EARTHQUAKE RISK BUILDINGS - HOW THEY STAND UP IN COURT

David C. Hopkins[1], Garry R. McKay[2], and R. Bruce Shephard[3]

ABSTRACT

The power to classify buildings as earthquake risk has been available to local authorities since 1968. Through provisions in the Local Government Act, local authorities could require owners to strengthen or demolish buildings so classified. Authorities throughout New Zealand have progressively taken up these powers and many unreinforced masonry buildings have been demolished or strengthened. Relatively few owners have challenged the local authority's classification and it took until 1989 for a Council's ruling to be challenged in the District Court. During that year, three cases were heard, and the authors as members of a statutory panel of experts, were called upon to assist the judges. The experience provided a valuable, if long delayed, learning experience for the Courts, local authorities, building owners and engineers. The Council's ruling was upheld in only one of the three cases.

This paper describes each case and draws attention to some engineering and procedural aspects which contain lessons for those involved in future applications. The main lessons for engineers include the need for adequate preparation and presentation for the standard of proof required by the Court.

BACKGROUND

In 1968, Amendment 301A to the Municipal Corporations Act (now Section 624 of the Local Government Act 1974) was enacted. This legislation enabled individual local authorities to apply to the Minister to be granted, by Order in Council, powers with respect to buildings likely to be dangerous in a moderate earthquake.

In essence the Act seeks to reduce the risk to life in earthquakes by empowering the local authority to require building owners to remove the danger represented by buildings or parts of buildings that in a moderate earthquake would constitute a danger to persons in or adjacent to the building.

Building owners and occupiers rights are protected by prescribing an objection process. When there is a valid objection to a notice by the Council for the owner to remove the danger under this Act, and the council reaffirms its requirements, the council is then required to apply to a District Court for an order confirming the notice. Any party to the District Court hearing may appeal to the High Court (Section 625 of the Local Government Act 1974), for an opinion of that Court on a question of law only.

Figure 1, reproduced from reference 1, outlines the procedures under Section 624 of the Local Government Act 1974.

On hearing the application by the council for an order confirming its notice, the District Court may do one of four things: (a) Confirm the notice without modification; or (b) Confirm the notice subject to modification; or (c) Extend the time specified in the notice for removing the danger; or (d) Set aside the notice.

In deciding which of these to follow, the Court has the benefit of the assistance of two assessors appointed for the purposes of that application by the Secretary for Local Government from the panel of persons of special skill or knowledge published by notice in the Gazette from time to time by the Minister.

The Act is quite clear that the sole function of the assessors shall be to assist the Court in determining the application and that the application shall be determined by

1 Director, KRTA Limited, Wellington (Fellow, NZNSEE)
2 Senior Consultant, Works Consultancy Services, Wellington (Member, NZNSEE)
3 Principal Consultant, Works Consultancy Services, Wellington (Fellow, NZNSEE)

