



Electronic Specialty Materials Security Program

Sept. 11, 2007

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Dir. Of ER & Disposal Technology

Eugene Y. Ngai

Mr. Eugene Ngai is the Director of ER & Disposal Technology for Products and Chemicals.

Eugene has a BS in Chemical Engineering and an MS in Environmental Engineering, all from New Jersey Institute of Technology.

He has over 30 years of Specialty Gas Experience in Production, Laboratory, R&D, Engineering, Safety positions at Matheson, Exxon Research, Solkatronic Chemicals and Scientific Gas Products. Had increasing management responsibilities during his career and held an Executive Management position as Vice President of Corporate Development and Technology for Solkatronic Chemicals for 10 years prior to the Air Products acquisition in 1999. He had responsibility for EHS, Engineering, Information Technology, Research and Development, and Quality. Most recently he was Director of Compound Semiconductor Technology in the Electronics Division and is now Director of ER and Disposal Technology in the Product Safety Group.

He is active in a number of industry associations, Compressed Gas Association (CGA), Asia Industrial Gas Association (AIGA), National Fire Protection Association (NFPA) and the Semiconductor Environmental Health and Safety Association (SESHA)

He also developed and manages the Emergency Response Equipment and Training group since 1990. He is the Course Director for a 3 day Specialty Gas Emergency Response course, which has trained over 4000 customers, government agencies and employees since 1990. He has trained over 750 Firefighters in Compressed Gas Safety and Emergency Response. He has taught at a number of Fire Academies worldwide, including New York and Singapore

He has made numerous presentations worldwide on Emergency Response, Product Safety, Gas Technology and Environment over the last 25 years.

He has 4 US patents for Gas Safety Devices and 2 pending for new Purification and Process Technology

Terrorist Use of Gas Cylinders

- In early April, 2003, a small device detonated inside the bathroom of a McDonald's restaurant in Beirut, Lebanon, injuring three people and driving most patrons outside. A short time later, a vehicle-borne improvised explosive device (VBIED) containing 55 kg of TNT and three propane cylinders parked outside the restaurant failed to function as planned. Only two of the three detonators fired, failing to initiate the device's main charge and the three propane cylinders. Based on the location and timing of the devices, the bombers apparently intended for the customers to be initially forced out of the restaurant and subsequently killed as they gathered outside.

Terrorism

Terrorism has been defined by the Federal Bureau of Investigation as “the unlawful use of force or violence against persons or property to intimidate or coerce a government, the civilian population, or any segment of it in furtherance of political or social objectives.” More importantly, it is necessary to understand that the objective of terrorism is not destruction or death – it is the psychological impact to the targeted population and world opinion. Disruption to public services, economies, and social patterns or a feeling of insecurity is the desired goal.

High Probability Low Impact	High Probability Moderate Impact	High Probability High Impact
Moderate Probability Low Impact	Moderate Probability Moderate Impact	Moderate Probability High Impact
Low Probability Low Impact	Low Probability Moderate Impact	Low Probability High Impact

Chemical Security at AP

- **Air Products has been one of the chemical industry leaders in developing security standards and regulations**
 - **American Chemistry Council**
 - **Compressed Gas Association**
 - **Chemical Sector Coordinating Council**
- **Created Security Committee at CGA**

Key Security Programs

- **Employee Security**
- **Global Operations Security**
 - Facility
 - Transportation Security
 - Product Security
- **Incident Reporting and Business Investigations**

Global Operations Security

- **Loss of containment of toxic or hazardous material at a facility or during transportation that can result in loss of life**
- **Materials that can be purchased or stolen and used as weapons of mass destruction (WMD) or precursors to WMD**
- **Product contamination resulting in loss of life**
- **A terrorist attack on a facility to disrupt the global and/or a national economy**

Product Transactions

- **Developed a list of APCI “Chemicals of Concern” which includes our products on the:**
 - **International Chemical Weapons Convention**
 - **FBI Weapons of Mass Destruction (WMD)**
 - **Drug Enforcement Agency (DEA)**
 - **APCI hazardous chemicals list**

