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Disaster Management and Educational Facilities

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PEB Exchange Programme on Educational Building

FEATURE

DISASTER MANAGEMENT AND EDUCATIONAL FACILITIES

Some 80 earthquake specialists, architects, engineers and civil servants from a dozen countries met to discuss the different relationships which may occur between educational facilities and natural disasters; the emphasis was on the implications and effects of earthquakes and the appropriate design and use of educational buildings, both in their role as protection for their everyday users and in their role as emergency shelter for potential earthquake survivors. This international seminar, which took place in November 2001 near Thessaloniki, Greece, was organised by PEB, the Greek Ministry of Education and Religious Affairs and the School Building Organisation S.A., Greece. The following article by Grace Kenny summarises the findings on the topics of educational buildings; partnerships; training; standards, regulations and procedures; finance and legislation; and research and support. PEB will publish the case studies presented at the seminar along with a more extensive summary and references.

Educational buildings

Apart from dwellings, the most common type of building in any settlement is that used for the teaching and training of young people, namely nurseries, schools, colleges and universities. These buildings, by their very function, are evenly distributed across their catchment areas, and are used by the vast majority of populations at some time in their lives. In some cultures, schools are seen at the hub of local community life. The implication of this is that they are ideally placed as potential refuges in the case of a disaster; at the same time, however, it also means that if a disaster occurs, educational buildings and facilities are bound to be affected, and must therefore be the subject of particularly stringent regulations concerning design, construction and emergency procedures.

The occupants of educational buildings, being young and vulnerable, hold a special place in the public's consideration; any harm to them, and above all, any harm which is preventable, is especially dreadful, and public authorities are only too aware of this.

The non-human contents of educational establishments can also be valuable. Many older universities house collections of documents and objects which represent national treasures. Research institutions can also hold runs of historical data of a sort that is not possible to back up electronically. At the same time, particular research institutes may handle materials which are extremely dangerous, and the normal health and safety procedures which apply need to be reinforced in disaster-prone areas.

Partnerships

One concern was shared by all at the seminar – the protection and security of people and buildings – and, apart from obvious geographical variations, cultural and national differences did not make themselves felt. One underlying agreement was on the usefulness of partnerships, at all levels, whether regarding design or locally, nationally and internationally.

At the level of design, a proper integration of the roles of the architect, engineer and client is necessary for the adequate strengthening of buildings. The engineer's part is particularly vital in the context of earthquake protection, while the architect should, among other things, consider providing simple buildings where potential subsequent damage is easy to detect and rectify. Inspection should be made as easy as possible in the event of a disaster. "Disguised" elements and, in Greece, half columns, were singled out as potential areas for hidden failure. Equally, the design and fitting of non-structural elements need to be considered and co-ordinated. A lot of injury in earthquakes and hurricanes is caused by falling light fittings and furniture and by flying roofs.

The location of buildings and facilities is also important, and meteorologists and environmental engineers can help to site buildings in optimum positions.

It may also be appropriate to bring in social scientists and disaster managers at some stages of the planning and design process in order to make sure that potential lifelines (water, heating, etc.) are adequate if the buildings are to be used as shelters.

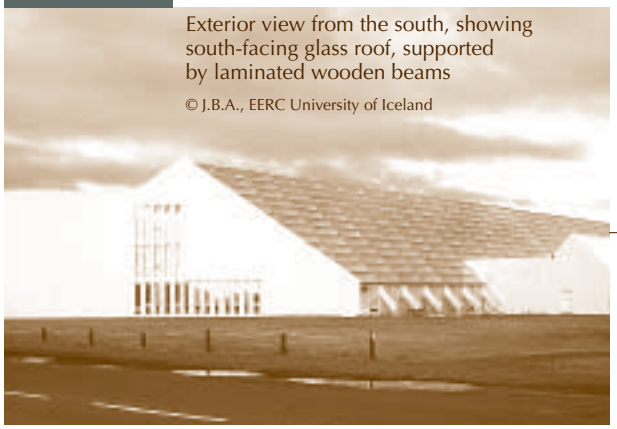
While educational buildings are in use, there needs to be co-operation among their staff and pupils, together with parents and the surrounding community, and local fire, police, environmental and health services, particularly if the buildings are to be used as refuges after a disastrous event. Even if these co-operative arrangements necessarily operate at the local level, they may need to be organised and promoted nationally.

