



**EC Collaborative Project SILER:
Seismic-Initiated events risk mitigation
in LEad-cooled Reactors**

THEME: Fission 2011-2.3.1: R&D activities in support of the
implementation of the Strategic Research Agenda of SNE-TP

Grant Agreement 295485

October 1st, 2011 - September 30th, 2014



How to isolate a NPP - interface components: fail safe system

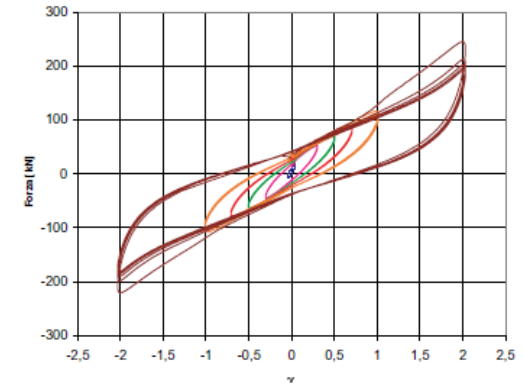
Verona - 25 May 2012

Alberto Dusi

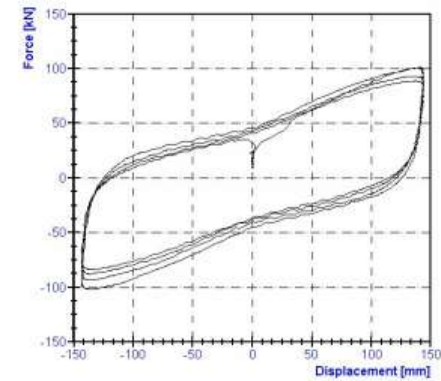
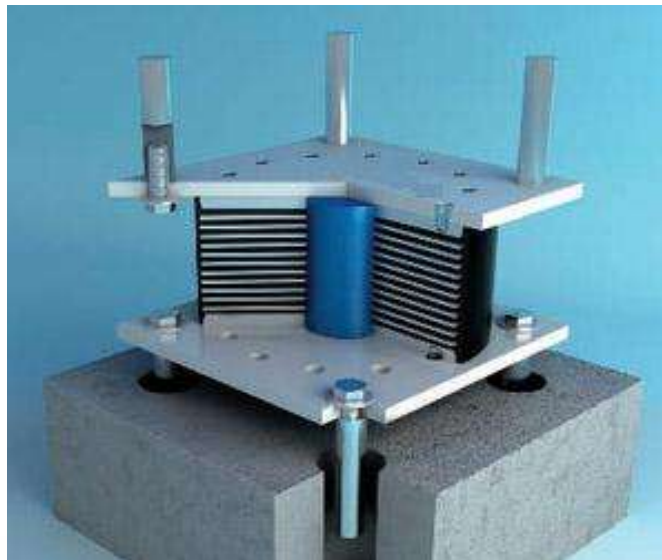
Numeria Consulting srl – Cremona, Italia