Weapons of Mass Destruction (WMD)

- **Of the 42 chemicals that the FBI has defined as "Chemical/Biological Materials likely to be used in the furtherance of WMD Terrorist Activities", 15 are gases which are in use in the Electronics Industry**

Ammonia

Boron trichloride

Chlorine

Ethylene oxide

Hydrogen bromide

Hydrogen fluoride

Phosphine

Tungsten hexafluoride

Arsine

Boron trifluoride

Diborane

Fluorine

Hydrogen chloride

Hydrogen sulfide

Sulfur dioxide

CGA Chemicals of Concern List

Chemical name	Classifying organizations					OSHA/EPA PSM/RMP ¹¹
	Security-related					
	FBI WMD ¹¹	FBI WME ¹²	CWC ¹³	DEA ¹⁴	CGA ¹⁵	
Acetylene						X 10 000 ¹⁶
Ammonia	X	X		X		X
Ammonium nitrate		X				
Arsenic	X					
Arsine (arsenic hydride)	X	X				X
Boron tribromide		X				
Boron trichloride		X				X
Boron trifluoride	X	X				X
Bromine trifluoride		X				X
Carbon monoxide		X				
Chlorine	X	X				X
Chlorine pentafluoride		X				
Chlorine trifluoride		X				X
Cyanides	X	X				
Cyanogen		X				
Cyanogen chloride		X				
Diborane	X	X				X
Dichlorosilane		X				X
Disilane		X				
Ethylamine				X		
Ethyl chloride		X				X
Ethylene						X
Ethylene oxide		X				
Formaldehyde		X				
Fluorine	X	X	X			X
Germane		X				
Germanium tetrafluoride		X				
Hexafluoro-1, 3-butadiene		X				
Hydrogen, gaseous (tube trailer)				X		
Hydrogen, liquid						X 10 000 ¹⁶
Hydrogen bromide	X	X				X
Hydrogen chloride	X	X		X		X
Hydrogen cyanide		X				
Hydrogen fluoride	X	X				X
Hydrogen selenide		X				X
Hydrogen sulfide	X	X				X
Methane						X
Methylamine				X		
Methyl chloride						X
Methylsilane		X				
Methyltrichlorosilane		X				X

Nickel carbonyl			X				X
Nitrogen oxides (NO; NO ₂ ; N ₂ O ₄ ; N ₂ O ₅)			X				
Nitrogen trifluoride (NF ₃)			X				X
Nitrous oxide ¹⁷						X	
Octafluorocyclopentene			X				
Oxygen (LOX)						X	
Phosgene			X				X
Phosphine			X	X			X
Phosphorus oxychloride (POCl ₃)			X		X		X
Phosphorus trichloride			X	X	X		X
Propane ¹⁸							X 10 000 ¹⁹
Propylene							X 10 000 ¹⁹
Red phosphorus						X	
Silane			X				X
Silicon tetrachloride			X				
Silicon tetrafluoride			X				
Sulfur dioxide			X	X			X
Sulfuric acid			X				
Sulfur tetrafluoride			X				X
TBA (Tertiary butyl arsine)			X				
TBP (Tertiary butyl phosphine)			X				
TDEAT (Tetra-kis-(diethylamino) Titanium)			X				
TDMAT (Tetra-kis-(dimethylamino) Titanium)			X				
Tetraethylsilane			X				X
Titanium tetrachloride			X				X
Trichlorosilane			X				X
Triethyl phosphite						X	
Trimethyl phosphite (TMPi)						X	
Trimethylsilane			X				
Tungsten hexafluoride			X				
Zinc arsenide			X				
All Toxic mixtures 2.3 hazard class A & B (DOT)							X

¹¹ United States Federal Bureau of Investigation Weapons of Mass Destruction [5].

¹² United States Federal Bureau of Investigation Weapons of Mass Effect [5].

