

Slide 1

Hazardous Materials



Operations Level Responder Review
Special Hazards Training Branch
Massachusetts Firefighting Academy

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**See Anything?
Recent Incidents?
HazMat/Terrorism?**

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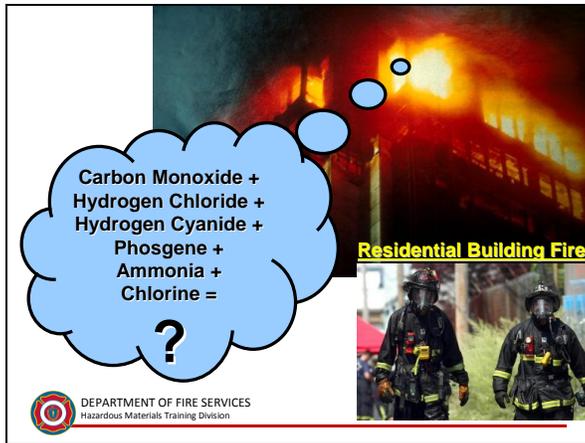
Perspectives

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Slide 4



Slide 5



Slide 6



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NO THERMAL PROTECTION BUT VAPOR/LIQUID PROTECTION



THERMAL PROTECTION LIMITED TO NO CHEMICAL PROTECTION



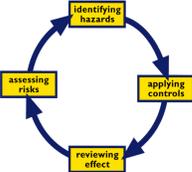
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Hazard & Risk Assessment

Rescue - Is the First Tactical Priority considered during a hazmat incident

**Line of sight rescue
Tier II/III, SPC, SCBA,
Vapor Control/
Emergency Decon Line
Keep Me Safe Detection**



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Hazard & Risk Assessment

Just what are we looking for ? *"Clues"*

What you hear (dispatch) ?
What you see (windshield) ?
What you hear (bystanders)?



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WHAT IS YOUR MISSION ?

Rescue: Line of Sight
KEEP OUT OF PRODUCT !!

Body Recovery: *No Rush*
Plumbing or Product Control: *No Rush*
Crime Scene: *No Rush*
Environmental: *No Rush*



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YOUR OPTIONS: ***KEEP OUT OF PRODUCT***

Life Hazards- Call a HM Tier II/III
Hazard & Risk Assessment
GO or NO GO

Establish Control Zones

Initial Evacuation
Solid = 75'
Liquid = 150'
Gas = 300'

Defensive - *KEEP OUT OF PRODUCT*



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**WHATEVER ACTION YOU TAKE, JUST
DON'T POSE FOR HOLY PICTURES**



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Haz-Mat Definition

Material that poses an unreasonable risk to the health and safety of operating emergency personnel, the public, and or the environment if it is not properly controlled during handling, storage, manufacture, processing, packaging, use and disposal or transportation



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**General
Information**



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Hazardous occupancies should be identified during Pre-Incident Planning

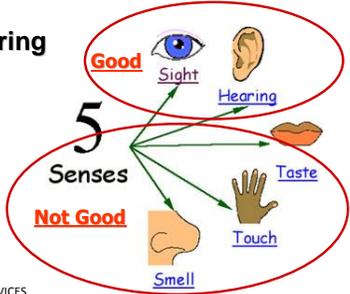


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Using senses of smell, touch or taste is unsafe !

Sight and hearing are the only senses used !



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Hazardous Materials can be found anywhere including:

**Private homes;
Doctor's offices;
Hardware Stores;
Supermarkets;
Fire Stations;
And So On ! It is not just chemical facilities, trains, trucks, etc.....**



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Hazmat incidents are more complex than other types of emergencies



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EVACUATION / ISOLATION



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SHELTER IN PLACE (S.I.P.)

“People inside a building should remain inside until the danger passes”



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SHELTER IN PLACE (S.I.P.)

**Close all windows, doors
Monitor local TV and radio
Reverse E-911**

Shut down the HVAC System



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Evacuate

Moving people threatened to a safe area

**One Factor that changes evacuation,
wind direction**



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Evacuate or SIP or Both

**No preferred method
Not an easy decision
Risk Based Response**



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Isolate- Keep people not directly involved away from the incident



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**Analyzing
the
Incident**



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**BEGINS WITH
THE CALL TO 911**



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The APIE Process
RISK BASED RESPONSE FRAMEWORK

EXHIBIT I.1.1 This diagram shows the duties of initial response personnel that are associated with emergencies involving hazardous materials.

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VERIFY & QUESTION

Fire Alarm/Dispatch Information

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Building/Facility Incident

Exact location of the BUILDING/PLANT

**Inside or Outside of a building
 Commercial/Residential or Mixed
 Use**

Building Markings (NFPA 704)

Type of Business

Pre-Incident Plans/MSDS Available

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CLUES ?

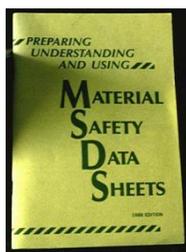


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Building/Facility Incident

CLUES ?



Pre-Incident Plans Resources

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What's The Game Plan?



- *What would happen if the Patriots hit the field without a game plan?*

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PROBLEM

Container Type

How much material is involved ?
Spill
Leak
Release

Explosive Devices?
Suspicious Packages



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HIGHWAY INCIDENT

Exact location of the HIGHWAY incident

Direction of Travel-NB/SB/EB/WB

Type of Vehicle
car/van/suv
freight truck
tanker truck

DOT Placards & Markings
Shipping Papers Available



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PROBLEM

Container Type

How much material is involved ?
Spill
Leak
Release

Solid-Liquid-Gas ?



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CLUES !

Highway/Railroad/Waterway

Vehicle Type;

Tanker Truck
Freight Truck
Railcar
Vessel

Vehicle markings or Placards

Shipping Papers Available



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Slide 41

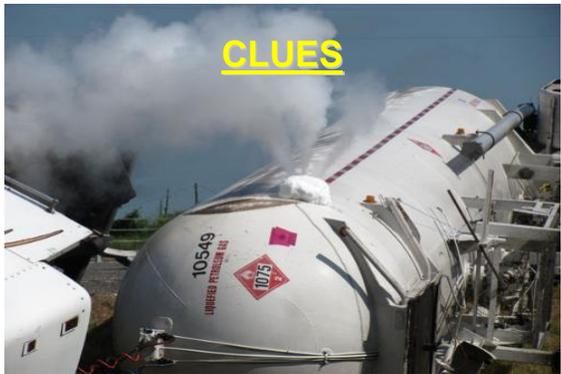
CLUES



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Slide 42

CLUES



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Slide 43



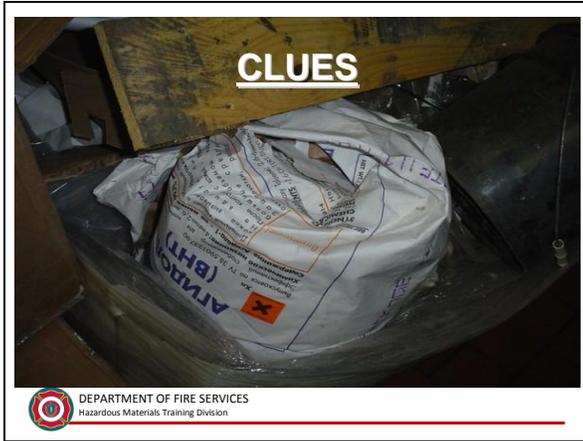
Slide 44



Slide 45



Slide 46



Slide 47

NOT SO OBVIOUS CLUES

What is it? Butylated Hydroxytoluene

Major Uses: FOOD ADDITIVE
Its also put in the cardboard of cereal and macaroni boxes as a preservative

What is it used for?:
An anti-oxidant in embalming fluid
What does it do to you? BHT dust is irritating if in contact with the eyes, nose or throat

Just because it has a scary name doesn't mean it's all that bad.

Slide 48

TRANSPORTATION INCIDENT

Exact location

SUBWAY

AMTRAK

AIRPORT TERMINAL

SEAPORT TERMINAL
WHARF/PIER/DOCK

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PROBLEM

Accidents

**Explosive Devices ?
Secondary Devices
Suspicious Packages**

**Biohazard Release
Chemical Release**



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CLUES

Multiple victims

**Signs & Symptoms
(SLUDGEM)**



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MINOR EVENT OR MCI

What happened ?

**Injuries ?
How Many ?
Trauma/Blast
Injuries**

Non-Trauma

**CBRN/Chemical/
Bio/Delayed/
Radiation/Nuclear**



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GEOGRAPHY/TOPOGRAPHY

Area Geography

- Densely populated
- Rural
- Low-lying area
- Waterways




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How's The Weather ?

VERIFY !

Weather Current/Change

Wind speed & direction
 "Wind out of the ___"

or



Wind Speed & Direction

- Calm
- ↖ 5 knots
- ↖ 10 knots
- ↖ 15 knots
- ↖ 20 knots
- ↖ 30 knots
- ↖ 45 knots
- ↖ 65 knots

Example Wind Mark



Read as West/Wind at 25 Knots

Dashes point to direction wind is coming from.
(1 Knot = 1.15 mph)


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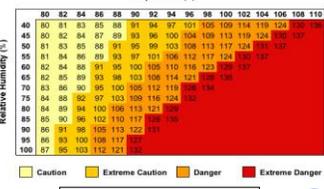
Slide 54

Temperature (F)

	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110
40	80	81	83	85	88	91	94	97	101	106	109	114	119	123	128	134
45	80	82	84	87	89	93	96	100	104	109	113	119	124	129	134	141
50	81	83	85	88	91	95	99	103	108	113	117	124	129	134	141	147
55	81	84	86	89	93	97	101	106	112	117	124	129	134	141	147	154
60	82	84	86	90	95	100	105	110	116	123	129	134	141	147	154	161
65	82	85	89	93	98	103	108	114	121	128	134	141	147	154	161	168
70	83	86	90	95	100	106	112	119	126	132	139	145	151	158	165	172
75	84	88	92	97	103	109	116	124	131	138	145	151	158	165	172	179
80	84	89	94	100	106	113	121	129	136	143	150	157	164	171	178	185
85	85	90	96	102	110	117	125	133	140	147	154	161	168	175	182	189
90	86	91	98	105	113	122	131	139	146	153	160	167	174	181	188	195
95	86	93	100	108	117	127	136	144	151	158	165	172	179	186	193	200
100	87	95	103	112	121	131	140	148	155	162	169	176	183	190	197	204