DEVICES FOR BASE ISOLATION OF NPP

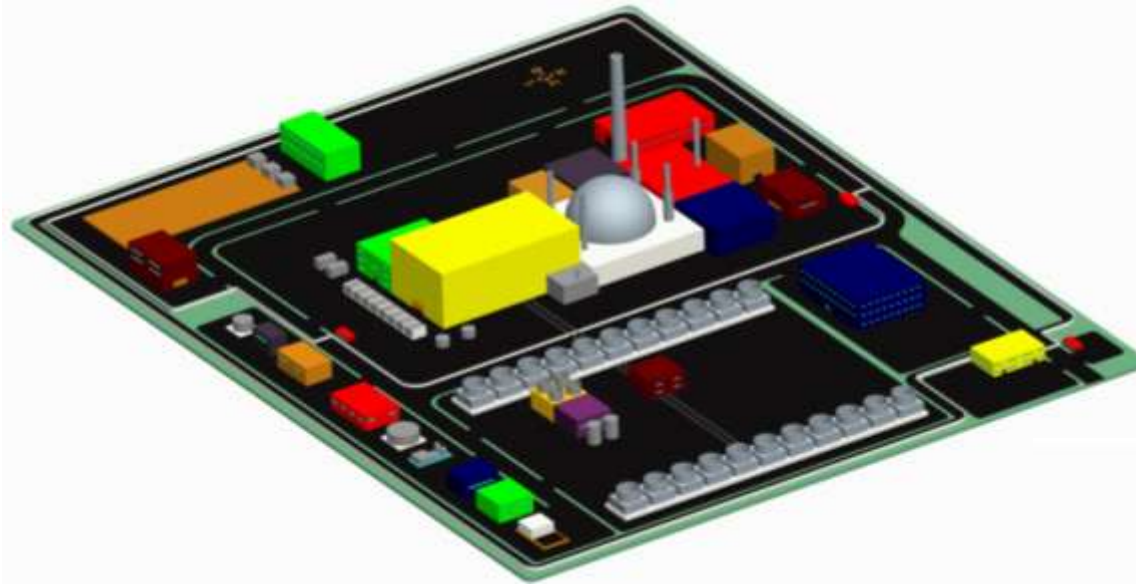
HDRB



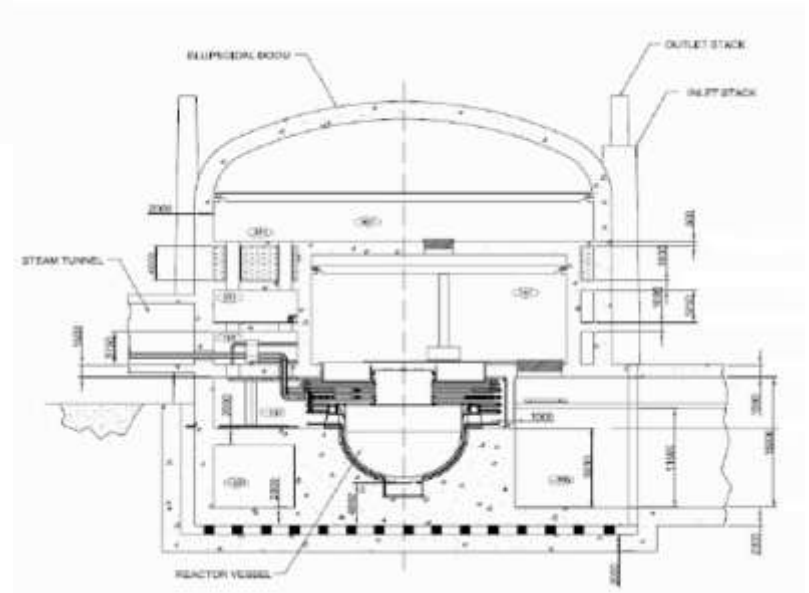
LRB



ELSY NPP

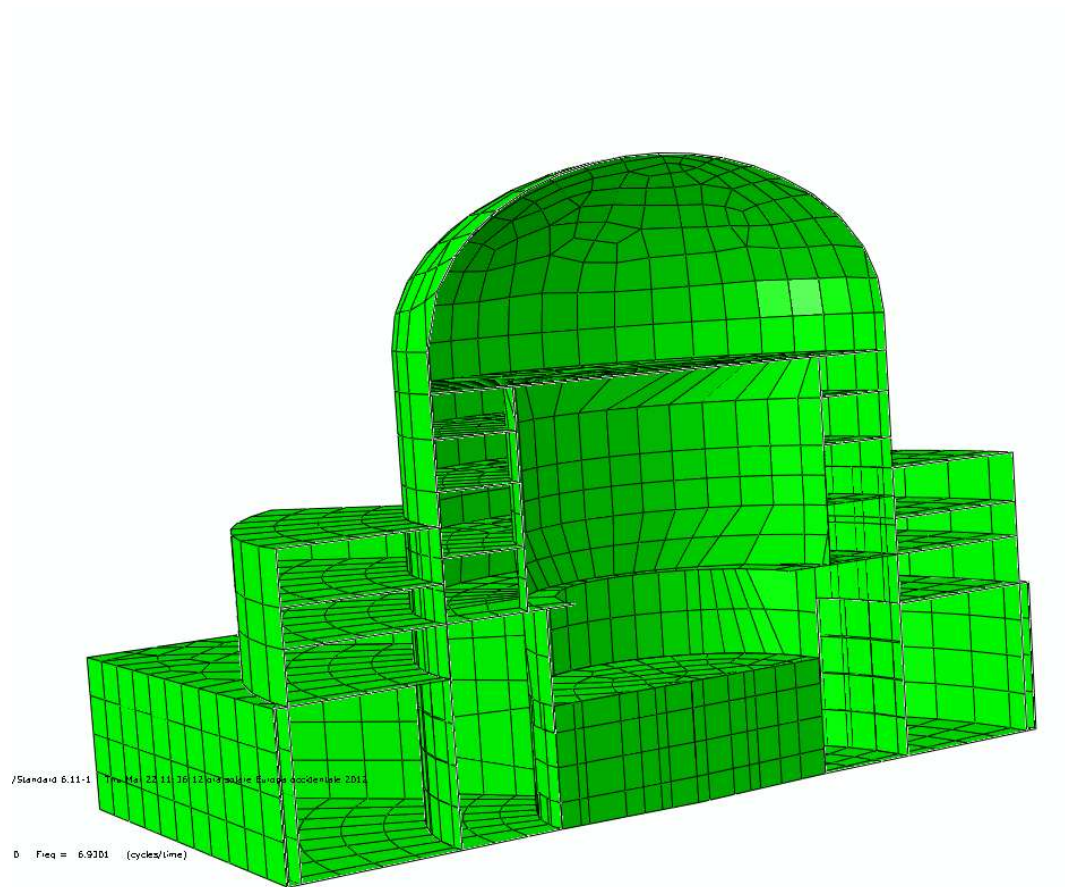


Sketch of the ELSY plan layout