¹³ Chemical Weapons Convention Treaty [6].

¹⁴ United States Drug Enforcement Agency [7].

¹⁵ Compressed Gas Association.

¹⁶ Process Safety Management/Risk Management Program [8, 9].

¹⁷ Quantity threshold (>lb).

¹⁸ Legal use and abuse of product results in a high occurrence of theft.

¹⁹ Some facilities storing propane on site have been exempted from the OSHA PSM regulations and the EPA RMP regulations [8, 9]. Facilities storing propane for use as a fuel or for sale as a fuel to end users (including cylinder exchange operators) were exempted from the RMP rules by Congress through Public Law 106-40 [10]. In addition, OSHA exempted propane retailers and end users from the PSM regulations through a fuel use exemption, 29 CFR 1910.119(a)(6)(ii) and a retail exemption, 29 CFR 1910.119(a)(2)(i) [8].

Responsible Care®

Security Code of Management Practices

- 1. Leadership Commitment**
- 2. Analysis of Threats, Vulnerabilities, and Consequences**
- 3. Implementation of Security Measures**
- 4. Information and Cyber-Security**
- 5. Documentation**
- 6. Training, Drills, and Guidance**
- 7. Communications, Dialogue, and Information Exchange**
- 8. Response to Security Threats**
- 9. Response to Security Incidents**
- 10. Audits**
- 11. Third-Party Verification**
- 12. Management of Change**
- 13. Continuous Improvement**

Global Operations

- **Global implementation of the American Chemistry Council (ACC) Responsible Care® Security Code**
 - **Developed an Air Products SVA Methodology, which has been approved by ACC**
 - **Completion of physical and cyber SVAs at all facilities worldwide and security upgrades where necessary**
 - **Auditing program to insure compliance**
- **Global Security Standards completed**
 - **Standardization around design, equipment selection, and security programs**
 - **Integration into the engineering work process**
 - **All new construction/acquisitions require an SVA**
- **Implemented a new Global Threat Warning Characterization matrix, which addresses specific guidelines for: employees, facilities, travelers, product sales, and information technology**

To Reduce the Risk, we are Implementing Multiple Levels of Protection for each Type of Threat

**A
D
V
E
R
S
A
R
Y**

**A
S
S
E
T**

Background Checks

- Employees
- Contractors

External Intelligence

- International
- Domestic
- Regional
- Local

Perimeter Barriers

- Fencing
- Gates
- Access Control

Surveillance

- Electronic
- People

Operating Safeguards

- Locks
- Minimizing inventories

Engineering Design Integrity

- Location of sensitive equipment
- Access to sensitive equipment and controls

CGA Security Ranking

Rank	COC	Quantity
Tier 1	WMD	Any quantity
	<ul style="list-style-type: none"> – Toxic, 2.3, hazard zone A with the exception of chlorine – Toxic, 2.3, hazard zone B with the exception of chlorine 	
Tier 2	WMD	Cylinders > 2 000 lb Bulk > 15 000 lb
	<ul style="list-style-type: none"> – Toxic, 2.3, hazard zone C and chlorine – Toxic, 2.3, hazard zone D and chlorine 	
	DEA Flammable bulk	> 100 000 lb
Tier 3	WMD	Cylinders < 2 000 lb Bulk < 15 000 lb
	<ul style="list-style-type: none"> – Toxic, 2.3, hazard zone C and chlorine – Toxic, 2.3, hazard zone D and chlorine 	
	DEA	10 000 lb to 100 000 lb
	Flammable bulk	
Oxygen bulk	> 250 000 gal	
Tier 4	Nitrous oxide (cylinders or bulk)	Any quantity
	Flammable bulk	< 10 000 lb
	Oxygen bulk	< 250 000 gal

