

## 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 2017-2018**

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

**Lecturers in academic year 2017-2018**

Annerel, Emmanuel	TW14	lecturer-in-charge
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**Offered in the following programmes in 2017-2018**

	crdts	offering
<a href="#">Bridging Programme Master of Science in Fire Safety Engineering</a>	6	A
<a href="#">Master of Science in Electromechanical Engineering (main subject Control Engineering and Automation)</a>	6	A
<a href="#">Master of Science in Electromechanical Engineering (main subject Electrical Power Engineering)</a>	6	A
<a href="#">Master of Science in Electromechanical Engineering (main subject Maritime Engineering)</a>	6	A
<a href="#">Master of Science in Electromechanical Engineering (main subject Mechanical Construction)</a>	6	A
<a href="#">Master of Science in Electromechanical Engineering (main subject Mechanical Energy Engineering)</a>	6	A
<a href="#">Master of Science in Civil Engineering</a>	6	A
<a href="#">International Master of Science in Fire Safety Engineering</a>	6	A
<a href="#">Master of Science in Fire Safety Engineering</a>	6	A
<a href="#">Postgraduate Studies in Fire Safety Engineering</a>	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%