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Resilience of buildings and civil engineering works

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 59, *Buildings and civil engineering works*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Introduction

Resilience is not a new concept. It is widely used in many fields such as human psychology, ecology, disaster risk management and product specification.

With an increasing impact, resilience is contributing to sustainable development on humanitarian issues at a global level, focusing on providing the general public, including vulnerable groups, with an environment that can better adapt to future disaster risks.

In view of the increasing demand for resilience of buildings and civil engineering works, this document attempts to collect and summarize typical relevant existing information to provide reference for research and standard preparation. Information is aggregated mainly on concept, disaster risk and countermeasure:

1) For concept, this document sorts out some perspectives of resilience in different contexts and definitions of resilience that have appeared in ISO documents.

2) For disaster risk, this document describes three categories of disaster risk closely related to buildings and civil engineering works, i.e. climate-induced, earthquake-induced and human-induced, and indexes some typical related reports and data.

3) For countermeasure, this document summarizes typical relevant information from the two dimensions of strategy and measurement. Some of this information is relatively mature, already in the form of standards, guidelines, etc., some are implemented in cases, and some are at the research stage.

Resilience of buildings and civil engineering works involves interested parties and participants which can include specialists in the field of buildings and civil engineering works (such as material manufacturers, engineers, architects, constructers and estimators, etc.), scientists, standard setters, investors and financial institutions, regulatory agencies, communities, residents and occupiers, government administrative departments, etc.

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Resilience of buildings and civil engineering works

1 Scope

This document provides an index of typical existing information on concept, disaster risk and countermeasure for resilience of buildings and civil engineering works.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

4 Concept

4.1 Perspectives in different contexts

Resilience is derived from the Latin word "resilio" for bounce[2] and in most cases its use retains this concept either literally or figuratively. The Oxford Dictionary of English gives two explanations of resilience, "the ability of a substance or object to spring back into shape" and "the capacity to recover quickly from difficulties"[3], which could be understood as mechanical and functional resilience respectively. Some domains also have understandings of resilience from different perspectives. Table 1 is a summary of some typical descriptions of resilience in different contexts, extracted from the literature found.

Table 1 — Resilience in different contexts

Context	Perspective	Citation
Ecology	A measure of the persistence of systems and of their ability to absorb change and disturbance and still maintain the same relationships between populations or state variables.	Holling, C.S. 1973[4]
Disaster management	Resilience is the capacity to cope with unanticipated dangers after they have become manifest, learning to bounce back.	Wildavsky, A. 1988[5]
	The ability to recoil effectively from adversity and enhancing the likelihood of exposure to adversity leading to growth.	Paton, D. and Johnston, D. 2001[6]
Building	A resilient built environment should be designed, located, built, operated and maintained in a way that maximises the ability of built assets, associated support systems (physical and institutional) and the people that reside or work within the built assets, to withstand, recover from, and mitigate for the impacts of extreme natural and human-induced hazards.	Bosher, L. 2008[7]
	Resilience is the capacity to adapt to changing conditions and to maintain or regain functionality and vitality in the face of stress or disturbance.	Resilient Design Institute[8]

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