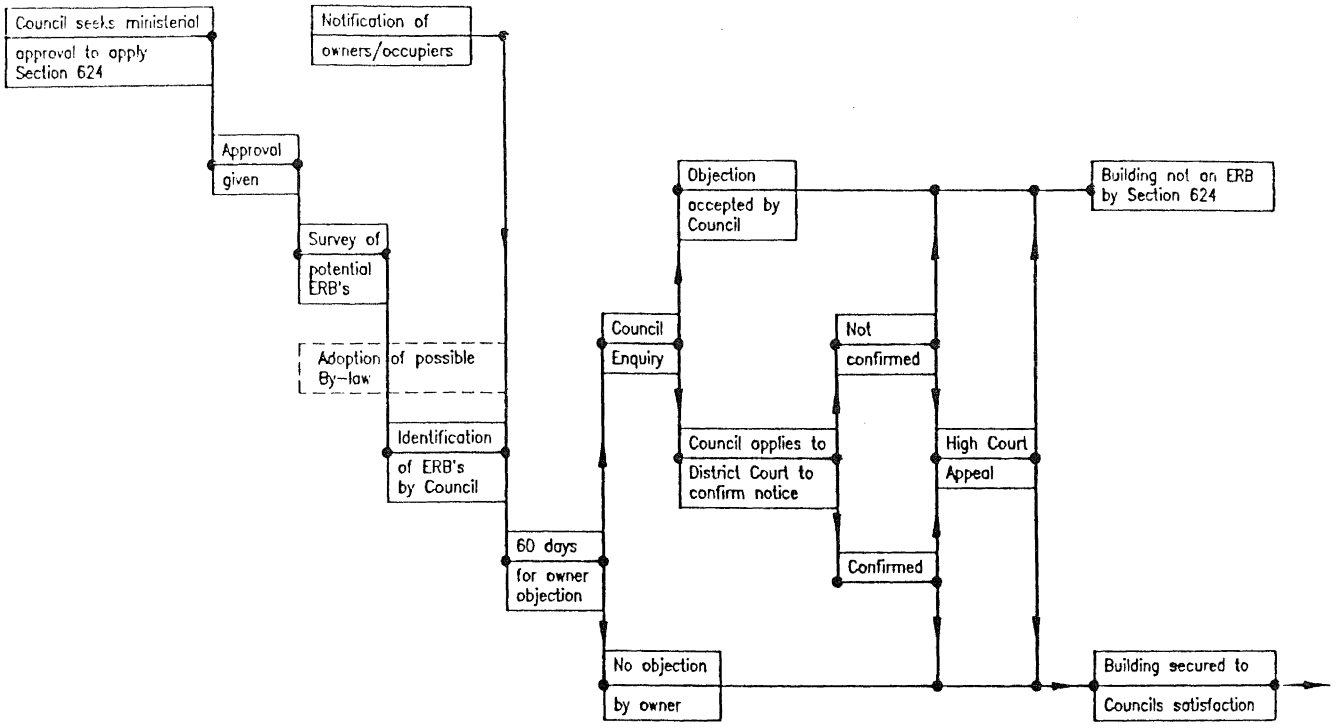


FIGURE 1 OUTLINE OF PROCEDURES UNDER SECTION 624 OF THE LOCAL GOVERNMENT ACT (FROM REFERENCE 1)

the Court alone.

While many buildings have been strengthened or demolished as a result of notices having been issued under the Act, so far there have been three applications to the District Court to confirm notices. In all three cases the argument was not about what level to strengthen to remove the danger, but rather was the building, or part, an earthquake risk in terms of the Act.

COURT PROCEEDINGS

The court proceedings are formal and under the absolute control of the presiding Judge. The assessors are seated beside the judge on either side. During proceedings the judge may refer items to and ask questions of the assessors. In the presentation of evidence by witnesses, the judge may invite questions to be put by the assessors. This is an important privilege and enables technical engineering evidence to be explored, elaborated upon and explained to the Court. Copies of all papers submitted to the court as evidence are given to the assessors.

Before the Court session, the judge briefed the assessors on the Act under which the hearing is conducted, the proceedings, and the role of the assessors. Emphasis was given to the fact that the assessors assist the court and that the decision is to be the judge's (The Court's) alone. The assistance given by assessors is to clarify and interpret the technical evidence for the judge. The standard of proof was to be "on the balance of probability" which is understood to be less rigorous than that in criminal cases. This standard of proof enabled judgment to be based on expert opinion given as evidence in court.

In each case the council first showed that all the legal requirements and processes of the Act up to that point have been complied with. This generally involved producing the relevant copies of the Order in Council showing that they had the power to apply the Act, evidence that the powers were adopted, and that notices were properly issued and confirmed. Evidence of the process of surveying buildings and adoption of technical criteria for interpreting the Act was also heard prior to discussing the engineering details of the particular building which is the subject of the notice.

The purpose of the technical evidence was to show that the building is a building that the Act applies to and in the words of Section 624(3): "... having regard to its condition, the ground on which it is built, its present and likely future use, and all other relevant matters, will have its ultimate load capacity exceeded in a moderate earthquake and hereby constitute a danger to persons therein or in any adjoining building or on any adjoining land or to passers-by..."