Caution
Extreme Caution
Danger
Extreme Danger

Heat Index Chart




Wind Chill Chart

Temperature

Heat/Cold Index

	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
5	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47
10	34	37	40	43	46	49	52	55	58	61	64	67	70	73	76	79	82	85
15	32	36	40	44	48	52	56	60	64	68	72	76	80	84	88	92	96	100
20	30	34	38	42	46	50	54	58	62	66	70	74	78	82	86	90	94	98
25	29	33	37	41	45	49	53	57	61	65	69	73	77	81	85	89	93	97
30	28	32	36	40	44	48	52	56	60	64	68	72	76	80	84	88	92	96
35	28	31	35	39	43	47	51	55	59	63	67	71	75	79	83	87	91	95
40	27	30	34	38	42	46	50	54	58	62	66	70	74	78	82	86	90	94
45	26	29	33	37	41	45	49	53	57	61	65	69	73	77	81	85	89	93
50	26	29	33	37	41	45	49	53	57	61	65	69	73	77	81	85	89	93
55	26	29	33	37	41	45	49	53	57	61	65	69	73	77	81	85	89	93
60	25	28	32	36	40	44	48	52	56	60	64	68	72	76	80	84	88	92

Wind Chill (F) = 35.74 + 0.6215T - 35.75(V^{0.16}) + 0.4275T(V^{0.16})
Where: T = Air Temperature (F); V = Wind Speed (mph)


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SOLID/LIQUID/GAS

What is the material ?
Physical Properties MP, Frz P, MW/SG, VD
FP, IT, LEL & UEL

Solid



Liquid



Gas



Insoluble
Water Vapor

Increasing Temperature →

Remember the NIOSH Book ?

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LIGHTER THAN AIR GAS

HAHA-MICE

Hydrogen
Ammonia
Helium
Acetylene
Methane
Illuminating Gases
Carbon Monoxide
Ethylene

4-H MEDIC ANNA

Hydrogen
Helium
Hydrogen Cyanide
Hydrogen Fluoride
Methane
Ethylene
Diborane
Illuminating Gases
Carbon Monoxide
Acetylene
Neon
Nitrogen
Ammonia



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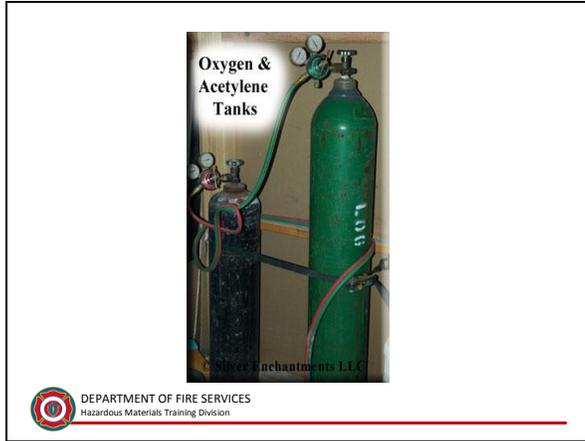
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An Example

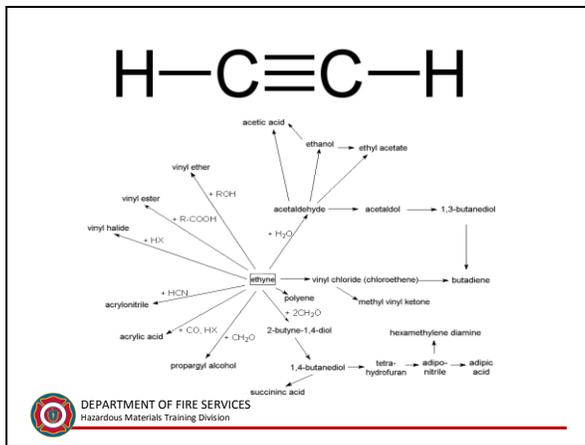


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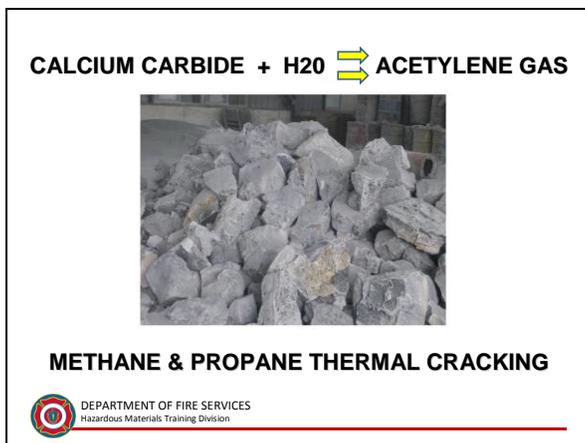
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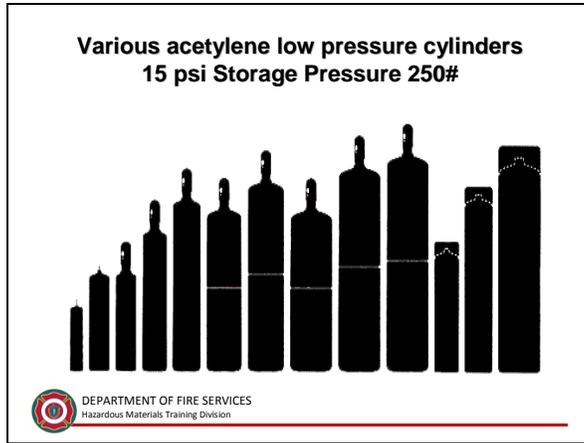
Slide 59



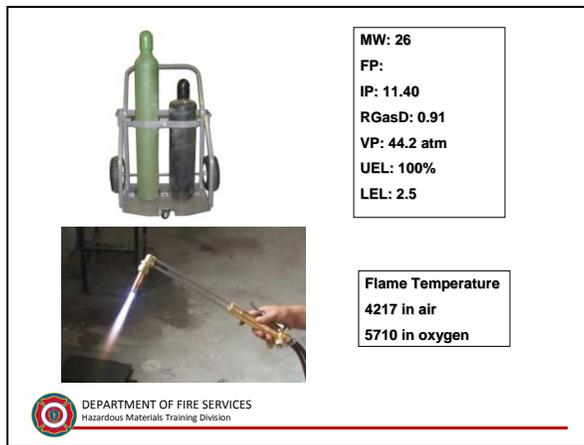
Slide 60



Slide 61



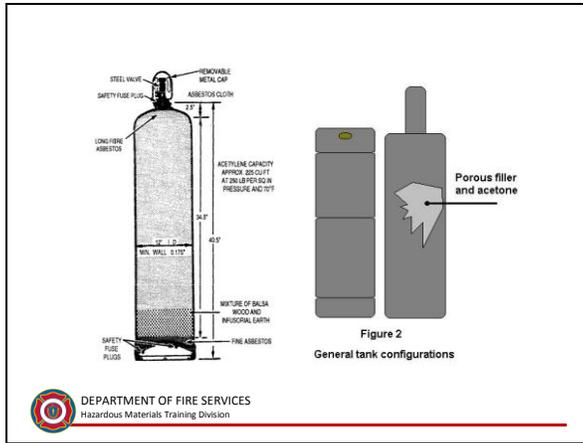
Slide 62



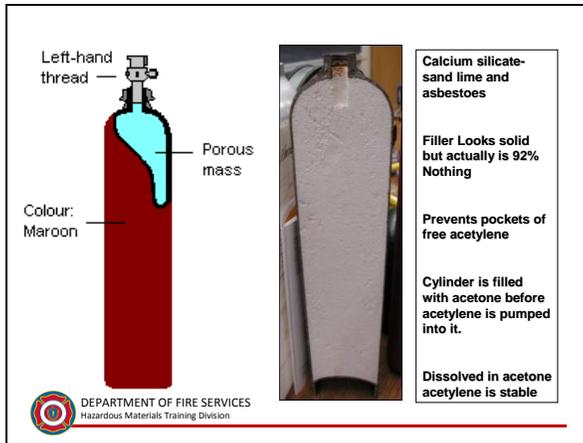
Slide 63



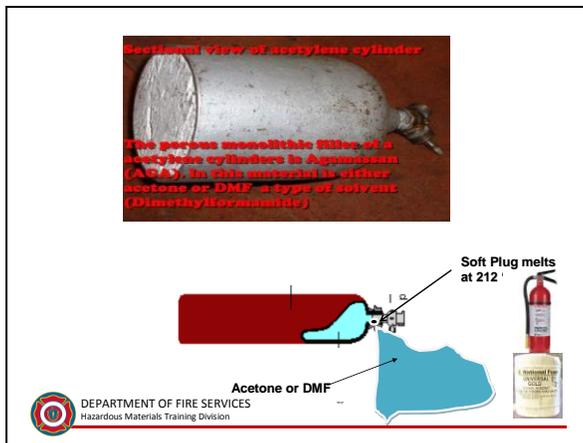
Slide 64



Slide 65



Slide 66



Slide 67

Decomposing acetylene flame can propagate back into its cylinder. Fire may appear to be out. Unless a cooling fog stream is kept upon it, it will probably explode.

Straight streams will knock unsecured cylinders over ! Use Fog streams...



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Acetylene Incident

Why we don't store Acetylene in a closed up vehicle !



