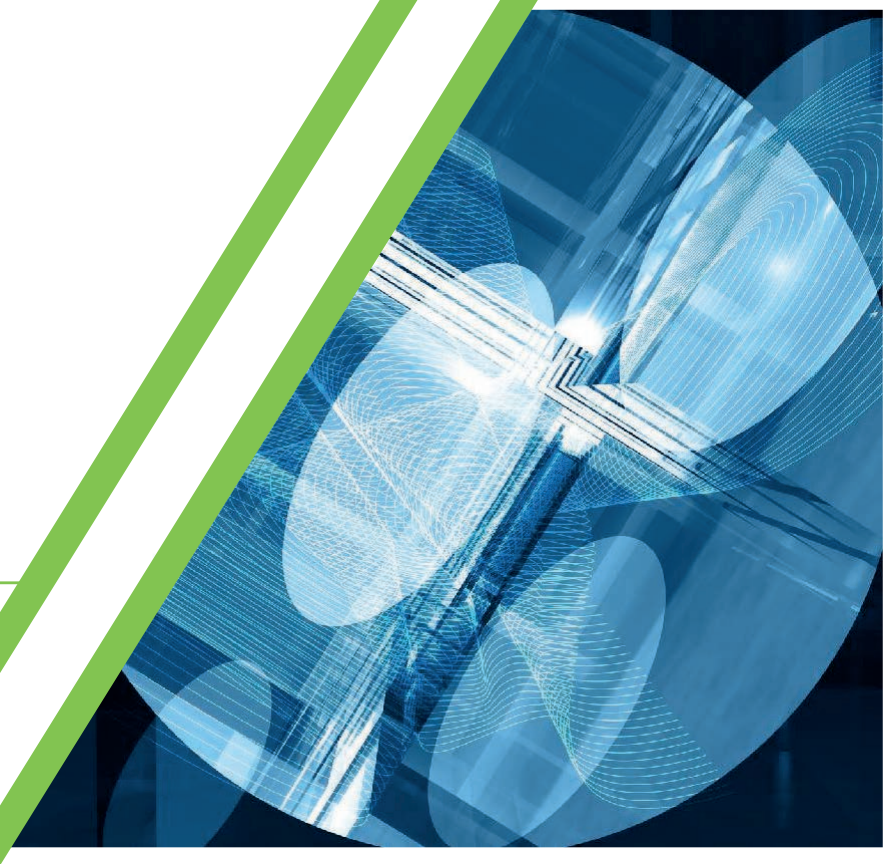
Recommendation of the Council Concerning Guidelines on Earthquake Safety in Schools



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Background Information

The Recommendation Concerning Guidelines on Earthquake Safety in Schools was adopted by the OECD Council on 21 July 2005 on the proposal of the Programme on Educational Building (PEB) Governing Board and the Education Committee (now called the Education Policy Committee). The Recommendation recognises that schools routinely collapse in earthquakes due to avoidable errors in design and construction, because existing technology is not applied and laws and regulations are not sufficiently enforced. In response to this need, the Recommendation invites Adherents to take steps to establish and implement programmes of school seismic safety based on a set of principles that form an integral part of the Recommendation and are annexed to it (Annex 1). Further, it recommends that in so doing Adherents should take into account the Major Elements of Effective School Seismic Safety Programmes that also form an integral part of the Recommendation and are annexed to it (Annex 2).

