MASSACHUSETTS MARITIME ACADEMY

BASIC AND ADVANCED MARINE FIREFIGHTING STUDY GUIDE

AS DEVELOPED BY THE BARNSTABLE COUNTY FIRE AND RESCUE TRAINING ACADEMY
BARNSTABLE, MASSACHUSETTS
This is a booklet for you to use throughout the remainder of your fire training here at Massachusetts Maritime Academy. You are encouraged to take notes in this booklet and may bring it with you when you go to Barnstable County Fire & Rescue Training Academy as a study guide in preparation for your firefighting exams.

This booklet IS NOT designed to replace classroom lecture and should not be used as the sole learning medium in preparation for your firefighting exams. Much of your education will also come from the classroom lecture and PowerPoint presentation.
SOPHMORE FIRE TRAINING
SOPHMORE FIRE TRAINING
Basic Marine Fire Fighting

- OBJECTIVES
  - REVIEW FOLLOWING:
    ▪ Fire Triangle & Tetrahedron
    ▪ Heat Transfer
    ▪ Stages of Fire
    ▪ Class of Fire & Fire Extinguishers
    ▪ Operation & Use of SCBA
  - INTRODUCE FOLLOWING:
    ▪ Firefighting PPE
    ▪ Firefighting Hose & Adapters
    ▪ Flammable & Combustible Liquid / Gas Fires
    ▪ FOAM
    ▪ Basic Hose Handling Skills

- FIRE TRIANGLE AND TETRAHEDRON
  - Basic Parts
  - Understand Differences between Parts
  - Understand how removing a leg will extinguish fire

- HEAT TRANSFER
  - 3 Methods
    ▪ Conduction
    ▪ Convection
    ▪ Radiation
  - Understand how each influences fire spread and how to anticipate fire direction

- STAGES OF FIRE
  - Ignition / Incipient
  - Growth
  - Flashover
  - Fully Developed / Free Burning
  - Decay
  - Backdraft – Understand danger
  - Radiation Feed Back – Understand how it influences fire growth
- **CLASSES OF FIRE**
  - Class A – Ordinary Combustible
  - Class B – Flammable Gases & Liquids
  - Class C – ENERGIZED electrical equipment
  - Class D – Combustible Metal
  - Class K – Kitchen Fires

- **SCBA – Self Contained Breathing Apparatus**
  - Designed to enter and IDLH Atmosphere
    - Understand and know what IDLH stand for
    - Limited to number of units available
  - Limited supply of air
    - ONLY 30 Minute
  - Designed to be worn like backpack
  - Reasons to leave space
    - Low Air Alarm
    - Nausea, Dizziness, Breathing Resistance
    - Malfunction of Unit

- **PERSONAL PROTECTIVE EQUIPMENT – PPE**
  - Helmet
  - Hood
  - Gloves
  - Coat & Pants
  - Boots

- **FIRE HOSE / NOZZLES / ADAPTERS / APPLIANCES**
  - Hose designed to provide way of FF to bring water to seat of fire
  - Construction allows resistance to heat, abrasion and high pressures
    - Normal operating pressure
      - 80 – 300 PSI
  - 2 types of hose
    - Attack
    - Supply
  - Length of hose varies
    - Typical attack hose length – 50’
    - Typical supply hose length – 100’
o Couplings on hose are typically 3 types
  ▪ NST
  ▪ Iron Pipe
  ▪ Stortz

o Nozzles
  ▪ Water is applied through 2 types of nozzles
    1. Size of nozzle does not influence fire suppression
  ▪ Nozzles are either
    ▪ FOG
    ▪ SMOOTH BORE

• FLAMMABLE LIQUID AND GAS FIRES
  o Preferred methods of extinguishment
  o USCG states that the cut off between Flammable and Combustible is
    ▪ 80 deg F
  o How does Flammable Liquid Fire Spread become concern on a vessel
    ▪ Smooth vs. Rough Seas
    ▪ Inside vs. Outside
  o BLEVE
    ▪ Understand danger and signs of BELVE
    ▪ Understand simple tactics of controlling and or preventing a BLEVE

• FOAM
  o Operates on 3 principles
    ▪ Smothers fire
    ▪ Suppresses fire by excluding oxygen
    ▪ Cools burning material decreasing potential of resignation
  o 4 Elements to properly make FOAM
    ▪ Air
    ▪ Water
    ▪ Concentrate
    ▪ Mechanical Agitation
  o 4 Needs to generate FOAM
    ▪ Hose
    ▪ Proportioner
    ▪ Concentrate
    ▪ Nozzle
• Kinds of FOAM
  ▪ AFFF
  ▪ Protein
  ▪ Polar Solvent
• Methods of Application
  ▪ Roll On
  ▪ Rain Down
  ▪ Bank Down
  ▪ Sub Surface Injection