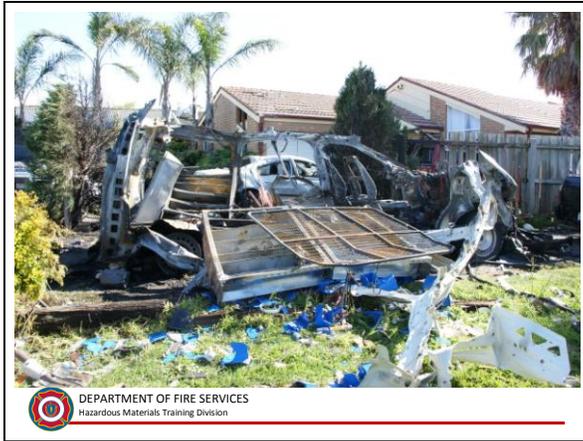
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Slide 69

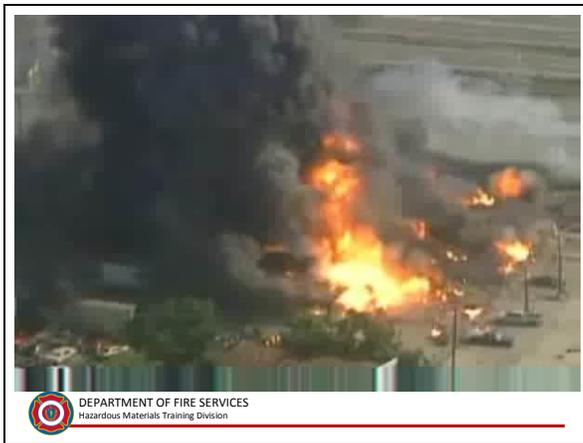


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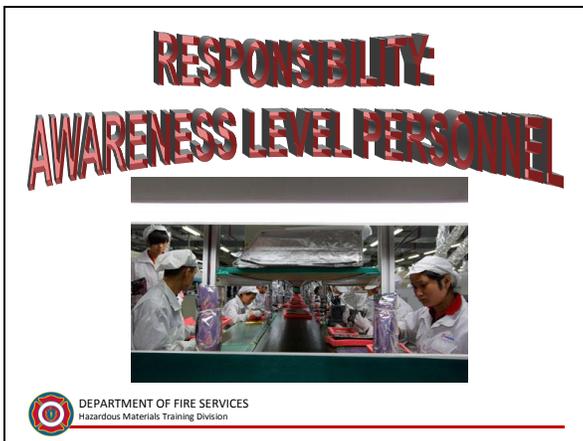
Slide 70



Slide 71



Slide 72



Slide 73

Awareness Level Personnel

Calling for help / making the appropriate notifications

- **Protect themselves**
- **Isolate the area**
- **Recognizing the presence of hazardous materials**
- **Recognizing the need for additional resources**



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RESPONSIBILITY
OPERATIONS LEVEL RESPONDER



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Operations Level Responder

Recognize - Identify - Isolate

Defensive Strategies

Product Control Measures:

- **Containment, Confinement**
- **Damming, Diking,**
- **Diversion and Retention**



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Diversion- the redirection of product away from an area.

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Absorption – Defensive, use of a material to soak up a spill

Requires FF's to be in close proximity to spill

Absorbent may react with hazardous substance

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Confinement – method to keep a material controlled in local areas; damming, diversion.

Containment – plugging, patching a container



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Vapor Suppression- reduce the emission of vapors (foam)



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Vapor Dispersion –

Defensive strategies

- Fire Streams or Fans to re-direct vapors away
- Not always a good idea with flammables
- Product does not need to be water-soluble



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When assessing scene with a vapor cloud:

OLR personnel do not enter the hot zone (Exception – the mission is RESCUE)

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RESPONSIBILITY: TECHNICIAN



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Haz-Mat Technician Level..

Analyze a hazardous materials/WMD incident to determine the complexity of the problem and potential outcomes by completing the following tasks:

Survey the hazardous materials/WMD incident to identify special containers involved,

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Haz-Mat Technician Level..

Identify or classify unknown materials, and verify the presence and concentrations of hazardous materials/WMD through the use of monitoring equipment.

Collect and interpret hazard and response information from printed and technical resources, computer databases, and monitoring equipment.

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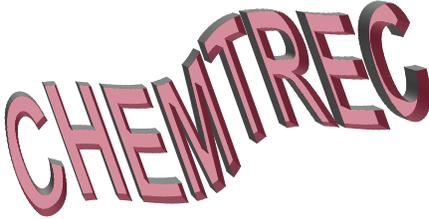
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Use of monitoring equipment in an endangered area done by HMRT



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Use CHEMTREC for product info



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An agency to contact when attempting to collect information during a hazmat event

 **1-800-424-9300**
The 24-hour HAZMAT Communications Center

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Principal agency to provide immediate technical assistance to an emergency responder

 **The 24-hour HAZMAT Communications Center**

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Advise  of the following:

Caller name and call back number
Type of container or vehicle
Material, shipper & manufacturer

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CHEMTREC
The 24-hour HAZMAT Communications Center



Provides:

- Hazard information warnings
- Data bases
- Technical information

Does not provide advice on remediation contractors

NOTE: It is not mandatory for chemical manufacturers and etc. to belong to this organization. It is a service !!

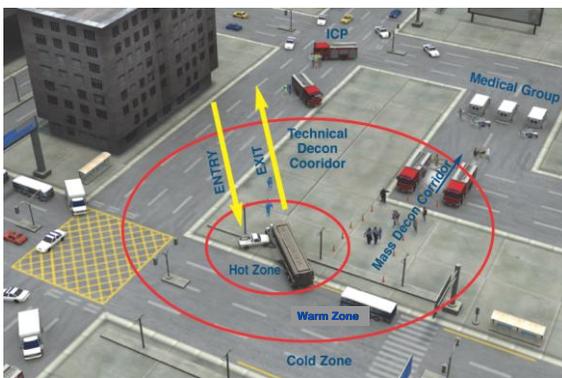
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DECON

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Slide 93



The diagram shows an aerial view of a city street intersection. A red circle highlights the 'Hot Zone' around a truck. A yellow double-headed arrow indicates the 'Technical Decon Corridor'. A blue double-headed arrow indicates the 'Mass Decon Corridor'. Other zones shown include 'Warm Zone' and 'Cold Zone'. Labels include 'ENTRY', 'EXIT', 'ICP', 'Medical Group', and 'Mass Decon Corridor'.

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Emergency Decon

Does not need to take place in the decon corridor

Removal of contamination of victims in need of medical attention

Goal of is to quickly remove possible contamination



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Emergency Decon

Does not need formal decon area

Provides only gross decon

Victim may still pose threat to secondary contamination

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Emergency Decon

Designed to remove contaminants that are an immediate threat to life

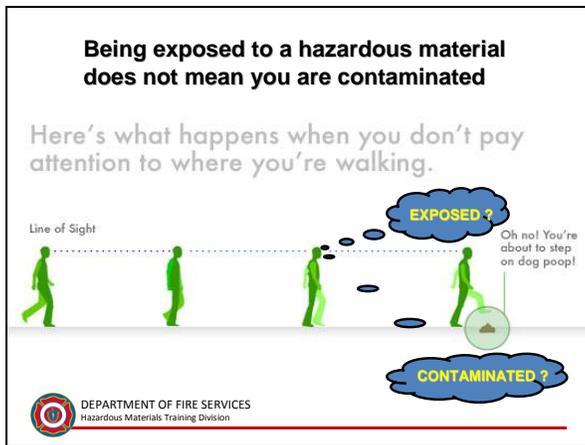
Run-Off Control- try to divert to an area to be handled later

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Slide 97



Slide 98



Slide 99



Slide 100

Expect contaminated equipment and personnel when:

- Working in Hot Zone**
- Working downwind and downhill**



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Slide 101

Expect contaminated equipment and personnel when:

- Parking apparatus downwind**
- Working in the decon area**



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Best work uphill and upwind



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Slide 103



Slide 104



Slide 105

Hot/Exclusion Zone

Contamination has occurred or may occur and requires established entry and exit control points

Highest known hazard



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Warm Zone –
Located just outside the Hot/Exclusion Zone
Includes the decon area



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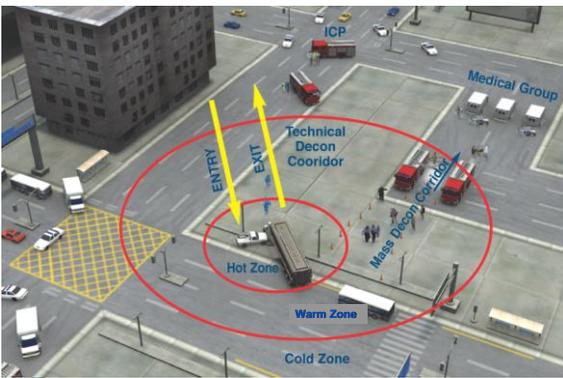
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Cold Zone –
Command Post and Staging



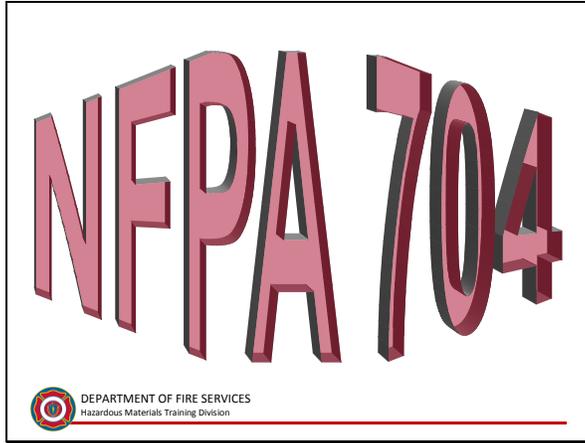
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Slide 108

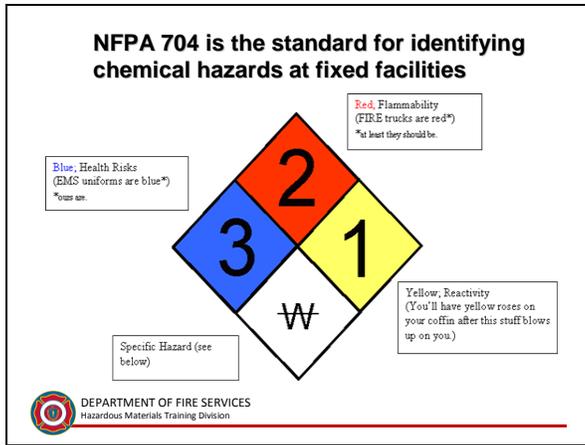


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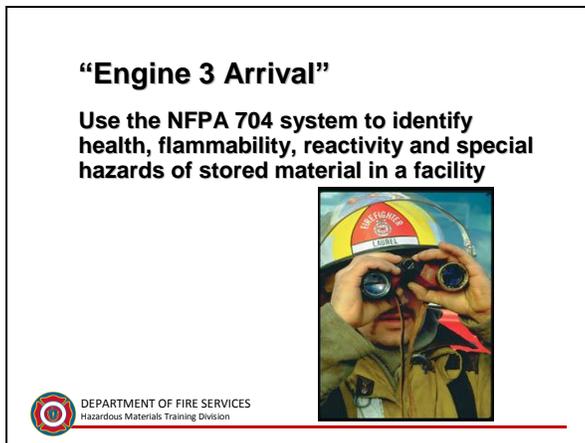
Slide 109



