

# INCIDENT COMMAND SYSTEM (ICS)





# OBJECTIVES

- ∞ **Identify the main purposes of ICS**
- ∞ **Identify the major benefits of ICS**
- ∞ **List the five functions of ICS**
- ∞ **A quick introduction of the Incident Management System (for now)**



# **“HAZWOPER” REGULATION STATES:**

**ICS is required by law if an  
emergency response is made  
to a situation involving  
hazardous materials**

June 21

*29 CFR 1910.120 (q) (3)*



# Homeland Security Presidential Directive 8

- ⌚ **National Response Framework (NRF)**
- ⌚ **National Incident Response System (NIMS)**
  - ICS

<http://training.fema.gov/is/crslist.aspx>

The screenshot shows the FEMA Emergency Management Institute website. The header includes the FEMA logo and the text "Emergency Management Institute". A search bar is located on the right side of the header. Below the header, there is a navigation menu with links for Home, Blog, Photos, Videos, Contact Us, and FAQs. The main content area is divided into six columns: EMI Courses & Schedule, EMI Students & Instructors, Apply, Programs & Activities, Independent Study, and Contact Us. The "Independent Study" column is highlighted with a yellow box, and a tooltip labeled "FEMA Independent Study" is visible over it. The "Apply" column is also highlighted with a yellow box. The "Independent Study" column lists several courses, including IS-907 Active Shooter: What You Can Do and IS-100.HCb Introduction to the Incident Command System (I...).

EMI Courses & Schedule	EMI Students & Instructors	Apply	Programs & Activities	Independent Study	Contact Us
Take a Course On Campus	Information for Students and Instructors	Learn how to apply to our programs	Resident, Trainer Program, IEMC, DFTO, etc.	Online courses available free of charge	Contact IS, NIMS, Admissions
IS-100.b Introduction to Incident Command System, ICS-100	IS-700.a National Incident Management System (NIMS) An In...	IS-200.b ICS for Single Resources and Initial Action Inci...	IS-800.b National Response Framework, An Introduction	IS-907 Active Shooter: What You Can Do	IS-100.HCb Introduction to the Incident Command System (I...
IS-1.a Emergency Manager: An Orientation to the Position	IS-5.a An Introduction to Hazardous Materials	IS-230.d Fundamentals of Emergency Management	IS-100.LEb Introduction to the Incident Command System (I...	IS-200.HCa Applying ICS to Healthcare Organizations	IS-120.a An Introduction to Exercises

# ICS Features: Overview

- **Standardization**
  - **Common terminology**
- **Command**
  - Establishment and transfer of command
  - **Chain of command and unity of command**
  - Unified command
- **Planning/Organizational Structure**
  - **Management by objectives**
  - Incident Action Plan (IAP)
  - Modular organization
  - **Manageable span of control**
- **Facilities and Resources**
  - Comprehensive resource management
  - Incident locations and facilities
- **Communications/Information Management**
  - Integrated communications
  - Information and intelligence management
- **Professionalism**
  - Accountability
  - Dispatch/Deployment



# PURPOSES OF ICS

∞ **To insure safety**

∞ **To define responsibilities**

– **Insure that someone is always in charge**

∞ **To efficiently use resources**



# BENEFITS OF ICS

- ∞ **Uses standard terminology**
- ∞ **Modular design, expands as incident grows, contracts as incident comes under control**
- ∞ **Designed to be flexible but consistent**
  - **local, state or federal response**

