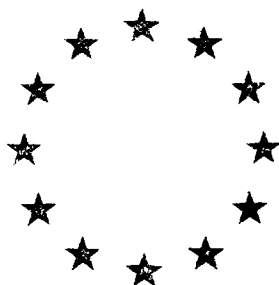


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Comité des Ministres



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For consideration at the 503rd
meeting of the Ministers' Deputies
(December 1993)

CULTURAL HERITAGE COMMITTEE (CC-PAT)

DRAFT RECOMMENDATION
ON THE PROTECTION OF THE ARCHITECTURAL HERITAGE
AGAINST NATURAL DISASTERS

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FINAL ACTIVITY REPORT

I. FINAL ACTIVITY REPORT

1. Origin of the Activity

This activity originated with the ad-hoc terms of reference (decision no. CM/407/120287) which the Committee of Ministers gave the Steering Committee for the integrated conservation of the historic heritage (CDPH)¹, as a follow-up to Assembly Recommendation 1042 (1986) on the protection of the cultural heritage against disasters and to the joint hearing held by the European Parliament and the Parliamentary Assembly of the Council of Europe on this theme in Brussels on 27 November 1985.

At its meeting in February 1989, the CDPH set up a group of specialists on the protection of the architectural heritage against natural or man-made disasters (PH-S-DN). This group was instructed to draw up, in the light of the work undertaken within other international organisations, an inventory of technical and legal measures taken in Europe in this field and to make proposals to the CDPH concerning concrete actions which could be undertaken by the Council of Europe.

2. Meetings of the Specialist Group

The group of specialists (PH-S-DN) met for the first time in Ravello (Italy) in November 1989 with Mr Jean Bonnin (France) in the Chair. Other meetings took place in June 1990 and in February and March 1992. In December 1992 a meeting of an ad-hoc working group of the CC-PAT, presided by Mr Hans Horcicka (Austria) carried out a final analysis and harmonisation of the text.

3. Membership of the Specialist Group

The group, which was presided in June 1990 by Mr Francis Haumont (Belgium) and in February 1992 by Mr Alan Parnell (United Kingdom), was composed of the following specialists:

Mr Franz Neuwirth (Austria), Mr Francis Haumont (Belgium), Mrs Lisbeth Saaby (Denmark), Mr Daniel Gaymard and Mr Gabor Czitrom (France), Mr Ralph Berg (Germany), Mr Thor Magnusson (Iceland), Mr Vincenzo Petrini (Italy), Mr Nils Marstein (Norway), Mrs Isabel Costa (Portugal), Mr James Edgarrand Mr Alan Parnell (United Kingdom), Mr Herbert Tiedemann (Swiss Reinsurance Company), Mr Jeff Malliet (ICCROM) and Mr Jean Bonnin (representing the partial agreement on major hazards). Mrs Margaret van Vliet (UNESCO) and Mr Theodossius Mastrominas (Commission of the European Communities) were present at the Ravello colloquy which was organised in collaboration with the Open Partial Agreement on prevention of, protection against, and organisation of relief in major natural and technological hazards.

¹ This Committee was replaced by the Cultural Heritage Committee (CC-PAT) upon the reorganisation of the specialised committees of the CDCC in 1990.

4. Progress of the Activity

Taking into account the results of the Ravello colloquy, which was intended to take stock of the situation in Europe particularly with regard to existing technical and legal measures in the field as well as of work undertaken by other international organisations, the specialist group felt that its work should result in a recommendation by the Committee of Ministers to member States on the protection of the heritage against natural disasters. This would make it possible to make up for the absence, at European level, of specific legislation and regulations adapted for this type of protection, as well as to enable coordination of the different sectors concerned.

An initial preliminary draft recommendation was drawn up by the British expert consultant, Mr James Edgar in collaboration with the Secretariat, and was examined and approved by the specialist group at its meeting on 6-7 February 1992 and by a restricted group in March 1992. Subsequently the CC-PAT appointed from amongst its number a small working group responsible for the final analysis of the text. The resulting final version of the text was adopted by the Cultural Heritage Committee at its session on 1-2 March 1993 and by the bureau of the CDCC at its meeting on 12-13 May 1993.

5. Characteristics of the Recommendation

The group thought it best to consider natural disasters as a whole (as they present similarities which can give rise to common strategies making it possible to combat major hazards threatening the heritage), including disasters which do not have an exclusively natural cause (such as fires and floods), but excluding voluntary damage more directly due to mankind, considering that the latter should be the subject of other specific work.

The draft is comprised of:

- a general part concerning the protection of the architectural heritage against natural disasters; and
- detailed technical appendices.

6. Future of the Activity

Recent events have shown how important historic monuments can be seriously damaged and how necessary preparation is both in organising prevention and in taking action after a disaster has taken place.