Slide 110



Slide 111



Slide 112

Provides a general hazard and degree of severity

0 - 4



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Slide 113

Number 4 indicates a severe hazard



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Slide 114

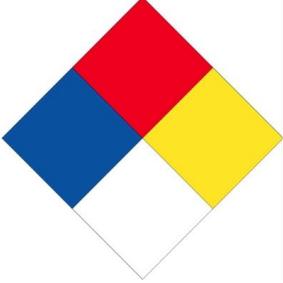
Most dangerous chemicals would have 4's in each category



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Slide 115

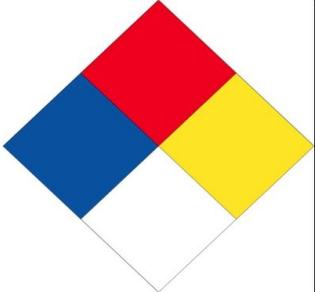
Red diamond indicates fire



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Slide 116

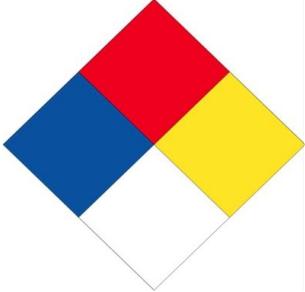
Blue diamond indicates health



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Slide 117

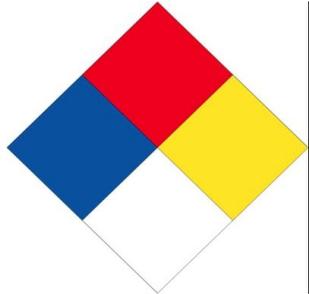
Yellow diamond indicates reactivity



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Slide 118

White diamond indicates special hazard



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Slide 119

White quadrant indicates special hazards:

W OXY ACID
ALK COR 

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Slide 120

Water reactive would be indicated in the white quadrant

W

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Slide 121

**NFPA 704 does NOT provide
a chemical name**



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Slide 122

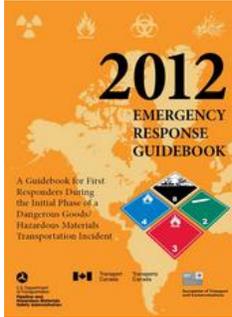
**DOT Placard System and
UN Labeling**



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Slide 123

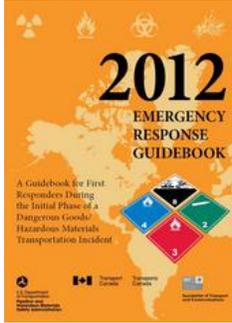
**The ERG is the reference book
carried on all fire apparatus in US**



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Slide 124

Use the ERG to determine an endangered area



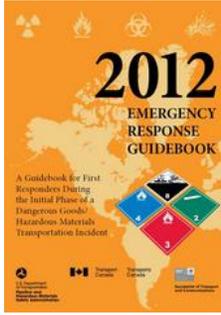
2012
EMERGENCY
RESPONSE
GUIDEBOOK

A Guidebook for First Responders During the Initial Phase of a Dangerous Goods/Hazardous Materials Transportation Incident

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Slide 125

The ERG deals with protective action distances involving poisonous substances



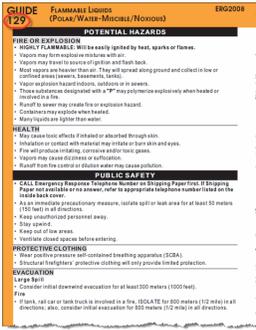
2012
EMERGENCY
RESPONSE
GUIDEBOOK

A Guidebook for First Responders During the Initial Phase of a Dangerous Goods/Hazardous Materials Transportation Incident

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Slide 126

The ERG orange section provides fire, explosion and health hazard information.



GUIDE 129 **FLAMMABLE LIQUIDS (POLAR/WATER-MISCIBLE/NONOXIC)** **ERG2008**

POTENTIAL HAZARDS

FIRE OR EXPLOSION

- **HIGHLY FLAMMABLE:** Will be easily ignited by heat, sparks or flames.
- Vapor may form explosive mixtures with air.
- Liquor may cause a cloud of ignitable mist to form.
- Most vapors are heavier than air. They will spread along ground and collect in low or confined areas (basements, cellars).
- Vapor explosion hazard outdoors, usually in or near sewers.
- These substances, when mixed with air, may form explosive mixtures when heated or confined in a fire.
- Rapid to severe may create fire or explosion hazard.
- Containers may explode when heated.
- Many liquids are lighter than water.

HEALTH

- May cause toxic effects if inhaled or absorbed through skin.
- Irritation or contact with material may irritate or burn skin and eyes.
- Fire and explosion heating can cause major lung damage.
- Liquor may cause irritation of mucous membranes.
- Runoff from fire control or shutoff water may cause pollution.

PUBLIC SAFETY

CALL Emergency Response Team: Before the Shipping Paper (or, if Shipping Paper not available, a placard), after the appropriate response number listed on the inside back cover.

- At a minimum, a trained emergency responder, wearing light or dark area for at least 50 meters (150 feet) in all directions.
- Keep unauthorized personnel away.
- Stay upwind.
- Keep out of low areas.
- Ventilate closed spaces before entering.

PROTECTIVE CLOTHING

- Wear positive pressure self-contained breathing apparatus (SCBA).
- Structural firefighting protective clothing and any provided limited protection.

EVACUATION

UPPER WIND

- Consider initial downwind evacuation for at least 300 meters (1000 feet).
- FIRE: If fire and tank leak have been controlled or if the BLEVE has been averted (100 feet in all directions); also, consider initial evacuation for 300 meters (1000 feet) in all directions.

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Slide 127

If a chemical name is highlighted in the ERG, the initial isolation distances would be found in the green pages.

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Slide 128

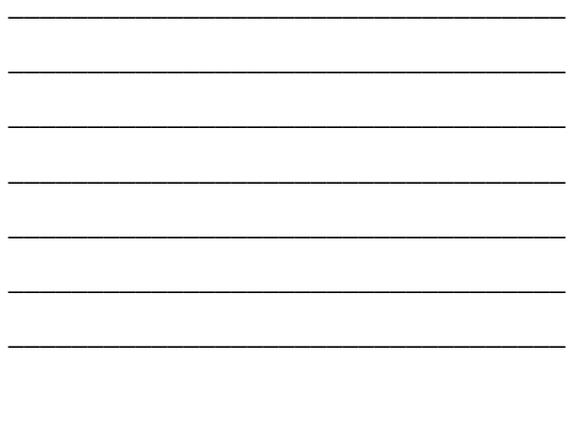
Table of Isolation distances, a large spill is defined as a quantity greater than 55 gallons

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Slide 129

A placard is required if the gross weight of product(s) is greater than 1001#



Slide 130

DOT Chart 14

A tractor-trailer carrying 975# of Organic Peroxide other than Type B- no placard required (see chart 14 – Table 1 & 2)

U.S. Department of Transportation
Pipeline and Hazardous Materials Safety Administration

DOT CHART 14

Hazardous Materials Markings, Labeling and Placarding Guide

Refer to 49 CFR, Part 172:
Marking - Subpart D
Labeling - Subpart E
Placarding - Subpart F



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Slide 131

UN/DOT placards indicate a general hazard by the UN/NA hazard class

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Slide 132

Number at bottom of placard indicates the UN hazard class



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Slide 133

Orange Placard with a number 1
EXPLOSIVES



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Slide 134

While rescuing victims where a fire involving a
Class 1 material
Primary Hazard- "*Explosion*"

This Is A Loser !!



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Slide 135

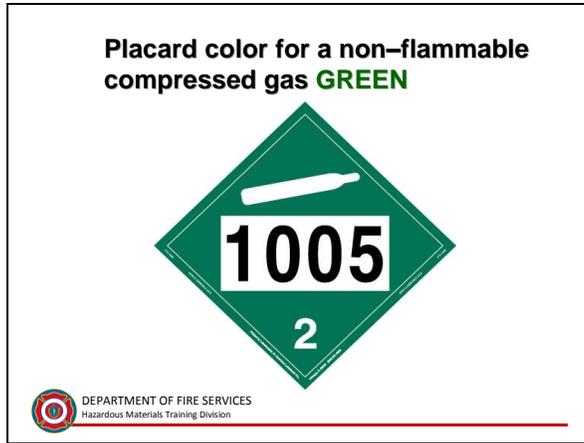
Placard with a number 2
- All Gases -



White
Red
Yellow
Green
**Placard
Backgrounds**

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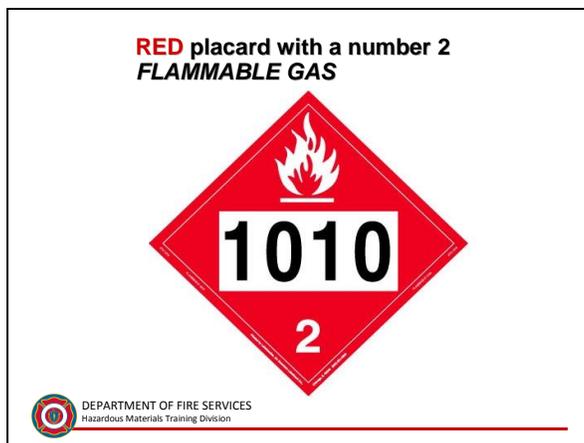
Slide 136



Slide 137



Slide 138



Slide 139

Flammable Gas/Liquid leaks – eliminate all ignition sources
OR
Change the environment



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Slide 140

White Background placard with skull and crossbones = **POISONOUS GAS**



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Slide 141

RED placard with a number 3
FLAMMABLE LIQUID / COMBUSTIBLE



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Slide 142

**Container of Flammable Liquid
UN/DOT Hazard Class 3**



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Slide 143

**Tractor – trailer hauling gasoline would
display a red hazard placard with a hazard
class 3**



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Slide 144

**Red and White striped placard with a
number 4 – FLAMMABLE SOLID**

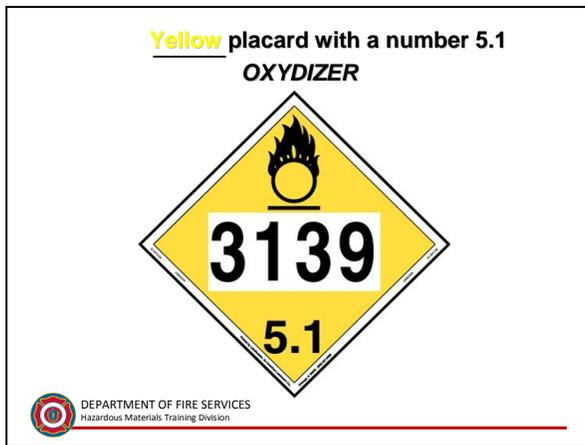


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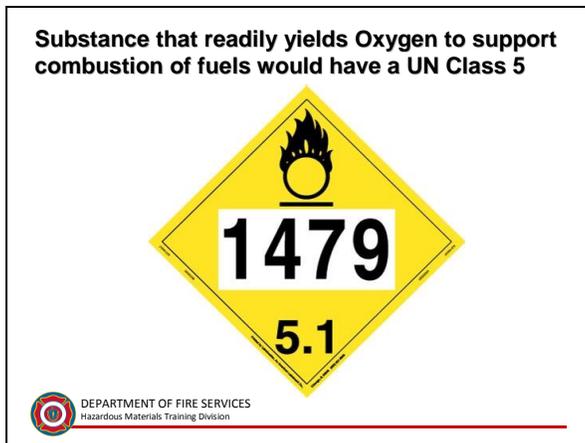
Slide 145



Slide 146



Slide 147



Slide 148

Primary hazard of a DOT class 5 is...
Oxidation which supports combustion



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Slide 149

DOT hazard class 6 includes liquid poisons, infectious substance, poison solids.



