CONTROL OF HAZARDOUS SUBSTANCES IN SINGAPORE

BSG Seminar 21 May 2009

National Workplace Safety and Health Campaign 2009

Martinn Ho
Pollution Control Department
National Environment Agency

National Environment Agency

Introduction

- A vibrant manufacturing sector creates the need for large amounts of chemicals to be imported and distributed in Singapore.
- Reclamation of 7 islands to form a 3,000 hectare petrochemical complex on Jurong Island.
- Hazardous Chemicals have the potential to **endanger life and pollute the environment**.
- Need to have a **comprehensive control programme** to ensure the Hazardous chemicals are managed safely at all times.
- The average population density in Singapore is about **6,650 people per square kilometre**.
- Large parts of Singapore are used as **water catchment areas**.
- Need to protect against terrorist threats

National Environment Agency

PAST INCIDENTS (OVERSEAS)

- BHOPAL, INDIA (Release of toxic gas) - 1984
  >2000 Killed by Toxic Gas, Few thousands injured

- MEXICO CITY (LPG Explosion) - 1984
  > 300 Killed, Damaged caused up to US$20 million

- FLIXBOROUGH, UK (Cyclohexane Vapor Cloud Explosion from Nylon Mfg Plant) – 1974
  > 28 Killed, Damaged caused up to US$232 million

- BEEK, NETHERLANDS (Ethylene Plant) – 1975
  14 Killed, 14 Injured, Damaged up to 14 km

National Environment Agency

PAST INCIDENTS (OVERSEAS)

- Chen JiaYing Village, outskirts of KUNMING, CHINA **(Release of Chlorine) -** Aug 2004

  > 2 critically injured 109 people ill

- South Eastern Indiana, NORTH VERNON **(Release of Anhydrous Ammonia) –** Aug 2004

  > four-car pileup, 300 evacuated

- MICHIGAN, CANADA **(Explosion at Atofina Chemical Inc. Plant, Release of Methyl Mercaptan) –** Jul 2001

  > 2 dead, one missing, 400 homes evacuated

- TULSA, Okla, **(Release of Arsine at Solkatronic Chemical Plant) –** Jul 2001

  >nearly 100 people hospitalized with breathing difficulties & nausea

National Environment Agency

PAST INCIDENTS (OVERSEAS)

Chlorine Leak in Huai'an City, Jiangsu, China on 29 Mar 2005 - 28 killed, 350 hospitalized & 3 in critical condition

National Environment Agency

PAST INCIDENTS (OVERSEAS)

Chlorine Leak in Huai'an City, Jiangsu, China on 29 Mar 2005 - 28 killed, 350 hospitalized & 3 in critical condition

National Environment Agency

PAST INCIDENTS (OVERSEAS)

Chlorine Leak in Huai'an City, Jiangsu, China on 29 Mar 2005 - 28 killed, 350 hospitalized & 3 in critical condition

National Environment Agency

More recent Environmental Disasters in China

- On Dec. 1, an explosion set **6.6 tons of acrylonitrile on fire at Jiangdu Chemical Plant in east China's Jiangsu Province**. The local environmental protection agencies immediately organized monitoring of the surrounding environment and blocked the river to contain the possible spread of the pollutants. It also asked nearby residents to take protection measures.
- On December 1, a laboratory of the Tianjiu Chemical Plant in **Shenyang, northeast China's Liaoning Province, reported the leakage of benzene** after an explosion of an LNG tank. The local environmental protection staff rushed to the site and swiftly conducted monitoring work, which showed the accident had not polluted the environment outside the plant.
- On Dec. 2, a tank truck was caught in a traffic accident in **Huai'an of east China's Jiangsu Province and emptied nine tons of formaldehyde** into ditches on both sides of the road. Local firefighters and environmental protection staff used detergent solutions to neutralize and dilute the pollutants. Thanks to the measure, the accident did not pollute a nearby river.

National Environment Agency

Control Criteria & Considerations

Highly toxic gases/volatile liquids which can have mass-disaster potential : e.g.

- Ammonia
- Arsine (Hydrogen Arsenide)
- Bromine
- Chlorine
- Ethylene Oxide (ETO)
- Hydrogen Chloride
- Hydrogen Fluoride
- Methyl Bromide
- Methyl Isocyanate (MIC)
- Tuolene Diisocyanate (TDI)
- Phosphine
- Phosgene

National Environment Agency

Highly toxic gases/liquids which can have mass-disaster potential

National Environment Agency

Deadly arsine leak kill 3 in Guizhou

Three workers died and 23 others were hospitalized following a toxic gas leak at a chemical plant in southwest China's Guizhou Province between May 4 and 10 2007. At least 26 workers were exposed to a serious release of arsine gas at Zhenpanjiang Chemical Plant in Dewo Town of Anlong County, in the Bouyei-Miao Autonomous Prefecture of Qianxinan. Doctors at the People's Hospital in Qianxinan diagnosed it as acute arsine poisoning.

He said three victims had been too late in seeking medical attention. "One of them died on May 11 and the other two on May 14."

Three victims had since been released from hospital while 20 other people were still being treated. Four of them were in critical condition.

Local authorities have shut down the factory and investigation is continuing. A similar accident in the same factory hospitalized three workers on March 30, the local government said.

People exposed to arsine gas, which has an odor like garlic, may not notice a reaction for several hours, a hospital source warned. Arsine is the most toxic form of arsenic, harmful even when ingested in even small quantities. The gas destroys red blood cells, which can lead to kidney failure. Exposure can cause chills, fever, dizziness, disorientation and abdominal pains.