• HOSE HANDLING
  o Moving hose is a team effort
  o Hose referred to as a “line”
  o Elements of hose line deployment
    ▪ Proper deploying out of fire station
    ▪ Pay attention to fire progress
    ▪ Direction of travel of fire and other crews
    ▪ Anticipated evacuation points
  o Hose Line Positions
    ▪ Nozzle Person
    ▪ Team Leader
    ▪ Overhaul
    ▪ Ventilation
    ▪ Door Person
    ▪ Hydrant Person

• FIRE ATTACK
  o 3 Operational Modes of Fire Attack
    ▪ Offensive
    ▪ Defensive
    ▪ No Attack
  o 3 Methods of Fire Attack
    ▪ Direct
    ▪ Indirect
    ▪ Combination
  o Water Streams
    ▪ Water used because it’s cheap
    ▪ Water patterns classified as
      ▪ Broken
      ▪ Fog
      ▪ Solid
JUNIOR FIRE TRAINING
JUNIOR FIRE TRAINING
Advanced Marine Fire Fighting

- OBJECTIVES
  - REVIEW BASIC MARINE FF SKILLS
    - Triangle & Tetrahedron
    - Hose Handling
    - PPE
    - SCBA
    - Hose streams / appliances / nozzles
  - INTRODUCE
    - Hose Handling
    - Fire Attack
    - Ventilation
    - Search & Rescue
    - Victim Removal

- HOSE HANDLING
  - Hose Team Positions
  - Methods of fire attack
  - Modes of fire attack

- TYPES OF FIRE ATTACK
  - Above Grade
  - At Grade
  - Below Grade

- VENTILATION
  - Defined as process of removing smoke, heat and toxic gases from a burning structure and replacing the products of combustion with cooler, cleaner and more oxygen rich air
  - Critical to efficient fire suppression
• VENTILATION
  o Benefits of proper ventilation
    ▪ Easier advancement of hose
    ▪ Locate trapped occupants faster
    ▪ Brings in clean air
    ▪ Reduces chances of backdraft
    ▪ Limits fire spread and decreases property loss
  o Factors which affect ventilation
    ▪ Convection
    ▪ Atmospheric conditions
    ▪ Construction
    ▪ Fire attack / Search / Improper use
  o 3 methods of ventilation
    ▪ Mechanical
    ▪ Natural
    ▪ Hydraulic
  o 2 directions of ventilation
    ▪ Horizontal
    ▪ Vertical
      • Can combine as in vertical-horizontal ventilation but not called that
  o Ventilate for 2 specific reasons
    ▪ Fire
    ▪ Life

• SEARCH & RESCUE
  o Conducting Search & Rescue is THE MOST DANGEROUS job to perform during firefighting
  o Usually conducted without benefit of hose line
  o Done in areas close to the seat of the fire
  o Coordination with fire suppression and ventilation is key
  o Based on
    ▪ Risk vs. Benefit
    ▪ Risk a lot - Save a lot
    ▪ Risk a Little – Save a little
- Search size up factors
  - Occupancy
  - Available Crew
  - Fire Spread
  - Viability of victims
- Search Priorities
  - Immediate fire area then rest of the floor
  - Directly above the fire
  - Uppermost floor above fire
  - Then work way up and down
- 2 Types of Search
  - Primary
  - Secondary
- Search Techniques
  - Teams of 2
  - Dependent on available SCBA’s
  - Wall Based search vs. advanced search techniques

- VICTIM REMOVAL
  - Personnel intensive
    - Study for 1 FF removal
      - 12 rescuers for 1 firefighter
  - Remove to places of safety or protect in place
    - Depends on many factors
  - Ambulatory vs. Non-Ambulatory
    - DO NOT increase injury or cause injury
SENIOR FIRE TRAINING
SENIOR FIRE TRAINING
Advanced Marine Fire Fighting

- OBJECTIVES
  - REVIEW
    - Basic firefighting knowledge
  - INTRODUCE
    - Vessel Stability
    - Documentation
    - Pre-Planning / Pre-Plan Formats
    - Fire Fighting Tactics
    - Incident Management
    - Confined Space

- BASIC FF LAWS
  - 46 CFR Part 92 – Means of Egress
    - There shall be two means of egress from where crew are quartered, with one being independent of watertight doors
    - Declares that firefighting is and should remain a state and local function
    - Prohibits Federal Agencies from being primary firefighting entity

- VESSEL STABILITY
  - Draft
  - Trim
  - List
  - Center of Gravity (CG) – Keeps you from rolling
  - Center of Buoyancy (B) – Keeps you afloat
  - Righting Arm (GZ) – Point of no return
  - Metacentric Height (GM) – Higher is better, Lower is unstable
  - Free Surface Effect
• FREE SURFACE EFFECT
  o Tendency of water to remain level
  o Water movement to achieve leveling causes wave motion
    ▪ Can cause vessel to capsize or at least lose stability
  o Remember that all stability tables are for “perfect” conditions
    ▪ Once Fire Occurs ... ALL TABLES are useless
    ▪ Act of suppressing a fire is more dynamic that storms at sea
    ▪ ALL Firefighting runoff increases Free Surface Effect

• DEWATERING
  o Plans for dewatering must be developed early in operations
    ▪ Or already planned for in certain target hazard areas
      • Engine Rooms
      • Pump Rooms
      • Cargo Holds ...