Does not include Poison Gases
(which is Class 2)



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Slide 150

DOT hazard class 6 poisons – *biological etiological agents and toxins*



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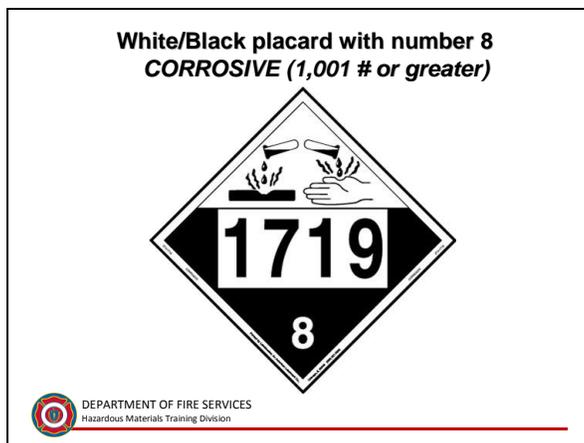
Slide 151



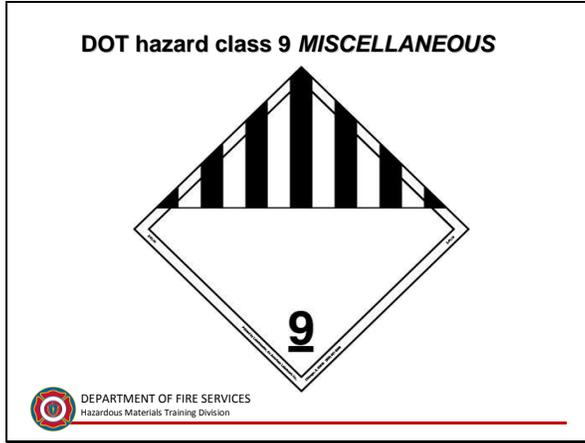
Slide 152



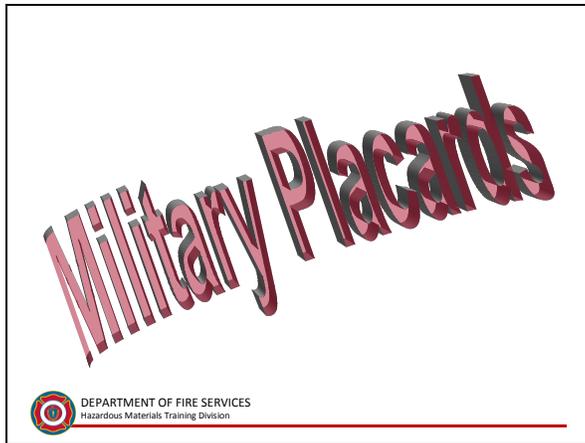
Slide 153



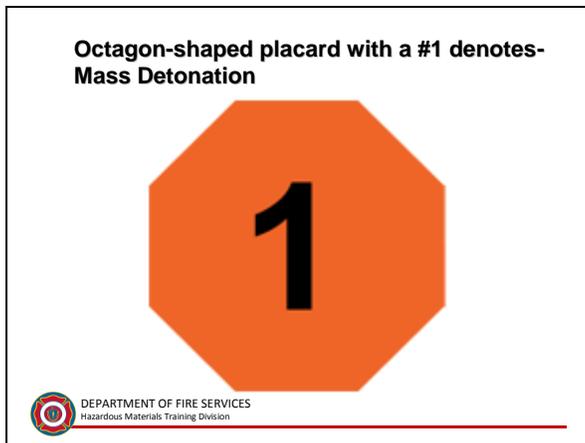
Slide 154



Slide 155



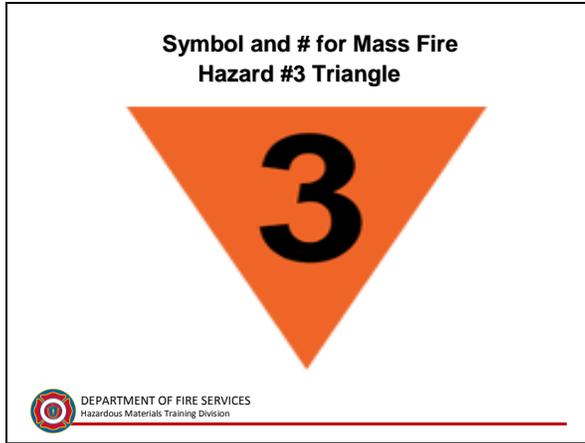
Slide 156



Slide 157



Slide 158



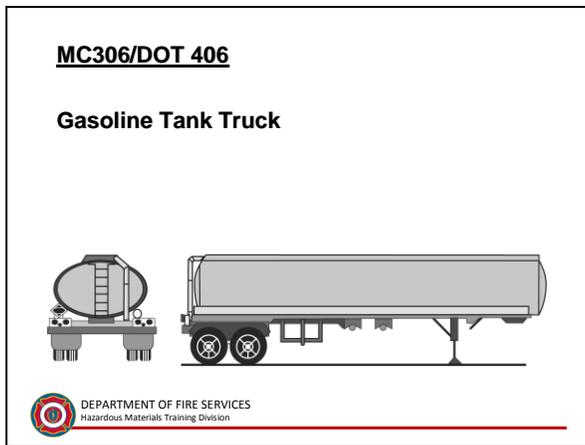
Slide 159



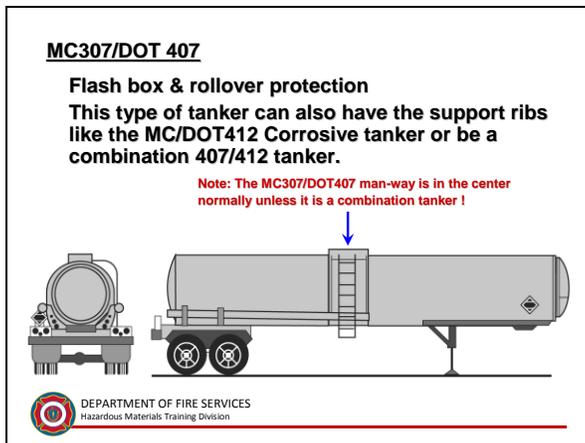
Slide 160



Slide 161



Slide 162

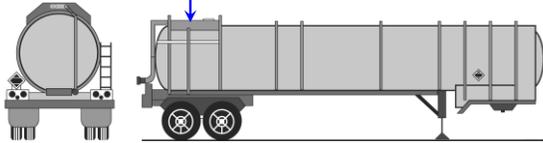


Slide 163

MC312/DOT 412

Corrosive Liquids, Sulfuric Acid external protective ribs

Note: The man-way is at the rear-end !



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Slide 164

The New Look

MC307/DOT407



New DOT 407/412 **Aluminum Shell**



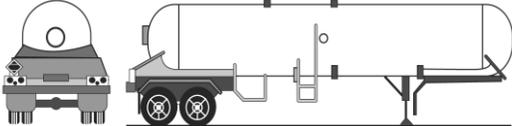
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Slide 165

MC331

Carries gases that have been liquefied

When a pressurized tanker fails violently due to over-pressurizing, the phenomenon is called a BLEVE

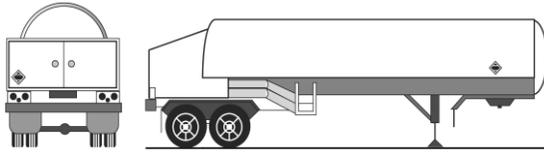


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Slide 166

MC 338

Cryogenics-well insulated with inner tank & outer shell (dbl shell)



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Slide 167

Dry Bulk “v” shaped carrier



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Slide 168

Inter-Modals



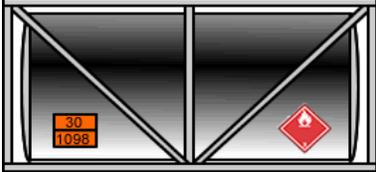
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Slide 169

Inter-Modal Tanks:

IMO-TYPE 101 designed working pressures of 25-100 psi

Transports flammable liquid or food grade products

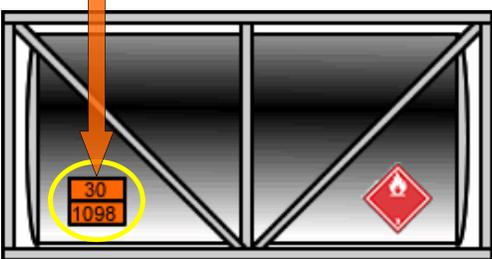


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Slide 170

Inter-Modal Tanks:

What is this / Where do you Look ?



