

EXECUTIVE SUMMARY

In December, 1989, Transit Bridge Group Ltd. (TBG) was retained to conduct a seismic risk assessment of the Vancouver School Board's 108 schools. The principal objective of the assessment was to determine the relative seismic risk for each school building and rank both the individual buildings and the schools in descending order of seismic risk.

To undertake this assessment, TBG has applied the unique seismic risk assessment procedure developed by TBG for the British Columbia Buildings Corporation in April, 1989. The latter procedure is based on state-of-the-art literature from California. To capitalize on the extensive California experience in this field, TBG retained the consulting engineering services of Dr. Onder Kustu of Oak Engineering, California. Dr. Kustu is a prominent California consultant, specializing in the seismic engineering field.

The adopted procedure is a rapid risk assessment method that culminates in the calculation of numeric seismic risk indices for each school building. The three calculated indices are life safety risk index, serious injury index and building damage index. These indices are determined by the building structural system, the number of occupants, the hours of occupation, the building replacement value, the foundation conditions and the probability of occurrence of earthquakes in the Vancouver region.

An essential step in the risk assessment procedure was an expert walk-through inspection of each building by experienced structural engineers to ascertain significant seismic hazards that were not readily identified from the drawings. Typical non-structural seismic hazards were also noted during the school inspections.

The assessment results are presented in two formats. The observations made during the expert walk-through inspections are incorporated in inspection reports for each building. Each report records all structural, non-structural and occupational information that has a bearing on the overall seismic risk of the given building. The second format for presenting the results is the expert computer program, QUAKESOFT 100, that calculates risk indices for any group of buildings. QUAKESOFT 100 permits the user to modify the primary input parameters in refining the computation of seismic risk. The computer results are sorted in descending order of risk.

Our principal seismic risk assessment findings are as follows:

- . 30% of the 302 buildings surveyed are classified as high risk buildings and a further 15% are classified as moderate risk buildings;
- . Each school has many non-structural seismic hazards that pose serious life safety and injury risks in the event of a moderate earthquake during school hours.

Our recommendations arising from this assessment are as follows:

1. Several buildings require detailed engineering evaluation to confirm the assigned seismic risk indices;
2. All buildings in the high and moderate risk classifications need to be evaluated for structural seismic upgrading;
3. Structural systems should be carefully selected for new schools to ensure the best seismic performance;

4. A review panel should be formed as part of a seismic upgrade program to advise the Vancouver School Board on technical seismic issues;
5. Priorities for improving school seismic safety should be:
 - i) abatement of the majority of non-structural hazards;
 - ii) progressive retrofitting of all school buildings in the high and moderate risk classifications in descending order of risk.