



## Seismic Design

Seismic design plays an integral part in modern safety. A design change may be required to improve the seismic withstand capability of an existing structures, systems or component (SSCs), or a new facility may need to be designed with qualified resistance to earthquakes.

Based on our extensive experience and expertise in seismic engineering, we offer design services to enhance seismic withstand capabilities of SSCs, such as buildings, pressure vessels and mechanical handling equipment.

The potential risks of seismic hazards can be great and with a high financial cost, by proper analysis and assessment, EASL can provide a clear and cost-effective service, helping saving money, time and even lives further down the line.

### What is Seismic Design?

For the SSCs for which seismic hazard is a significant design consideration, seismic design brings the design principles that would minimise or reduce the seismic responses into the standard design process. This can potentially reduce the cost of seismic substantiation/qualification of SSCs that have not been designed for earthquake resistance.

The seismic design principles are based on the fundamental understanding of the seismic response of SSCs during/after earthquakes and the safety function requirements such as integrity, functionality, operability and stability. Seismic design will increase structural resistant to earthquakes.

### EASL's Seismic Design Services

We have extensive seismic analysis expertise and experience in calculating seismic response of a wide range of SSCs for seismic design, substantiation or nuclear safety case. We are happy to work with our clients' design team or to undertake small scale seismic design. Supported by hand calculations and/or finite element modelling, analysis and structural integrity assessments, the areas covered by our seismic design service includes:

- Evaluation of design basis earthquake, seismic margin earthquake response spectra and/or floor response spectra for the intended assessment purposes
- Working with our clients' designers for new facilities, we will optimise the conceptual design to reduce seismic responses of SSCs
- The conceptual seismic design will be supported by our preliminary seismic analysis to minimise the risk of design changes due to seismic issues later in the design process
- On completion of design detailing by clients, the preliminary seismic analysis will be updated to for a full seismic assessment
- For existing SSCs with a shortfall in resisting earthquakes, we will carry out design changes and substantiation to demonstrate improved seismic withstand capability

For existing SSCs, seismic design solutions can come from a number of sources apart from a design change:

- Reduction in seismic demands;
- Reduction in seismic responses; and
- Reduction in assessment pessimisms.

Pessimisms are inherent in deterministic analysis and assessments and sometimes it is acceptable to reduce/remove some of them. With the expertise in the evaluation of ground motion spectrum, generation of secondary response spectrum, seismic analysis methods and application of code assessments, we are in a position to evaluate and choose the most cost-effective route to a successful seismic design.



As part of a design substantiation, structural integrity involves a wide range of possible failure mechanisms beyond seismic issue. A design to minimise seismic response should also avoid introducing/enhancing other failure mechanisms. With expertise in other areas of structural integrity, we will ensure our design will provide a balanced integrity substantiation, which tend to lead to a more cost-effective solution.

For seismic design, early engagement with seismic evaluation could lead to significant cost reductions for the whole of the design process. Our seismic analysis and assessment expertise will allow us to make valuable early seismic evaluation in a design process leading to the formation of a cost effective seismic design strategy.

To find out more about our other related seismic services, take a look at some of our related services and case studies or get in touch on [enquiries@easl-stress.co.uk](mailto:enquiries@easl-stress.co.uk).

#### Related Services

- Hazards
- Seismic Analysis of Structures
- Seismic Assessment