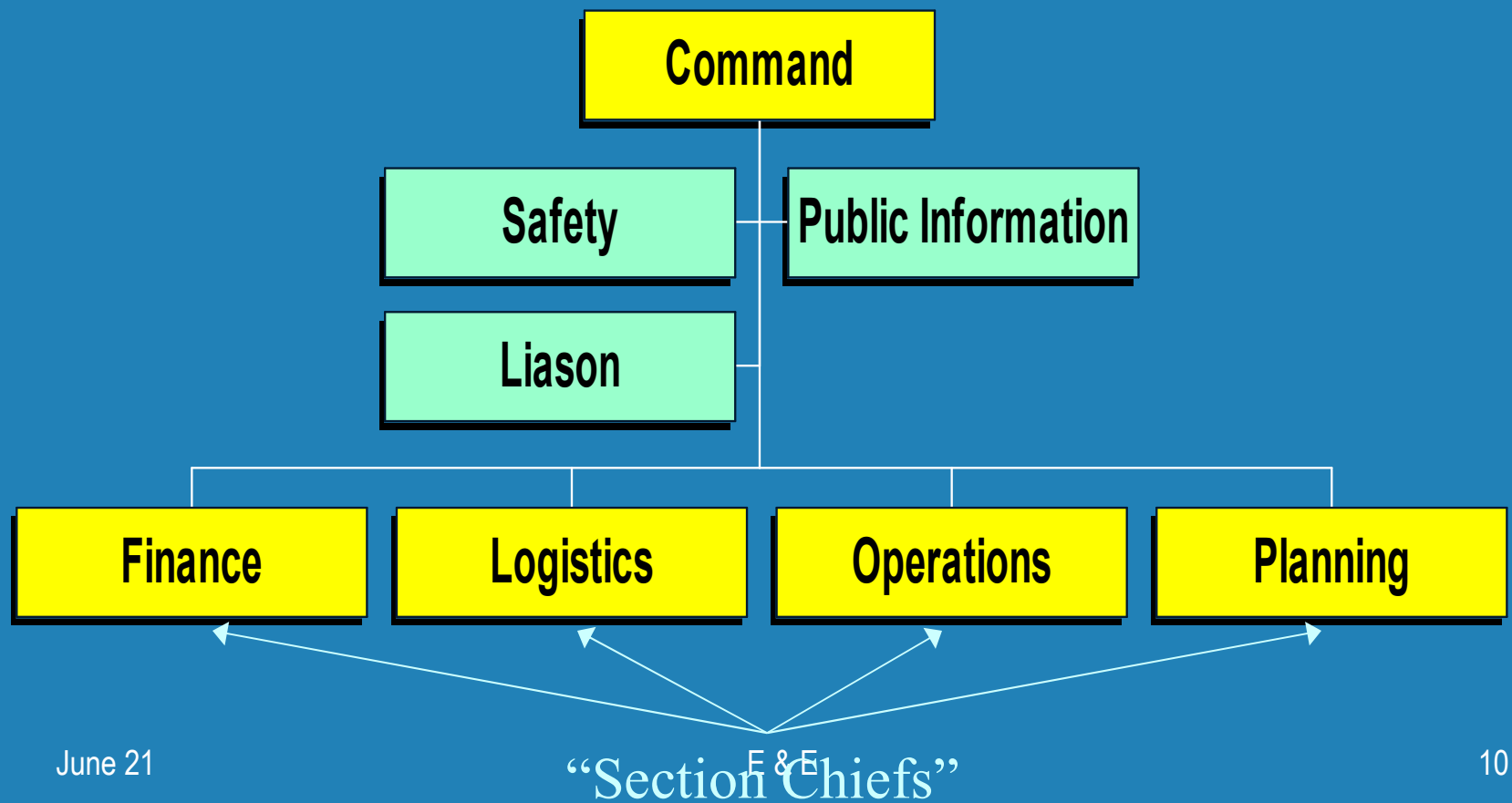




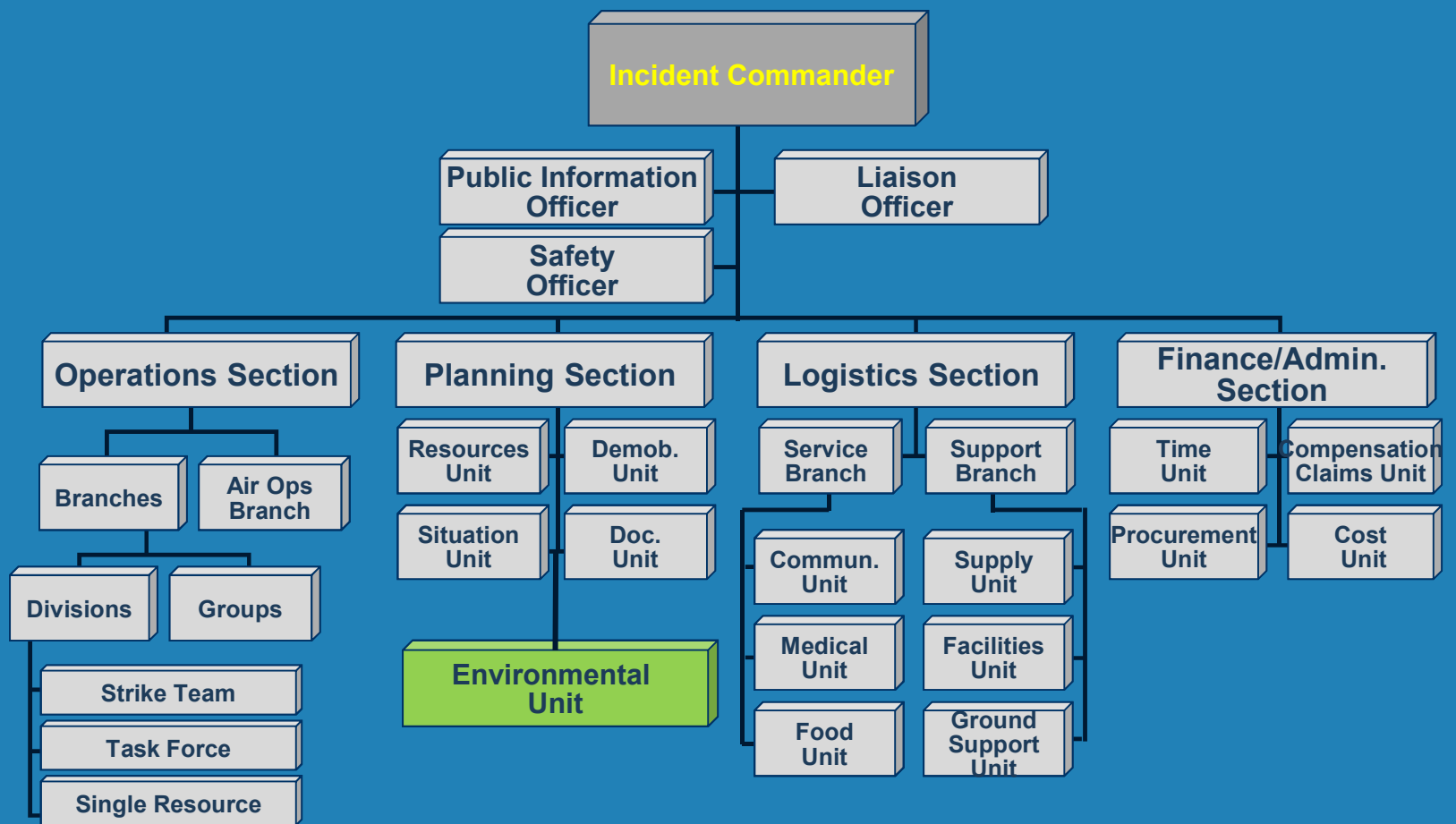
# BENEFITS OF ICS (CONT)

- ∞ **Manageable span-of-control *(5:1)***
- ∞ **Comprehensive resource management**
  - **Unity of effort, maximize efficiency**
- ∞ **Consolidated Incident Action Plans**

# 5 FUNCTIONS OF ICS



# ICS Organization: Review





# ICS

## Small Incident/Emergency

### Incident Command/Operations

(Safety, PIO, Planning, Logistics, and Financial/Admin)

Crew Leader  
Team



# COMMAND FUNCTION

- ∩ **Central responsibility & accountability for response operations**
- ∩ **Provide a central place for communications**
- ∩ **Formulate objectives, priorities, etc**
- ∩ **Assign roles**
- ∩ **Coordinate actions of other functions**



# COMMAND FUNCTION

- ∩ **Retains all positions until delegated to someone**
- ∩ **Also Safety until delegated to someone!!**
- ∩ **Needs to maintain the 1:5 span of control**
- ∩ **Must be in a fixed location**



# OPERATIONS FUNCTION

- ∩ **The groups doing the work**
- ∩ **Group leaders and teams as needed**
- ∩ **Deploying equipment**
- ∩ **Fighting fires/EMS/Clean-up Crew/Evacuation crews**
- ∩ **Mitigating the incident**
- ∩ **Providing current information IC**

# Incident Command System

- ⌚ **That is enough for a small incident**
- ⌚ **There is a lot more to building a good ICS**
- ⌚ **Everyone must know the system, including administrative and non-emergency leadership**
- ⌚ **Must be formally accepted by all local, state, private, and Federal agencies involved in emergency response activity**



<http://training.fema.gov/is/crslst.aspx>

The screenshot shows the FEMA Emergency Management Institute website. The header includes the FEMA logo and the text 'Emergency Management Institute'. A search bar is located on the right. The main content area is divided into six columns: 'EMI Courses & Schedule', 'EMI Students & Instructors', 'Apply', 'Programs & Activities', 'Independent Study', and 'Contact Us'. The 'Independent Study' column is highlighted with a light yellow background. A tooltip labeled 'FEMA Independent Study' is positioned over the 'Independent Study' column. The course IS-100.b is highlighted with a yellow box.

EMI Courses & Schedule	EMI Students & Instructors	Apply	Programs & Activities	Independent Study	Contact Us
Take a Course On Campus	Information for Students and Instructors	Learn how to apply to our programs	Resident, Trainer Program, IEMC, DFTO, etc.	Online courses available free of charge	Contact IS, NIMS, Admissions
IS-100.b Introduction to Incident Command System, ICS-100	IS-700.a National Incident Management System (NIMS) An In...	IS-200.b ICS for Single Resources and Initial Action Inci...	IS-800.b National Response Framework, An Introduction	IS-907 Active Shooter: What You Can Do	IS-100.HCb Introduction to the Incident Command System (I...
IS-1.a Emergency Manager: An Orientation to the Position	IS-5.a An Introduction to Hazardous Materials	IS-230.d Fundamentals of Emergency Management	IS-100.LEb Introduction to the Incident Command System (I...	IS-200.HCa Applying ICS to Healthcare Organizations	IS-120.a An Introduction to Exercises



# FEMA Online Programs

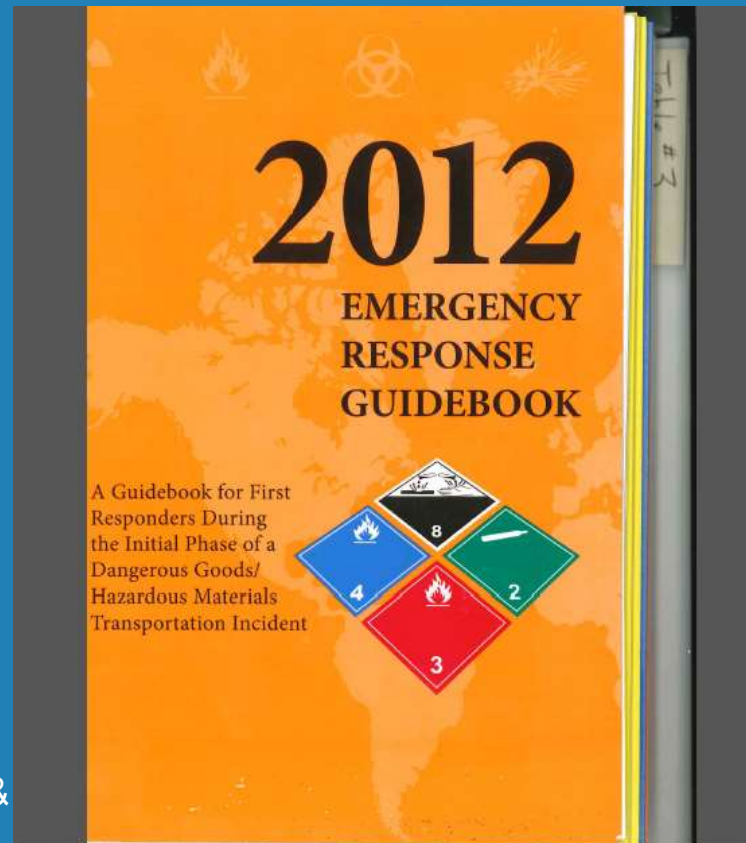
- ∩ **IS-700**
- ∩ **IS-800**
- ∩ **IS-100**
- ∩ **IS-200**
- ∩ **IS-300 Classroom**
- ∩ **IS-400 Classroom**