Regular updating of the technical appendices to follow the development of scientific/technical data would seem to be indispensable to keep this legal instrument up-to-date. For this reason the CC-PAT requests that the Committee of Ministers authorise it to carry out the necessary regular updates whilst undertaking to report on the possible updates to the CDCC and to the Committee of Ministers before 31 December 1998.

International workshops concerning the problems dealt with in this recommendation could be envisaged.

II. DECISIONS TO BE TAKEN BY THE COMMITTEE OF MINISTERS

The Committee of Ministers is invited:

1. to adopt draft Recommendation No. R(93).. on the protection of the architectural heritage against natural disasters as it appears in the Appendix to the present document;

2. to authorise the Cultural Heritage Committee regularly to re-examine the technical appendices to the Recommendation and to adopt the amendments which may be necessary, it being understood that the Cultural Heritage Committee will report to the CDCC and to the Committee of Ministers, before 31 December 1998, on the changes made.

APPENDIX

DRAFT RECOMMENDATION No. R(93)...

**OF THE COMMITTEE OF MINISTERS TO MEMBER STATES
ON THE PROTECTION OF THE ARCHITECTURAL HERITAGE
AGAINST NATURAL DISASTERS**

(adopted by the Committee of Ministers on ...
at the ... meeting of the Ministers' Deputies)

The Committee of Ministers, under the terms of Article 15.b of the Statute of the Council of Europe,

Considering that the aim of the Council of Europe is to achieve a greater unity between its members;

Having regard to the European Cultural Convention signed in Paris on 19 December 1954;

Having regard to the Convention for the Protection of the Architectural Heritage of Europe signed in Granada on 3 October 1985;

Having regard to the Convention (revised) on the Protection of the Archaeological Heritage signed in Malta on 16 January 1992;

Having regard to the Unesco Convention for the Protection of Cultural Property in the Event of Armed Conflict adopted at The Hague on 14 May 1954;

Having regard to Recommendation 1042 (1986) of the Parliamentary Assembly of the Council of Europe on protecting the cultural heritage against disasters;

Having regard to Resolution (87) 2 setting up a Co-operation Group for the Prevention of, Protection against, and Organisation of Relief in Major Natural and Technological Disasters;

Having regard to its previous Recommendations :

- on the Specialised Training of Architects, Town Planners, Civil Engineers and Landscape Designers (No. R (80) 16);
- on the Promotion of the Crafts Trades Involved in the Conservation of the Architectural Heritage (No. R (86) 15);
- on control of Physical Deterioration of the Architectural Heritage Accelerated by Pollution (No. R (88) 5);

Appendix

- on Measures Likely to Promote the Funding of the Conservation of the Architectural Heritage (No. R (91) 6);

Recognising that the architectural heritage constitutes an irreplaceable expression of the richness and diversity of Europe's cultural heritage;

Emphasising that the lack of specific legislation and measures for protection of the architectural heritage against the effects of natural disasters would lead to irreparable losses of Europe's heritage;

Stressing that in this field human life and its quality always takes priority;

Convinced that strategies for the protection of the architectural heritage can also protect human life;

Bearing in mind the work of other international organisations, especially Unesco, in this field;

Stressing the importance of international co-operation,

Recommends that the governments of the member states adopt all legislative, administrative, financial, educational and other appropriate measures, with reference to the principles set out in the appendix to this Recommendation, as part of their general policy for conserving the architectural heritage.

Instructs the Secretary General to transmit the text of the present recommendation to the non-member states party to the European Cultural Convention and/or the Conventions for the Protection of the Architectural Heritage and of the Archaeological Heritage of Europe (revised), and to members of the Open Partial Agreement on the Prevention of, Protection Against, and Organisation of Relief in Major Natural and Technological Disasters;

Appendix to Recommendation No. R(93)...

Principles and measures

I. Scope and definitions¹

1. "Architectural heritage" comprises monuments, groups of buildings and sites as defined by Article 1 of the Granada Convention, as well as movable objects having particular historical or aesthetic association with the protected buildings;
2. "Natural disaster" means the occurrence of a natural phenomenon which causes extensive loss of and damage to the architectural heritage;
3. "Hazard" means the probability of occurrence, within a specific period of time of a potentially damaging natural phenomenon, for each building or object; and the hazards are: seismic activity; volcanic activity; tsunami; flooding; land, earth and mud slide and avalanche; wind storms; fire and explosion.

(Secondary hazards are often created as the result of the occurrence of a primary disaster.)
4. "Vulnerability" means the degree of damage or loss to a given element at risk or set of such elements resulting from the occurrence of a natural phenomenon (and fire).
5. "Risk" means the expected damage to or loss of the architectural heritage due to a particular natural phenomenon or combination of phenomena, and consequently the product of specific risk and elements at risk.

