

building.

Only in cases where the needs of the services have not been catered for in the building design will the sub-contractor have to resort to the extra time-consuming and annoying practice of drilling through concrete to install the essential pipes and ducts.

The real message of your editorial seems to be that structural designers who work to 7 decimal places of seismic design and ignore the practical requirements of co-ordinating the overall building requirements, should come out of their ivory towers and refrain from blaming other parts of the engineering profession for difficulties that arise in construction."

F. M. BLACKWELL

"After reading the editorial in the Bulletin of the N.Z. Society for Earthquake Engineering Vol. 6, No. 3, September, 1973, it is interesting to postulate the design philosophy behind the type of structural engineering proposed. Should a building frame be designed for simplified structural analysis using advanced design techniques with minimum steel and occupying the minimum building volume, to resist an earthquake whose precise magnitude is not known to 1 decimal place and may not occur for 100 years? Alternatively, should the frame be designed for the everyday needs of the occupants?

It would be most fortunate if building services designers could predict the location of all services requirements 50 years from now, it would not be too bad if they could predict the requirements for the first tenants! This is wishful thinking as is the ability of the structural engineer to predict the precise location of a steel bar so a hole can be drilled through the concrete alongside.

This whole situation would be improved if structural engineers would design frames to realistic requirements, for example, where false ceilings pass directly under beams then either a pattern of holes should be provided or areas specified where large holes can be drilled.

If structural engineers or clients are not sufficiently far sighted to provide this flexibility then perhaps Local Authorities may be persuaded to amend their by-laws."

EDITORIAL REPLY - D. S. MacKENZIE

"The interest of building services engineers in the problem of service holes in structural work is most gratifying.

The design of services unfortunately often lags behind that of the structure. This is not necessarily the fault of building services engineers. Frequently, the positions of holes are determined by subcontractors, who do not start their work until the structural design is completed.

It is not the job of the structural engineer to design the service systems - only to make provision for them after he

is told what holes are needed. Often the structural engineer is not aware of the precise needs of the services until the die - or the concrete - is cast.

The intention of the Editorial was to draw attention to the dangers of cutting holes in cast concrete, often done indiscriminately in the most vital places, and to plead for design guidance in those cases where we do know the intended positions of the holes. These affect the strength and stiffness of the structure, but by what amounts is not certain.

There is a considerable need for such guidance, and it is to the Universities and the now well funded Building Research Association that practitioners look in hope."

## **AN EARTHQUAKE CODE FOR PLUMBING**

The following is an extract from a report prepared by Mr. G. H. F. McKenzie at the request of the Management Committee. Investigation into ways and means is proceeding and comment is welcomed from readers.

### REPORT TO THE NEW ZEALAND NATIONAL SOCIETY FOR EARTHQUAKE ENGINEERING, SUGGESTIONS FOR AN EARTHQUAKE CODE TO GOVERN PLUMBING IN BUILDINGS.

Adequate provisions to cover earthquake resistance already exist in the New Zealand Model Building Bylaws. However, these are put in the structural chapters, which are normally never seen by plumbers, and their applications, in many cases, require the services of a trained structural engineer.

The first requirement for a plumbing code would be to define who is responsible for the seismic adequacy of the plumbing system. This responsibility would have to be put on to the organisation responsible for the plumbing of the particular building.

In the case of larger buildings, this would be a firm of building services engineers. Such a firm may elect to employ a structural engineer to design seismic adequacy into the plumbing system, but it would have to take the responsibility in the first instance.

In the case of smaller plumbing installations, such as those in houses, which are not normally supervised by a building services engineer, the plumbing contractor would have to take the responsibility for the necessary seismic provisions in the plumbing system. To assist plumbing contractors to meet the structural requirements, there appears to be a need for the production of a manual of standard practice for commonly used arrangements and fittings. (For example, how a water tank of certain proportions should be fixed to resist seismic forces and the flexibility provisions necessary in the connected pipes.)

The code requirements for earthquake provisions for plumbing systems can be summarised as below, and this would appear to give sufficient guidance for a qualified

structural engineer.

Summary of Seismic Requirements for Plumbing

1. All tanks and contents, boilers and other fittings must be fixed to the structure of the building in such a manner that the fittings and their fixings can withstand the seismic design forces for "Parts of a Building" set down in the loading code of the relevant local body bylaws.

(Most local bylaws at present use Chapter 8 : 1965 of the New Zealand Standard Model Building Bylaw, N.Z.S.S. 1900, as their loading code. However, a new draft New Zealand Standard Code of Practice for Design Loadings has now been prepared by S.A.N.Z., with the reference number D.Z. 4203/304, and this will probably be adopted in due course by most local bodies.)

2. All vertical elements such as pipes, running between floors, should be designed to withstand three times the computed interstorey deflections resulting from design seismic forces. Again, all elements such as pipes and drains, passing between parts of a building which will have different seismic response movements or passing between the building and the ground, should be designed to withstand three times the maximum relative movement which can result from application of design seismic forces. The maximum relative movement should be calculated assuming the most unfavourable phase relationships between the response movements of the various parts of a building. The provisions to withstand such movements can incorporate either adequate flexibility or else adequate freedom for movement in the fixings, or a combination of both.

3. For special cases of essential service buildings, such as hospitals, where it is necessary that the plumbing and other services should continue to function after an earthquake disaster, if at all possible, consideration shall be given to special provisions to reduce the risk of earthquake damage to the lowest practical level. These may include ring main systems round hospital complexes and duplication of supply points to large blocks.

4. Sprinkler systems should be considered as part of the plumbing and hence subject to the above requirements. In addition, provisions must be added to ensure that sprinklers will operate if the water supply is cut off by breakage of the mains.

## **SOUTH PACIFIC REGIONAL CONFERENCE ON EARTHQUAKE ENGINEERING**

The New Zealand National Society for Earthquake Engineering will conduct a South Pacific Regional Conference on Earthquake Engineering, of a three day duration, during May 1975 (dates to be advised).

Prominent workers in earthquake engineering from overseas have expressed

an interest in the holding of this conference.

Papers for the conference are invited, and should conform with the requirements for publication in the Society's Bulletin - as set out inside the back cover. Length should not exceed 10,000 words. Completed papers should preferably be in the hands of the Secretary by 31 August 1974 and in no case later than 24 December, 1974.

All who are interested in attending the Conference should write to the Secretary, asking for the 1st circular with application form attached. Those intending to submit papers should mark the application form accordingly.

All correspondence should be addressed to the Administrative Secretary, New Zealand National Society for Earthquake Engineering, P.O. Box 243, Wellington, New Zealand.