THE COUNCIL,

HAVING REGARD to Article 5 b) of the Convention on the Organisation for Economic Co-operation and Development of 14 December 1960,

RECOGNISING that:

- All too frequently, earthquakes strike countries, causing collapse of school buildings and the injury or death of staff and students;
- The knowledge presently exists to significantly lower the seismic risk of schools and to help prevent further injury and death of school occupants during earthquakes, at reasonable cost and in a reasonable time frame;
- Schools built world-wide routinely collapse in earthquakes due to avoidable errors in design and construction because existing technology is not applied and existing laws and regulations are not sufficiently enforced; unless action is taken immediately to address this problem, much greater loss of life and property will occur;
- A state requirement for compulsory education, while allowing the continued use of seismically unsafe buildings, is a dangerous practice;
- Efforts to improve the seismic safety of schools and education systems require co-ordination at appropriate levels while acknowledging the need to provide flexibility and alternative means of achieving equivalent results depending on the level of seismic hazard, knowledge, technology and resources, and commensurate with indigenous capacity, need and level of sophistication.

On the proposal of the Programme on Educational Building (PEB) Governing Board and the Education Committee:

RECOMMENDS that Member countries take steps to establish and implement programmes of school seismic safety based on the principles set forth in Annex 1 to this Recommendation of which it forms an integral part. In so doing Member countries should take into account the major elements of such programmes as set out in Annex 2 to this Recommendation of which it forms an integral part.

INSTRUCTS the PEB Governing Board to review actions taken by Member countries as requested in pursuance to this Recommendation and report thereon through the Education Committee to the Council three years from the date of this Recommendation.

INVITES non-Member economies to take account of the terms of this Recommendation.

ANNEX I

PRINCIPLES FOR SCHOOL SEISMIC SAFETY PROGRAMMES

Programmes for seismic safety in schools should recognise the safety of children in schools as an important goal. Such programmes, to be established on an urgent basis to assure earthquake safety of new and existing schools, should be based on the following principles:

1. Establish clear and measurable objectives for school seismic safety, based on the level of risk, that can be implemented and supported by the affected residents of communities and agencies at the local government level, and provide adequate resources and realistic timelines to achieve these objectives.

2. Define the level of the earthquake hazard in order to facilitate the development and application of construction codes and standards under the responsibility, as appropriate, of national, state or local authorities. At a minimum, natural hazard zones should be established and, where possible, seismic hazard maps should be based on probabilistic analysis.

3. Set forth expectations or objectives that define the desired ability of school buildings to resist earthquakes. School buildings should be designed and constructed, or retrofitted, to prevent collapse, partial collapse or other failure that would endanger human life when subjected to specified levels of ground shaking and/or collateral seismic hazards such as surface fault rupture, landslide or inundation from tsunami waves or dam failure. However, some authorities may desire that school buildings have additional seismic resistance to the extent that damage is limited and the buildings can be occupied immediately after earthquakes and used for shelter or emergency operations.

4. Give priority to making new schools safe. Efforts to identify vulnerable existing schools; to establish standards for retrofitting or replacing dangerous buildings; and to develop a list of priority actions can be made over a short period of time. A longer timeframe will likely be needed to correct seismic weaknesses of existing school buildings.

5. Be established as long-term undertakings with a strong commitment to sustained effort rather than one-time action.

6. Adopt a multi-hazard approach to school safety, with earthquake mitigation strategies that complement disaster countermeasures for other hazards.

7. Employ advisory committees as needed to assure that policy and technical decisions are consistent, and to provide long-term independent support and evaluation for the seismic safety effort.

ANNEX II

MAJOR ELEMENTS OF EFFECTIVE SCHOOL SEISMIC SAFETY PROGRAMMES

An effective school seismic safety programme will include the major elements described below:

Seismic Safety Policy Element

Policies should be established by the competent authorities and should state well-defined and measurable objectives. Priorities and strategies for satisfying the objectives should be established by the appropriate authorities. The policy must be clear and should have adequate support and authority to enforce its scope and objectives and to carry out the plan over a specified number of years. The policy should:

- Recognise the need to ensure the safety of schoolchildren;
- Recognise the consequential need for the safety of school buildings;
- Establish minimum standards for protection of human life;
- Adopt sustainable standards to guide design for new and existing school infrastructure based on prescribed performance objectives, knowledge of the ground shaking severity in different regions, quantification of site specific hazards, and the ability of the community to educate, train and license its members to effectively achieve established objectives;
- Establish programmes for seismic risk reduction of school buildings and their components;
- Provide adequate funding and human resources for the protracted duration of the programme;
- Be supported by committed and competent leaders with sufficient legal and moral authority to ensure the effectiveness, sustainability and continuity of the programmes that derive from the policy.