II. Legal and administrative framework for disaster protection

1. Each state should establish and complete the compilation of lists of the buildings, objects and monuments of interest. Copies of the lists should be deposited with all the relevant authorities.
2. In recognition of the variety and extent of the architectural heritage, priority should be given to those buildings and objects of greatest importance and to those most at risk.
3. All items on the lists should be recorded and inventories, as detailed as possible, should be produced.
4. Owners of items on the lists should maintain their property in good condition, by means of structural surveys and by the implementation of regular schedules of maintenance and repair and of risk assessment studies.

¹ Definitions 2, 3, 4 and 5 are based on the terms used by the Office of the United Nations Disaster Relief Co-ordinator (UNDRO)

Appendix

5. Authorities responsible for the architectural heritage should be empowered to ensure that the necessary survey, maintenance and repair work is undertaken.
6. Authorities should be empowered to enforce measures to reduce risk where it jeopardises the building.
7. If an owner cannot be traced, or is unwilling to undertake the works, the authorities should have the right to enter and undertake the works, at the expense of the owner, or to effect the compulsory purchase of the property.
8. The issue of risk should be a material consideration in the assessment of town planning and land use proposals. Proposals which are likely to increase the risk, to alter or extend historic buildings should be refused.
9. Authorities responsible for the architectural heritage should be responsible for disaster prevention and mitigation in their field of competency. They should employ trained staff to: produce and maintain records; monitor disaster activity and produce protection strategies; implement salvage, recording and emergency works; provide educational and technical assistance and guidance; and plan and implement restoration projects after the disaster.
10. Authorities should be empowered to raise or be provided with the resources to undertake the functions required for disaster prevention and mitigation.
11. Prescriptive building and safety codes should not automatically apply to the architectural heritage. Safety measures and standards should be attained by the application of performance requirements which employ an optimum and flexible choice of organisational, technical and structural measures.

III. Financial and insurance measures

1. Financing disaster prevention and mitigation

Adequate and quickly accessible resources should be established both for planned maintenance, upgrading and preventive works and for contingency funding in the event of a disaster, for instance by setting up national and local funds.

2. Insurance

- i. States should remove any legal obstacles and facilitate the insurance of buildings and objects which comprise the architectural heritage against loss and damage caused by disasters and against theft and arson.
- ii. All steps to encourage, support and facilitate full and appropriate insurance cover should be taken.

- iii. Policies should ensure that the sums insured shall represent the full cost to be incurred at the time of the loss or damage, in order to repair, restore or reinstate the buildings or objects to their condition before the disaster, using materials, workmanship and techniques according to best conservation practice. If a policy stipulates an excess or co-insurance, the insured should prove that he has the means to cover such sums out of his own funds.
- iv. The buildings and objects should be inspected regularly by experts and insurers and the conditions and warranties stipulated in connection with such inspections should be binding.
- v. Efforts should be made to ensure full co-operation and exchange of information and expertise between the authorities and the insurance companies.

IV. Education and training

In order to improve risk awareness, education should be promoted at different levels: to the general public through informed media coverage and in the school systems as part of the curriculum; to the professionals and technicians through general training and in specialist courses; and, to owners and occupiers of the architectural heritage by the provision of guidance.

1. Education and training should be given a high priority and be provided with an adequate level of resources.
2. Training, at a professional and technical level, must take into account the following considerations:
 - i. only specially qualified and experienced teachers should be used to provide the specialist knowledge and training required;
 - ii. all professionals should be taught general principles and practice at the pre-qualification or undergraduate level and specialist post-graduate courses should be undertaken by those who wish to, or have to, specialise or practice in the field;
 - iii. the general principles must stress the importance of:
 - the determination of event probability;
 - the evaluation of vulnerability;
 - the assessment of risk;
 - preventive and protective action and measures to minimise or eliminate vulnerability and/or risk;
 - conservation repair and maintenance methods and techniques.
 - iv. all courses should be multi-disciplinary;

- v. all practitioners should undertake continuing professional training in order to keep abreast of events and developments;
- vi. fire brigade, civil defence and all other public emergency authorities, including the military, should be made aware of the importance of the architectural heritage in their region;
- vii. other interested parties such as the insurance companies should be offered specialist training;
- viii. the international and regional exchange of teaching staff and circulation of ideas and information should be encouraged;
- ix. specialist research programmes should be initiated.

V. Risk assessment

- 1. Risk assessment should be adopted and implemented as part of the maintenance of property, at a series of management levels, by all owners, occupiers and authorities responsible for the architectural heritage:
- 2. Fire risk assessment and prevention/mitigation strategy should essentially be undertaken at the local level by the owners and occupants of the architectural heritage.
- 3. The role of the authorities should be to decide on statutory matters, to co-ordinate, to provide advice and education, to provide technical and financial assistance and to provide emergency support.
- 4. For the hazards other than fire, authorities should undertake co-ordinated research and the publication of advice at the regional, national and international levels.
- 5. For each of the natural hazards, it is essential to quantify and assess the probability of occurrence notably through the production of distribution studies and zoning maps, through both time and space.
- 6. Information should also be held on computer and be subject to constant monitoring and updating.