Section of the reactor building with seismic isolation

ELSY NPP

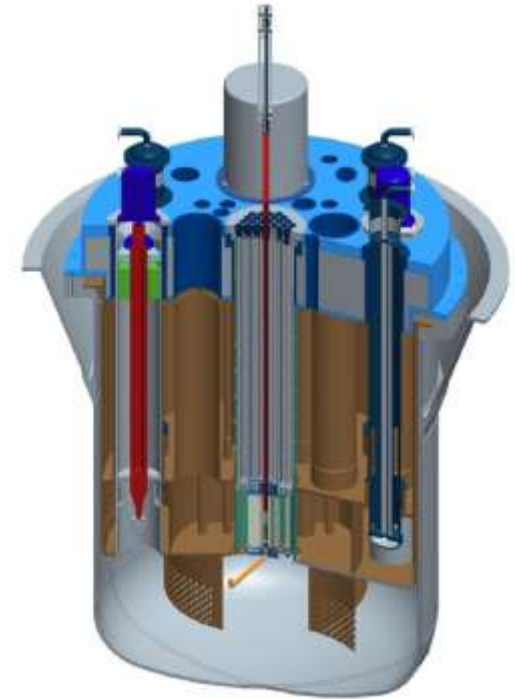


FEM

MYRRHA NPP

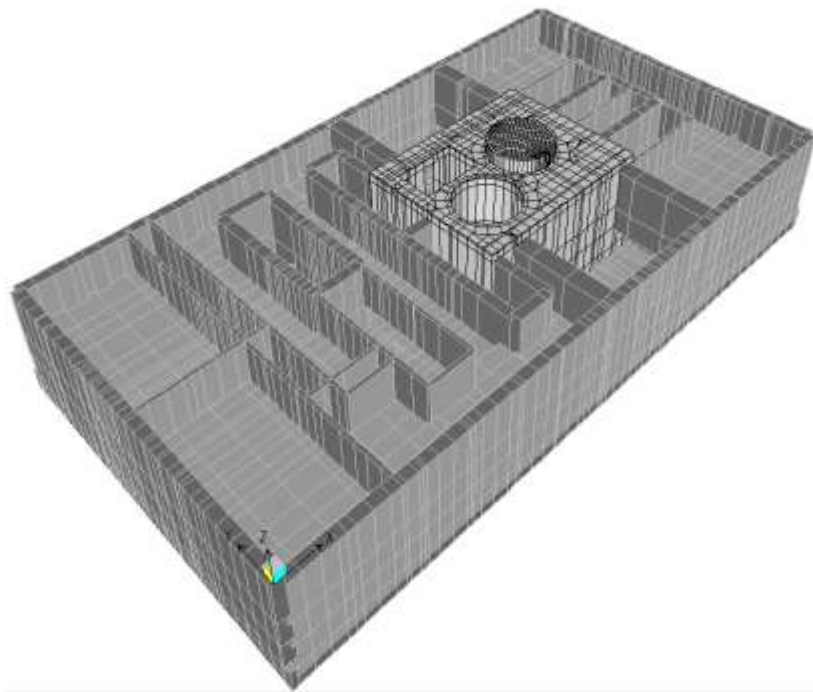


Sketch of the MYRRHA plan layout