In the field of public buildings, there may be a gap between central design and funding, and local maintenance; this gap can be crucial when it comes to keeping buildings safe and secure, and some sort of agreed national intervention may be necessary. In the event of a disaster, there is evidence that the presence of nationally accredited building inspectors, brought in as quickly as possible, is reassuring to the victims.

Because expertise is scarce, and to safeguard and support particularly vulnerable countries, international co-operation is essential, at both the prevention and the recovery stages. Among the networks and organisations working at this level are the United Nations International Strategy for Disaster Reduction, the Disaster Management Planning Programme of the United Nations Centre for Regional Development and RADIUS (Risk Assessment Tools for Diagnosis of Urban Areas against Seismic Disasters) which is being promoted by the United Nations Inter-Agency Secretariat of the International Strategy for Disaster Reduction.

The following are views of the South Iceland College in Selfoss, Iceland, which has around 800 students aged 16 to 20, specialising in information and communications technology. The building was completed in 1994 and was designed by Dr. M. Jonsson who applied earthquake standards exceeding the current code requirements. Located in the South Iceland seismic zone, the college was severely tested by the strong earthquakes of June 2000. The demand on the strength of the building during this event reached 50% g (where g is the acceleration of gravity), more than twice the code requirement. The building was only 14 km from the causative fault, but it sustained no structural damage.

South Iceland College



Exterior view from the south, showing south-facing glass roof, supported by laminated wooden beams

Exterior view from the north

Interior view from the library

Interior view looking east

Training

A critical element of all such initiatives and programmes is training, both for building designers and for building users. Earthquake-prone countries must put greater emphasis than others on the appropriate training of architects and engineers, and specialists may be needed in the field of assessing and retrofitting existing buildings.

If good action plans are in place, they can be put into effect very quickly. In Greece on 7 September 1999, the Attica basin was struck by an earthquake measuring 5.9 on the Richter scale; during the night of 7-8 September an operational programme was elaborated, and on 8 September, teams of civil engineers of the national School Building Organisation were visiting, inspecting and checking 634 buildings in the 20 municipalities of the epicentral area. Schools were able to reopen on 20 September.

The training for school users needs to be specific to the type of danger to be expected; this may seem obvious, but there have been cases where children have been trained in evacuation procedures when remaining in the building might have been safer (in the case of external chemical leakage for example).

Training must be accepted as normal, and in a sense routine; this both lessens the feeling of alarm and improves levels of achievement. In Mexico, earthquake drills are carried out every two months. In France, emergency plans now have to be prepared and submitted to governors every year; this has been imposed on schools by the national government, a fact which underlines both the attention which is now being given to disaster management in schools and the role of authoritative bodies in ensuring that the problem is seriously addressed.

The acceptance of this type of preparedness training shifts the emphasis of programmes from reaction to prevention.

Standards, regulations and procedures

All programmes of prevention and strengthening begin with some form of risk assessment; this must start with a visual inspection of buildings, and it will then be accompanied by standardised but appropriate formulae to cover such elements as age, type of construction, location and environmental conditions. Programmes such as RADIUS produce software to help in this process.

There may well be a gap between the establishment of appropriate standards and their proper implementation

"on the ground". Any set of building codes must be backed up by a rigorous policing system, capable of imposing penalties.

There may also be tension between standards which have been established by national bodies, to cover all types of buildings and eventualities, and the conditions which may be found locally. A particular problem may be that national school safety standards may not be able to take local geographic conditions into account, and they may not adequately consider the snow-ball effect of several weather conditions and multiple hazards coming into play at the same time (*e.g.* wind and rain).

Standards need constant revision as technologies change, and indeed as conditions change (*e.g.* increasing urbanisation, climate change). In Greece for instance, the building codes relevant to earthquakes have been revised in 1959, 1985, 1995 and 2000.

Finance and legislation

The range of sources for carrying out strengthening and prevention programmes is extremely wide. In some villages which are involved in UN projects, the local inhabitants have even resorted to fund-raising in order to protect their own schools. In Greece, a substantial programme of assessment and improvement is under way, with considerable help from European Union funds. In Japan, there is now an arrangement in place whereby, according to the state of school buildings, the government will subsidise up to half the cost of seismic reinforcement for public schools, and up to a third of the cost for private schools. This is in recognition of the importance and impact of damage to public buildings, and of the fact that on the whole, such costs cannot be borne locally.