VI. Disaster prevention and mitigation strategies

- 1. Disaster prevention and mitigation strategies should be developed for the architectural heritage. All parties involved must be made responsible for the Strategies but the degree and extent of involvement and responsibility will vary according to the type of hazard and disaster.
- 2. There are two approaches to the mitigation of risk, neither of which is exclusive:

- to reduce the hazard or prevent the occurrence of the disaster; or,
- to minimise the loss or damage which will result from the disaster.

3. Risk is reduced by the planned application of a choice of organisational/management, technical and structural measures which must be developed on a case by case basis for each building according to each disaster.

4. Guidelines and checklists for disaster prevention and mitigation strategies are described in the accompanying annexes.

TECHNICAL APPENDICES

APPENDIX I

Disaster prevention and mitigation strategies

Organisational measures

General

1. Disaster prevention and mitigation strategies require preparation and planning and the implementation of technical and physical measures, in order to prevent or reduce loss or damage, both in the event of disaster and in the aftermath. It is recognised that it is neither possible to prevent nor to predict the occurrence of some disasters. Nevertheless, in all cases, probability studies and a thorough understanding of the risk are vital for the formulation of a strategy.
2. The success of a strategy depends on the effectiveness of regional/national/international co-operation and co-ordinated policy, as well as on the vigilance and good housekeeping/maintenance by the owners and occupiers of historic buildings. It is important that bodies responsible for the architectural heritage should adopt a major role and establish disaster protection units. Disaster plans should be developed and implemented immediately. They must include an evaluation of the risk, based on a thorough knowledge of the hazard, and an assessment of the vulnerability of the historic buildings. To date, risk assessment for buildings has concentrated on codes for new structures and there has been little attention paid to the collection and analysis of information specific to historic buildings.
3. The local or regional authority dealing with the architectural heritage, or the civil defence or other emergency authorities in consultation with the representatives of the architectural heritage authority, should identify and train staff to deal with disaster prevention and mitigation planning and with disaster assistance. These staff should attend during or immediately after the disaster, in order to supervise salvage and recording operations (the use of photogrammetric recording is particularly useful in the context of an emergency) and they should be involved in any decisions of demolition and/or on the control of emergency repairs and making safe or good. According to local law and practice, staff should liaise and co-operate with contingency planning, civil defence, and emergency services in the establishment of disaster plans and priorities and in the publication of guidelines and advice on all aspects of disaster planning.

4. The fire, civil defence and emergency planning authorities, as appropriate, should be trained and made aware of the importance of the architectural and cultural heritage in their region. They should be provided with the following information:

- i. full lists of buildings and objects which comprise the architectural heritage, including details of contents;
- ii. copies of salvage plans and priorities indicating the objects of particular interest;
- iii. plans of the building which indicate means of escape routes, the location of access points, fire-fighting equipment, power and other services, and of hazardous or fragile materials;
- iv. advice on the likely effect of the various extinguishing agents (water and gas) on delicate or fragile historic fabric, structure and materials - wall paintings, panelling and so on.

APPENDIX II

Fire organisational measures

1. For each historic building a named member of staff or of the household, with deputies, must be made responsible for fire safety. This fire safety manager, who might also be responsible for security and health and safety, should initiate and oversee all aspects of the fire prevention or mitigation strategy or plan, in liaison with the fire brigade staff and with professional advisors (architects, surveyors, engineers, planners, specialists on historic buildings) and representatives from the insurance companies. The strategy should be subject to constant rehearsal and review, and records of all activities should be made.

2. The main objective is to reduce the risk by undertaking systematic fire prevention. A balanced series, or optimum choice, of organisational, technical and physical measures should be employed. Specifically, the strategy will seek:

- i. to assess the risk of outbreak of fire, to minimise that risk and to prepare a plan of action in the event of a fire;
- ii. to ensure safe and orderly means of escape for all occupants;
- iii. to protect the historic structure and to ensure the limitation of fire-spread;
- iv. to establish a staff structure with clearly defined responsibilities in the event of an outbreak;
- v. to train and educate staff in fire-fighting and evacuation procedures, and in the implementation of salvage priorities and plans, including regular and monitored practice drills;
- vi. to prepare and maintain documentation on the layout of the premises, including detailed plans which indicate the location of fire-fighting facilities, of means of escape routes, and of fragile, important and valuable structures and fittings;
- vii. to ensure that the uses of the building and its rooms or spaces are consistent with safety requirements;
- viii. to encourage good housekeeping and maintenance standards in order to reduce the risk of ignition;
- ix. to ensure that fire safety systems are correctly maintained and operational;
- x. to ensure that the building and its curtilage are secure against arson and vandalism;
- xi. to keep records of protection activities and to evaluate the effectiveness of the strategy.

