CHAPTER IV
CONCLUSIONS AND RECCOMENDATIONS

4.1 Conclusions

This study investigated six steel joist supported wood floor systems with three different bracing configurations and examined four design considerations: 1) subjective acceptability, 2) prediction of deflection, 3) prediction of frequency, and 4) the effects of diagonal bracing. Conclusions reached for each aspect are given in the following sections.

4.1.1 Subjective Acceptability

Five acceptability criteria were examined to determine the most suitable method for evaluating a proposed floor system. The Swedish (1988b) and Murray (1979) criteria were found not to be applicable since at least some of the properties for each floor were not within the limitations of the method. The Onysko's method (Onysko 1985) predicted four floors to be acceptable, two floors to be marginal, and twelve floors to not be acceptable. The Australian Code (1993) and Johnson (1994) criteria rated all of the floors as unacceptable. It must be emphasized that all of the criteria, except Johnson's, are based on finished floors with typical furnishings. The Johnson criterion is based on bare floors, e.g. only subflooring and joists.

The six laboratory floors constructed for this study were all subjectively rated as unacceptable. The floors were evaluated without furnishings but the people that evaluated the floor were asked to attempt to project their response to a finished residence. The subjective evaluations agree with Johnson's criterion but the data base is very limited. Thus, without tests of in-situ floors, a definitive recommendation of an acceptability criterion cannot be made.

4.1.2 Prediction of Deflection

Four different methods to predict deflection were evaluated; Australian Code, SJI, AISC, and Kitterman. The Kitterman method was the only method to accurately predict midspan deflection of some floor systems when compared to measured results. Although Kitterman's method correctly predicted only eight of the eighteen floor configurations within 10 percent, it underpredicted the number of effective joists for 16 of the 18 floors. If a floor is evaluated using a smaller value of N_{eff}, the predicted amplitude will be larger than expected resulting in a conservative evaluation.

4.1.3 Prediction of Frequency

Frequency measurements were taken for each floor system. The simplified frequency equation (Equation 1.24) was found to be an acceptable method for predicting the fundamental frequency for these floor systems. It was shown through the power spectrum for each floor system that multiple and torsional frequencies contribute very little to the acceleration traces due to a heel drop impact. Therefore, the fundamental frequency is the dominant vibration component that influences these floor systems.

4.1.4 Effects of Diagonal Bracing

Three different diagonal bracing configurations were tested for each floor system. It was found that the type of diagonal bracing does significantly effect the static deflection a floor system but does not alter its fundamental frequency. The most effective diagonal bracing was found to be a combination of cross and horizontal braces with diagonal cross bracing alone being the second best. The least effective bracing configuration was found to be horizontal bracing alone.

4.2 Recommendations

The number of floor systems tested in this study was not enough to develop or recommend a procedure for determining acceptability of steel joist supported wood floor systems subjected to human activity excitations. A significant data base of results from tests of in-situ floors must be developed before a design procedure can be recommended.