Layers of Protection

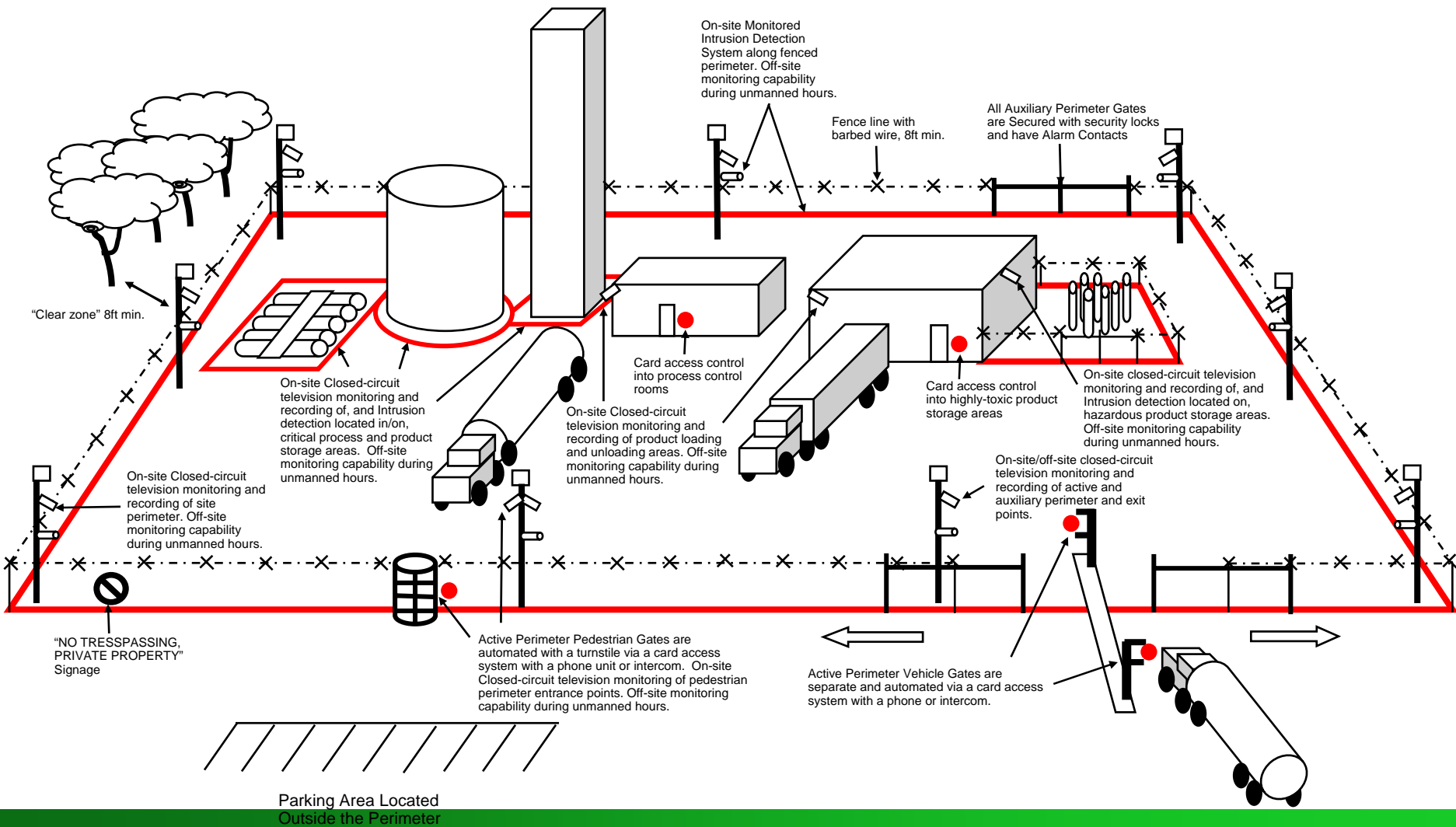
Table 2—Minimum physical security layers of protection