# 2012

## EMERGENCY RESPONSE GUIDEBOOK



June 21



E &

19





- About Us
- Calendar
- Contact Us
- Data & Statistics
- Electronic Services
- Field Operations
- Grants
- Hazardous Materials Information Center
- Incident Reporting
- International Standards
- Interpretations
- Library
- NTSB Safety Recommendations
- Registration
- Regulations
- Risk Management
- Safety Advisory Notices
- Security
- Special Permits & Approvals
- Training & Outreach

Home > Hazmat Safety Community > Training & Outreach

## Emergency Response Guidebook (ERG)

### Overview



Quickly Identify Hazmat Emergency Procedures

PHMSA's 2012 Emergency Response Guidebook provides first responders with a go-to manual to help deal with hazmat accidents during the critical first 30 minutes. DOT's goal is to place an ERG in every emergency service vehicle nationwide.

To date, nearly 11 million free copies have been distributed to the emergency response community through [state emergency management coordinators](#). Members of the public may purchase a copy of the ERG through the [GPO Bookstore](#) and other [commercial suppliers](#).

**First responders, we want your feedback! Submit your name, organization, contact information, and comments to [ERG2012@dot.gov](mailto:ERG2012@dot.gov).**

#### In This Article:

- [Overview](#)
- [Before an Emergency](#)
- [State Coordinators](#)
- [Argonne National Laboratory Report](#)
- [ERG Data Files \(English\)](#)
- [ERG Data Files \(Spanish\)](#)
- [Emergency Response Guidebook \(ERG\) Training Presentations](#)

#### Related Downloads:

- [Current ERG \(PDF\)](#)
- [ERG2012 Software for Windows XP/Vista/7](#)
- [ERG2012 Mobile Apps Press Release](#)
- [ERG2012 Press Release](#)
- [2012 Summary of Changes from ERG2008](#)
- [CORRECTIONS \(list of changes to the current ERG\)](#)
- [Commercial Suppliers List \(PDF\)](#)
- [Current Spanish ERG \(PDF\)](#)
- [Argonne National Laboratory Report \(PDF\)](#)

#### Related Links:

- [ERG Mobile App](#)
- [National Library of Medicine's WISER \(Wireless Information](#)

### Home

### About PHMSA



- [Mission and Goals](#)
- [About the Agency](#)
- [Key Officials](#)



# ERG 2012 Background Info

- ⌚ **Formerly the DOT Guidebook**
- ⌚ **New edition every four years**
- ⌚ **Designed for people trained to the Awareness Level (pages 2-3)**
- ⌚ **Used for Defensive Actions Only**
- ⌚ **Provides general response guidelines based on chemical hazard characteristics**
- ⌚ **Not chemical-specific- Classes of Chemicals**



# Shipping Documents *(inside cover)*

- ∞ **Required for most hazmat in transportation**
- ∞ **Contain vital info for first responders**
  - **Emergency contact phone number**
  - **Shipping Name, UN 4- digit ID Number**
  - **Hazard Class / Division and Packing Group**
  - **Number / type of packages, Total quantity**
- ∞ ***Note placard examples***

# Shipping Papers

## SHIPPING DOCUMENTS (PAPERS)

Shipping Documents (Papers) are synonymous and can be found as follows:

- Road – kept in the cab of a motor vehicle
- Rail – kept in possession of a crew member
- Aviation – kept in possession of the aircraft pilot
- Marine – kept in a holder on the bridge of a vessel

Shipping Documents (Papers) provide vital information regarding the hazardous materials/dangerous goods to initiate protective actions\*

Information provided:

- 4-Digit Identification Number, UN or NA (go to Yellow Pages) \*\*
- Proper Shipping name (go to Blue Pages)
- Hazard Class or Division number of material
- Packing Group
- Emergency Response Telephone Number
- Information describing the hazards of the material (entered on or attached to shipping document)

EMERGENCY CONTACT 1-000-000-0000		EXAMPLE OF EMERGENCY CONTACT TELEPHONE NUMBER	
HAZARD CLASS OR DIVISION NO.			
NO. & TYPE OF PACKAGES			QUANTITY
1 TANKTRUCK	UN1219	ISOPROPANOL 3	II 12 000 LITERS
ID NUMBER	SHIPPING NAME	PACKING GROUP	

### EXAMPLE OF PLACARD AND PANEL WITH ID NUMBER

The 4-digit ID Number may be shown on the diamond-shaped placard or on an adjacent orange panel displayed on the ends and sides of a cargo tank, vehicle or rail car.



\* For the purposes of this guidebook, the terms hazardous materials/dangerous goods are synonymous.  
 \*\* After January 1, 2013 in the United States, the identification number must appear first in the basic description. For example, "UN2744, Cyclobutyl chloroformate, 6.1, (3, 8), PG II". This is currently optional in Canada.

# How To Use This Guidebook

(White page 1)

Identify the material

Look up the 3-digit Guide Number

- 4 –digit ID Number Index (Yellow pages)
- Alphabetical Name Index (Blue pages)
- Explosives List (p. 1)
- Table of Placards (p. 6-7)
- If no info available, use Guide # 111

“P” suffix - may violently polymerize

Highlighted - Look in Green pages



# How to Use This Guidebook

*(continued)*

- ∞ **Read the Numbered Guide (Orange pages)**
  - Read all sections before responding
- ∞ **Read the “Table of Initial Isolation and Protective Action Distances” (Green pages) if indicated**
- ∞ **Follow Safety Precautions (White page **2**)**
- ∞ **Call for assistance (White pages **392**)**



# DOT Hazard Classification System

(White page 4)

- ⌚ Hazard Classes are identified by a Class (or Division) number and name
- ⌚ Vehicles transporting hazmat must display placards corresponding to the hazard classes of the materials
- ⌚ The Primary Hazard placard includes the class/division number; *Secondary Hazard placards do not*



# DOT Hazard Classes

∩ **Class 1 Explosives**  
– 6 Divisions

∩ **Class 2 Gases**  
– 3 Divisions

∩ **Class 3 Flammable Liquids**

∩ **Class 4 Flammable Solids**  
– 3 Divisions

∩ **Class 5 Oxidizers**  
– 2 Divisions

∩ **Class 6 Toxics**  
– 2 Divisions

∩ **Class 7 Radioactive Material**

∩ **Class 8 Corrosives**

∩ **Class 9 Miscellaneous**

# DOT Placards

## EXAMPLE OF PLACARD AND PANEL WITH ID NUMBER

The 4-digit ID Number may be shown on the diamond-shaped placard or on an adjacent orange panel displayed on the ends and sides of a cargo tank, vehicle or rail car.




