

Passive Fire Protection (E051473)

Course size (nominal values; actual values may depend on programme)

Credits 6.0 Study time 180 h Contact hrs 45.0 h

Course offerings and teaching methods in academic year 2018-2019

A (semester 1)	English	seminar: coached exercises	25.0 h
		lecture	20.0 h
B (semester 1)		seminar: coached exercises	25.0 h
		lecture	20.0 h

Lecturers in academic year 2018-2019

Annerel, Emmanuel TW14 lecturer-in-charge

Offered in the following programmes in 2018-2019

	crdts	offering
Master of Science in Electromechanical Engineering (main subject Control Engineering and Automation)	6	A
Master of Science in Electromechanical Engineering (main subject Electrical Power Engineering)	6	A
Master of Science in Electromechanical Engineering (main subject Maritime Engineering)	6	A
Master of Science in Electromechanical Engineering (main subject Mechanical Construction)	6	A
Master of Science in Electromechanical Engineering (main subject Mechanical Energy Engineering)	6	A
Master of Science in Civil Engineering	6	A
International Master of Science in Fire Safety Engineering	6	A
Master of Science in Fire Safety Engineering	6	A
Postgraduate Studies in Fire Safety Engineering	6	B

Teaching languages

English

Keywords

compartmentation, fire testing, fire resistance, reaction to fire, prescriptive structural design, performance based structural design

Position of the course

The course passive fire protection fits within the European Construction Products Directive, according which a building should be fire safe for occupants, the environment and the structure itself. Hence, requirements are given to contain the fire within one fire compartment. Those demands can be translated to fire resistance of the structure and reaction to fire of building products. Within the domain of passive fire protection 2 design ways are active. Firstly, a prescriptive approach is developed, consisting of classification based on fire tests according to a normalized fire curve and resulting in a CE-mark. Secondly, the trend towards a performance based structural design is used, in which the global structural response is investigated based on natural fires, taking into account a cooling phase. Both approaches can use the structural Eurocodes as input data and calculation framework.

Contents

- Role of Fire Safety Engineering towards passive fire protection
- Compartmentation: general rules, legislation, fire tests, fire reports, products, construction details

- Fire tests with respect to fire resistance & reaction to fire: classification system, CE-mark, fire test demonstration
- Material behavior in fire: thermal and mechanical properties of steel, concrete, timber and insulation materials
- Structural fire design (including design fires) according to Eurocodes 1, 2, 3 & 5
- Performance based structural design: general principles about indirect actions, introduction to SAFIR (FEM package)
- Group work

Initial competences

Knowledge of the basic concepts of physics, civil engineering, chemistry, fluid dynamics, heat transfer. The ability to systematically collect, research, interpret, assimilate and present relevant information

Final competences

- 1 profound understanding of compartmentation rules and their construction details
- 2 profound understanding of fire tests (fire resistance & reaction to fire) and related classification systems
- 3 profound understanding about material properties related to fire
- 4 profound understanding of the structural fire design according to the Eurocodes and performance based structural design
- 5 ability to critically evaluate the passive fire protection in an existing project
- 6 ability to design an original plan for passive fire protection
- 7 ability to execute a prescriptive and performance based structural design

Conditions for credit contract

This course unit cannot be taken via a credit contract

Conditions for exam contract

This course unit cannot be taken via an exam contract

Teaching methods

Lecture, seminar: coached exercises

Extra information on the teaching methods

The excursion consists of a visit to a Belgian company with demonstration of a fire test.

Learning materials and price

Slides posted on Minerva

References

- EN1991-1-2, EN1992-1-2, EN1993-1-2, EN1995-1-2
- ENV 13381 - 1-7: Test methods for determining the contribution to the fire resistance of structural members
- EN1363, EN1364, EN1365, EN1366, EN 1634
- EN13501
- Buchanan, A., Structural Design for Fire Safety, John Wiley & Sons, 2001
- Wang, Y., Performance-Based Fire Engineering of Structures, CRC Press, 2013

Course content-related study coaching

Evaluation methods

end-of-term evaluation

Examination methods in case of periodic evaluation during the first examination period

Oral examination, assignment

Examination methods in case of periodic evaluation during the second examination period

Oral examination, assignment

Examination methods in case of permanent evaluation

Possibilities of retake in case of permanent evaluation

not applicable

Extra information on the examination methods

During the course, groups of about 4 students will work on a passive fire safe design of a to determine case. Group counseling sessions are foreseen within the contact hours of the course. The students provide a written report of their design which is the basis for the exam.

The exam is oral and consists of 2 parts, namely a) an individual evaluation of the

group work and b) individual oral questioning about the course content

Calculation of the examination mark

Weighting factors:

- Group work report: 40%
- Oral exam part a: 30%
- Oral exam part b: 30%