A "Moderate Earthquake" is defined in Section 624(1) as meaning "an earthquake that would subject a building to seismic forces one-half as great as those specified

in New Zealand Standard Model Building Bylaw (NZS 1900 Chapter 8; 1965) for the zone (as described in that bylaw) in which the building is situated:"

The respondents were then given the opportunity to show why they believed that the notice should not be confirmed by the Court.

In all cases, the onus of proving that the building in question would have its ultimate load capacity exceeded in a moderate earthquake, was on the Council. Obviously evidence to this effect had to be produced in the court hearing. This factor assumed an importance in the hearing of WCC v Port Nicholson Holdings, where the assessors found it difficult not to introduce material or opinion as evidence and to confine themselves only to that given in evidence.

In preparation of the judgment the judge sought opinions of the assessors and in turn the assessors felt free to offer comment. The final judgment was the responsibility of the Judge.

CASE DESCRIPTIONS

Wellington City Council vs Poys Buildings [2]

Summary of Evidence

This case concerned a three storey building at 360 Lambton Quay built prior to 1903. Refer Figure 2.

Wellington City Council (WCC) were represented by counsel, with technical evidence being presented by their Director of the Building and Structural Division. The Respondent, Poys Buildings, no longer owned the building and were not represented in Court. The new owners, Lambton Quay 360 Limited, as an affected party, were represented by counsel. They brought no technical evidence and indicated that they were aware of and did not dispute evidence to be given by the Council. They would abide by the Court's decision.

The case consisted largely of WCC's evidence, which was presented as a written report. The first part set out the background to the case starting with resolution by WCC in February 1970 to apply to take up the powers under the Act. An Order in Council in November 1970 gave WCC these powers and they resolved to survey all buildings in the City. Surveys were carried out and the owners notified in August 1973 of Council's assessment and of their powers. The owners were further notified in March 1979 that a formal notice requiring demolition or strengthening of their building would be issued in 1983 with a five year maximum period for compliance. In the case of 360 Lambton Quay, notice was served in April 1984 including a 7-year period for compliance. The notice went to the owners and their mortgagee.

The owner objected almost immediately on the grounds that the notice was wrong in law and in fact. The Council's By-Laws Subcommittee heard the objection in March 1985 and it was not upheld. In December 1985 the Council made application to the District Court to confirm the notice. Copies of relevant letters were presented in support.

WCC presented evidence to show that the building had walls of load bearing brickwork, timber floors and timber roof trusses supporting corrugated iron. The maximum unsupported length of wall was 10.5 metres and the maximum height was 13.5 metres.

Council had no record of damage from the 1942 earthquakes but structural fractures were evident in the front wall at first floor level and in the walls around the lightwell. A transverse wall had fractured and showed signs of settlement. The building was extended from 2 to 3 storeys in 1903. Plans and specification for this were presented.

Evidence on strength evaluation centred on the front wall panel, 8.2 metres wide and 13.5 metres high, analysed under face loads derived from NZSS 1900 Chapter 8 according to the Parts and Portions Coefficients in Amendment No. 3 1976. Stresses were calculated on the basis that the floor and roof fixings offered no significant restraint, and were shown to be excessive.

Additional evidence was given to demonstrate that the parapet could not sustain the required loads.

WCC had surveyed all city buildings between September 1971 and October 1974, involving 758 buildings in all. Approximately 300 owners had voluntarily demolished or strengthened their buildings. This was the first time WCC had sought confirmation of the notice from the District Court.