Required layers of protection	Tier 1	Tier 2	Tier 3	Tier 4	Sections containing additional information
Perimeter					
Signage					7.2
– NO TRESPASSING posted at regular intervals	X	X	X	X	
– General security advisory posted at main entry points	X	X	X	X	
Barrier					7.3
– Structure	X	X	X	X	7.3.1
– Top guard	X	X	X	X	7.3.2
Clearance					7.4
– Interior	X	X	X	X	
– Exterior (applicable to company property)	X	X	X	X	
Bollards	O	O	O	O	7.5
Access control ¹⁾		¹⁾	¹⁾	¹⁾	7.6
Access points					
– Building, exterior door	X	X	X	X	
– Main gate	X	X	X	X	
– Vehicle or construction gate	X	X	X	X	
– Personnel gate	X	X	X	X	
– Emergency exit	X	X	X	X	
Access control methods					
– Uniformed security guards	O	O	O	O	
– Controlled access system					
– Electronic (key pad, card, etc.)	X	O	O	O	7.6.1
– Manual (lock/key [key control process])	N	X	X	X	7.6.2
Facility security systems					
– Closed circuit TV (CCTV)/video motion detection (VMD) or infrared (IR)	X	O	O	O	
– Electronic alarm systems, external (external IR, contacts door and breakage windows)	O	O	O	O	
– Electronic alarm systems, internal (interior motion, door contact, heat detection, etc.)	X	O	O	O	

Lighting					7.7
Perimeter	X	X	X	X	
Facility building (all sides)/parking lot	X	X	X	X	
Bulk storage	X	X	X	X	
Toxic storage	X	X	X	X	
Fill zones	X	X	X	X	
COC storage (WMD and nitrous oxide) bulk and cylinders storage (full and empty)					7.8
Inventory control	X	X	X	X	
Access control	X	X	X	X	
– Secondary layer of security (security systems, storage building, cages, secondary fence/gate, bulk storage lockout controls [to reduce unauthorized release])	X	X	X	X	
– Security systems (can use any of the following 3 categories)	X	O	O	O	
– CCTV/VMD or IR					
– Electronic alarm system, external (exterior IR, contacts door and breakage windows)					
– Electronic alarm systems, internal (interior motion, door contact, heat detection, etc.)					

O = optional areas of security
 X = required areas of security
 N = not authorized
¹⁾ At a multi-business site, a facility's SVA and security plan may indicate the need for multiple tiers within the site. For example, an air separation unit (ASU) ranked Tier 3 can store Tier 1 product in a restricted area.

APCI Owned Production Facility without 24hour Manned Operations: Level A

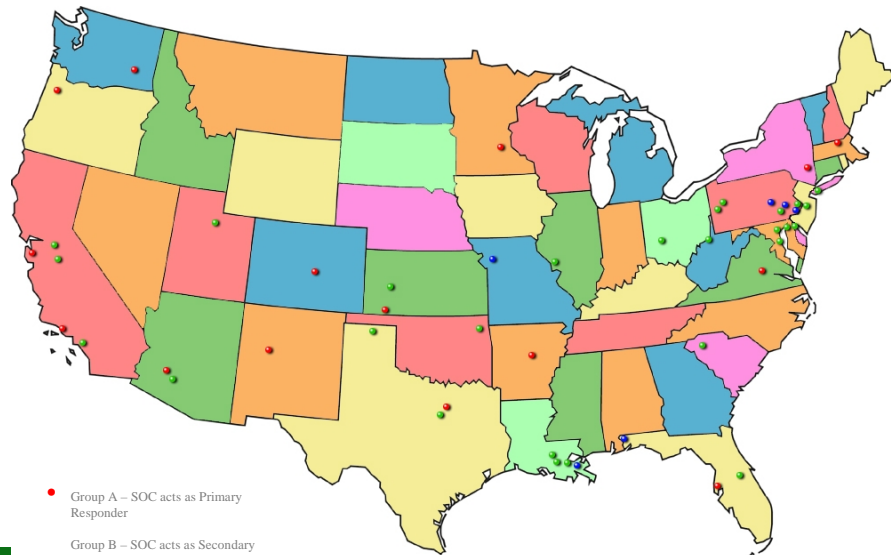


Global Operations



Global Operations

- Implemented a remote monitoring system within the Security Operations Center which monitors 400+ cameras in the U.S.
- SOC is first responder for 14 sites
- Identified third party monitoring companies for Europe and Asia
- Developed a Global Security Plan