Accountability Element

There should be a basis for action with clear lines of accountability of the different members of society who are given responsibility for implementing earthquake safety programmes. To achieve the objectives of these programmes there should be:

- A clear definition of the roles and responsibilities of the various individuals, agencies and organisations involved in school seismic safety;
- A process for making all planning, design, regulation and enforcement decisions transparent;
- Qualification requirements for professionals engaged in the design of school facilities;
- An independent assessment of the proper design, construction and maintenance of school facilities including:
  - Conducting assessments of existing school facilities;
  - Reviewing and approving construction documents prepared for new structures and the retrofit of existing structures;
  - Inspecting and approving construction;
  - Qualifying personnel for design, plan review and inspection, materials testing and support functions;
- A clearly identified jurisdiction in terms of the area and the type of school systems and buildings affected.

Building Codes and Code Enforcement Element

The primary objective of school building codes and regulations should be to protect the life of occupants of a school building. Other objectives could include minimising damage to allow rapid occupancy of buildings after earthquakes. Building codes should govern the design of new and retrofitted school buildings. Design earthquake ground motions may be based on a probabilistic approach, a deterministic approach, or on a map of seismic zones. The competent authorities should determine the most appropriate design criteria, based on a review of their country's seismic hazard and other pertinent factors.

An effective school building code and enforcement element should establish:

- Clear building performance objectives based on:
  - Ground motion characteristics and geology of the region;
  - Collapse prevention and structural damage control criteria;
  - Secondary effects such as tsunamis, landslides and surface rupture;
  - Socio-economic impacts to the community.
- A process for periodic review and revision of codes and guidelines by knowledgeable individuals to reflect current understanding of good earthquake engineering practice.
- Enforcement procedures for school building code and construction regulations that take into account community needs but provide clear provision for:
  - Checking of design plans for school buildings by qualified reviewers;
  - Review and certification of constructed school facilities;
- A mechanism for ensuring that enforcement activities are not compromised by overt or subtle pressures due to project-specific cost, deadlines or other financial considerations.

The mere existence of a building code in a community can give the false impression that buildings are being constructed safely and that their seismic performance will be satisfactory. While extremely important, the writing and adoption of building codes and regulations can be an incomplete strategy if they are not enforced at every step of the design and construction process. Steps should be taken to ensure that proper implementation and enforcement of code regulations is done in a consistent manner and has equal priority to code development.

Training and Qualification Element

Building safety relies on regulations and laws that require proper training and qualification of professionals, builders and technicians involved in the different aspects of the design and construction process. Building safety training programmes should be carried out within the context of each individual country. Training programmes must accommodate governmental structure and division of responsibilities, perception of risk to the institution and its stakeholders, community values and economic conditions. Training and licensing should be required for design professionals, code enforcement officials, plan checkers, inspectors and contractors.

- ***Engineers and architects*** should be properly trained and licensed by the competent authorities, and their training should include seismic design as well as elements specific to school design and construction.
- ***Qualifications of contractors*** should be considered in awarding construction projects. This could involve the establishment of training programmes on best constructions practices for contractors and trades.
- ***Building officials, plan-check professionals and inspectors*** should be certified through a process of adequate training and experience.

Preparedness and Planning Element

Effective programmes should include the following measures at education authority and school level to reduce risks and to prepare employees and students to react in safe ways during emergencies.