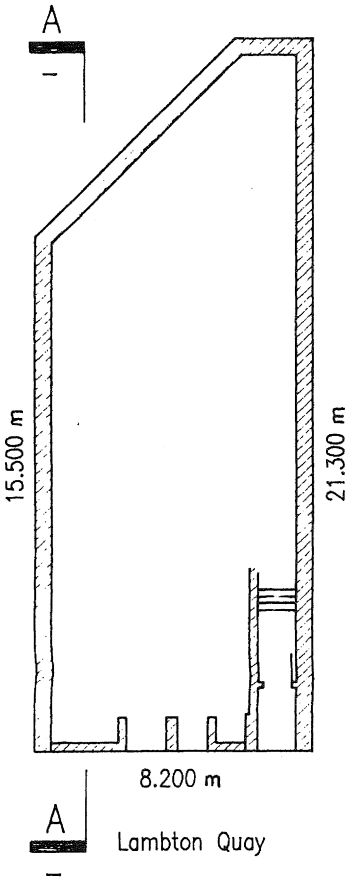
The Court questioned the assumption by WCC of insignificant strength of the fixings. The WCC Director noted that no detailed inspection had been made, and that owners could refute this. He agreed there was a wide variety of fixing strengths in Wellington's buildings but stated that even if the fixings were in the upper end of the strength spectrum, the building would still be an earthquake risk under the Act.

Other questions from the Court sought to clarify technical terms such as "ultimate load capacity".

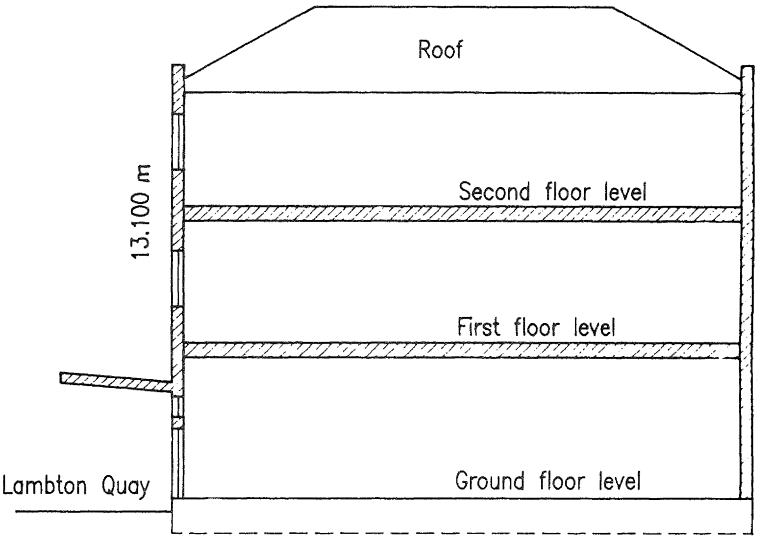
Summary of the Judgment

The Court confirmed Council's notice without modification. The judgment referred to a number of significant points:

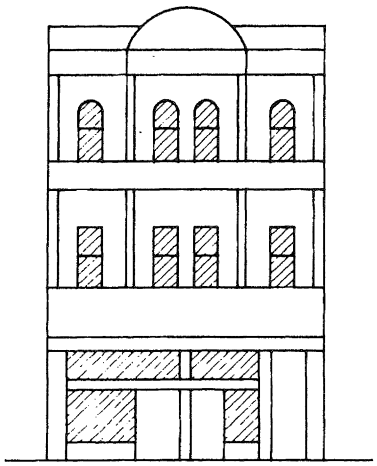
- Council had properly taken up powers under the Act.
- The evidence on the strength of fixings was carefully examined. The Court accepted the WCC Director's opinion that, even if the fixings had been as good as could be expected, the building would still be an earthquake risk building in terms of the Act.
- Specific reference was made to the parapet. The Court was careful to point out that deficiencies in the



GROUND FLOOR PLAN



SECTION A–A



FRONT ELEVATION

FIGURE 2 360 LAMBTON QUAY

FIGURE 3 BUILDING IN GROVE ROAD BLENHEIM

parapet alone would not be sufficient to justify an order to secure or to demolish the whole of the building.

Discussion

The judgment emphasised the role of assessors as assistants, not part of the Court. They are there to clarify and interpret the evidence for the judge. They thus are restricted to examining the evidence before the Court and cannot introduce material or opinions on matters not covered in evidence.