- Group A – SOC acts as Primary Responder
- Group B – SOC acts as Secondary Responder
- Group C – SOC doesn't monitor but can view and retrieve data



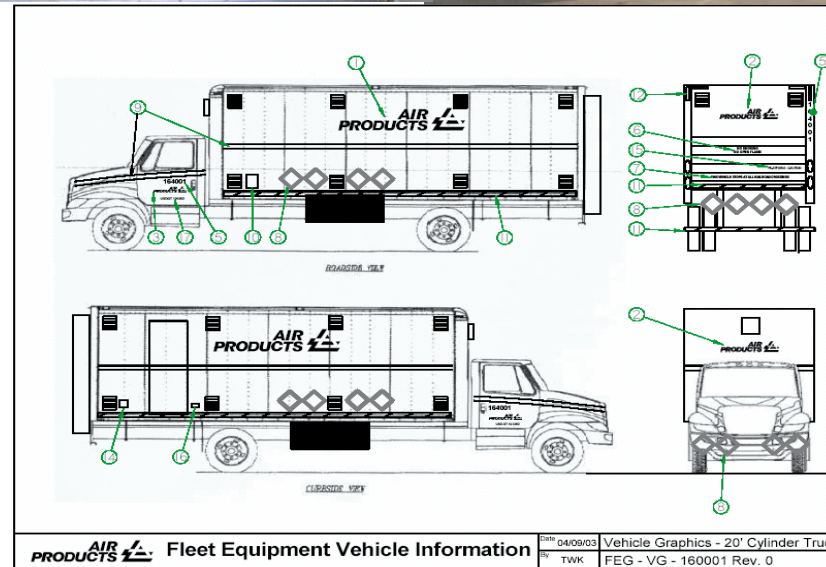
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Global Operations – Transportation

- Formed a Global Transportation Security Task Force
- Developed a Global Land Transportation Security Standard
- Accepted as a member of the U.S. Customs-Trade Partnership Against Terrorism (C-TPAT) in April 2003
- Implemented a NA Transportation Tracking Program for shipment of selected hazardous/toxic chemicals
- Implementing the use of security cages for shipment of toxic cylinders



Security of COC Cylinders



Product Transactions

- Reviewed our 2500 products and developed a list of “Chemicals of Concern” which contains 81 of our highest risk products
- Implemented a new Customer Qualification process based on the “Chemicals of Concern” to:
 - Allow quick and easy qualification of legitimate customers
 - Identify questionable purchasers or orders needing follow-up
- Identifying customers who do not have the knowledge and ability to provide the proper security for our products, and addressing issues appropriately



Incident Reporting and Business Investigations

- **Developed a Global Investigation Council designed to report, prioritize, and organize business investigations with input from a cross-functional team**
- **Corporate Security's Incident Report Template and Global Incident Database were identified as the incident management system for global business investigations**
- **Regional teams have been developed to manage investigations globally**

New DOT Safety Permit

Hazardous Materials for Which a Safety Permit Would Be Required

- **Radioactive Materials – A highway route-controlled quantity of Class 7 materials**
- **Explosives – More than 25kg (55 pounds) of a Division 1.1, 1.2, or 1.3 material, or an amount of a Division 1.5 material requiring a placard under 49 CFR part 172, subpart F.**
- **Toxic-by-Inhalation (Division 2.3 and 6.1) Materials – Hazard Zone A materials in a packaging with a capacity greater than 1 liter (0.26 gallons); a shipment of Hazard Zone B materials in a bulk packaging (capacity greater than 450L [119 gallons]); or a shipment of Hazard Zone C or D materials in a packaging having a capacity equal to or greater than 13,248 L (3,500) gallons.**
- **A shipment of compressed or refrigerated liquid methane or natural gas or other liquefied gas with a methane content of at least 85 percent, in a bulk packaging having a capacity equal to or greater than 13,248 L (3,500 gallons) for liquids or gases.**