A Numbered  
Placard

or

A Placard  
and an  
Orange Panel





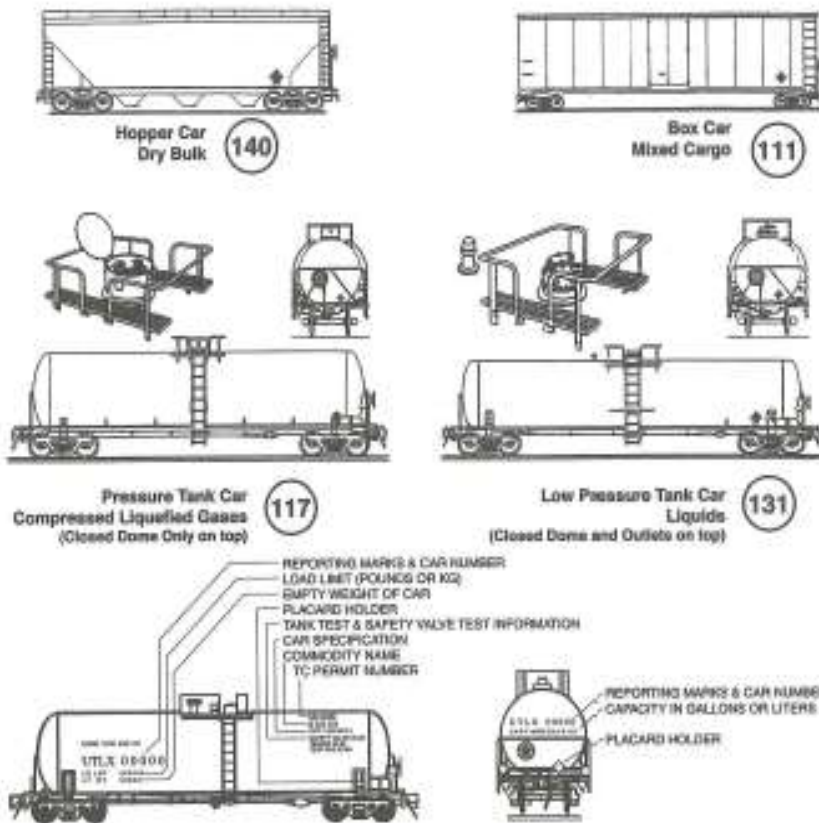


**As you respond to a highway accident, you notice there is no placard number and no visible markings on the over-turned trailer. The driver cannot be found, or doesn't have the proper shipping papers.**

**Where in the ERG can you find information for this situation? And what guide number would you use for a MC-338 Cryogenic Liquid tank?**



## RAIL CAR IDENTIFICATION CHART\*

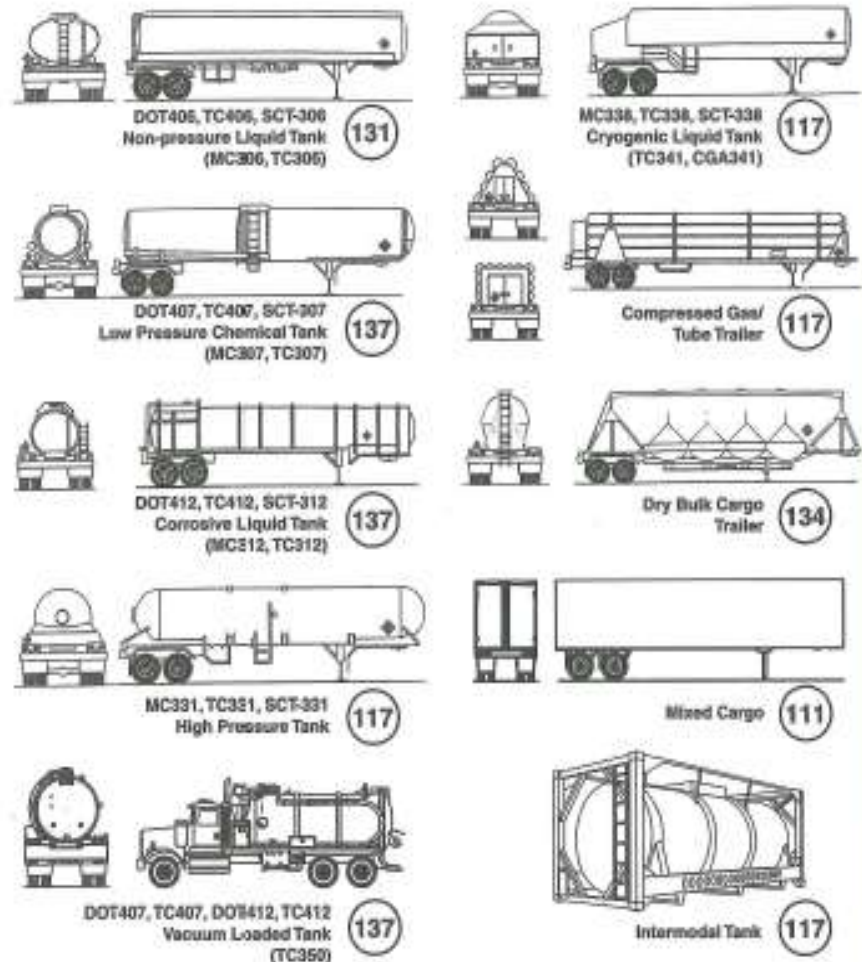


**CAUTION:** Emergency response personnel must be aware that rail tank cars vary widely in construction, fittings and purpose. Tank cars could transport products that may be solids, liquids or gases. The products may be under pressure. It is essential that products be identified by consulting shipping documents or train consist or contacting dispatch centers before emergency response is initiated.

The information stenciled on the sides or ends of tank cars, as illustrated above, may be used to identify the product utilizing:

- the commodity name shown; or
  - the other information shown, especially reporting marks and car number which, when supplied to a dispatch center, will facilitate the identification of the product.
- \* The recommended guides should be considered as last resort if the material cannot be identified by any other means.

## ROAD TRAILER IDENTIFICATION CHART\*



**CAUTION:** This chart depicts only the most general shapes of road trailers. Emergency response personnel must be aware that there are many variations of road trailers, not illustrated above, that are used for shipping chemical products. The suggested guides are for the most hazardous products that may be transported in these trailer types.

- \* The recommended guides should be considered as last resort if the material cannot be identified by any other means.

# What does the 33 and 1203 stand for and where can you find this?

## **HAZARD IDENTIFICATION CODES DISPLAYED ON SOME INTERMODAL CONTAINERS**

Hazard identification codes, referred to as "hazard identification numbers" under European and some South American regulations, may be found in the top half of an orange panel on some intermodal bulk containers. The 4-digit identification number is in the bottom half of the orange panel.




The hazard identification code in the top half of the orange panel consists of two or three figures. In general, the figures indicate the following hazards:

- 2 - EMISSION OF GAS DUE TO PRESSURE OR CHEMICAL REACTION
- 3 - FLAMMABILITY OF LIQUIDS (VAPORS) AND GASES OR SELF-HEATING LIQUID
- 4 - FLAMMABILITY OF SOLIDS OR SELF-HEATING SOLID
- 5 - OXIDIZING (FIRE-INTENSIFYING) EFFECT
- 6 - TOXICITY OR RISK OF INFECTION
- 7 - RADIOACTIVITY
- 8 - CORROSIVITY
- 9 - RISK OF SPONTANEOUS VIOLENT REACTION

- Doubling of a figure indicates an intensification of that particular hazard (i.e. 33, 66, 88).
- Where the hazard associated with a material can be adequately indicated by a single figure, the figure is followed by a zero (i.e. 30, 40, 50).
- A hazard identification code prefixed by the letter "X" indicates that the material will react dangerously with water (i.e. X88).





