

9 DAMAGE TO BUILDINGS

9.1 Wooden houses

Mainly old wooden houses were either collapsed or heavily damaged. The failure was quite similar to those observed in 1995 Kobe earthquake. The failure mechanism mainly involved hinging of wooden columns at the base and also at the interface between 1st floor and 2nd floor as a result of large horizontal earthquake forces. The traces of such mechanism can be seen widespread in the epicentral area. In addition some relatively new wooden houses either collapsed or were heavily damaged. The main cause was the weak floor situation observed at the first floor used as garage, workshop or storage (Figure 9.1).

Some houses either collapsed or were heavily damaged by the slope or embankment failure, on which they were built. This type of failure observed in mainly hilly regions and also Yamakoshi village, which suffered from extensive slope and embankment failures.



Figure 9.1: Collapse of wooden houses

9.2 RC Buildings

RC buildings with or without steel frames in the epicentral region are few. They are used as schools, public offices and a few residential buildings. The number of stories is mostly 3 to 5. Some residential buildings had 10 stories. Furthermore, the infill walls of the RC buildings were constructed with shear-walls. Therefore, their behavior should had been close to rigid boxes on softer ground. The observations and investigations in many cities and towns indicated that the RC buildings were generally none or slightly damaged in spite of high ground accelerations. Damage to RC buildings was caused by column failure at the ground floor. In some of buildings, the quality of concrete and density of stir-ups were not in accordance with regulations (Figure 9.2).



Figure 9.2: Damaged RC buildings