The evidence was clear, logically presented and concise. No detailed supporting calculations were presented for evaluation by the Court. Had the Court found reasons to doubt WCC's conclusions, these could have been worthwhile.

Blenheim Borough Council v J G Orchard Partnership[3]

Summary of Evidence

The building at the centre of this case is unusual in that it is an unreinforced concrete cavity wall building rather than an unreinforced brick one.

This single storey building, Figure 3, circa 1923, is L shaped in plan, has external unreinforced concrete cavity walls, piers and parapets, and a timber roof system with iron sheeting over close boarded timber sarking. The reinforced concrete floor is some 1.2 m above ground and street level.

The applicants, Blenheim Borough Council, were represented by counsel, but the respondents represented themselves.

In 1970 the Blenheim Borough Council took up powers under the Act and in 1972 began surveying buildings within the Borough which might be an earthquake risk. It was not until July 1987 that the Consultant Engineer for the Council inspected the building at the centre of this case. In October 1987 the Respondent agreed to purchase the building and settlement was effected in November 1987. Despite having tried to ascertain from the Council the nature of the Council's requirements the new owners did not become aware of the notice under Section 624 until after settlement when they became the registered protrietors. The respondents then objected to the notice which was subsequently confirmed by the Council.

The evidence for the Applicant was presented mainly by the Consultant Engineer employed by the Council and addressed the timing of the various events, Council decisions, policy, seismicity of Blenheim, town planning requirements and condition, earthquake resistance and occupancy of the building.

The Blenheim Borough Council adopted in 1985 for the purposes of Section 624 a draft of the New Zealand National Society for Earthquake Engineering book "Earthquake Risk Buildings Recommendations and Guidelines for Classifying Interim Securing and Strengthening" with a K factor of 0.33 thus envisaging that the programme of hazard removal could be carried out within a 10 year period.

The occupancy of the building varied over the period in question. While two thirds of the area was used for seed cleaning with considerable space for stacking of sacks of seed, the other third changed from a retail shop and show room, to an entertainment

parlour and then to an aluminium fabricating shop. The pedestrian count on the adjacent footpath is low, but the building is located on the corner of the junction between State Highways 1 and 6.

The condition of the building in terms of the New Zealand National Society for Earthquake Engineering book was rated by the Council as BA (below average). The Council submitted that the road-widening provisions in the District Scheme had no bearing on the case. The wire ties between the wall eaves and the roof were not inspected but presumed to be ineffective as corrosion was evident in the floor reinforcement.

The respondent was supported by a Consulting Engineer who, erroneously in the Court's view, stated that because the floor contained reinforcing the building was not a building within the meaning of Section 624 of the Act. He agreed that the building was an earthquake risk as far as its parapets were concerned but submitted that the remainder was not an earthquake risk in terms of the Act.

The Respondent criticised the Council for not disclosing the terms of the requirement on the building prior to his Partnership entering into the Agreement for Sale and Purchase. He also questioned the urgency of the need to strengthen the building in three years when the Council itself had taken some 17 years from the date the Section became operable as far as it was concerned until the requirement was filed.

By agreement with the Respondents and the Council the Court inspected the building at the conclusion of the evidence with both of the assessors being present.

Summary of Judgment

The Court confirmed the notice only in respect of the parapets in the building and set aside the notice in respect of all other parts of the building. The judgment referred to a number of significant points:

- Times required for strengthening must be realistic and notification given as early as possible to allow owners to plan for the consequences.
- Council's requirements should be readily available to all interested parties or better still, they should be publicly notified so that anyone who has some present or future interest in the building can proceed with full knowledge of the requisition.
- All relevant departments in a local authority should be consulted so that a definitive response of the matter under question can be obtained by the owner of the building.
- That the K factor modifying the time allowed for strengthening could well be reassessed in the light of current economic conditions.
- That if possible an assessment of buildings as a group would be a better way to tackle the problem than being assessed individually.
- That appraisal using the classification system of the NZNSEE book is adequate for initial assessment and setting of priorities for strengthening, and even the serving of notices.
- That when an objection is lodged, the Council is obliged before confirming the notice to establish by analysis, calculation and if necessary measurement of physical properties, that the building would not sustain the forces required.
- It is not up to the Court to assess the building except through evidence properly presented to it.
- That considerable assistance by the assessors was given to the Judge concerning the "somewhat complex engineering issues with which this case is involved".