**While responding to a highway accident, you notice a placard with the number 2618 on an involved tanker**

**Where would you look in the ERG 2012 to identify the contents of the tanker?**

# ID Number Index (Yellow pages)

ID No.	Guide No.	Name of Material	ID No.	Guide No.	Name of Material
2599	126	Chlorotrifluoromethane and Trifluoromethane azeotropic mixture with approximately 60% Chlorotrifluoromethane	2602	126	Refrigerant gas R-12 and Refrigerant gas R-152a azeotropic mixture with 74% Refrigerant gas R-12
2599	126	Refrigerant gas R-13 and Refrigerant gas R-23 azeotropic mixture with 60% Refrigerant gas R-13	2602	126	Refrigerant gas R-152a and Refrigerant gas R-12 azeotropic mixture with 74% Refrigerant gas R-12
2599	126	Refrigerant gas R-23 and Refrigerant gas R-13 azeotropic mixture with 60% Refrigerant gas R-13	2602	126	Refrigerant gas R-500 (azeotropic mixture of Refrigerant gas R-12 and Refrigerant gas R-152a with approximately 74% Refrigerant gas R-12)
2599	126	Refrigerant gas R-503 (azeotropic mixture of Refrigerant gas R-13 and Refrigerant gas R-23 with approximately 60% Refrigerant gas R-13)	2603	131	Cycloheptatriene
2599	126	Trifluoromethane and Chlorotrifluoromethane azeotropic mixture with approximately 60% Chlorotrifluoromethane	2604	132	Boron trifluoride diethyl etherate
2600	119	Carbon monoxide and Hydrogen mixture	2605	155	Methoxymethyl isocyanate
2600	119	Carbon monoxide and Hydrogen mixture, compressed	2606	155	Methyl orthosilicate
2600	119	Hydrogen and Carbon monoxide mixture	2607	129P	Acrolein dimer, stabilized
2600	119	Hydrogen and Carbon monoxide mixture, compressed	2608	129	Nitropropanes
2601	115	Cyclobutane	2609	156	Triallyl borate
2602	126	Dichlorodifluoromethane and	2610	132	Triallylamine
			2611	131	Propylene chlorohydrin
			2612	127	Methyl propyl ether
			2614	129	Methyl alcohol
			2615	127	Ethyl propyl ether
			2616	129	Triisopropyl borate
			2617	129	Methylcyclohexanols
			2618	130P	Vinyltoluenes, inhibited
			2619	132	Benzyl dimethylamine

# Numbered Guide (orange pages)

**GUIDE  
130**

**FLAMMABLE LIQUIDS  
(NON-POLAR/WATER-IMMISCIBLE/NOXIOUS)**

NAERG96

## POTENTIAL HAZARDS

### FIRE OR EXPLOSION

- **HIGHLY FLAMMABLE:** Will be easily ignited by heat, sparks or flames.
- Vapors may form explosive mixtures with air.
- Vapors may travel to source of ignition and flash back.
- Most vapors are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks).
- Vapor explosion hazard indoors, outdoors or in sewers.
- Some may polymerize (P) explosively when heated or involved in a fire.
- Runoff to sewer 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.
- Inhalation or contact with material may irritate or burn skin and eyes.
- Fire will produce irritating, corrosive and/or toxic gases.
- Vapors may cause dizziness or suffocation.
- Runoff from fire control or dilution water may cause pollution.

## PUBLIC SAFETY

- **CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.**
- Isolate spill or leak area immediately for at least 50 to 100 meters (160 to 330 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 firefighters' protective clothing will only provide limited protection.

## EVACUATION

### Large Spill

- Consider initial downwind evacuation for at least 300 meters (1000 feet).

### Fire

- If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.

NAERG96

**FLAMMABLE LIQUIDS  
(NON-POLAR/WATER-IMMISCIBLE/NOXIOUS)**

**GUIDE  
130**

## EMERGENCY RESPONSE

### FIRE

**CAUTION:** All these products have a very low flash point: Use of water spray when fighting fire may be inefficient.

#### Small Fires

- Dry chemical, CO<sub>2</sub>, water spray or regular foam.

#### Large Fires

- Water spray, fog or regular foam.
- **Do not use straight streams.**
- Move containers from fire area if you can do it without risk.

#### Fire involving Tanks or Car/Trailer Loads

- Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
- Cool containers with flooding quantities of water until well after fire is out.
- Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
- **ALWAYS** stay away from the ends of tanks.
- For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

## SPILL OR LEAK

- **ELIMINATE** all ignition sources (no smoking, flares, sparks or flames in immediate area).
- All equipment used when handling the product must be grounded.
- Do not touch or walk through spilled material.
- Stop leak if you can do it without risk.
- Prevent entry into waterways, sewers, basements or confined areas.
- A vapor suppressing foam may be used to reduce vapors.
- Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers.
- Use clean non-sparking tools to collect absorbed material.
- **Large Spills** • Dike far ahead of liquid spill for later disposal.
- Water spray may reduce vapor; but may not prevent ignition in closed spaces.

## FIRST AID

- Move victim to fresh air. • Call emergency medical care.
- Apply artificial respiration if victim is not breathing.
- Administer oxygen if breathing is difficult.
- Remove and isolate contaminated clothing and shoes.
- In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
- Wash skin with soap and water.
- Keep victim warm and quiet.
- Effects of exposure (inhalation, ingestion or skin contact) to substance may be delayed.
- Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.



# Insert Blue Page picture

June 21

E & E

36



# Numbered Guide (orange pages)

**GUIDE  
137**

**SUBSTANCES - WATER-REACTIVE - CORROSIVE**

**NAERG96**

## POTENTIAL HAZARDS

### HEALTH

- TOXIC; inhalation, ingestion or contact (skin, eyes) with vapors, dusts or substance may cause severe injury, burns, or death.
- Fire will produce irritating, corrosive and/or toxic gases.
- Reaction with water may generate much heat which will increase the concentration of fumes in the air.
- Contact with molten substance may cause severe burns to skin and eyes.
- Runoff from fire control or dilution water may cause pollution.

### FIRE OR EXPLOSION

- Some of these materials may burn, but none ignite readily.
- May ignite combustibles (wood, paper, oil, clothing, etc.).
- Substance will react with water (some violently), releasing corrosive and/or toxic gases.
- Flammable/toxic gases may accumulate in confined areas (basement, tanks, hopper/tank cars etc.).
- Contact with metals may evolve flammable hydrogen gas.
- Containers may explode when heated or if contaminated with water.
- Substance may be transported in a molten form.

## PUBLIC SAFETY

- **CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.**
- Isolate spill or leak area immediately for at least 50 to 100 meters (160 to 330 feet) in all directions.
- Keep unauthorized personnel away.
- Stay upwind.
- Keep out of low areas.
- Ventilate enclosed areas.

## PROTECTIVE CLOTHING

- Wear positive pressure self-contained breathing apparatus (SCBA).
- Wear chemical protective clothing which is specifically recommended by the manufacturer.
- Structural firefighters' protective clothing is recommended for fire situations ONLY; it is not effective in spill situations.

## EVACUATION

### Spill

- See the Table of Initial Isolation and Protective Action Distances for highlighted substances. For non-highlighted substances, increase, in the downwind direction, as necessary, the isolation distance shown under "PUBLIC SAFETY".

### Fire

- If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.

**NAERG96**

**SUBSTANCES - WATER-REACTIVE - CORROSIVE**

**GUIDE  
137**

## EMERGENCY RESPONSE

### FIRE

- **When material is not involved in fire: do not use water on material itself.**

#### Small Fires

- Dry chemical or CO<sub>2</sub>.
- Move containers from fire area if you can do it without risk.

#### Large Fires

- Flood fire area with large quantities of water, while knocking down vapors with water fog. If insufficient water supply: knock down vapors only.

#### Fire Involving Tanks or Car/Trailer Loads

- Cool containers with flooding quantities of water until well after fire is out.
- Do not get water inside containers.
- Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
- ALWAYS stay away from the ends of tanks.