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Slide 171

Inter-Modal Tanks:

IMO-TYPE 5 designed working pressures of 100-500 psig

Transports liquefied gas (propane/butane)



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Slide 172

Compressed Gas Tube Trailers

**Designed working pressures of 2000 – 6000 psig.
Pipe controls at rear and permanent markings**



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Slide 173

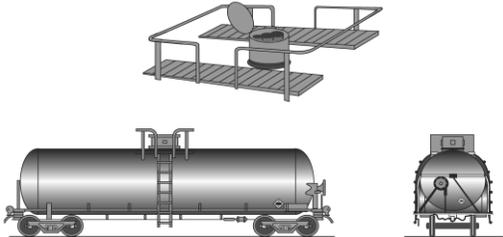
Railcars

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Slide 174

Railcars –

Pressure Tank-covered dome for fittings and valves

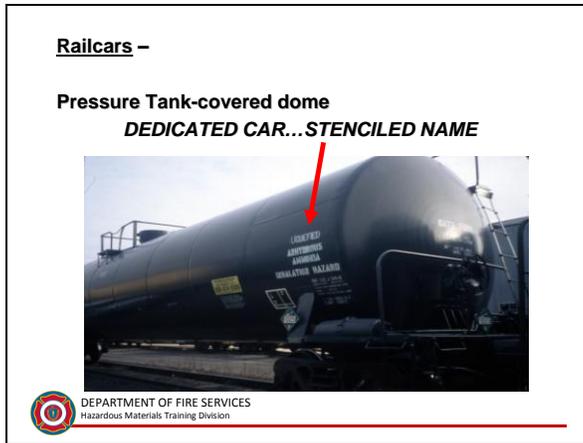


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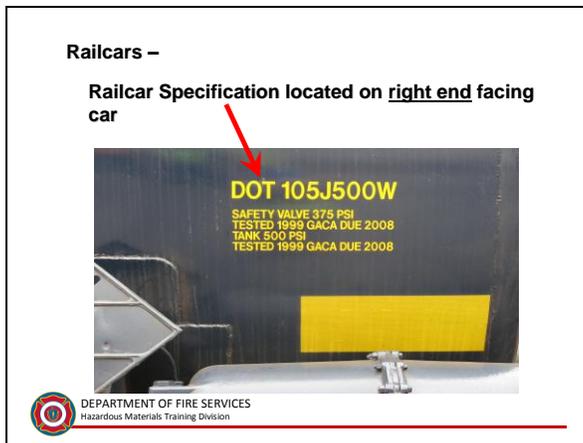
Slide 175



Slide 176



Slide 177



Slide 178

Railcars –

Railcar Specification # Tank Test Pressure in psi



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Slide 179

Railcars –

T = Thermal Protection System and Head Shield



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Slide 180

Railcars –

Railcar Identification Number is located on left end facing car



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Slide 181

Containers



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Slide 182

Carboys- corrosives

2 to 5 Gallon



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Slide 183

Dewar - Cryogenics



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Slide 184

Bags- non-bulk dry items

Fertilizers



Pest Control



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Slide 185

DRUMS

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Slide 186

Drum Types –

Open Head – Removable Lid



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Slide 187

Drum Types –
Closed Head – Permanent Lids with small openings (bungs)



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Slide 188

Fiberboard drum poses a minimal health risk from product



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Slide 189

Pipelines

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Slide 190

Required on pipeline markers –
Contents, Owner, Emergency Contact #



WARNING
PETROLEUM
PIPELINE
BUCKEYE PARTNERS, L.P.
1-800-331-4115
www.buckeye.com

PP
E
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Slide 191

AST / UST STORAGE

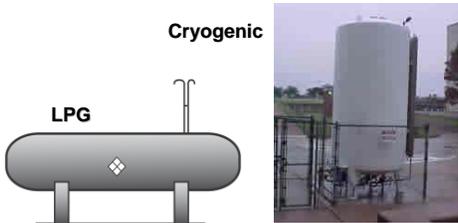


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Slide 192

AST –
Above Ground Storage Tanks
Two categories:
Low Pressure & High Pressure

Cryogenic

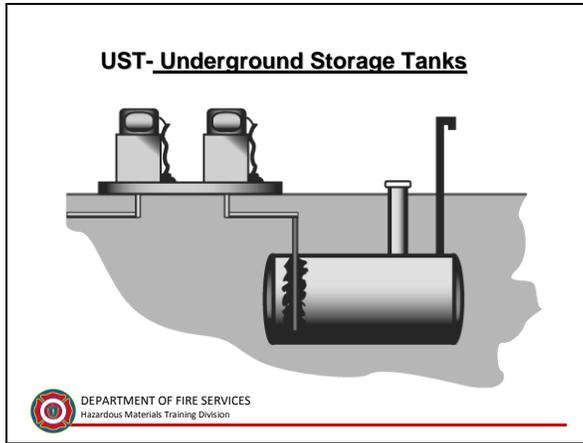


LPG

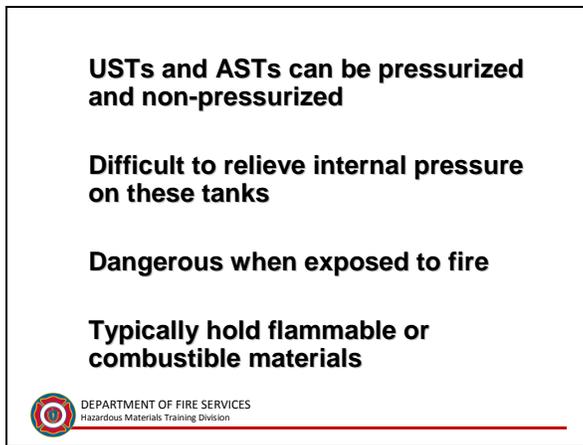


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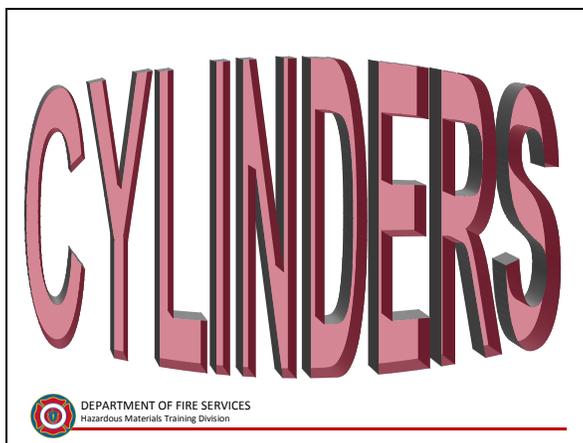
Slide 193



Slide 194



Slide 195



Slide 196

Common design feature- Pressure relief device

****NO COLOR CODE FOR CYLINDERS**



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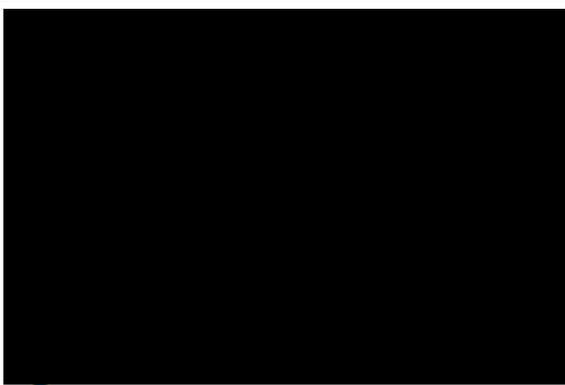
Slide 197

Common hazard with cylinders involved in fire – Explosion



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Slide 198



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Slide 199



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Slide 200

Bill of Lading

Highway Transportation

Control & responsibility –
Truck Driver

Found in the cab of the truck
*Within his seated reach

HAZMATS MUST STANDOUT



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Slide 201

Way Bill or Consist

Railway Transportation

Control and
responsibility train
conductor/engineer

Found in locomotive/
engine, caboose



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Slide 205

Haz-Mat Shipping Papers:

Must contain emergency an contact number, the proper shipping name(s) of shipped material(s), the hazard class for the material(s), the UN or NA number(s) and the Packing Group(s) of the material(s)



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Slide 206

Transportation vehicles must have shipping papers when transporting **ANY QUANTITY of hazardous materials but... may not be required to be placarded (see Chart 14)**

(49 CFR)



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Slide 207

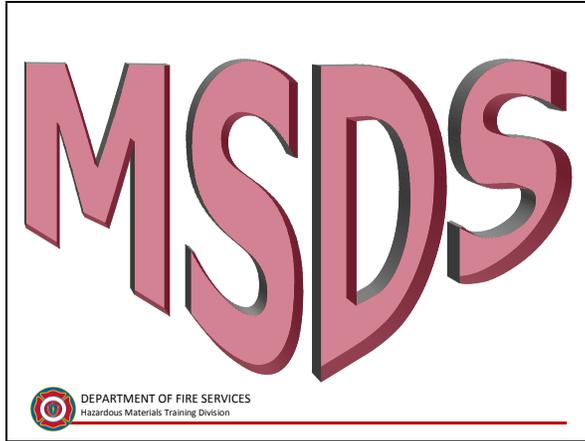
May include packing group (PG) numbers I, II, III. (PG I, being most hazardous)

****Radiation packaging III is most hazardous**



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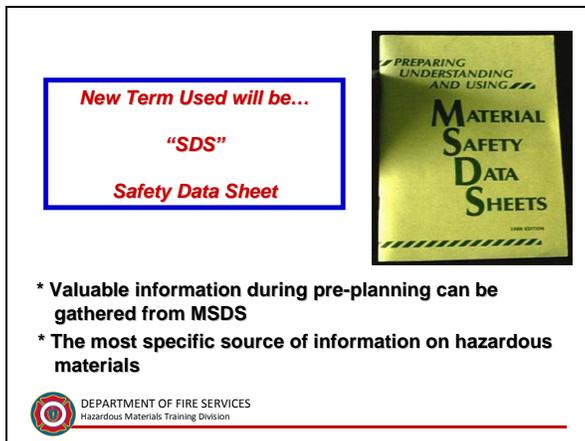
Slide 208



Slide 209



Slide 210



Slide 211

Physical Data, Chemical Name, Exposure Limits, Health Hazard Data and Special Precautions are all parts of the MSDS / SDS



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Slide 212

SARA Title III

Primary consideration requiring all facilities to have MSDS / SDS sheets even if the stored chemicals are considered consumer quantities.

Private citizens / individual homes do not fall under this regulation unless they operate a business from home that handles hazardous materials i.e. cleaning company, pest control, etc.