Maintenance, which is usually the responsibility of local authorities, is another area where proper funding is essential if safety and security are to be kept up to acceptable standards.

Similar arrangements are in place when it comes to recovery and repair. In Japan, restoration of disaster is subsidised, when there is "severe destruction" (designated by Cabinet order), on the scale of two thirds of the cost for public schools, and one half of the cost for private schools.

There are also ad hoc or established disaster funds (such as the National Fund for Natural Disasters set up in 1996 in Mexico), and the involvement of private foundations and benevolent individuals. Iceland uses a system of semi-mandatory private insurance.

One of the crucial decisions to make when buildings are damaged is whether to repair or to demolish, and there are many and various formulae upon which this decision can be made. In Greece, if a building which has survived for more than half its lifespan is to be repaired, the cost of repair must be less than half that of new build. And if it is newer, up to 80% may be allowed. However, listed buildings do not come under this criterion, and indeed local political and cultural pressures can result in schools being repaired when the formulae would decree otherwise. The Field Act (United States, 1933) recommends up to 70%, and Iceland and Spain prefer only 50%.

When a disaster hits, rapid intervention and repair are of the essence. In Greece, where earthquakes are fairly common, and as after the 1999 earthquake, the Ministry of National Economy can allow for exceptional procedures and funding in times of emergency, by-passing normal arrangements. The law also allows special dispensations in order for building licences to be obtained, land to be acquired and contracts to be let. Such legal constraints, which require certain time rules to be followed, were a particular obstacle during the repair work following the storms in France in December 1999, not to mention the potential conflicts between different expert professions, and the disagreements over liability. There needs to be a disinterested, overarching third party to resolve such conflicts.

Even if programmes of assessment and strengthening may appear costly in the first instance, after the first round the costs will quickly reduce. It has been estimated that such costs will be recovered within 15 years. This is another reason why it may be worthwhile for international bodies to fund the first stages of such projects – to kick start them – in order to pass the future funding onto national and local authorities. Again, the importance of proper maintenance must be stressed.

Research and support

Real progress can only be achieved through the proper recording and assessment of catastrophic events. In Japan, particular studies were made of how different building materials react to earthquakes; in the recent Californian events, studies were made of what caused the most injuries: falling furniture rather than structural elements; whereas in the storms in France, flying roofs were more hazardous than walls or windows. As

far back as 1929 experience in Iceland showed that "traditional" timber buildings were more robust than "masonry" and non-reinforced concrete, and this early realisation has been borne out increasingly since; the more recently established School Earthquake Safety Initiative has reinforced these findings.

As awareness and networking have grown, it has been possible to test various combinations of approaches – constructional, planning, proactive and reactive – in the field. This has been the great impetus behind the RADIUS project, where actual at-risk cities have been offered the chance to set up and put into place assessment, prevention and management strategies.

Data and experience, which used to be gathered at the time of a catastrophic event and which were often forgotten, are now gathered, assessed and disseminated by specialist units. There are such organisations within individual countries, and they are generally public bodies, such as the Earthquake Planning and Protection Organisation in Greece and the Disaster Prevention Unit in Japan, both of whom concentrate largely on educational and cultural buildings. Other such organisations are not necessarily made up of people who share a workplace, or even a country; increasingly they are more or less loosely constituted organisations which can call on the appropriate range of experts when these are needed. The various agencies of the United Nations are a prime example of this, and exchanges of information (feed-back, experience) and expertise (professional research and studies) are becoming easier with the Web and the Internet.

Although these units may have a primarily technical bias, the importance of raising awareness of the issues involved can mean that the team will sometimes include psychiatrists and other social scientists, and even celebrities, useful for gaining public attention, or when money needs to be found. The essence of these units is that they are teams, virtual or real, which can be co-ordinated by quite small secretariats, in order to try to foresee and to react to potentially catastrophic public events. Such "global" teams can help motivate and organise local teams.

The growth of specialist teams and organisations underlines the value that the public and politicians attach to these events. It is clear that as urbanisation increases, as the effects of climate change begin to be felt (with particularly disastrous consequences in developing countries) and as the globalisation of information becomes a reality, disasters and their impact can no longer be left to the best efforts of communities and regions. Overarching organisations, either national or international, are the only ones with the necessary funding and influence to support and, if necessary, to impose acceptable criteria for construction, maintenance and recovery.

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