### SPILL OR LEAK

- Fully encapsulating, vapor protective clothing should be worn for spills and leaks with no fire.
- Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.
- Stop leak if you can do it without risk.
- Use water spray to reduce vapors; do not put water directly on leak, spill area or inside container.
- Keep combustibles (wood, paper, oil, etc.) away from spilled material.
- **Small Spills** • Cover with DRY earth, DRY sand, or other non-combustible material followed with plastic sheet to minimize spreading or contact with rain.
- Use clean non-sparking tools to collect material and place it into loosely covered plastic containers for later disposal.
- Prevent entry into waterways, sewers, basements or confined areas.

### FIRST AID

- Move victim to fresh air. • Call emergency medical care.
- Apply artificial respiration if victim is not breathing.
- **Do not use mouth-to-mouth method if victim ingested or inhaled the substance; induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.**
- Administer oxygen if breathing is difficult.
- Remove and isolate contaminated clothing and shoes.
- In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
- For minor skin contact, avoid spreading material on unaffected skin.
- Removal of solidified molten material from skin requires medical assistance.
- Keep victim warm and quiet.
- Effects of exposure (inhalation, ingestion or skin contact) to substance may be delayed.
- Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.



# **Table of Initial Isolation and Protective Action Distances (Green pages)**

**Used for goods considered toxic by inhalation (TIH)**

**Based on first 30 minutes after spill**

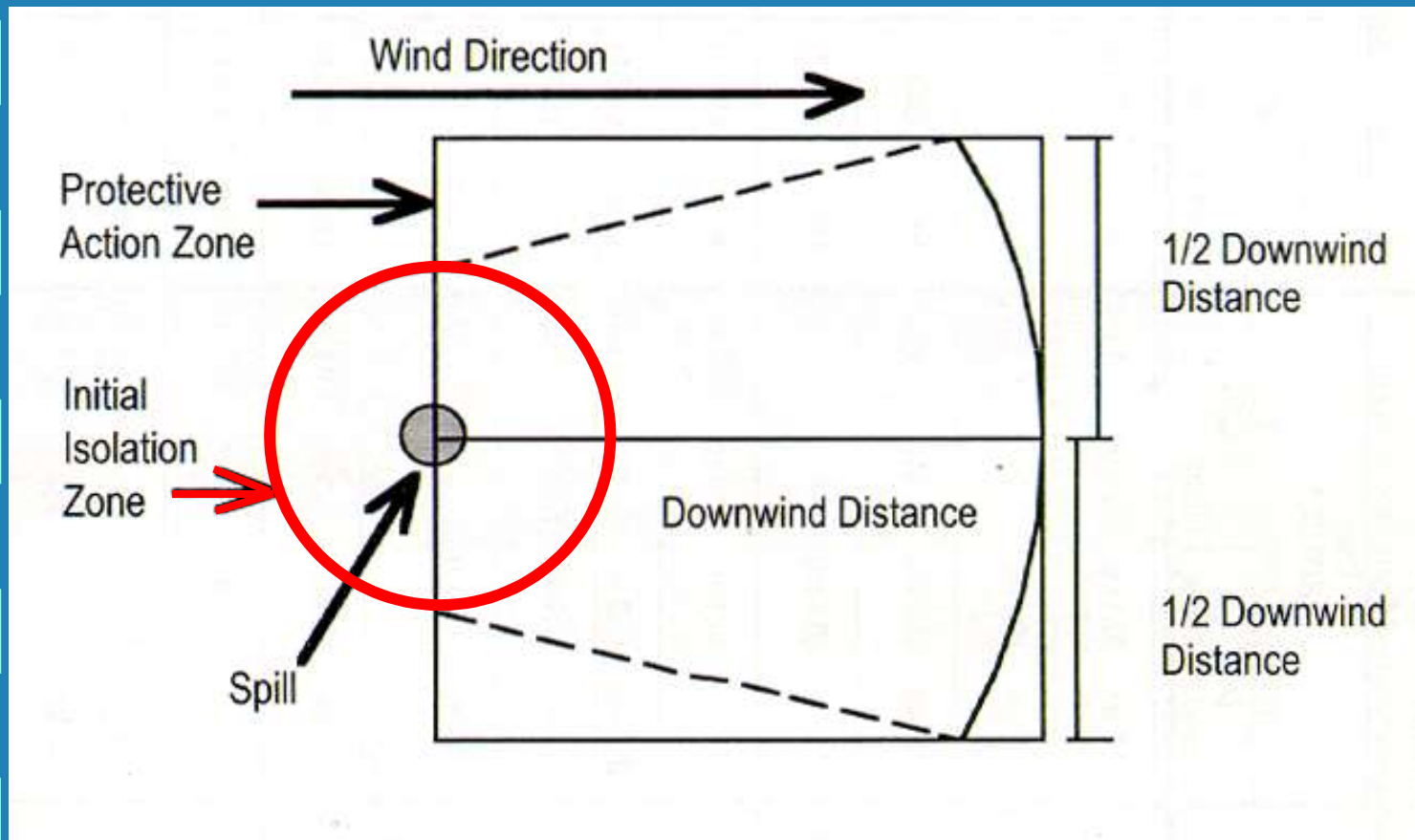
**Many factors may affect actual distances needed**

**Divided by Small/Large and Day/Night**

- Small spill - generally up to 55 gallons**
- Daytime - atmosphere generally less stable so plume breaks up more quickly**

# Initial Isolation vs. Protective Action

(Green pages **290-291**)





# Isolation & Protection Distances (Green pages)

TABLE 1 - INITIAL ISOLATION AND PROTECTIVE ACTION DISTANCES

Page 292

ID No.	Guide	NAME OF MATERIAL	SMALL SPILLS (From a small package or small leak from a large package)				LARGE SPILLS (From a large package or from many small packages)			
			First ISOLATE in all Directions Meters (Feet)	Then PROTECT persons Downwind during-		First ISOLATE in all Directions Meters (Feet)	Then PROTECT persons Downwind during-			
				DAY Kilometers (Miles)	NIGHT Kilometers (Miles)		DAY Kilometers (Miles)	NIGHT Kilometers (Miles)		
1005 *	125	Ammonia, anhydrous	30 m (100 ft)	0.1 km (0.1 mi)	0.2 km (0.1 mi)	150 m (500 ft)	0.8 km (0.5 mi)	2.0 km (1.3 mi)		
1005 *	125	Anhydrous ammonia								
1008	125	Boron trifluoride	30 m (100 ft)	0.1 km (0.1 mi)	0.5 km (0.4 mi)	300 m (1000 ft)	1.7 km (1.1 mi)	4.8 km (3.0 mi)		
1008	125	Boron trifluoride, compressed								
1016	119	Carbon monoxide	30 m (100 ft)	0.1 km (0.1 mi)	0.2 km (0.1 mi)	200 m (600 ft)	1.2 km (0.8 mi)	4.8 km (3.0 mi)		
1016	119	Carbon monoxide, compressed								
1017 *	124	Chlorine	60 m (200 ft)	0.4 km (0.2 mi)	1.5 km (1.0 mi)	500 m (1500 ft)	3.0 km (1.9 mi)	7.9 km (4.9 mi)		
1023	119	Coal gas	60 m (200 ft)	0.2 km (0.1 mi)	0.2 km (0.1 mi)	100 m (300 ft)	0.4 km (0.2 mi)	0.5 km (0.3 mi)		
1023	119	Coal gas, compressed								
1026	119	Cyanogen	30 m (100 ft)	0.1 km (0.1 mi)	0.5 km (0.3 mi)	60 m (200 ft)	0.4 km (0.2 mi)	1.7 km (1.0 mi)		
1026	119	Cyanogen gas								
1040 *	119P	Ethylene oxide	30 m (100 ft)	0.1 km (0.1 mi)	0.2 km (0.1 mi)	150 m (500 ft)	0.9 km (0.5 mi)	2.0 km (1.3 mi)		
1040 *	119P	Ethylene oxide with Nitrogen								
1045	124	Fluorine	30 m (100 ft)	0.1 km (0.1 mi)	0.2 km (0.1 mi)	100 m (300 ft)	0.5 km (0.3 mi)	2.3 km (1.4 mi)		
1045	124	Fluorine, compressed								
1048	125	Hydrogen bromide, anhydrous	30 m (100 ft)	0.1 km (0.1 mi)	0.3 km (0.2 mi)	200 m (600 ft)	1.2 km (0.8 mi)	3.9 km (2.4 mi)		
1050 *	125	Hydrogen chloride, anhydrous	30 m (100 ft)	0.1 km (0.1 mi)	0.3 km (0.2 mi)	60 m (200 ft)	0.3 km (0.2 mi)	1.3 km (0.8 mi)		
1051	117	AC (when used as a weapon)	60 m (200 ft)	0.3 km (0.2 mi)	1.0 km (0.6 mi)	1000 m (3000 ft)	3.7 km (2.3 mi)	8.4 km (5.3 mi)		