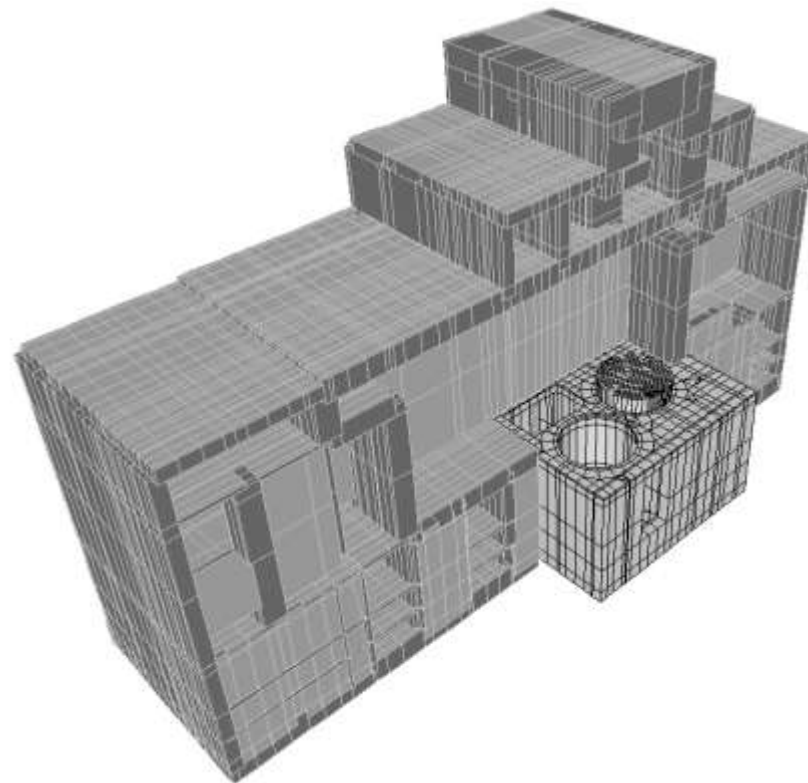


Tank-proton beam coupling

MYRRHA NPP

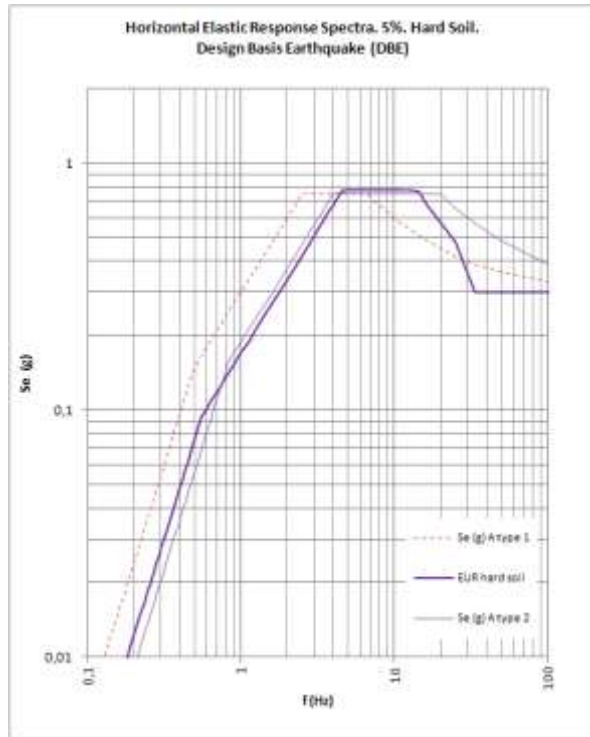


FEM – plan view

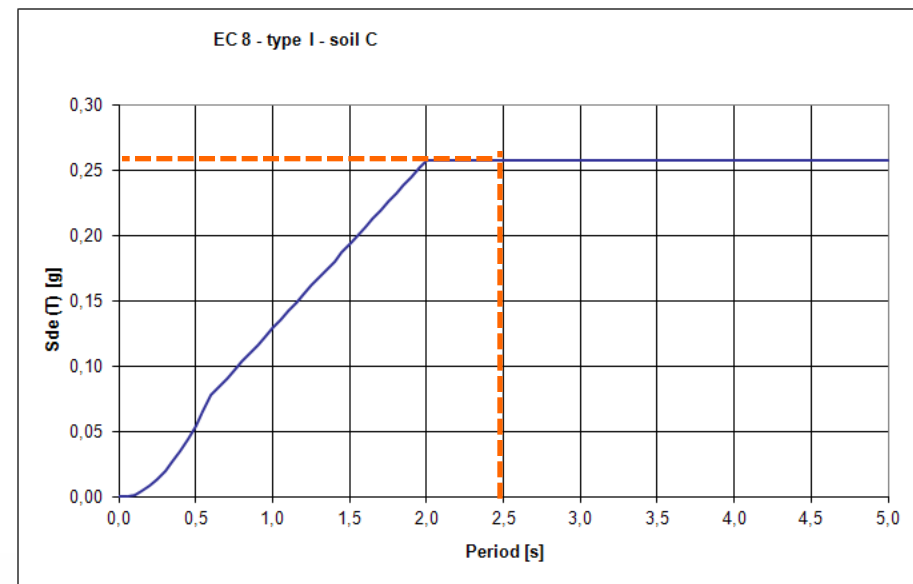
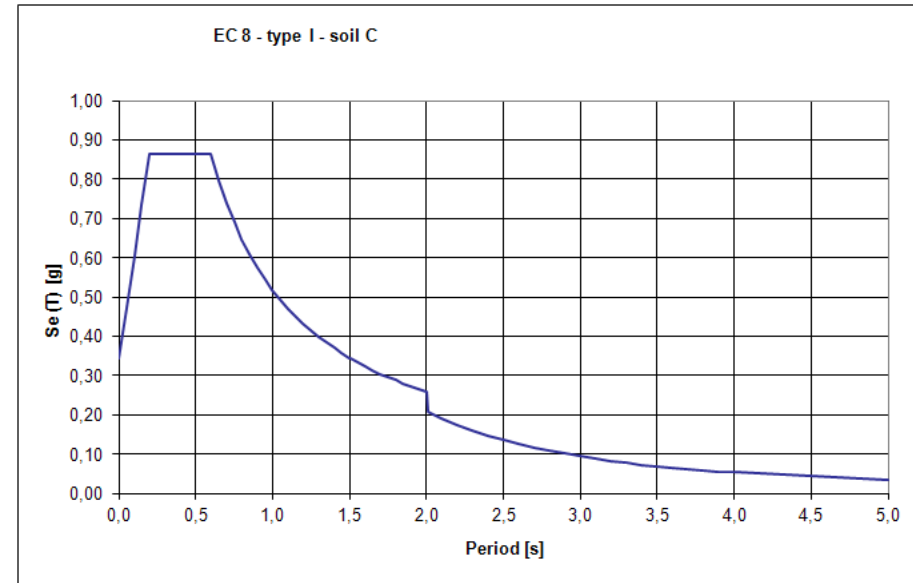


