

# AMSF-04 FIRE ENGINEERING FUNDAMENTALS

## UNIT-1 INTRODUCTION

- 1.1 Temperature, heat, specific heat, flash point, fire point, ignition, combustion;
- 1.2 Ignition- pilot ignition, spontaneous ignition, ignition sources;
- 1.3 Types of combustion-rapid, spontaneous, explosion;
- 1.4 Development of fire-incipient, smoldering, flame and heat stages;
- 1.5 Diffusion flames-zones of combustion, smoldering combustion,
- 1.6 Characteristics of diffusion flame;
- 1.7 Premixed flames-burning velocity, limits of flammability, explosion and expansion ratios,
- 1.8 Deflagration and detonation, characteristics of premixed flame;
- 1.9 Explosion- physical explosion, chemical explosion;
- 1.10 Special kinds of combustion- Flash fire, Pool fire, Deep seated fire, Spillover, Boil over, Dust explosion, BLEVE, UVCE; Classification of fire based on material.

## UNIT-2 PRODUCT OF COMBUSTION

- 2.1 Flame, heat, smoke, fire gases;
- 2.2 Flame and its characteristics, spread of flames in solids and liquids,
- 2.3 Linear and three dimensional fire propagation;
- 2.4 Spread of fire in rooms and buildings;
- 2.5 Effect of heat exposure to human body, body burns.
- 2.6 Smoke- constituents of smoke, quantity and rate of production of smoke,
- 2.7 Quality of smoke, smoke density, visibility in smoke, smoke movement in buildings,
- 2.8 Modeling of smoke movement; Smoke control in buildings natural and mechanical ventilation, pressurization;
- 2.9 Design principles of smoke control using pressurization technique;
- 2.10 Principles of smoke vent design.
- 2.11 Toxicity of smoke- effect of harmful agents preventing escape and causing injury or death - CO, CO<sub>2</sub>, HCN, SO<sub>2</sub>, NH<sub>3</sub>, Nitrogen oxide.

## UNIT-3 USE, OPERATION AND MAINTENANCE OF FIRE SERVICE EQUIPMENT'S AND ACCESSORIES-

- 3.1 Suction and delivery Hose, Hose reel, Hose fittings-coupling,
- 3.2 Adapters, branches, branch holders, radial branches, collecting heads, stand pipe, monitors, hydrants;
- 3.3 Introduction to fire fighting vehicles and appliances-
- 3.4 Pumps, primers, crash tenders, rescue tenders, hose laying tenders, control vans, hydraulic platforms;
- 3.5 Ladders- extension ladders, hook ladder, turntable ladders, snorkel;
- 3.6 Uses and maintenance of small gear and miscellaneous equipment's used during firefighting;
- 3.7 Lamps and lighting sets;
- 3.8 Ropes and Lines- Types-wire and rope lines used in fire service.
- 3.9 Use and testing of lines, knots, Bends and hitches; General rope work.

#### **UNIT-4 FIRE STREAM-PATH**

- 4.1 Range; nozzles-types, calculation of discharge capacity, nozzle reaction, water hammer;
- 4.2 Hydraulic and energy grade lines, pressure loss or gain because of elevation, back pressure;
- 4.3 Friction losses in pipes, fire hoses and fixtures, parallel and series connections;
- 4.4 Flow in pipes and fire hoses, branching lines; water relay techniques;
- 4.5 Estimation of fire protection water requirements, pump capacity and other Para meters relating to fire hydraulics.

#### **UNIT-5 FIRE GROUND OPERATIONS**

- 5.1 Preplanning, action on arrival and control,
- 5.2 Methods of rescue, methods of entry.
- 5.3 Personnel safety.
- 5.4 Control procedure and use of other safety equipment.
- 5.5 Ventilation and salvage operations.

#### **References Books:**

1. RonHirst, “Under downs Practical Fire Precautions”, Gower Publishing Company Ltd., England, 1989.
2. HMSO, “Manual of Firemanship 1 to 13”,
3. Jain V.K.,“Fire Safety in Buildings”, New Age International(P)Ltd.,NewDelhi,1996
4. James F Cassey, “Fire service hydraulics” 5. Clark, W.E., “Firefighting principles & practices”