3. The nature of the fire prevention and mitigation strategy can neither be fixed nor prescribed by rigid codes of practice. It must be flexible and in each case a fire safety package should be built so as to fulfil basic means of escape requirements, whilst at the same time not to impair the character and value of or inflict damage upon the historic building. Individual strategies will vary but in each case the emphasis will be on prevention, preparation and vigilance rather than on provisions requiring structural alterations.

4. All structural alterations and the installation of mechanical, electrical or other systems associated with prevention, detection and fire-fighting must be agreed with the authorities responsible for the architectural heritage. The aim is to minimise the amount and effect of "passive", physical or structural, precaution works on the interest of the historic building or artefact. A systematic approach which treats each case and building on its merits and which employs a flexible package of organisational and technical measures, will reduce the need for major physical works, whilst, at the same time, meet the safety legislation and requirements. Essentially, this represents a strategy of vigilance and prevention, coupled with early detection and the orderly application of evacuation and fire-fighting procedures.

Technical and practical measures

1. The sources of ignition should be identified and eliminated or minimised.
 - i. All parts of the building should be kept clear of waste and rubbish. In particular, attics, basements, enclosed stairways and under-stairs areas, cupboards and empty store rooms should be inspected regularly, cleared of unnecessary material and kept clean.
 - ii. Cleared strips or zones in grassland, heath or forest areas should be provided, if acceptable in aesthetic terms.
 - iii. Electrical installations, circuits and equipment should be regularly tested, properly maintained, utilised and overhauled. Circuits should not be overloaded and faulty equipment and wiring should be replaced. It is advisable that main cable and fuse-boxes are located in a separate fire-proof room or area.
 - iv. Naked flames from heat and light sources such as candles, torches, gas lighting and open fires or stoves should be discouraged. Where their use is to be permitted, there should be careful monitoring, strict control and the provision of safety guards when unattended. The provision of suitable fire-fighting equipment adjacent to the risk is advisable.
 - v. Only trained workmen should be allowed to undertake maintenance, repair and improvement work on historic properties. They should be made aware of the importance of the building or its fittings and should be supervised by a senior and responsible member of staff. Smoking should be banned and hot-work (blow-lamps, etc.) only allowed if there is no alternative. Any acceptable hot-work should be the subject

of a permit which identifies and controls responsible parties, the nature, location and duration of the work and which ensures that combustible materials are removed or protected. In addition, extinguishers and alarm systems must be provided and work supervised and monitored at all times, with provision for checks for a period after the work is completed.

- vi. Lighting conductors (arresters or rods), properly designed and maintained, should be fitted.
- vii. Chimneys should be swept regularly. All hearths, flues and ducts should be maintained in a sound condition. All cookers, heaters, boilers and furnaces should be serviced regularly, be kept clear of combustible materials and be provided, where appropriate, with fire and safety guards. Kitchens, plant and boiler/furnace rooms should always be provided with suitable fire-fighting equipment and the rooms should not be used for storage.
- viii. Smoking should be banned in historic buildings or confined to specific fire-protected rooms or areas, installed with fighting and alarm equipment.
- ix. Provisions should be made against arson and, in particular, premises and their curtilages should be secure against unauthorised entry. Temporary staff and visitors should be checked and supervised and flammable and waste materials kept out of reach.

2. Fire detection and alarm systems should be installed. The bare minimum would be fire gongs or an electrically operated system. Preferably, automatic and active fire detection systems should be installed and connected to an alarm report centre and to the local fire brigade. Each individual detector should be identifiable and the systems be provided with the ability to monitor faults and false alarms. Smoke, heat and flame detectors can be installed and connected to alarm centres by hard wiring or by radio-link. The casings for the detectors should be unobtrusive, as small as possible and adapted in shape and colour so as not to impair their historic setting. On the exterior, in some cases (thatch, timber-cladding, for example) heat-detecting cables should be considered. In all cases, detectors and alarms must be properly and regularly maintained and responsible staff trained to understand and handle the systems.