- ***Education:*** Develop and implement educational programmes or curricula in schools and communities to make citizens aware of earthquake hazards and preparedness actions;
- ***Risk reduction measures:*** Undertake measures to improve the safety of the physical environment by bracing and anchoring furnishings, bookcases, and equipment and building components such as lights, heaters and water heaters;
- ***Emergency plan:*** Prepare and maintain plans that identify the actions, decisions and responsibilities needed before, during and following an earthquake; the organisation and responsibilities to carry out these plans, including determining whether to shelter or release students or to use school facilities as community shelters; and the equipment and supplies needed to carry out these decisions;
- ***Safety assessments:*** Establish standards, line of responsibility and procedures to assess the safety of buildings following earthquakes, and decide on evacuation, repair and re-occupancy procedures;
- ***Training***: Provide training and materials for employees and students on earthquake hazards and actions to take to improve personal safety;
- ***Drills:*** Hold periodic drills simulating realistic conditions of earthquake events to reinforce training and to test the adequacy of plans and safety assessments.

Community Awareness and Participation Element

Paramount to the success of a programme to improve the seismic safety of schools is the understanding and involvement of the community. All members of the community should understand the seismic hazard of the region, the vulnerability of existing school buildings, the consequences of not properly constructing new school buildings or improving the resistance of existing buildings, and the feasibility of improving seismic safety. In particular, those members of the community who are involved in the construction of school buildings need to understand why they are required to follow prescribed practices, and the consequences of their failing to do so. An effective community awareness effort will include:

- Programmes to raise public awareness and knowledge of the risk from earthquakes and other natural hazards;
- Educational programmes to transfer and disseminate technical knowledge and to explain risk in terms understandable to community stakeholders;
- Activities to empower the community to be part of, and contribute to, the reduction of seismic risk of schools;
- Use of school curricula to increase awareness of earthquake hazards and preparedness actions.

Risk Reduction Element for <u>New</u> Facilities

Verified procedures currently exist to ensure good seismic performance of school buildings and their contents, and the implementation of such procedures is feasible. The following components are needed in a risk reduction element for ***new*** facilities:

- Determination of seismic hazard in the region and development of seismic hazard maps;
- Development of performance criteria and codes suitable to the culture and economic conditions of the region with recognition of the fundamental societal importance of schools and the shelter function of school structures in post-disaster emergencies;
- Development of simple regulations, or best construction practices, for regions where such an approach may have an immediate impact on seismic safety (*e.g.* simple, low-cost education facilities in rural regions of developing countries);
- Training and education of professionals, technicians and the construction workforce;
- Target dates for implementation of construction standards recognising the different levels of current practice in different countries;

- Effective building codes and regulations, and rigorous enforcement of these regulations.

Risk Reduction Element for <u>Existing</u> Facilities

To reduce the seismic risk of existing school buildings, it is important to understand why this risk exists and what actions can be taken by the community to eventually reduce the risk. Community values, economic conditions, financial possibilities and the type of building materials available in the region should be considered when developing and implementing a risk reduction plan.

Key ingredients for an effective risk reduction element for existing facilities include:

- Determination of the seismic hazard and preparation of hazard maps;
- Assessment of risk to existing schools and their contents;
- Evaluation of the consequences of not taking corrective action;
- Development and implementation of technical guidelines to improve performance of existing facilities during earthquakes (*e.g.* methods and procedures to estimate forces and displacements of the structure and predict damage, acceptable margins of safety or confidence, proper use of building materials, and monitoring of the construction processes);
- Formulation of an action programme based on availability of funding, human resources and their qualifications, existing infrastructure and the operational structure of the community;
- Prioritisation and risk reduction plan implementation, considering financial and human resources and the role of school buildings in post-disaster emergency management;
- Monitoring of effectiveness of plan implementation.

Given the magnitude of the retrofitting task in many countries, responsible officials should establish time schedules and priorities to retrofit at least those facilities deemed to be at the highest risk. While several decades may be needed to complete implementation of a school seismic retrofit programme, work on the facilities at greatest risk can be undertaken on a priority basis over a much shorter period.

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