FEM – section

SEISMIC INPUT



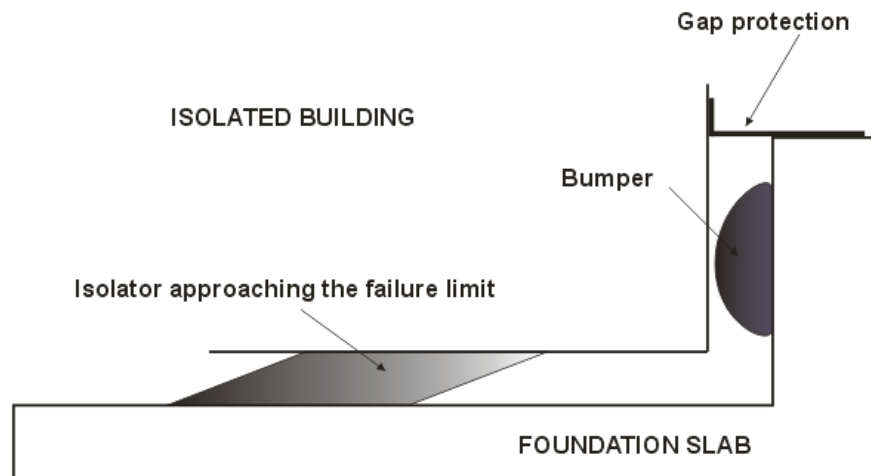
The isolators (HDRB or LRB) are designed for shear deformations corresponding to the design conditions (**DBE**)



