



## INSC Project MC3.01/13

EC Contract N° NSI/2014/343-969

“Training and Tutoring for experts of the NRAs and their TSOs for developing or strengthening their regulatory and technical capabilities”

## Training Course

# NPP civil structures requirements & seismic safety

organized by ITER-Consult

**Roma – October 26-30, 2015**

**VILLA EUR - Parco dei Pini**

P.le M. Champagnat, 2 - 00144 Rome - Italy

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## Course Objective

The training course will provide a comprehensive description of approaches and methods for civil structures design and safety analysis in a NPP.

It will cover description of current available technology of main structures and buildings including structural functions, containment functions, design requirements, seismic design and seismic margins requirements. Specific topics will be presented and discussed related to: concrete and reinforced concrete structures, safety functions of civil structures under different loading conditions and associated admissible limits for the response of the structure, load combinations, classification of loading conditions, geotechnical aspects, soil-structure interaction, foundation problems and seismic isolation concept, NPP buildings construction issues.

Design basis of civil structures and buildings to internal loads and external loads (natural and non-natural) will be included with particular focus on the reactor building and its containment function. The course will present the available computer codes for licensing review and independent assessment.

Attention will be given to: safety and seismic classification of structures/buildings and associated requirements, in-service inspections, scope and approach for regulatory inspections of safety classified structures during construction and operation.

The content of the SAR for civil structures and related safety analyses will be presented and discussed. Reference standards for Civil structures design will be provided. Practical application sessions are included in the training program.



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## Course Daily Program

Monday 26 <sup>th</sup> October 2015	
08.30 - 09.00	Registration
9.00 – 13.00	Welcome Organizational aspects, Training objective, Training program EU infrastructure for Nuclear and Radiation Safety - <i>A. Madonna (ITER)</i>
	Regulator's role and functions - <i>A. Madonna (ITER)</i>
	NPP Safety Conception - <i>A. Madonna (ITER)</i>
13.00 – 14.00	Lunch
14.00 – 17.45	Typical civil structures in a NPP – <i>Gs. Pino (ITER)</i>
	Safety structures and buildings in a NPP and related safety functions – <i>Gs. Pino (ITER)</i>
	Content of SAR for Civil structures – <i>Gs. Pino (ITER)</i>

Tuesday 27 <sup>th</sup> October 2015	
9.00 – 13.00	Safety classification and related requirements for civil structures in a NPP – <i>P. Välikangas (STUK)</i>
	Seismic categorization of civil structures and related design requirements – <i>P. Välikangas (STUK)</i>
	Design load on civil structures in normal and accident conditions (verification methodology and reference technical standards) – <i>P. Välikangas (STUK)</i>
13.00 – 14.00	Lunch
14.00 – 17.45	Static and dynamic soil- structure interaction - <i>J. Bochert (TÜV SÜD ET)</i>
	Static and dynamic analysis of civil structures - <i>J. Bochert (TÜV SÜD ET)</i>
	NPP foundation typology and concept of seismic isolation - <i>J. Bochert (TÜV SÜD ET)</i>

Wednesday 28 <sup>th</sup> October 2015	
9.00 – 13.00	Construction issues and regulatory surveillance – <i>N. Cipriani (ISPRA), Gs. Pino (ITER)</i>
	Regulatory inspections procedures (construction and operation) – <i>N. Cipriani (ISPRA), Gs. Pino (ITER)</i>
	Management of non-conformities and corrective actions – <i>N. Cipriani (ISPRA)</i>
13.00 – 14.00	Lunch
14.00 – 17.45	<b>Practical Application n.1</b>

Thursday 29 <sup>th</sup> October 2015	
9.00 – 13.00	Geological and geotechnical issues – <i>E. Vittori (ISPRA)</i>
	Site events impact on the design of civil structures of a NPP - <i>E. Vittori (ISPRA)</i>
	Foundation soil behaviour and bearing capacity – <i>V. Chiessi (ISPRA)</i>
13.00 – 14.00	Lunch
14.00 – 17.45	<b>Practical Application n. 2</b>

Friday 30 <sup>th</sup> October 2015	
9.00 – 13.00	Civil structures behaviour under extreme external loads: Aircraft impact , pressure wave , other human induced events – <i>A. Saarenheimo (VTT)</i>
	Building response to seismic event beyond design level (seismic margin assessment) – <i>G. Orsini (ITER)</i>
13.00 – 14.00	Lunch
14.00 – 17.45	Course summary
	Questionnaire
	Opinion from trainees
	Training Minutes