Discussion

This case would have been quite different had either engineers giving evidence attempted to establish by analysis, calculation or measurement of physical properties that the building could or could not sustain the forces required by Section 624.

The question of how much increase to the value of a property, with its obvious lengthening of future life, should be permitted before being subject to Town Planning requirements was raised. This aspect should be further explored if the community is to make progress in dealing with buildings which are an earthquake risk.

Wellington City Council vs Port Nicholson Holdings [4]

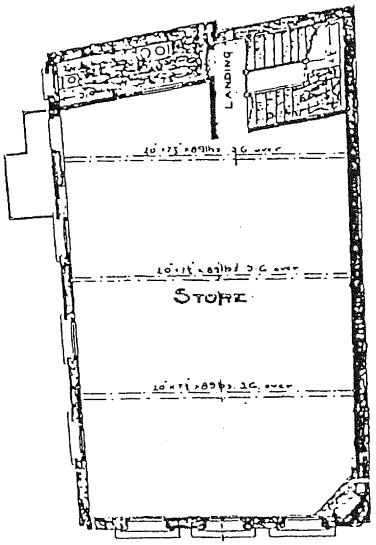
Summary of Evidence

The building in question is known as Edwards Building, situated at 131 Manners Street. It was erected in 1907 and comprises four storeys with load bearing brick walls, timber floors, timber trusses and corrugated iron roof. The maximum height is 17.6m and plan dimension 8.3m wide with 13.7m and 15.1m side lengths. Parapets extend 2.0m maximum above the roof line. Refer to Figure 4.

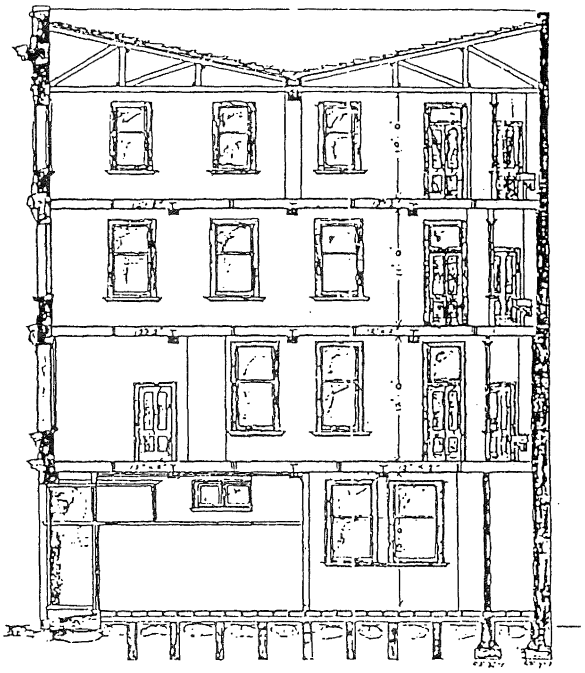
This application originally to be heard together with the WCC vs Poys Buildings, was undefended, as for WCC vs Port Nicholson Holdings, with the personnel essentially the same. Hence, the Court's jurisdiction, statutory powers and functions, in the part to be played by the assessors were not repeated.

Evidence was given of the WCC powers under the Act, building surveys, specific reports on the Edwards Building, all notices served on the building owner, and the process of objection. Only a verbal presentation was made on behalf of the owners at the objection hearing, for which there is apparently no record and the objection was not upheld.

