not have power until two weeks after the earthquake. This delay was most likely due to extensive damage to the utility poles and the power distribution system in this area (Fig. 7.25).

Fig. 7.25. Utility pole damaged in the street next to Hotel Candelobra, Pisco.

This cell site is equipped with 20 channels to support its customer base. The observed damage was to the base, where the tower is anchored to the roof (Fig. 7.26). The beams were secured to the roof structure by steel reinforcement rods welded to the reinforcement of the building (Fig. 7.27). At the time of ASCE/TCLEE visit, the damage was not repaired.

Fig. 7.26. The damage at the base of the tower

Fig. 7.27. Details of securing the steel beam to the roof structure

Telefónica, Ica City, Central Office and Cell Site (S14.0666, W75.7289)

Ica was one of the hardest hit areas. The major telephone service provider is Telefónica. Cellular services are provided by Telefónica, Nextel and Claro.

Fig. 7.28. Telefónica central office in Ica City. Surface cracks on the outside wall were fixed.

The ASCE/TCLEE investigation team met with the central office manager in Pisco; however, he referred us to the head office in Lima for details.

There are about 45,000 to 50, 000 lines provided by this Telefónica central office for a population of around 90,000.

This location is also a cell site for Telefónica. Figure 7.28 shows the antenna tower on the back of the building. Microwave links are used to connect to other cell sites and central office.

The only damage observe at this location was the crack on the building's outside wall (Fig. 7.28). There were no signs of damage on the inside where we met the office manager.

Cell Sites Near Paracas (S13.8214, W76.2443)

The cell sites of Telefónica, Nextel, and Claro are located very close to each other on the west side of the highway leading to the Port of San Martin (Fig. 7.29). This location is less than 1 km from the coast. These cell sites were built on sandy ground. We did not observe any signs of ground deformation or liquefaction. The only damage observed was the wall above the doorway of the Telefónica cell site (Fig. 7.30).

The equipment was anchored to a concrete pad. The power equipment was anchored to two steel beams that were secured to the concrete pad by four U-shape brackets (Fig. 7.31). This installation method is typical of the other cellular service providers. The only difference is the design of the antenna towers (Fig. 7.29).

The electric power supply to these cell sites came from a single source (Fig. 7.32). The feed cable comes down from the pole-mounted transformer along the pole and then feeds the sites via underground conduits. Although there are three cell sites, there is no redundancy to prevent a power failure.

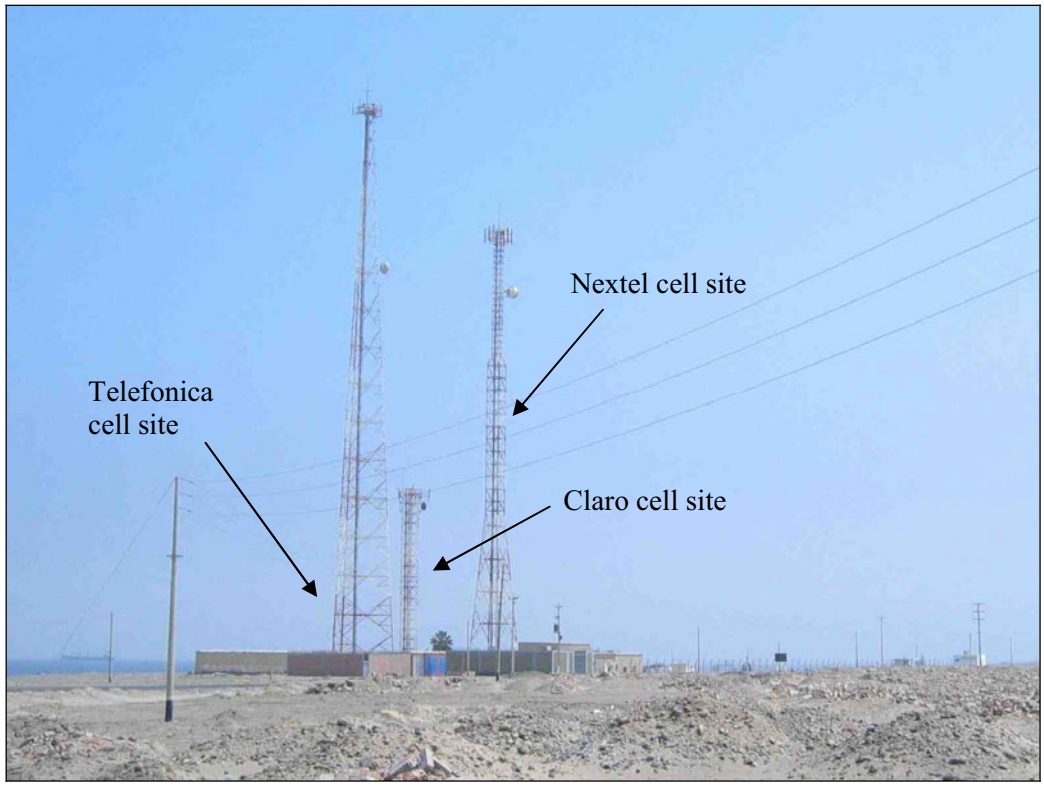

Fig. 7.29. Three cell sites near Paracas along the coast south of Pisco

Fig. 7.30. Damaged wall above the door, no other signs of damage observed

Fig. 7.31. Cell site equipment anchored on concrete pads

Fig. 7.32. Electric power supply to all three cell sites comes from this pole. This is an underground feed to the sites.

Telefónica Cell Site Outside of Ica City

At the time when the ASCE/TCLEE investigation team visited this site, the collapsed wall around the cell-site equipment building has not been rebuilt (Figs. 7.33 and 7.34).

As there were no Telefónica personnel around, the team took a number of photos to evaluate what had happened at this location. The ground around this location did not show any settlement or liquefaction. However, strong shaking was evident from the paint chips on the antenna tower base (Fig. 7.35).

Discarded sectorized antenna casing were found near the fuel tank for emergency power generator inside the building (Fig. 7.36). This indicated damage to the antenna at this site, and the antennas were replaced.

The damaged electric power transformer (Fig. 7.37) was chained to the halon cylinder for fire suppression at this cell site. The transformer was a pole-mounted transformer just outside the perimeter of the collapsed wall (Fig. 7.34).

This site was mostly back to normal within one week of the earthquake.

Fig. 7.33. Telefónica cell site outside of Ica City

Fig. 7.34. Preparation for rebuilding the enclosure wall. Note the utility pole with a pole mount transformer serving this site.