• SHIP BOARD DOCUMENTATION
  o Documents
    ▪ Ship Arrangement Plans
    ▪ Fire Plan
    ▪ Watch Station Bills
    ▪ Dangerous Cargo Manifest
    ▪ Cargo Stowage Plans
    ▪ Trim & Stability
    ▪ Cargo Loading
    ▪ Crew / Passenger List
  o Pre Fire Plans
    ▪ Based on basic vessel construction
      • Be aware of significant changes and incorporate into new plans
    ▪ Based on fire operations
    ▪ Used for Training
    ▪ Useful for ship familiarization
• Pre Fire Plans – General Format
  ▪ General Information
  ▪ Construction
  ▪ Location Lists
  ▪ System Information
  ▪ Tactics
  ▪ General Arrangements

• TATICS
  o Based of several elements not limited to:
    ▪ Water Supply
    ▪ Shipboard Detection Systems
    ▪ Exposure Protection
    ▪ Ventilation
    ▪ RIT/FAST
    ▪ Defensive Operations
    ▪ Offensive Operations
  o Basic Tactic begins with Size-Up
    ▪ Rescue
    ▪ Evacuate
    ▪ Confinement
    ▪ Extinguishment
    ▪ Overhaul
    ▪ Ventilation
    ▪ Salvage

• RESCUE
  o Crew vs. Passengers
  o Determine Occupancy of space
  o Evaluate Life Safety
  o Confirm Location
  o Determine Rescue Priorities
  o Deploy Resources
- Location of potential Victims
  - Superstructure
  - Engine Room
  - Pump Rooms
  - Holds
  - Machinery paces
  - Other Locations?

- EVACUATION
  - Determine Safe Haven Location
  - Shelter in place vs. Evacuation
  - Whom do you use?

- CONFINEMENT
  - Fire, Smoke, Water
  - Establish Boundaries
  - Secure Ventilation, Watertight Doors, Power
  - Establish Ventilation

- OFFENSIVE EXTINGUISHMENT
  - Actual entry into space to extinguish fire
  - Medium to high risk operation
  - Determine fire flow needs
    - 30 – 100+ gpm
  - Determine hose line size
  - Determine Needs of operation
    - Hose Teams, Search Teams, RIT, Entry Officer, Etc
  - Establish Water Supply Early
    - Fire Mains
    - ISC
    - Independent supply for attack lines
  - Ventilation Needs
  - Attack Teams
    - Watch for multiple line operations and opposing hand lines
    - Watch for search team progress
    - Back up lines
• DEFENSIVE EXTINGUISHMENT
  o Attacking fire from safe distance
    ▪ Establish boundaries
    ▪ Secure all doors
    ▪ Secure Ventilation
  o Minimal risk to personnel
    ▪ Attacking from a safe place
    ▪ Establish fire watches
    ▪ Position vessel for effective operations
  o Utilize ships systems
    ▪ CO2
    ▪ Steam Smothering
    ▪ Hand Lines
  o Use of Master Streams
  o Maybe “No-Attack” option
  o Remember to remove combustible material
  ▪ Reduce fire spread from “Conduction” if possible

• VENTILATION
  o Positive
  o Negative
  o Natural
  o Ventilation Systems

• Salvage and Overhaul
  o Necessary for complete fire suppression
  o Act of overhaul necessitates need to damage stuff
    ▪ Don’t go crazy...too much damage can result in law suits
  o Salvage is act of preserving not only valuable items, but also scene for fire investigation
• INCIDENT MANAGEMENT
  o Hierarchy of responsible people for firefighting operations
    ▪ Master
    ▪ Chief Engineer
    ▪ Chief Mate
    ▪ First Engineer
    ▪ First Mate
    ▪ Second Engineer
    ▪ Second Mate
    ▪ Third Engineer(s)
    ▪ Third Mates(s)
    ▪ Watch Engineers
    ▪ Deck Hands
    ▪ Stewards
    ▪ Others
  o Sector Officer
    ▪ Fire Suppression
    ▪ Search & Rescue
    ▪ Support/Resources
    ▪ Water Supply
    ▪ Stability
    ▪ RIT
  o Team Leader
    ▪ Attack lines
    ▪ Search
    ▪ RIT
    ▪ Ventilation
    ▪ HAZMAT
    ▪ Dewatering
NOTES