New DOT Safety Permit

Information That Must Be Carried In the Vehicle

- During transportation, the following must be maintained in each commercial motor vehicle that transports the hazardous materials noted above:
- Copy of safety permit or another document showing the permit number provided that document clearly indicates the number is the FMCSA Safety Permit #.
- Telephone number including area code or country code of an employee/representative of the motor carrier who is familiar with the routing of the permitted material
 - Employee/Representative must be able to verify that the shipment is within the general area for the expected route for the permitted material.
 - Telephone number must be answered directly by the motor carrier employee/representative **AT ALL TIMES. ANSWERING MACHINES ARE NOT SUFFICIENT**

New DOT Safety Permit

Written Communication Plan

- Companies holding safety permits must develop a communications plan that allows for:
 - The periodic tracking of the shipment;
 - Contact between the commercial motor vehicle operator and the motor carrier.
 - At the beginning and end of each duty tour, and
 - At the pickup and delivery of each permitted load
 - Contact may be by telephone, radio or via an electronic tracking or monitoring system.
- Record of Communication

New DOT Safety Permit

A record of communication must be maintained by the motor carrier or driver and contain the following information:

- **Name of driver**
- **Identification of the vehicle**
- **Permitted material(s) being transported**
- **Date, location and time of each contact**
- **The records must be kept for six months after the initial acceptance of the shipment.**

[1] Note: If the driver is making the call, he or she should make it during periodic rests (taken for reasons other than making the call), or at the beginning and end of each duty period while not operating the vehicle or obtaining necessary rest.

Proposed Transportation Security Requirements

- High Hazard Materials (HHM)
- Security Sensitive Hazardous Materials (SSHM) Security

DOT Hazard Class	Threshold Quantity	HHM	SSHM	Personnel Security			Unauth. Access		En-route Security														Other					
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
Division 2.1 Flammable Gases (for def, see 49 CFR 173.115 and 173.116)	In Bulk - 3000 L (792 gal) or 3000 kg (6614 lbs.)		X	x	x	x	x	x		x	x	x	x			x					x		x	x			x	x
Division 2.2 Non-Flammable Gas (classified as Poison Inhalation Hazard)	Any Quantity (note: see bulk packaging requirements for domestic shipments of anhydrous ammonia in nurse tanks, 49 CFR 173.315(m))	X	X	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Division 2.3 Poison (Toxic) Gas (all hazards zones)	Any Quantity	X	X	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

List of Security Practices: Personnel Security

1. **Federal Security Threat Assessment associated with Commercial Drivers License-Hazardous Materials Endorsement.**
2. **Background checks for non-drivers.**
3. **Security Awareness training.**
4. **Unauthorized Access**
5. **Company photo identification for drivers (in addition to commercial driver license).**
6. **Access control system for facilities incidental to transport.**
7. **En-route Security**
8. **Two way communications in the tractor.**
9. **Doors locked on tractor while unattended by driver.**
10. **Locked cargo doors on package truck.**
11. **Tamper evident (indicative) seals, numbered seals on bulk containers.**
12. **Advance notice of arrival and receipt confirmation procedures with receiving facility.**

List of Security Practices: Personnel Security

13. **Steering lock system when drivers are absent from tractor for extended periods.**
14. **King pin locks to secure disconnected trailers.**
15. **Driver login and tractor disabling capability.**
16. **Pre-determined routes with alternate routes and deviations reported to carrier dispatcher.**
17. **Driver teams for long hauls (exceeding hours of service) to minimize interruption of transport.**
18. **Tractor and trailer tracking systems.**
19. **High alert level protocols (escorts).**
20. **Safe haven plan and procedures (pre-designated secure areas).**
21. **Pre-departure and en-route security inspections (tractor/trailer/truck/container) in conjunction with inspections required in 49 CFR Part 392.9.**
22. **Reporting procedures for suspicious incidents, threats, or concerns.**
23. **Driver attendance at all times.**
24. **Dedicated truck (no subcontracting of loads, driver substitutions, transloading).**