3. Fire fighting facilities should be provided and maintained.

- i. Fire fighting by staff or occupants should be encouraged with the provision of regular and monitored programmes of awareness and training. Premises should be fitted with fire buckets and hand-held extinguishers which must be suitable for both general and special risks. Extinguishers should be inspected and overhauled on a regular basis.
- ii. Automatic fire-fighting systems should be installed wherever possible and where it can be demonstrated that the risk will be reduced, but only where there is likely to be little or no impact on the special interest of the historic buildings. Attic and roof spaces,

spires and towers on churches might provide possible locations inside buildings. However, the danger of collapse or decay following operation must be carefully assessed. Industrial, commercial, transport and military premises might be capable of greater intervention than domestic properties. Roof ridges (particularly on thatch, grass, reed, straw) and architectural ledges on elevations might be investigated. In dense urban areas dry sprinkler systems on facades in narrow gaps will assist in the control of urban fire spread. The use of copper pipes with hidden joints should be encouraged. Modern fast response sprinkler systems, based on zone signalling, should be employed. Regular maintenance, with the identification and elimination of faults, must be undertaken. The use of sprinkler systems, particularly in areas of fragile construction, containing delicate fabrics, panelling, furniture, works of art, and so on, and in unventilated areas must be carefully assessed.

- iii. Access at all times for the fire brigade is vitally important. Roads and access points should be made and maintained wherever possible. In sensitive gardens and landscapes the maintenance of "green ways" might suffice. Fast and reliable routes between fire stations and historic buildings and centres should be identified and plotted on maps. Water supplies should also be identified and plotted, to include all mains water sources, wells, reservoirs and storage tanks and towers, ornamental canals, ponds and lakes, swimming pools and natural sources such as rivers, streams and lakes. If there is no ready and nearby supply, then consideration should be given to the establishment of such or to the provision of an emergency storage tank of adequate capacity, suitably located, hidden or disguised. Immediate access to and within the building should always be reviewed and improved, for example by the formation of roof hatches and by ensuring that doors can be unlocked and opened.
4. In some circumstances, in particular in relation to the provision of a safe and adequate means of escape, physical alterations might prove necessary. These might include:
 - i. the enclosure of the staircase compartment, where appropriate, and protection of the means of escape;
 - ii. alternative means of protecting the means of escape, such as positive air pressure systems, to prevent smoke and flame penetration and spread;
 - iii. the installation of automatic smoke vents and hatches, which will also allow improve access for fire-fighting;
 - iv. lobbies, with new partitions scribed around existing features;
 - v. adequate fire-resisting doors including self-closers, fire-stops and intumescent strips to doorways;

- vi. the application of intumescent paint and other finishes to panelling or cast iron columns, for example;
- vii. the installation of automatic emergency lighting and signs which are independent of the normal electricity;
- viii. the construction of barriers where they will not detract from the character of the building, for example in undivided roof spaces, and by the reinstatement of missing partitions.

The approach adopted should begin with a package of "soft", non-intrusive measures with the application of "hard", intrusive measures only where all other measures are demonstrably inadequate and jeopardise human life and the architectural heritage.

5. After a fire the following action should be taken:

- i. the minimum of making safe in order to allow recording, salvage and rescue work;
- ii. valuable artefacts and fittings, including those either dislodged or in danger of collapse, should be recorded in situ and then carefully removed, under the supervision of conservation specialists, to a safe store for urgent conservation measures;
- iii. emergency recording by appropriate means, at least plans and photographs, but photogrammetric recording is to be encouraged;
- iv. damaged roofs should be covered by temporary works, for example, with tarpaulins, and the property secured against unauthorised personnel and theft;
- v. residual water should be removed by mechanical and physical methods (suction pumps, sponges, cloths, etc.) and the building should be thoroughly dried by the maintenance and improvement of air-flow and, where possible by the use of dehumidifiers;
- vi. investigation, by non-destructive techniques, of hidden structure and fabric must be undertaken and the installation of moisture monitoring equipment should be considered;
- vii. all alarm systems and fire-fighting equipment should be reinstated;
- viii. any further structural works, including proposals for restoration and repair or for demolition, must only be undertaken after full consultation with and the approval of the authorities for the architectural heritage.

APPENDIX III

Earthquakes, volcanism, tsunami, floods, wind-forces, avalanches and landslides or flows Organisational measures

The disaster plan should comprise a number of stages:

1. understanding the hazard including precise data on the probability of occurrence, type, location, zoning, estimation of intensity and return period. This must be undertaken on the basis of present-day and long-term scientific research into of causes and events and their monitoring and, also, of an analysis of documentation on past disasters. Information should be published in map form, with computer copies. All material should be held in a safe place;
2. understanding other geological, hydrological, meteorological and natural processes and factors - water courses and levels, soil characteristics and subsurface geologytheir behaviour in the event of disaster and their action on the architectural heritage. Microzoning and site effect studies and maps should be produced;
3. Incorporating seismic, meteorological, hydrological and geological data into the administration of the architectural heritage and of town and land use planning in order to:
 - i. identify, and assess the vulnerability of the architectural heritage (by means of vulnerability and damage graphs and matrices) to assess the risks and the probable damage or loss;
 - ii. minimise the vulnerability by developing and implementing plans for assistance (technical and financial) with the strengthening, repair and maintenance of the architectural heritage;
 - iii. control proposed alterations to and the use or change of use of historic buildings where the risk is already high or might be increased;
 - iv. control proposed alterations to the use of land in the vicinity (local and regional) of major or numerous elements of the architectural heritage, where there is a demonstrable risk created by that land use practice;
4. training and preparing staff, including those from civil defence and all other public authorities in the country, according to local law, in recording, salvage and emergency repair, shoring, propping and emergency protection methods and practice, and in the implementation of security measures to counter theft, arson and other criminal activity. This must include the publication of technical advice, of survey and record plans and forms, and, regular practice and exercises;