# Table 2

## HOW TO USE TABLE 2 - WATER-REACTIVE MATERIALS WHICH PRODUCE TOXIC GASES

Table 2 lists materials which produce large amounts of Toxic Inhalation Hazard (TIH) gases when spilled in water and identifies the TIH gases produced.

The materials are listed by ID number order.

These Water Reactive materials are easily identified in Table 1 as their name is immediately followed by (when spilled in water).

**Note:** Some Water Reactive materials are also TIH materials themselves (e.g., Bromine trifluoride (1746), Thionyl chloride (1836), etc.). In these instances, two entries are provided in Table 1 for land-based and water-based spills. If the Water Reactive material is **NOT** a TIH and this material is **NOT** spilled in water, Table 1 and Table 2 do not apply and safety distances will be found within the appropriate orange guide.

## TABLE 2 - WATER-REACTIVE MATERIALS WHICH PRODUCE TOXIC GASES

Materials Which Produce Large Amounts of Toxic-by-Inhalation (TIH) Gas(es) When Spilled in Water

ID No.	Guide No.	Name of Material	TIH Gas(es) Produced
1162	155	Dimethyldichlorosilane	HCl
1183	139	Ethyldichlorosilane	HCl
1196	155	Ethyltrichlorosilane	HCl
1242	139	Methyldichlorosilane	HCl
1250	155	Methyltrichlorosilane	HCl
1295	139	Trichlorosilane	HCl
1298	155	Trimethyldichlorosilane	HCl
1305	155P	Vinyltrichlorosilane	HCl
1305	155P	Vinyltrichlorosilane, stabilized	HCl
1340	139	Phosphorus pentasulfide, free from yellow and white Phosphorus	H <sub>2</sub> S
1340	139	Phosphorus pentasulphide, free from yellow and white Phosphorus	H <sub>2</sub> S
1360	139	Calcium phosphide	PH <sub>3</sub>
1384	135	Sodium dithionite	H <sub>2</sub> S, SO <sub>2</sub>
1384	135	Sodium hydrosulfite	H <sub>2</sub> S, SO <sub>2</sub>
1384	135	Sodium hydrosulphite	H <sub>2</sub> S, SO <sub>2</sub>
1397	139	Aluminum phosphide	PH <sub>3</sub>
1419	139	Magnesium aluminum phosphide	PH <sub>3</sub>
1432	139	Sodium phosphide	PH <sub>3</sub>
1541	155	Acetone cyanohydrin, stabilized	HCN
1680	157	Potassium cyanide	HCN
1680	157	Potassium cyanide, solid	HCN
1689	157	Sodium cyanide	HCN
1689	157	Sodium cyanide, solid	HCN

### Chemical Symbols for TIH Gases:

Br <sub>2</sub>	Bromine	HF	Hydrogen fluoride	NO <sub>2</sub>	Nitrogen dioxide
Cl <sub>2</sub>	Chlorine	HI	Hydrogen iodide	PH <sub>3</sub>	Phosphine
HBr	Hydrogen bromide	H <sub>2</sub> S	Hydrogen sulfide	SO <sub>2</sub>	Sulfur dioxide
HCl	Hydrogen chloride	H <sub>2</sub> S	Hydrogen sulphide	SO <sub>2</sub>	Sulphur dioxide
HCN	Hydrogen cyanide	NH <sub>3</sub>	Ammonia		

Table # 3

Table

# Water-Reactive Materials

(Green pages **344-350**)

TABLE OF WATER-REACTIVE MATERIALS WHICH PRODUCE TOXIC GASES

Materials Which Produce Large Amounts of Toxic-by-Inhalation (TIH) Gas(es)  
*When Spilled in Water*

ID No.	Guide No.	Name of Material	TIH Gas(es) Produced
1834	137	Sulfuryl chloride	HCl SO <sub>3</sub>
1834	137	Sulphuryl chloride	HCl SO <sub>3</sub>
1836	137	Thionyl chloride	HCl SO <sub>2</sub>
1838	137	Titanium tetrachloride	HCl
1898	156	Acetyl iodide	HI
1923	135	Calcium dithionite	H <sub>2</sub> S SO <sub>2</sub>
1923	135	Calcium hydrosulfite	H <sub>2</sub> S SO <sub>2</sub>
1923	135	Calcium hydrosulphite	H <sub>2</sub> S SO <sub>2</sub>
1939	137	Phosphorus oxybromide	HBr
1939	137	Phosphorus oxybromide, solid	HBr
2004	135	Magnesium diamide	NH <sub>3</sub>
2011	139	Magnesium phosphide	PH <sub>3</sub>
2012	139	Potassium phosphide	PH <sub>3</sub>
2013	139	Strontium phosphide	PH <sub>3</sub>
2442	156	Trichloroacetyl chloride	HCl





# BLEVE

## BLEVE - SAFETY PRECAUTIONS

**Use with caution.** The following table gives a summary of tank properties, critical times, critical distances and cooling water flow rates for various tank sizes. This table is provided to give responders some guidance but it should be used with caution.

**Tank dimensions are approximate** and can vary depending on the tank design and application.

**Minimum time to failure** is based on *severe torch fire impingement* on the vapour space of a tank in good condition, and is approximate. Tanks may fail earlier if they are damaged or corroded. Tanks may fail minutes or hours later than these minimum times depending on the conditions. It has been assumed here that the tanks are not equipped with thermal barriers or water spray cooling.

**Minimum time to empty** is based on an engulfing fire with a properly sized pressure relief valve. If the tank is only partially engulfed then time to empty will increase i.e., if tank is 50% engulfed then the tanks will take twice as long to empty). Once again, it has been assumed that the tank is not equipped with a thermal barrier or water spray.

**Tanks equipped with thermal barriers or water spray cooling** significantly increase the times to failure and the times to empty. A thermal barrier can reduce the heat input to a tank by a factor of ten or more. This means it could take ten times as long to empty the tank through the Pressure Relief Valve (PRV).

**Fireball radius and emergency response distance** is based on mathematical equations and is approximate. They assume spherical fireballs and this is not always the case.

**Two safety distances for public evacuation.** The minimum distance is based on tanks that are launched with a small elevation angle (i.e., a few degrees above horizontal). This is most common for horizontal cylinders. The preferred evacuation distance has more margin of safety since it assumes the tanks are launched at a 45 degree angle to the horizontal. This might be more appropriate if a vertical cylinder is involved.

It is understood that these distances are very large and may not be practical in a highly populated area. However, it should be understood that the risks increase rapidly the closer you are to a BLEVE. Keep in mind that the furthest reaching projectiles tend to come off in the zones 45 degrees on each side of the tank ends.