FAIL SAFE SYSTEM

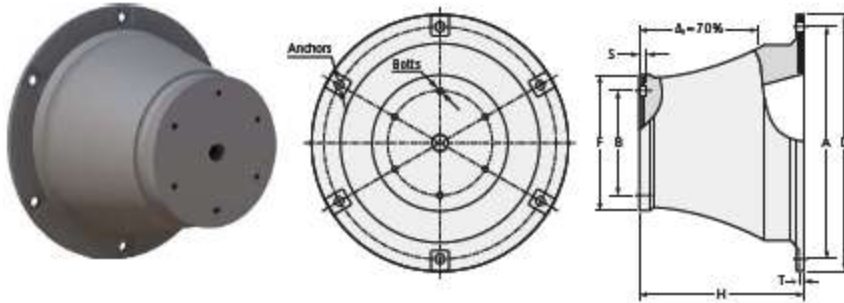
In case of **beyond design earthquakes**, the isolators shall never lose the capability of supporting the vertical load.

Thus, the adoption of an horizontal fail safe system is needed to limit the isolator deformation for extreme events.



FAIL SAFE SYSTEM – some preliminary conceptual design options

Goal: develop a unit capable of dissipating the kinetic energy with controlled displacement and an almost constant force



Fender type



Modified elastic device
(like those used in bridges)



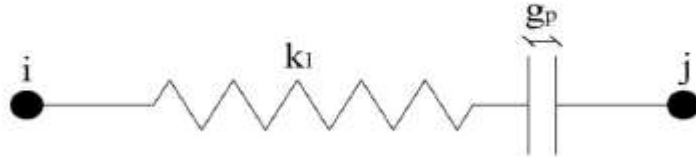
Stop unit

+

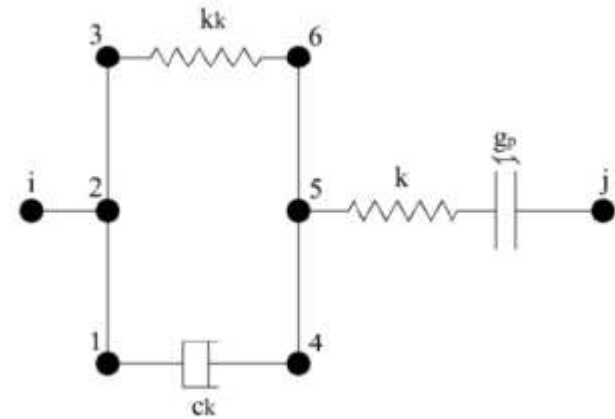


Dampers (?)

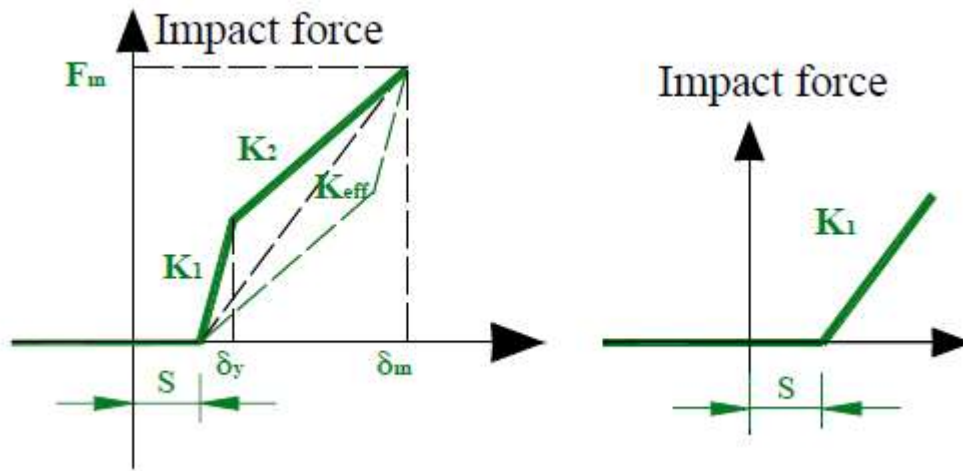
FAIL SAFE SYSTEM – pounding modeling: simplified approach



“Gap” model



“Kelvin-Voigt” model



Truss contact element for pounding simulation

THANK YOU

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