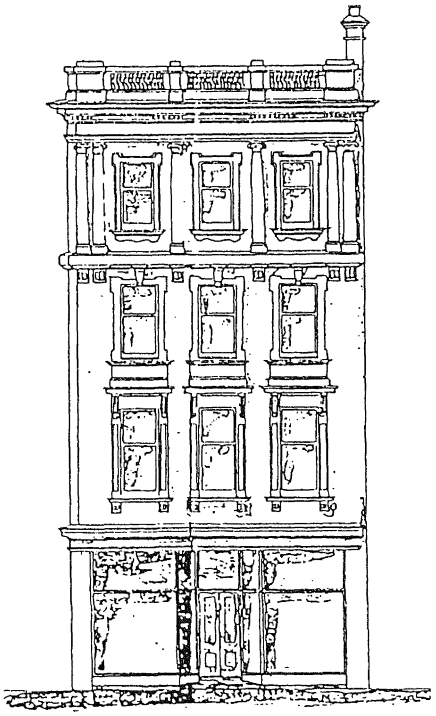
The technical evidence was presented by the WCC Director, speaking to a written submission together with supplementary documentation including the original



SECOND FLOOR PLAN



SECTION



ELEVATION TO MANNERS STREET

FIGURE 4 131 MANNERS STREET

building drawings and specification. In the absence of detailed investigation, all structural elements and fixings were assumed to not have deteriorated, resulting in a building strength capability more than may actually be the case. The building was generally reported to be in reasonable condition. Under this assumption, it was his opinion that the building was an earthquake risk.

Assessment was based on analysis of a full length, full height freestanding perimeter wall including the parapet, under the prescribed face loading for parts and portions of NZS 1900 Chapter 8 Amendment No. 3. Due allowance was made for floor and roof girder connections providing support under this loading condition. The wall was analysed using yield line theory to determine a bending stress that would exceed the ultimate bending capacity available in the brickwork. Evidence was also submitted to show that the parapet would have its ultimate load capacity exceeded under free-standing cantilever action.

The specification submitted in evidence indicated the presence of steel reinforcement placed horizontally in the brickwork, and special ties between walls and floors.

One specification clause stated "lay continuous bands of No. 12, SW gauge Galvd. hoop iron 1.2 wide at every 4 ft in height, one row for each half brick in thickness." Questioning by the Court found that no allowance had been made for this reinforcement. It was also established that window openings were not taken into account in determining yield lines, and that a thickened horizontal band, and a concrete band, evident in the upper part of the wall, had not been allowed for in strength calculations.

The WCC representative acknowledged that his analysis of the wall allowed for higher loads than in fact would apply, and on the other had analysed the situation with a lesser wall capacity than is in fact available. He considered that the simplifications assumed were compensated for by the two factors. He also acknowledged that the brickwork would not be able to sustain a bending moment during deformation as required for yield line analysis theory.

WCC considered that there would be a progressive type of failure in the wall if it was shaken by a moderate earthquake, initiated by failure in the parapet, upsetting the girder and connections and effect of the horizontal reinforcing bands, and that the wall would progressively collapse from the top.

The WCC representative considered that the wall in question was most susceptible to damage in a moderate earthquake. He had not analysed other areas of the building, but considered that the frontage parapet and heavy ornamentation could well be dangerous.

Summary of Judgment

The Judgment notes that since WCC had not taken into account the longitudinal reinforcement, the effect of window openings and thickened band of brickwork, these "omissions have given the assessors and hence the court, considerable reason for pause in this case".

The role of the assessors is elaborated upon, warning against the Court to act on their opinions as for expert witnesses, but depending upon advice in reaching a decision whether or not to accept the witness' evidence.

An appendix giving reasons for the assessor's advice is attached to the judgment. It concludes that the "proposition that the building would not withstand a moderate earthquake, is inconclusive".

The decision of the court was that the notice be confirmed subject to modification. The modification was to require the owner of the building only to either demolish or secure the two metre high parapet to the building, on all sides of the building.

DISCUSSION

In both Wellington City Council cases, no evidence was given on behalf of the owner. Yet in one case the Court confirmed the notice and in the other it did not, even though the evidence was in similar detail. The key difference was the existence of an above average specification for the second building, which introduced some doubt as to the conclusive nature of WCC's evidence.