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Slide 213

Properties & Effects

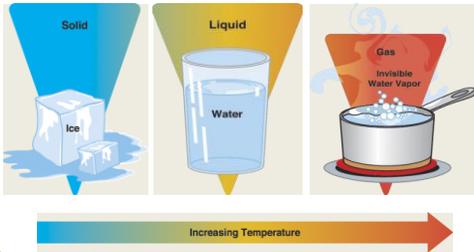


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Slide 214

Physical State –

- Whether a product is a **SOLID-LIQUID or GAS**



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Slide 215

Vapor Density

As it relates to air-air being 1.0

> 1.0 collects in low lying areas

Used to determine if a vapor will rise or fall



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Slide 216

Specific Gravity

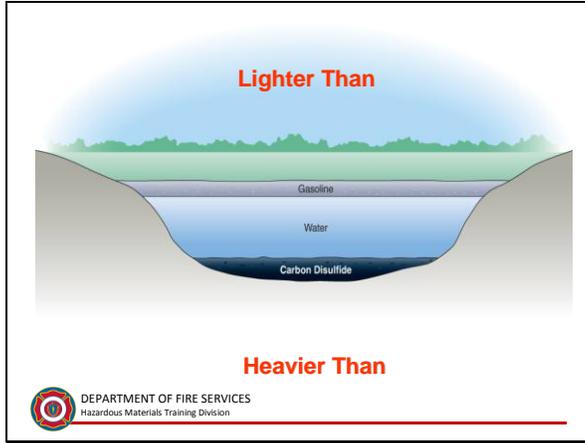
Relationship between a volume of liquid compared to an equal volume of water

If water has a value of 1.0 a substance greater than 1 will sink

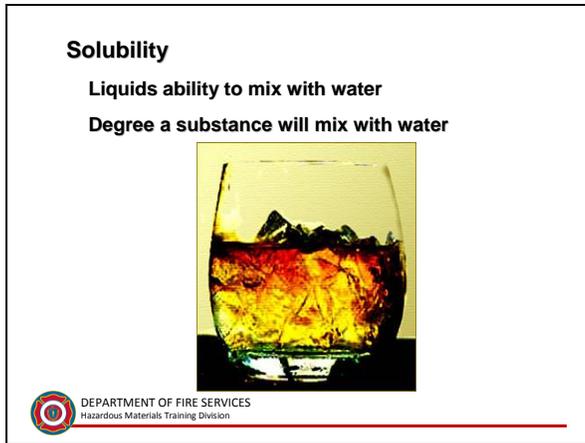
A substance less than 1 will float

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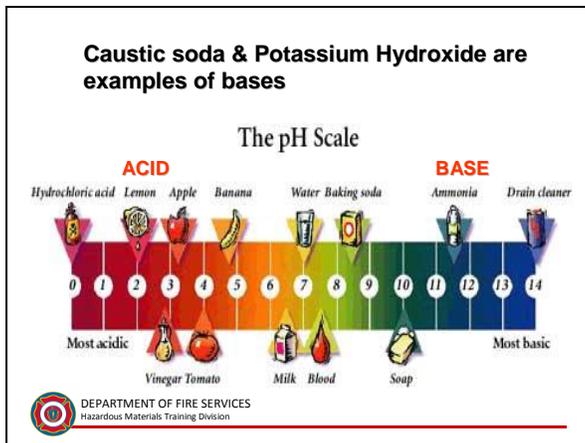
Slide 217



Slide 218



Slide 219



Slide 220

General routes for human exposure to hazardous materials



(A) Inhalation (B) Absorption

(C) Ingestion (D) Injection



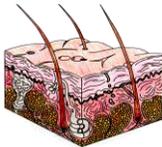
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Slide 221

Absorption –

Process where one substance combines with another

Chemical contact with skin



Through Eyes and ears also absorption routes



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Slide 222

Exposures:

Thermal – excessive heat or cold

Asphyxiation – suffocation simple or chemically

Etiological – micro-organism

Most common route of exposure – the respiratory system



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Slide 223

Asphyxiates

interfere with oxygen exchange during normal respiration

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Slide 224

Simple Asphyxiates – Displace O₂

**carbon dioxide
nitrogen**

Chemical Asphyxiates – Blood Agent

**Carbon Monoxide
Hydrogen Cyanide**

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Slide 225

Blood agents –
(chemical asphyxiates)

CO-HCN

highly toxic that interfere with oxygen exchange and hemoglobin during normal respiration

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Slide 226

Choking Agents –
Attack the airway and lungs causing tissue damage (Phosgene)

Blister/Chemical Agents –
Chemical Burns to skin (Sulfur Mustard, Lewisite)



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Slide 227

Irritants –
Vapors that attack the mucus membranes, eyes, nose & throat

Chlorine & Anhydrous Ammonia-severe irritant to respiratory system



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Slide 228

Sensitizers –



After repeated exposure, may cause severe allergic reactions, (Henna Tattoo)



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Slide 229

Chronic Health Hazard –

Victim exposed to a chemical over long duration may develop



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Slide 230

Cryogenics – liquids that are stored at (-150) degrees F

“THINK FROSTBITE”



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Slide 231

Corrosives



Substances tendency to deteriorate another substance

May cause severe chemical burns and extensive tissue damage on contact with skin

Acids- Surface Burns - Short Decon
Bases- Deep Burns - Long Decon



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Slide 232

Flammable Range –

Difference between upper & lower flammable limits

Percentage of flammable gas or vapor concentration in air



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Slide 233



flashpoint

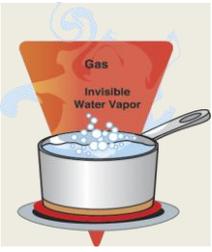
Minimum temperature that a liquid gives off enough vapors to form an ignitable mixture with air

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Slide 234

Boiling Point –

- Liquid with a low BP will more readily change to a vapor than a liquid with a high BP when exposed to fire/heat
- Point when a liquid converts to gas



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Slide 235

Auto-Ignition Temperature

- **Minimum temperature a fuel in air must be heated to initiate self-sustained combustion without initiation from an independent ignition source**



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Slide 236

Atmospheric Exposure Values



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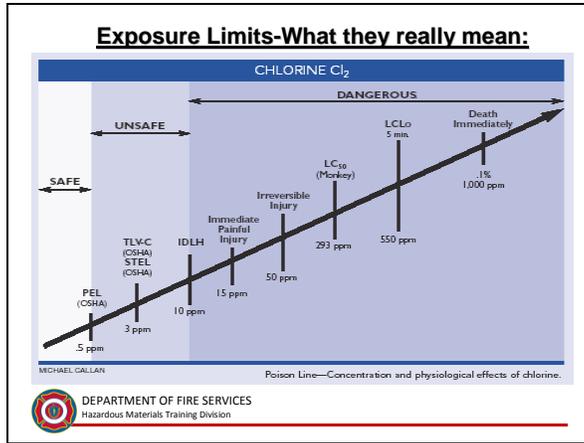
Slide 237

Exposure Limits	Definition	Maximum Exposure	Exposure Reduction	Remarks
TLV-STEL	Threshold Limit Value Short-Term Exposure Limit	Up to 15-minute intervals, up to four times a day without damage	Minimum one hour rest between exposures	The lower the TLV-STEL, the more toxic the substance
TLV-TWA	Threshold Limit Value Time-Weighted Average	Up to 8 hours a day, 40 hours a week with no ill effects		The lower the TLV-TWA, the more toxic the substance
TLV-C	Threshold Limit Value Ceiling	Maximum concentration a worker should not be exposed to, even for an instant		The lower the TLV-C, the more toxic the substance
TLV-S	Threshold Limit Value Skin	Possible and significant exposure by absorption through the skin, mucous membranes, and eyes		Minimize skin absorption so that the TLV/TWA is not exceeded
PEL	Permissible Exposure Limit	95% of healthy adults can be exposed over a 40-hour workweek without damage		Comparable to the TLV-TWA PEL set by OSHA (enforceable by Law) REL set by NIOSH (does not have the force of Law)
REL	Recommended Exposure Limit	Same as above		
IDLH	Immediately Dangerous to Life and Health	These types of IDLH atmospheres: > Toxic > Flammable > Oxygen-deficient (<19.5%) An atmospheric concentration of any toxic, corrosive, or asphyxiant that poses an immediate threat to life or could cause irreversible or delayed adverse health effects	SCBA or equivalent protection	The lower the number the higher the toxicity



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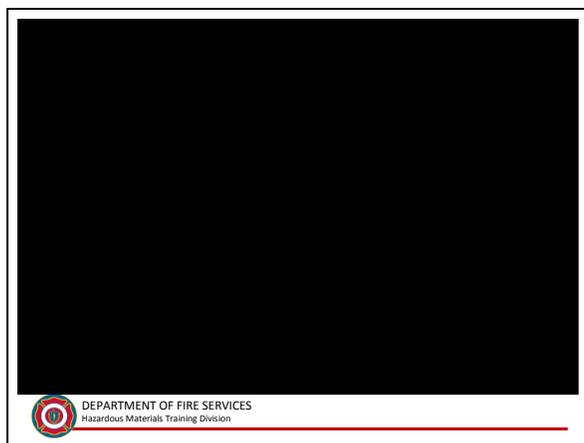
Slide 238



Slide 239



Slide 240



Slide 241

**Substance releasing ionizing radiation
would be labeled Class 7**

Denotes radioactive levels → 

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Slide 242

Radiation Labels:

Transport Index: *Measured in mrem/hour*
**Found on labels indicate the highest
radiation level found 3' from the
surface of package**

Max TI=1 Max TI=10

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Slide 243

Radioactive Packaging 4 General TYPES

Exclusive Use –
Shipped as low radioactivity
Authorized for domestic shipment

Excepted Use –
Extremely Low Levels
Smoke Detectors

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Slide 244

Radioactive Packaging

TYPE A
Designed to withstand normal transport and normal transport conditions

Metal Drum
Fiberboard
Cardboard



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Slide 245

Radioactive Packaging

TYPE B – may contain life-endangering amounts of radiation

Packaged in steel reinforced concrete casks, lead pipes or heavy gauge metal drums.

