

# ISO 18195:2019 (E)

## Method for the justification of fire partitioning in water cooled nuclear power plants (NPP)

---

### Contents

	Foreword
	Introduction
1	Scope
2	Normative references
3	Terms, definitions, symbols and abbreviated terms
3.1	Terms and definitions
3.2	Symbols
3.3	Abbreviated terms
4	Method for justification of nuclear safety fire partitioning: global approach
4.1	Objective of the method
4.1.1	The basis of design: standard fire resistance tests
4.1.2	Aim, limitations, and precautions
4.1.2.1	Aim
4.1.2.2	Limitations
4.1.2.3	Precautions
4.1.3	Minimum requirements concerning the qualification of the method practitioners
4.2	General principle of the method
4.3	Design of the partitioning: justification of the adequate performance of fire barriers
4.4	Fire barriers and structural elements
4.5	Overall flowchart (flowchart 1)
5	Determination of the design basis fire temperature curve (room fire curve)
5.1	General considerations in room fire scenarios
5.1.1	Typical development stages of a compartment fire
5.1.1.1	Phase 1: ignition
5.1.1.2	Phase 2: growth
5.1.1.3	Phase 3: fully developed fire
5.1.1.4	Phase 4: decay
5.1.1.5	Phase 5: decay in the absence of combustion
5.2	Defining the design basis fire temperature curve for a room
5.3	Requirements concerning calculation tools
5.4	Assumptions and input data for numerical calculations
5.4.1	Fixed automatic fire fighting system (credited or not)
5.4.2	Modeling assumptions
5.4.3	Characteristics of a room
5.4.3.1	Room shape:
5.4.3.2	Openings at the boundaries of the room (Non fire resistant elements + shafts)
5.4.3.3	Nature and thickness of the walls
5.4.3.4	Mechanical ventilation
5.4.3.5	Air leakage
5.4.4	Nature of fuels
5.4.5	Fire scenarios
5.4.5.1	Summary
5.4.5.2	Fire spreading
5.4.5.3	Spreading criteria: PFG/PFL
5.4.5.4	Scenarios taking into account the spreading factors
5.4.5.5	Credited combustible mass
5.4.5.6	Pyrolysis rate curves

- 5.4.6 Recommended value for pyrolysis rates
- 5.5 Design basis fire temperature curve calculation process
- 5.5.1 Data input
- 5.5.2 Modelling of the fire volume and scenarios
- 5.5.3 Modelling options
- 5.6 Determination of the fire temperature curve
- 6 Determination of the performance of fire barriers (performance curve diagram)
  - 6.1 Principles
  - 6.2 Characterization of the performance diagram: global methodology
  - 6.3 Phase 1: analysis of the standard test
  - 6.4 Phase 2 branch A: determination by calculation
    - 6.4.1 Study approach
    - 6.4.2 Selection of representative experimental curves
    - 6.4.3 Calculation tools and choice of the modelling
    - 6.4.4 Thermal properties of materials
      - 6.4.4.1 Principles for the determination of thermal properties
      - 6.4.4.2 Known materials
      - 6.4.4.3 Materials with properties to be determined
    - 6.4.5 Plotting performance curves from the reference curves
    - 6.4.6 Plotting “steady state” curves
    - 6.4.7 Plotting the performance diagram
  - 6.5 Phase 2 BRANCH B: working out a new family system
    - 6.5.1 Study approach for branch B
    - 6.5.2 Experimental check (step 5B)
  - 6.6 Phase 2 branch C: specific characterization tests
  - 6.7 Alternative performance curves
  - 6.8 Performance curve diagram
  - 6.9 Validation of the models
- 7 Uncertainty and sensitivity
  - 7.1 Use of average values (zone model vs. CFD model)
  - 7.2 Uncertainties and sensitivities in fire temperature curve calculation
  - 7.3 Uncertainties and sensitivities in the performance curve process
- Annex A (informative) Spreading criterion PFG/PFL (examples)
  - A.1 PFG Room
  - A.2 PFL Room
  - A.3 Neither PFG nor PFL room
- Annex B (informative) Value examples for fire scenarios
  - B.1 Growth factors  $\alpha$
  - B.2 Maximum pyrolysis rate
  - B.2.1 Scenarios 1, 3, 6 and 8: PFG type fire
  - B.2.2 Scenario 2: PFL liquid fire
  - B.2.3 Scenarios 4 and 5: electrical cabinet or cubicle fire (PFL)
  - B.2.4 Scenario 7: cable fire (PFL)
    - B.2.4.1 Horizontal cable trays
    - B.2.4.2 Vertical cable racks
  - B.2.5 Scenario 9: fire of combustible masses in storage (PFL)
  - B.3 Other characteristics of the fire source
  - B.4 Summary of the complete fire scenario
- Annex C (informative) Loss of classification criteria : examples
- Annex D (informative) Example of performance diagram of a cable fire-wrap
  - D.1 Standard fire test: Cable wrap (EDF)
  - D.2 Analysis of the standard test
  - D.3 Determination of the performance criteria
  - D.4 Determination of physical characteristics
  - D.5 Determination of the performance diagram