In the case in Blenheim, the technical evidence was not comprehensive and convincing, again leaving room for doubt.

The existence of doubt owed much to the low level of required strength under the Act. Had the strength requirement been at a significantly higher level, it would have been easier to demonstrate that the buildings did not meet it.

As in any court, the case stands or falls by the evidence presented. The evidence as presented, generally left the impression that Councils and the owners' engineers may have expected that the presence of the assessors would alter this basic rule.

The draft of the proposed new New Zealand Building Code implies that the strength criterion for ERB's will change dramatically. This is an oversight since the technical requirements are not intended to change. There is however some pressure to modify the process of appeal to do away with the role of the assessors. At present, the Court is required to appoint assessors regardless of the case. On the basis of the cases described, the assessors have an important role - the judges questioned them extensively and commented on the value of their assistance.

The cases point up the difficult situation faced by local authorities in assessing ERB's. Detailed surveys initially are expensive and disruptive, and yet their assessments are open to dispute by the owner. Overall, it seems reasonable for Councils to assess initially on the basis of available records and a walk-through survey, recognising that owners may challenge the finding. In the event of a challenge, a more detailed review is warranted and local authorities may wish to prepare a detailed case for the Council hearing.

The judgment in both Wellington cases established that each part of a building may be considered separately. Thus, a weak parapet in itself is not sufficient to classify the whole building as an ERB. This is clearly a significant point for both owners and local authorities.

In the Blenheim case, the issue was raised of the Town Planning requirement that if a property is increased in value by more than 60% it must be subject to current Town Planning regulations rather than enjoying some dispensation. This figure of 60% should perhaps exclude the value of legally required structural upgrading for earthquake. Otherwise upgrading of at-risk properties could be unfairly penalised.

The requirement of Blenheim Borough Council for an owner to demolish or strengthen a building within three years came in for criticism, especially as they first started issuing notices in 1972. It may be fairer to issue notices more or less simultaneously and allow reasonably long times for action. Wellington City Council's approach allowed owners plenty of time to prepare.

This raises the issue of change of ownership, which could result in a new owner being unaware that the building has been the subject of a notice. The existence of ERB notices should be a matter of public knowledge and in addition a caveat should be put on the title. The objective of the Act is to reduce earthquake risk over time, and this is best served by wide knowledge of which buildings need strengthening.

CONCLUSIONS

From the experience of the three cases, the following conclusions are drawn:

(a) No questions were raised as to the Council's adoption and application of Section 624 of the Local Government Act.
(b) Councils should ensure that their approach in surveying, assessing, serving notices and setting times for compliance results in reasonable requirements.
(c) The low strength criterion in the Act was a significant factor in the outcome of two of the cases reviewed.
(d) Courts decide on the evidence presented.
(e) The assessors interpret and explain evidence. They do not contribute evidence nor are they responsible for the Court's decision.
(f) Preparation and presentation of evidence are at least as important as the technical evidence itself, which nevertheless needs to be full and thorough.
(g) The Court interpreted evidence in relation to the latest Amendment to NZS 1900 Chapter 8, even though this Amendment was made after the Act was passed.
(h) The judgments clearly established that the failure of one part of the building to meet the requirements of the Act, does not necessarily mean that the whole building must be upgraded.

These cases provided a valuable learning experience for all parties involved - the Court, the assessors, the local authorities, building owners and their engineers. We now have a better measure of how these buildings stand up in Court.

REFERENCES

1. "Earthquake Risk Buildings. Recommendations and Guidelines for Classifying, Interim Securing and Strengthening". New Zealand National Society for Earthquake Engineering, December 1985.

2. District Court Judgment. Reference MA: 54/86. "Wellington City Council vs Poys Buildings Limited".

3. District Court Judgment. Reference MA:555/86. "Wellington City Council vs Port Nicholson Holdings Limited".

4. District Court Judgment. Reference MA:189/88. "Blenheim Borough Council vs J G Orchard Partnership".