Designed to withstand severe accident conditions



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Slide 246

Pesticides

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Slide 247

Active ingredients listed by name and percentage



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Slide 248

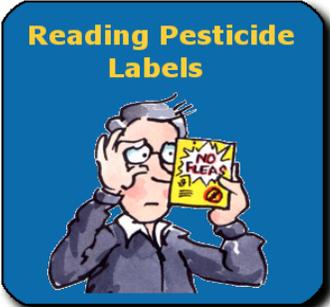
“Keep Away From Children” is a precautionary statement



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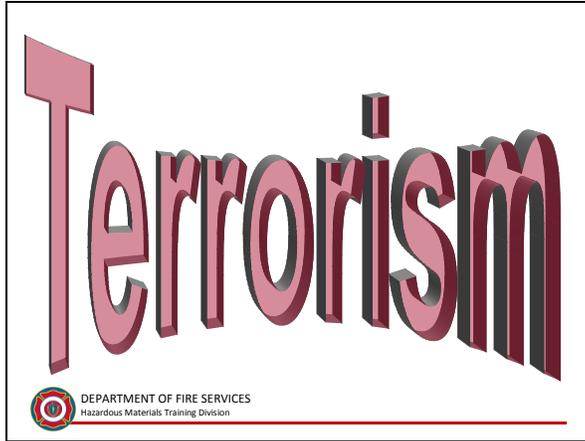
Slide 249

“Keep Away From Waterways” is a hazard statement



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Slide 253



Slide 254



Slide 255



Slide 256

Biological Agents are toxic living materials obtained from living organisms

1984

ECOLI



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Slide 257

Awareness levels should peak when responding to a call for a non-trauma MCI



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Slide 258

Possible targets for terrorism-Symbolic and Historic, Public and Public Assembly, Controversial Businesses (abortion, night clubs), Infrastructure systems



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On-scene clues –

- Unexplained patterns of illness or death**
- Unexplained signs and symptoms of skin, eye or airway irritation**
- Recognizable odors and tastes**

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Slide 260

On-scene clues –

- Unexplained vapor clouds and plumes**
- Occupancy and Location**
- Timing of event**
- Type of event**

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Slide 261

Nerve agents –

- Sarin, Soman and V agent designed to injure and cause death.**
- Have low vapor pressure and do not vaporize readily**

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Nerve agents –

Table 34-1 Common Nerve Agents

Nerve Agent	Method of Contamination	Characteristics
Tabun (GA)	Skin contact Inhalation	Disables the chemical connections between nerves and target organs
Soman (GD)	Skin contact Inhalation	Odor of camphor
Sarin (GB)	Inhalation	Evaporates quickly
V-agent (VX)	Skin contact	Oily liquid that can persist for weeks

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People exposed to a nerve agent may present with runny nose, difficulty breathing or convulsions, loss of bladder control, vomiting (SLUDGEM)

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Blister agents belong in the Chemical category

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Federal Buildings are prime targets for terrorists attack but not all terrorist attacks are directed at Federal Buildings



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Slide 266

Evidence collection primary responsibility of

“law enforcement”



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Slide 267

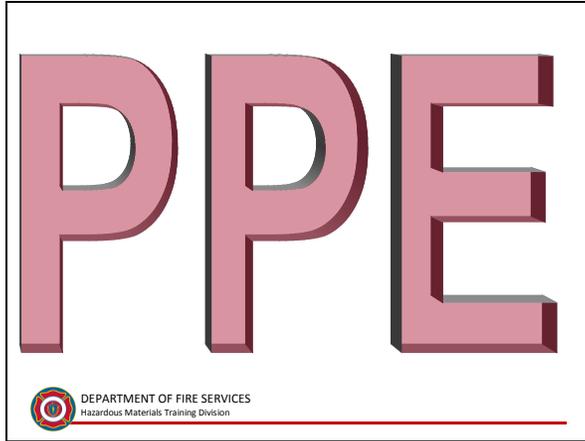
Implementing tactics on Bomb incidents:

Be alert for secondary devices



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Slide 268



Slide 269

PPE –



Hydrate frequently to minimize physical limitations

Most critical parameter when selecting PPE is the chemical compatibility

Physical, mental, or emotional condition can cause problems

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Slide 270

PPE –

Practice and conditioning can help reduce physical limitations

Training & Education can help reduce psychological limitations

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Penetration –

Chemical enters thru garment openings/closures (through seams, pinholes)



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Slide 272

Degradation –

Physical destruction or decomposition of CPC due to chemical action

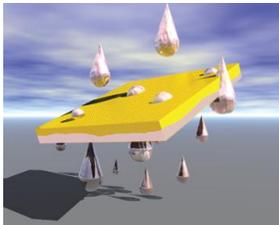


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Slide 273

Permeation –

Chemical action involving movement of chemicals on a molecular level through intact materials



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Level A – (Vapor & Respiratory)

Highest level of protection (VAPOR)

Vapor tight suit, which resists permeation by most chemicals

SCBA worn inside PPE



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Slide 275

Level B- (SPLASH & Respiratory)

Highest level of respiratory protection with a lesser chemical protection for the skin (SPLASH with respiratory)



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Level B –

Type 1 – Fully Encapsulated SCBA inside



Type 2- Encapsulated with SCBA outside



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Level C –
Splashes may occur but respiratory hazards are minimal



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Slide 278

Level D –
Work uniforms



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Slide 279



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Slide 280

Approach scene from uphill and upwind



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Slide 281

Safety Briefings Haz-Mat Incident:

Pre-Incident Plan info is vital to establishing briefing items

MSDS information can be important part of briefing

Risk/Benefit assessment most important item



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Slide 282

Safety Briefings Haz-Mat Incident



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Slide 283

Safety Briefings Criminal or Terrorist Incident:

Should include an approach similar to a Haz-Mat incident

Should stress secondary explosive devices possible

Should stress crime scene evidence preservation

MANASSAHETTEN HAZARDOUS MATERIALS TEAM
Site Safety Plan

Location	Activation Date	Activation Number
Name	Site Name	Site Type
Operational Period / Start Date / Time	End Date / Time	End Date / Time

Chemical Agents, Contaminants, Type of Release Material Properties & Modes of Exposure

Agent Name	Area	Notes
------------	------	-------

Site Remarks

Emergency Procedures

Evacuation Route	Evacuation Point
------------------	------------------

Personnel & Equipment

Personnel	Equipment
-----------	-----------

SPCC/OSHA Site Information

Inspector	Contact	Phone/Fax
-----------	---------	-----------

OSHA

Service	Contract
---------	----------

Incident #

Incident Location	Incident
-------------------	----------

Adult Sup. Systems, Systems, Units & OSHA/OSHA

Requested by: Date Time 10/09/09

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Slide 284

Safety Briefings Criminal or Terrorist Incident:

MANASSAHETTEN HAZARDOUS MATERIALS TEAM
Site Safety Plan

Location	Activation Date	Activation Number
Name	Site Name	Site Type
Operational Period / Start Date / Time	End Date / Time	End Date / Time

Chemical Agents, Contaminants, Type of Release Material Properties & Modes of Exposure

Agent Name	Area	Notes
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Site Remarks

Emergency Procedures

Evacuation Route	Evacuation Point
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Personnel & Equipment

Personnel	Equipment
-----------	-----------

SPCC/OSHA Site Information

Inspector	Contact	Phone/Fax
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OSHA

Service	Contract
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Incident #

Incident Location	Incident
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Adult Sup. Systems, Systems, Units & OSHA/OSHA

Requested by: Date Time 10/09/09

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Slide 285

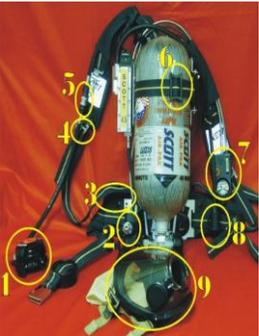
SCBA –

Atmosphere supplied device

Use Daily Inspection Procedure

Clean and inspect after each use

Restore unit to service after use



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Slide 286

SCBA Regulator –

Reduces high storage pressure and controls air flow



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SCBA Safety –

Use of buddy system is required when using PPE



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Slide 288

SCBA Limitations –

Places a strain on wearers cardiovascular system

Claustrophobia

Wearer's *must be trained*



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SAR –

Supplied Air Respirators



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APR –

Air Purification Respirator



Type of breathing system that **cannot** be used in an O₂ deficient atmosphere

*****NEED TO METER YOUR LOCATION*****

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Cold Emergencies –

Hypothermia is a **true** emergency

Hypothermia is a lowered body core temperature

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Cold Emergencies –

**Decon and doffing in cold environment
the body cools rapidly**

**Wet clothing extracts heat from up to
240 times faster than dry clothing and
can lead to hypothermia**

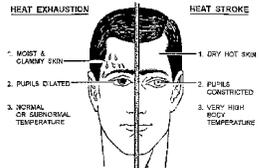


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Slide 293

Heat Emergencies –

Heat Exhaustion



**Circulatory system begins to fail, rapid
shallow breathing and cool clammy skin**

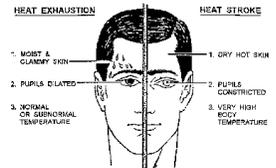
**Body is unable to dissipate excessive
heat and becomes overheated**



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Slide 294

Heat Stroke –



Life threatening emergency

**No sweating, hot dry skin, rapid pulse,
deep than shallow breathing**

Body can no longer regulate heat



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Ice cooled and Liquid cooled vest are typically used for emergency response applications.

Air cooled are NOT



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Incident Command



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Slide 297

Scene Accountability

Command Post Location

Who has Command (Responsibility)



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Command Post (CP)
Scene location where information gathering occurs



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Incident Commander



It is not vital for the IC to see the incident

Responsible for overall plan

Unified Command works best

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Operations –
Controls tactical portion of incident



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Logistics –

Responsible for resources: facilities, services and equipment



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Safety –

Immediately intervenes in un-safe actions

Monitors scene for conditions, personnel and SOP

May have two or more safety officers

**Scene Safety
HazMat safety**



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Haz-Mat Branch –

Functions under Operations



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Unity of Command –

Individual reports to only one supervisor

Not the same as Unified Command



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Slide 305

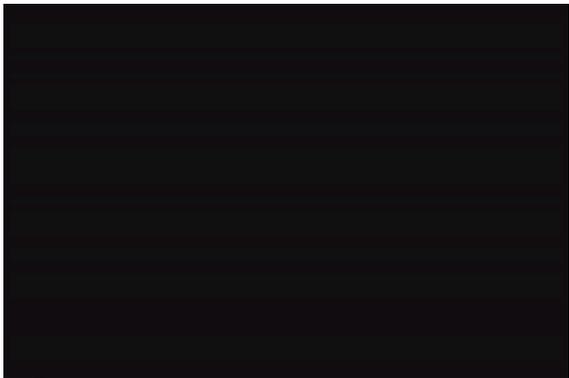
Span of Control

5:1



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Slide 306



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Slide 307



Slide 308