C-TPAT

- **Customs-Trade Partnership Against Terrorism (C-TPAT) program. C-TPAT is an initiative between business and government to protect global commerce from terrorism.**
- **The program calls upon importing businesses to establish policies to enhance their own security practices and those of business partners involved in the supply chain. Once these policies are in effect, imports by these businesses would be given expedited processing at ports of entry.**

DHS Chemical Facilities Anti-Terrorism Standards (CFATS)

- **The Department of Homeland Security (DHS) promulgated the Chemical Facility Anti-Terrorism Standards (CFATS) on April 9, 2007. This rigorous new program was designed to secure the nation's chemical infrastructure by identifying high risk chemical facilities and requiring them to implement risk-based performance standards (RBPS). Facilities that manufacture, use, store or distribute the following types of chemicals can expect to be covered by the new requirements:**
 - **RMP Chemicals**
 - **Explosives**
 - **Poison inhalation hazards**
 - **Chemical weapon and IED precursors**
 - **Water reactives**

Facilities with such chemicals above screening threshold quantities must register and submit a “Top-Screen” consequence questionnaire through the secure DHS Chemical Security Assessment Tool (CSAT) web site. The list of chemicals and threshold quantities are contained in Appendix A of the rule. Appendix A is expected to be finalized in June and then facilities will have only 60 days to submit their Top Screen.

DHS Chemical Facilities Anti-Terrorism Standards (CFATS)

- **Proposed rules published Dec 6, 2006**
- **Final rules published April 9, 2007**
- **Final Comments May 9, 2007**
- **Implementation?**
- **Top-screen**
 - **Basic questionnaire to determine if a facility represents a risk**
- **RAMCAP**
- **Security Plan**
 - **High risk facilities must complete a security plan to counter a variety of threats**

DHS Chemical Facilities Anti-Terrorism Standards (CFATS)

- **Risk Analysis and Management for Critical Asset Protection (RAMCAP)**
- **RAMCAP is risk based and performance based methodology to allow for a consistent and systematic assessment of a facility**
- **5 Key Steps**
 - **Asset Characterization**
 - **Threat Assessment**
 - **Vulnerability Analysis**
 - **Risk Assessment**
 - **Countermeasures Analysis**

Appendix A: DHS Chemicals of Interest

- **Appendix A list the threshold amounts of CIS which trigger the Top Screen process**
- **Levels for some materials are very low creating a huge burden for R&D and universities that use very small quantities. Highly toxic gases such as Arsine or Diborane triggers the requirements at any amount.**
- **CGA has proposed that Toxic Gases have the following thresholds**
 - **Zone A - 5 lbs**
 - **Zone B - 15 lbs**
 - **Zone C- 500 lbs**
 - **Zone D- 2000 lbs**

CGA Publications

- **P-50 Site Security Standard**
- **P-51 Transportation Security Standard for the Compressed Gas Industry**
- **P-52 Security Standard for Qualifying Customers Purchasing Compressed Gases**
- **P-53 Security Code Top Screen**
- **CGA is attempting to have these qualified as Alternative Security Programs by DHS**

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CGA P-50—2007

**SITE SECURITY
STANDARD**

SECOND EDITION



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CGA P-51-2007
TRANSPORTATION
SECURITY STANDARD
FOR THE
COMPRESSED GAS
INDUSTRY

SECOND EDITION



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CGA P-52—2007
SECURITY STANDARD
FOR QUALIFYING
CUSTOMERS PURCHASING
COMPRESSED GASES

SECOND EDITION



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CGA P-53—2007

**SECURITY CODE
TOP SCREEN**

FIRST EDITION



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