5. encouraging and controlling the good maintenance and repair of historic buildings by the initiation of action plans in co-operation with local communities and individual owner/occupiers;
6. preparing plans and priorities for salvage, removal, storage and emergency conservation work of movable property;
7. identifying and marking buildings of special interest;
8. preparing and implementing plans and priorities for full restoration in the aftermath of a disaster;
9. ensuring that there is an adequate supply of materials for protection, conservation and restoration;
10. ensuring that emergency teams of specially trained conservation professionals (architects, engineers, surveyors, planners, archaeologists and historians), craftsmen and builders and responsible members of the local communities are identified and trained for action;
11. monitoring, evaluating and improving the disaster plans.

Preventive/technical measures

1. Measures for the protection of the architectural heritage against natural disasters should begin with the development of specifications and guidelines for the assessment and upgrading or strengthening of historic buildings. It is imperative that any works intended to improve the resistance of a building do not result in the unacceptable intervention into or loss of the special interest of the building. In order to achieve this goal it is important to ensure full survey and recording, inspection and understanding of the historic building, its structural system and constructional materials and techniques, its evolution and history and its conservation. Preventive measures fall into two categories:
 - i. site specific - maintenance, improvement and emergency works to the historic building or object (the first two are undertaken on a regular or planned basis and the third, although prepared in advance, is undertaken at the time of a disaster);
 - ii. site general - local or regional control of, and alteration to, land use patterns and local or regional preventive measures and works (to be planned and implemented as part of a co-ordinated programme to minimise the frequency of specific disasters, such as flooding, avalanche and land flows and slides).

2. Good maintenance is the single most effective means of reducing the amount of potential damage or loss. Therefore, it is essential that quality maintenance work, undertaken on a periodic basis after regular inspections (on a cycle of at least five to ten years) and employing traditional and compatible techniques and materials, be advised and specified. The use of mortars and grouting in masonry structures and the issues of tensile resistance, bonding, tying of floors and roofs to walls and wind and water tightness in all structures, are the paramount considerations.

3. All alterations intended to improve resistance must be agreed with the authorities for the architectural heritage, which should produce technical guidelines, after undertaking experimental, analytical and comparative research into:

- i. the resistance of historic structures and materials;
- ii. historic concepts and methods of improving resistance;
- iii. the behaviour of different structures and materials - timber-frame, rubble or ashlar masonry, earth-structures etc.;
- iv. the implications and likely behaviour of building defects, both intrinsic and extrinsic, in the event of a disaster;
- v. the evaluation of previous "modern" strengthening practice and techniques;
- vi. the assessment of different levels of disaster intensity and of the frequency of occurrence.

The criteria and guidelines must specify that:

- i. the degree of works proposed should not result in the total or partial impairment of the special interest or integrity of the historic building;
- ii. the existing structural systems and materials are retained, respected and enhanced, if necessary;
- iii. traditional materials and techniques are preferred;
- iv. if new materials and techniques are proposed these should be compatible with the existing, durable and reversible, as far as is practicable, where these conditions cannot be met, alternative proposals should be commissioned and evaluated;
- v. each building and any proposed works are assessed on their own merits and that works will be undertaken on the basis of performance requirements, not according to a prescribed code, with due consideration given to the possibility of improved and more sensitive methods in the light of technological development;

- vi. that proposed works are designed against realistic probability assessments of disaster occurrence and intensity, and graduated according to different levels of risk.

The opportunity to undertake works to improve resistance should always be investigated and implemented before a building is considered for a major programme of repairs or of alteration and extension.

Existing inappropriate or unauthorised forms of construction, extension or alteration should be removed, where possible, by the use of legislative and financial measures.

All improvements and strengthening work should be fully documented and allowing for long-term review and with the aim of establishing international standards.

