2.2. Relation of dwelling collapse and human loss

Figure 2.3 shows the relation between rate of dwellings totally collapsed and rate of human loss for village statistics in Bantul District. Normal correlation is obvious with correlation coefficient R=0.896 and human loss rate further increases while total collapse rate exceeds 60%. Linear regression equation is obtained as follows.

\[ FR = 0.023 \times CR - 0.17 \]  

(2.1)

where FR: Fatality Rate (%),
CR: Dwelling Collapse Damage Rate (%)

Based on the damage report of the 1995 Kobe earthquake by Fire Research Institute of Japan, the following relation between dwelling heavy damage rate and human loss rate is given for earthquake damage estimation manual (Fig. 2.4).

\[ FRW = 0.0359 \times CHR \]  

(2.2)

where FRW: Fatality Ratio in Wooden Buildings (%),
CHR: Wooden Dwelling Collapse and Heavy Damage Ratio (%)

For the same levels of dwelling damages, fatality ratio in Java is approximately half of that in the Kobe earthquake, probably because single story dwellings are majority in Java, while two story dwellings were common in Kobe. In Central Java, more two story dwellings have been constructed along urban sprawl and economic development of the area. It is very important to provide education and training of dwelling earthquake safety (seismic resistance) for local residents (home owners) and carpenters, otherwise we are afraid that human casualty could be doubled in future earthquakes.

3. SEISMIC INTENSITY ESTIMATION BY QUESTIONNAIRE SURVEY

3.1. Survey Method

In order to estimate strength of seismic shaking in the disaster area, we conducted questionnaire survey of seismic intensity. The author (H.M.) made the questionnaire based on MSK intensity scale definition and utilized for the field reconnaissance survey of the 2001 Gujarat, India earthquake (Murakami, 2001). Out of the 26 questions, 16 are used to estimate seismic intensity as indicated in Table 3.1. Based on the 12 scale MSK seismic intensity definition, each item category is given a respective intensity coefficient in the form of