

Systems and solutions for building in a seismic zone



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Dear users of this manual,

The seismic events that occur in many parts of our planet, unfortunately too often with tragic consequences, require our careful focus on the importance of building responsibly.

This manual seeks to make its own contribution to that end.

For decades, we have sought to provide, with our fixing systems, economically appropriate and qualified solutions to construction problems. Our international commitment means that we have been active for a long time in the field of safety of anchoring in a seismic zone. Our many initiatives include: a conference with university instructors in Turkey, a design group that we created in Germany, our collaboration with many research institutes in Italy.

All the knowledge developed together with our scientific and technical partners and the know-how that we have acquired in all the most important areas of application are accessible and useable today thanks to this manual. I am sure that this instrument will be a valid aid for all operations in the areas of construction, engineering studies and public entities, at the same time representing a step forward in making buildings safer all over the world.

Best regards,

Honorary Professor
Senator E.h., Dipl. Ing. (FH)
Klaus Fischer

A handwritten signature in black ink, appearing to read 'Klaus Fischer', written in a cursive style.



Chairman of the Board Order number 3274 of March 20, 2003 opened up a period of lively discussions, updating courses, structure safety assessments, development of antiseismic technologies and details in the construction industry.

One may discuss, as some wish, the advisability of changes in seismic classification and the introduction of more modern regulatory contexts consistent with European law, but it cannot be denied that seismic risk in our country has in point of fact already decreased as a result of the renewed interest and knowledge of technicians, the greater awareness on the part of government entities, and the willingness of the industry.

A profoundly changed regulatory context that adopts, in a homogeneous manner for the entire country, solutions consistent with the regulatory system already defined at the European level and being adopted by the European Union, necessarily implies a professional and industrial dynamism whose effects cannot but be beneficial.

It matters little that the standards are mandatory or optional, what is important is that this starts a process that leads to the abandonment of the conventional and purely prescriptive nature of the technical standards of the past in favour of rules of an explicitly service-related nature in which the objectives that the regulations set forth are stated and the methods used in that connection (procedures for structural analysis and the dimensioning of elements) are singularly justified.

Respect for fundamental principles aimed at attaining levels that are homogeneous and risk-sharing in nature and the possibility of defining systems of alternative rules that guarantee that they will be complied with, constitute

the necessary foundation for the development of new ideas in construction techniques and are therefore a powerful impetus for technological research and innovation.

It is in this environment that Fischer operates, and along with it many other companies active in the production of other structural elements, in order to define and verify the adequacy of the fixing systems among various parts that contribute to the building of a modern structure.

The correct connecting of interconnection among systems, suspended ceilings, façade panels...must be considered as important aspects for seismic safety, especially where the reference limit status, or the performance is related to the functionality of the building and not just to limiting damage and the protection of human life.

Too little has been done in this field, in terms of both research and applications.

I am sure that the publication of a manual on the correct seismic dimensioning of fixings constitutes a useful instrument for the profession, but I hope that it will prove to be a point of departure, rather than a conclusion, of a process of development based on laboratory experimentation, digital analysis, and the intelligent innovation of products and construction methods.

G. Michele Calvi
Regular Professor
University of Padua

Director of Eucentre

The new rules, while not giving the designer definitive directives, nevertheless stress the importance not only of the structural portion of the building, but also of everything else that is “not structural” which is also part of the building.

The need to bring the designer and the final user together arises, therefore, from the advisability of offering our own competence in fixing systems, instruments for a correct selection and dimensioning of the anchor, but also from knowledge of the application as a whole.

Considering only one part, though an important one, such as the anchor, is no longer sufficient.

In the seismic environment, the path of research and experimentation is to guarantee resistance to seismic stresses and, therefore, the functionality of the structure itself. It cannot consider only the performance of the individual anchor, even if studied in the various critical conditions of cracking of the support and the variability of the load applied.

It is also necessary to analyse how the systems react to the horizontal stresses. Systems, bracing, ventilated façades, items that are suspended or merely supported and that are well dimensioned for the weight involved, can be extremely labile and vulnerable in the event of an earthquake.

In this manual, the reader can find not only the most appropriate products and the relative areas of application, but also all those devices that make the performance of the “non-structural” parts capable of also resisting these new forces using refined technologies, such as structural reinforcements or parametric analyses to study the ventilated façades, or also mere and apparently banal suggestions, such

as drilling methods or the use of struts in the plant engineering.

This is just a first step in disclosing the knowledge of fixing technology and the current state of the art and suggesting antiseismic solutions in specific areas of application.

Research at fischer does not stop here and will gradually lead to providing increasingly complete systems designed for earthquakes and solutions that help to meet the requirements for safety and simplicity of installation. In the meantime, we can only hope that the world of construction will start to use what is set forth in this manual.

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Foreword

Part one

- 1 Seismic situation**

- 2 External parameters that affect the performance of the anchor**

- 3 Approved products and corresponding standards**

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