**Water flow rate is based on  $\sqrt{\text{capacity (USgal)}} = \text{usgal/min}$  needed to cool tank metal.**

**Warning:** the data given are approximate and should only be used with extreme caution. For example, where times are given for tank failure or tank emptying through the pressure relief valve - these times are typical but they can vary from situation to situation. Therefore, never risk life based on these times.

20 lb propane tanks hold 4.7 gallons of propane @ 4.2 lb/Gallon

BLEVE  
(USE WITH CAUTION)

Capacity	Diameter	Length	Propane Mass	Minimum time to failure for severe torch	Approximate time to empty for engulfing fire	Fireball radius	Emergency response distance	Minimum evacuation distance	Preferred ammunition distance	Cooling water flow rate	
										Meters (Feet)	Litres (USGals)
100 (38.8)	0.3 (1)	1.5 (4.9)	40 (88)	4	8	16 (33)	90 (295)	104 (305)	307 (1007)	94.5	25
400 (154.0)	0.61 (2)	1.5 (4.9)	160 (352)	4	12	16 (33)	90 (295)	244 (891)	489 (1601)	139.3	50
2000 (770)	0.95 (3.2)	3 (9.8)	800 (1754)	5	18	28 (92)	111 (364)	417 (1386)	834 (2736)	424	112
4000 (1540)	1 (3.3)	4.5 (16.1)	1600 (3527)	5	20	35 (115)	140 (459)	635 (1722)	1270 (3445)	388	150
6000 (2088)	1.25 (4.1)	6.5 (21.3)	2400 (7655)	6	22	41 (144)	178 (577)	861 (2169)	1723 (4341)	648	224
20000 (8486)	2.1 (6.9)	6.7 (22)	8000 (19400)	7	28	62 (203)	247 (810)	1205 (3038)	2410 (6076)	1404	371
42000 (16212)	2.1 (6.9)	11.8 (38.7)	16930 (37627)	7	32	77 (253)	305 (1004)	1149 (3779)	2298 (7218)	1608	512
85000 (31632)	2.75 (9)	15.7 (51)	20800 (72310)	8	40	95 (315)	383 (1257)	1435 (4706)	2870 (9138)	2718	716
140000 (54040)	3.3 (10.8)	17.2 (56.4)	26000 (122457)	9	45	114 (374)	457 (1499)	1715 (5607)	3430 (11210)	3539	885

# BLEVE

20 lb propane tanks hold 4.7 gallons  
 4.1 gallons of propane or 4.2 lb/Gallon

## BLEVE (USE WITH CAUTION)

Capacity	Diameter	Length	Propane Mass	Minimum time to failure for severe torch	Approximate time to empty for engulfing fire	Fireball radius	Emergency response distance	Minimum evacuation distance	Preferred evacuation distance	Cooling water flow rate	
										Litres (Gallons)	Meters (Feet)
100 (38.6)	0.3 (1)	1.5 (4.9)	4 (88)	4	8	10 (33)	90 (295)	154 (505)	307 (1007)	94.6	25
400 (154.4)	0.61 (2)	1.5 (4.9)	160 (353)	4	12	16 (53)	90 (295)	244 (801)	488 (1601)	189.3	50
2000 (772)	0.96 (3.2)	3 (9.8)	800 (1764)	5	18	28 (92)	111 (364)	417 (1368)	834 (2736)	424	112
4000 (1544)	1 (3.3)	4.9 (16.1)	1600 (3527)	5	20	35 (115)	140 (459)	525 (1722)	1050 (3445)	598	158
8000 (3088)	1.25 (4.1)	6.3 (21.3)	3200 (7055)	6	22	44 (144)	176 (577)	661 (2169)	1323 (4341)	848	224
22000 (8492)	2.1 (6.9)	6.7 (22)	8800 (19400)	7	28	62 (203)	247 (810)	926 (3038)	1852 (6078)	1404	371
42000 (16212)	2.1 (6.9)	11.8 (38.7)	16800 (37037)	7	32	77 (253)	306 (1004)	1149 (3770)	2200 (7218)	1938	512
82000 (31652)	2.75 (9)	13.7 (45)	32800 (72310)	8	40	96 (315)	383 (1257)	1435 (4708)	2200 (7218)	2710	716
140000 (54048)	3.3 (10.8)	17.2 (56.4)	56000 (123457)	9	45	114 (374)	467 (1499)	1715 (5627)	2200 (7218)	3539	935

# BLEVE

Boiling

Liquid

Expanding

Vapor

Explosion.

June 21

E & E



46

Improvised Explosive Device (IED)  
SAFE STAND OFF DISTANCE

	Threat Description	Explosives Mass (TNT equivalent) <sup>1</sup>		Building Evacuation Distance <sup>2</sup>		Outdoor Evacuation Distance <sup>3</sup>	
		lbs	kg	ft	m	ft	m
High Explosives (TNT Equivalent)	Pipe Bomb	5	2.3	70	21	850	259
	Suicide Belt	10	4.5	90	27	1,080	330
	Suicide Vest	20	9	110	34	1,360	415
	Briefcase/Suitcase Bomb	50	23	150	46	1,850	564
	Compact Sedan	500	227	320	98	1,500	457
	Sedan	1,000	454	400	122	1,750	534
	Passenger/Cargo Van	4,000	1,814	640	195	2,750	838
	Small Moving Van/ Delivery Truck	10,000	4,536	860	263	3,750	1,143
	Moving Van/Water Truck	30,000	13,608	1,240	375	6,500	1,982
	Semitrailer	60,000	27,216	1,570	475	7,000	2,134

	Threat Description	LPG Mass/ Volume <sup>1</sup>		Fireball Diameter <sup>4</sup>	Safe Distance <sup>5</sup>		
		lbs/gal	kg/L		ft	m	
Liquefied Petroleum Gas (LPG - Butane or Propane)	Small LPG Tank	20	9	40	12	160	48
	Large LPG Tank	100	45	69	21	276	84
	Commercial/ Residential LPG Tank	2,000	907	184	56	736	224
	Small LPG Truck	8,000	3,630	292	89	1,168	356
	Semitanker LPG	40,000	18,144	499	152	1,996	608

<sup>1</sup> Based on the maximum amount of material that could reasonably fit into a container or vehicle. Variations possible.

<sup>2</sup> Governed by the ability of an unreinforced building to withstand severe damage or collapse.

<sup>3</sup> Governed by the greater of fragment throw distance or glass breakage/falling glass hazard distance. These distances can be reduced for personnel wearing ballistic protection. Note that the pipe bomb, suicide belt/vest, and briefcase/suitcase bomb are assumed to have a fragmentation characteristic that requires greater standoff distances than an equal amount of explosives in a vehicle.

<sup>4</sup> Assuming efficient mixing of the flammable gas with ambient air.

<sup>5</sup> Determined by U.S. firefighting practices wherein safe distances are approximately 4 times the flame height. Note that an LPG tank filled with high explosives would require a significantly greater standoff distance than if it were filled with LPG.

# Improvised Explosive Device (IED)



# Other (white page) Information

**Intro: Table of Initial Isolation and Protective  
Action Distances** 285

**Protective Action Decision Factors** 287

**Protective Actions** 288

**Background - Isolation and Protective Action  
Table** 289

**Glossary** 374

**Pub Data**

**Emergency Numbers *(inside back cover)***





# White Pages (continued)

⌚	<b>“ERG 2012 USER’S GUIDE”</b>	<b>356</b>
⌚	<b>Protective Clothing</b>	<b>361</b>
⌚	<b>Fire and Spill Control</b>	<b>363</b>
⌚	<b>Criminal/Terrorist Use of Chemical/Biological Agents</b>	<b>368</b>
⌚	<b>Improvised Explosive Device (IED)</b>	<b>372</b>

# Questions???



**Beemer—\$28,000**  
**Fire hose—\$300**  
**Knocking the glass out of this Idiots car—PRICELESS!!**