4. Preparation for emergency action in the event of a disaster should identify the specific action to be undertaken. It is essential to co-operate with other authorities, both civil and military. Provision should be made for:

- i. fire-fighting and protection against water damage;
- ii. immediate safety works of shoring and propping;
- iii. closing and guarding to ensure protection against land and water flows, air-borne debris, adverse weather and criminal activity;
- iv. marking important objects and structures;
- v. clearing debris, taking care to record in situ and to recover movable and displaced or fragile objects;
- vi. emergency conservation work and removal to safe storage of important, movable, displaced or fragile objects;
- vii. full recording, preferably by photogrammetry, of damaged structures;
- viii. the reinstatement of fire and safety equipment, the provision of emergency power supplies and adequate transportation.

For the long term, a full survey and inspection of the damage must be organised in order to plan, develop and implement restoration, repair and conservation of the architectural heritage.

5. Site general works should follow the identification of those elements of the architectural heritage most at risk from preventable disasters, such as flooding, avalanches and landslides. In these cases, prevailing land-use practices - agriculture, forestry, communications, industry and general development - should be assessed and remedial measures undertaken in order to minimise the risk. Particular attention should be paid to deforestation, soil abuse and degradation, and the use of and alterations to ground and underground water.

In certain circumstances, physical prevention works must be planned and implemented: levees, dykes and dams; tree screens; consolidation of slopes; and diversionary barriers.

Checklists

The following checklists are recommended:

A. Earthquakes

1. Seismicity

- geo-tectonic studies and mapping
- historical earthquake information
- instrumental recording
- active and inactive phases (seismic trends)
- seismic gaps
- seismicity and hazard zoning maps, of suitable sophistication
- microzoning considering the adverse effects of subsoil

2. Seismic damage to the architectural heritage

- quality of structural members (brick, stone, mortar, steel and iron, wood, reinforcement and tiles; concrete)
- quality of non-structural items (brick, mortar, stone, timber, tiles, all cladding and infill materials, roofing materials, services)
- compatibility and behaviour of various materials
- ease of repair and availability of materials
- availability of experienced and qualified professionals and craftsmen and labour
- supervision and control of essential repair and upgrading work
- foundation (type, vulnerability, intrinsic safety, differential settlement)
- damping
- soft or stiff or mixed structures
- symmetry (plans, elevations, openings, roofs)
- natural period of buildings vs. probable periods of subsoil
- emergency shoring and propping; removal of artefacts;

B. Volcanic activity

- characteristics and eruptive history
- eruption probability
- instrumentation to record, monitor and to provide early warning
- proximity of the architectural heritage, according to assumed magnitude of eruption
- the possibility of diversions to and the cooling of lava flows
- vulnerability of the architectural heritage to lava flows, bombs, glowing avalanches, ash deposits and corrosive gases
- emergency protection to roofs and for openings; removal of artifacts

C. Tsunami

- probability of this kind of event in the region or in nearby locations which might affect the region
- probability of height and penetration inland; zoning maps showing areas submerged by various run-up heights
- sensitivity of the architectural heritage to waves of tsunami type
- the possibility of coastline protection.

D. Flooding

- probability and return periods of flooding, not only on basis of past events but also in view of changes in land use
- systematic mapping; publication of torrent and flooding registers
- reliability and adequacy of records
- seasonal variations
- effect of climatic trends and changes on maximum short-term precipitation and floods
- infiltration (soil, vegetation and sealed areas) and disturbance to infiltration (cropping, deforestation, removal of top-soil, traffic)
- topography of site (distance to watershed, slopes, elevation, probability of ponding)
- effect of water and rain on the architectural heritage, watertightness of buildings, damage to elements and the effects of increased humidity
- effects of flooding to foundations and lower floors, on structural members (walls and floors), on non-structural elements and on fixtures and fittings - possibility of improved drainage of the area
- provision of protective dykes, levees, channels, and in an emergency, cofferdams and sandbags and pumping and dehumidification equipment; removal of artefacts
- control of land-use/exploitation

E. Avalanches, land- and mud-slides and flows

- assess slope stability, including type and composition of surface layers and the general hazard of the layers to slide (past events)
- existing slope angle in relation to safe angle
- exposed slopes in case of avalanches
- obstacles in the path of slides, flows and avalanches
- extraneous factors such as water saturation, interference by construction works, seismic activity
- systematic mapping; publication of registers
- possible protective measures and works to include
- drainage slopes and reduction of infiltration and percolation of water
- obstacles, retaining basins, deflectors,

- retaining walls
- planting
- research to understand better the function of forests
- control of land-use/exploitation

F. Wind-forces and -storms

- evaluation of probabilities and maps
- return periods for given velocities in gusts
- distribution and prevailing direction of high winds
- topographic features which protect or expose the architectural heritage
- effect of other structures, vegetation and other items on the exposed element
- roofs and supporting structures (strength, fastenings or tiles), cladding
- towers, spires, pinnacles, cupolas, parapets and other exposed elements (additional anchoring)
- large, laterally unsupported walls
- windows and openings (shutters and other temporary means of closure against flying debris)