

**Corus Fire Engineering**

*Bi-Steel & Construction Services*



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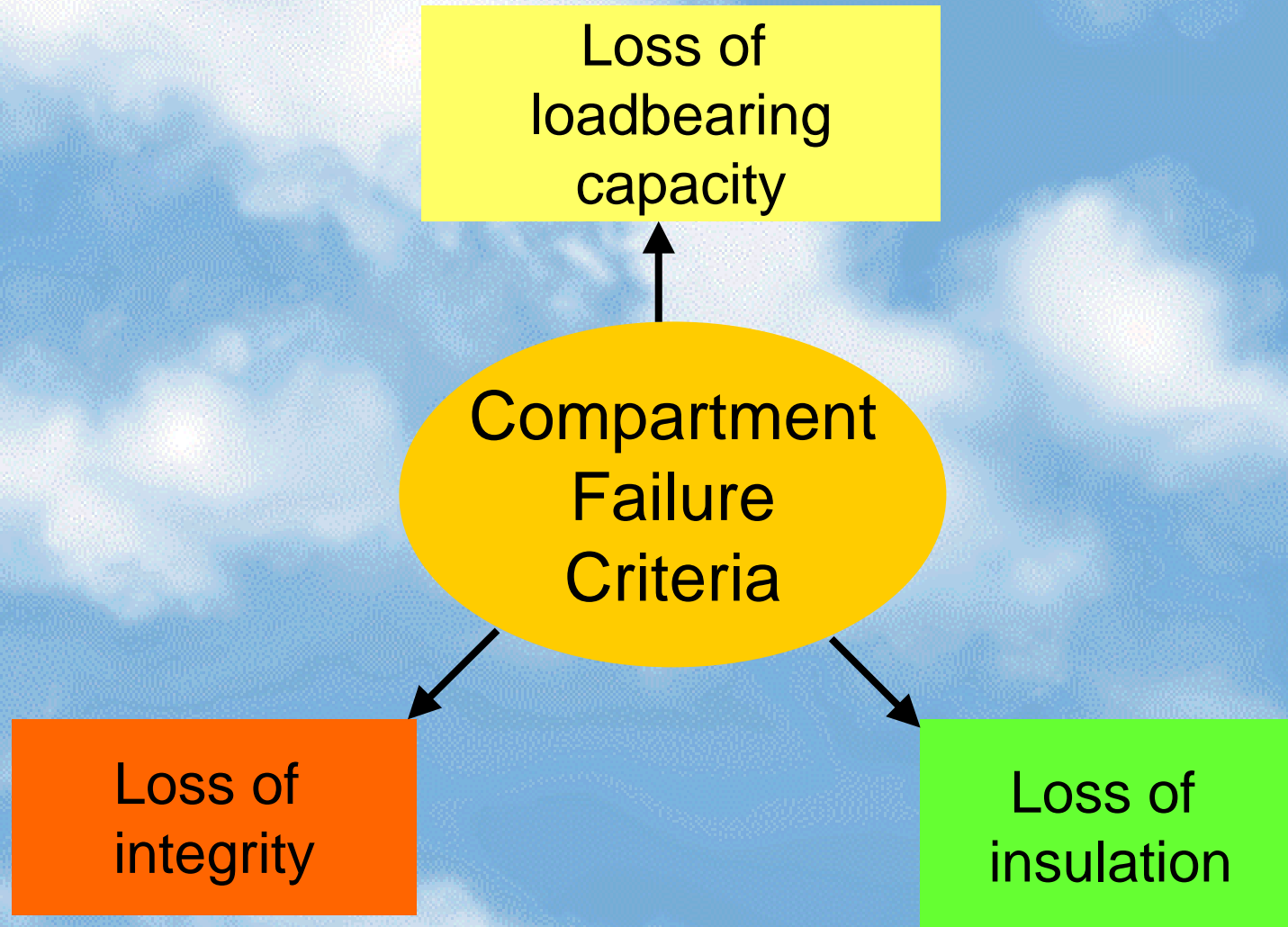
# **Compartmentation & Failure**

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# Failure Criteria for Compartmentation

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# Definitions of Failure Criteria

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- **Loss of loadbearing capacity:**

**Limit or rate of deflection:**

For flexural elements:  $D = L^2/400d$  or,  
 $dD/dt = L^2/9000d$

For vertical elements:  $C = h/100$  or,  
 $dC/dt = 3h/1000$

- **Loss of integrity:**

**Ignition of a cotton pad:** within 30s,

**Penetration of a gap gauge:**

6mm with 150mm of movement, or,  
25mm with full penetration

**Sustained flaming**

- **Loss of insulation:**

**Temperature rise:** +140 °C average or,  
+180 °C max.

# Additional Requirements

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- Leakage rate – ducts and dampers
- Radiation – non-insulated barriers  
(5, 10, 15, 20 & 25 kW/m<sup>2</sup>)
- Impact test for walls (200kg of lead shot)

# Compartment Failure or Failure of the Enclosure??

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- Criteria for compartment failure or structural failure as given in Standardised test requirements provide a means of ranking the performance of materials and products under a specific set of conditions. They are determined on the basis that often have little to do with real buildings and may reflect problems of systematically recording experiments, ease of testing or preventing damage to equipment.
- The objective of defining a compartment is to **prevent fire spread**. In dealing with real fires in real buildings we should therefore dispense with the traditional approach of defining a compartment but quantify the ability of fire to spread from an **enclosure**.

# Mechanism of Fire Spread

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- Conduction
- Radiation
- Convection
- Pyrolysis
- Mass transfer

- In a fire engineering approach the conditions for failure and its consequences should be set in a **qualitative design review** for the particular building or structure concerned.
- Some of these may be more or less onerous than the traditional specifications given in Standardised test methods but should be prescribed to suit the particular circumstances and their potential impact on the overall safety of the building and its occupants.
- All enclosures can initially be considered as a compartment until one of the conditions for fire spread has been achieved.