### Fire Hazards & Extinguishment

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ME 415: Refrigeration & Building Mechanical Systems



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1 / 10

## Types of Combustion

- Slow or incipient combustion: amount of heat and light emitted are feeble.
- 2 Rapid or active combustion: considerable amount of heat and light are emitted within a short period of time.
- 3 Deflagration: combustion takes place with considerable rapidity, evolving heat and light.
- Explosion or detonation: very rapid combustion accompanied by loud sound and impact within an extremely short time. It generates very high pressure and temperature.



#### Fire

Fire is defined as a steady state of exothermic, self catalysed chemical reaction with the characteristic ability to propagate through a combustible medium, usually a fuel and an oxidiser which is generally atmospheric oxygen.



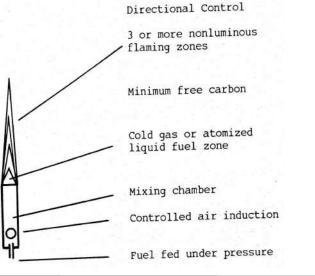
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2 / 10

## Types of Flame: Premixed Flame



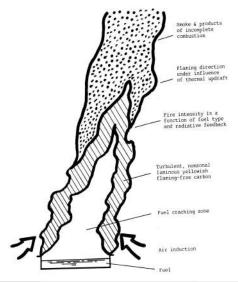
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4 / 10

# Types of Flame: Diffusion Flame





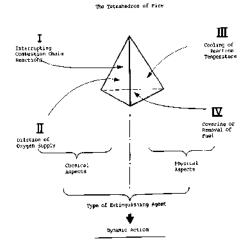
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<u>e275</u>

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5 / 10

## Fire Extinguishment Mechanism





Flammable Liquid Classification

- ① Class I: all liquids with flash points below 38°C. In most areas indoor temperature may reach 38°C<sup>1</sup>.
- 2 Class II: liquids with flash points between 38°C and 60°C.In some areas, flash point may exceed 38°C.
- 3 Class III: liquids with flash points above 60°C. Considerable heating from a source is required other than ambient temperature is required before ignition could occur.

 $^1$ Based on boiling temperatures, Class IA liquids have boiling points not exceeding  $38^{\circ}$ C and Class IB liquids have boiling points in excess of  $38^{\circ}$ C

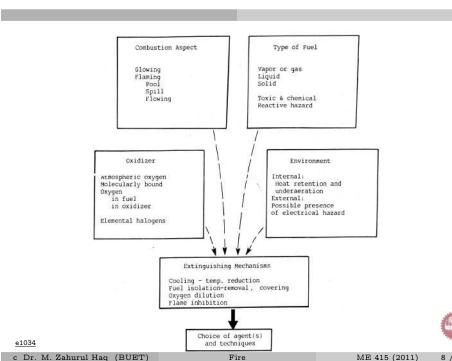


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6 / 10



e276

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Extinguisher Characteristics Flame Velocity vs Agent Velocity Extinguishment by Explosion (Oil & Gas Wells)

# Identification for Fire Hazard Materials

#### Class A:



Fires in ordinary combustible materials, i.e., wood, cloth, paper, rubber and many plastics which require cooling water (and solutions) or coating effect of certain dry chemicals.

#### Class B:



Fires involving flammable or combustible liquids, flammable gases which require exclusion of air, inhibiting evaporation or interrupting combustion chain reactions

#### Class C:



Electrically nonconductive agent to be used for operator safety in fires involving live electrical equipment. Class A and B extinguishing can be used.

#### Class D:



Fires with certain combustible metals, i.e., magnesium, aluminum, titanium, uranium, etc., which are combustible and on which Class A and Class B agents are not applicable.



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<u>e1033</u>

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9 / 10

# Examples of Portable Extinguisher

Extinguisher type	Class A	Class B	Class C	Class D
Soda-acid	OK			
Foam	OK			
Loaded stream	OK	OK		
Dry chemical		OK	OK	
Carbon-di-oxide		OK	OK	
Dry power				OK



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ME 415 (2011)

10 / 10