National Environment Agency

Five people have been killed and 14 seriously injured after a powerful blast at a workshop in a chemical factory in Hebei province, north China on 11 May 2007. The blast occurred at 1:40 p.m. at a workshop in Cangzhou Dahua TDI Co. Ltd, a major TDI producers in China.

The fire caused by the blast was put out around 4:30 p.m. Most of the injured suffered bruising and scratches to the head and face and are receiving medical treatment.. Hospital sources said some workers suffered serious burns and all the injured are being treated in hospital. According to a local taxi driver, the death toll is even higher. More than 2,000 residents in a nearby village were evacuated in case of a possible toxic gas leak. The blast also damaged most of the houses in the nearby Dazidian village some 200 meters away, which is inhabited by about 4,000 people and some of the villagers were injured by flying window glass,"

TDI, or Toluene diisocyanate is primarily used as a chemical intermediate in the production of polyurenthane products. Investigations into the cause are underway

National Environment Agency

Control Criteria & Considerations

Highly toxic and pollutive liquids

Cyanides, phenol, chlorophenols, organic compounds of mercury,organo-tin compounds..etc

Pesticides : e.g.

- Arsenical substances
- Carbamates such as Methomyl & Propoxur
- Chlorinated Hydrocarbons such as Chlordane, Lindane, Benzene Hexachloride (BHC)
- Phosgene
- Paraquat & its salts
- Organo-phosphorous compounds such as Chlorpyriphos, Dichlorvos

National Environment Agency

Control Criteria & Considerations

Highly toxic and pollutive liquids

Caustic / Corrosive chemicals: e.g.

- Ammonium Hydroxide
- Hydrochloric Acid
- Hydrofluoric Acid
- Nitric Acid
- Phosphoric Acid
- Potassium Fluoride
- Sodium Hydroxide
- Sodium Fluoride
- Sulphuric Acid
- Boric Acid

National Environment Agency

Control Criteria & Considerations

Chemicals that generate wastes which cannot be safely and adequately disposed of

POPs under the Stockholm Convention: e.g.

- Aldrin
- Chlordane
- DDT
- Endrin
- Heptachlor
- Hexachlorobenzene
- Toxaphene
- Polychlorinated Biphenyls

National Environment Agency

Control Criteria & Considerations

Highly flammable substances with fire risk and/or explosive hazard

- Benzene
- Carbon Disulphide
- Ethyl Mercaptan
- Ethylene dichloride
- Ethylene Imine
- Ethylene Oxide
- Hydrogen Selenide
- Methyl Chloride
- Methyl Mercaptan
- Silane
- Styrene Monomer

National Environment Agency

Control Criteria & Considerations

Oxidizing Agents & Organic Peroxides

Ammonium Perchlorate	Guanidine Nitrate
Ammonium Nitrate	Potassium Nitrite
Hydrogen Peroxide	Methyl Ethyl Ketone Peroxide
Potassium Chlorate	Tert-Butyl Peroxide
Sodium Chlorate	Methyl Isobutyl Ketone Peroxide
Sodium Nitrate	Lauroyl Peroxide
Sodium Nitrite	Di-Isobutyrl Peroxide

National Environment Agency

Explosion at chemical plant in Baoshan, Northern Shanghai

An explosion and fire on 28 Jul 2005, struck a plant belonging to the Shanghai Yuanda Peroxide Co. Ltd., seriously injuring at least four people and billowing thick smoke across the Baoshan industrial district to the city's north, the official Xinhua News Agency said.

The fire occured after an explosion at 2 silos storing hydrogen peroxide, was quickly brought under control and investigators were looking into the cause, said a woman who answered the phone at Yuanda's headquarters in Shanghai.

In a later report, Xinhua said the Yuanda explosion had initially been ruled an accident with no sign of foul play.

Yuanda's Web site describes it as a joint venture with a Hong Kong company that produces 50,000 tons per year of the chemical peroxide.

National Environment Agency

Truck spontaneous combustion releases chlorine gas in Hunan

A truck carrying 13 tons of potassium chlorate and food additive caught fire at 10am on 10 May 2007 on an overpass in Shaoyang city in central China's Hunan Province.

The fire caused a release of chlorine gas into the air, which polluted the environment and was harmful to local inhabitants. No casualties were reported.

The local fire brigade, environmental protection service and traffic management departments arrived at the incident that took firemen two hours to complete the rescue work.

According to local official release, spontaneous combustion caused the accident.

National Environment Agency

Control Criteria & Considerations

Hazardous Substances known to cause environmental public health problems

Asbestos in the form of

- ✓ Crocidolite
- ✓ Amosite
- ✓ Chrysotile
- ✓ Amphiboles

Risk of Asbestosis & Mesotheliomia ?

and products containing these forms of asbestos such as brake & clutch linings, roofing sheets, refuse chutes, ceiling boards, fire barriers, doors, paints, cement, floor tiles and putty.

National Environment Agency

STRATEGY OF CONTROL

- **Avoidance** – Do away with the danger as far as possible
  - Siting Control
  - Use of safer substitutes
  - Reduce storage of hazardous Chemicals
- **Prevention** - Prevent the danger from occurring
  - Provision of control & safety facilities
  - Safe operation and maintenance procedures
- **Mitigation** - Mitigate the impact should an accident occur
  - **(EMERGENCY PLANNING)**

National Environment Agency

Key Control Programmes

- Planning and Building Plan Control
- Licensing Control
- Monitoring and Enforcement
- Partnership and Education

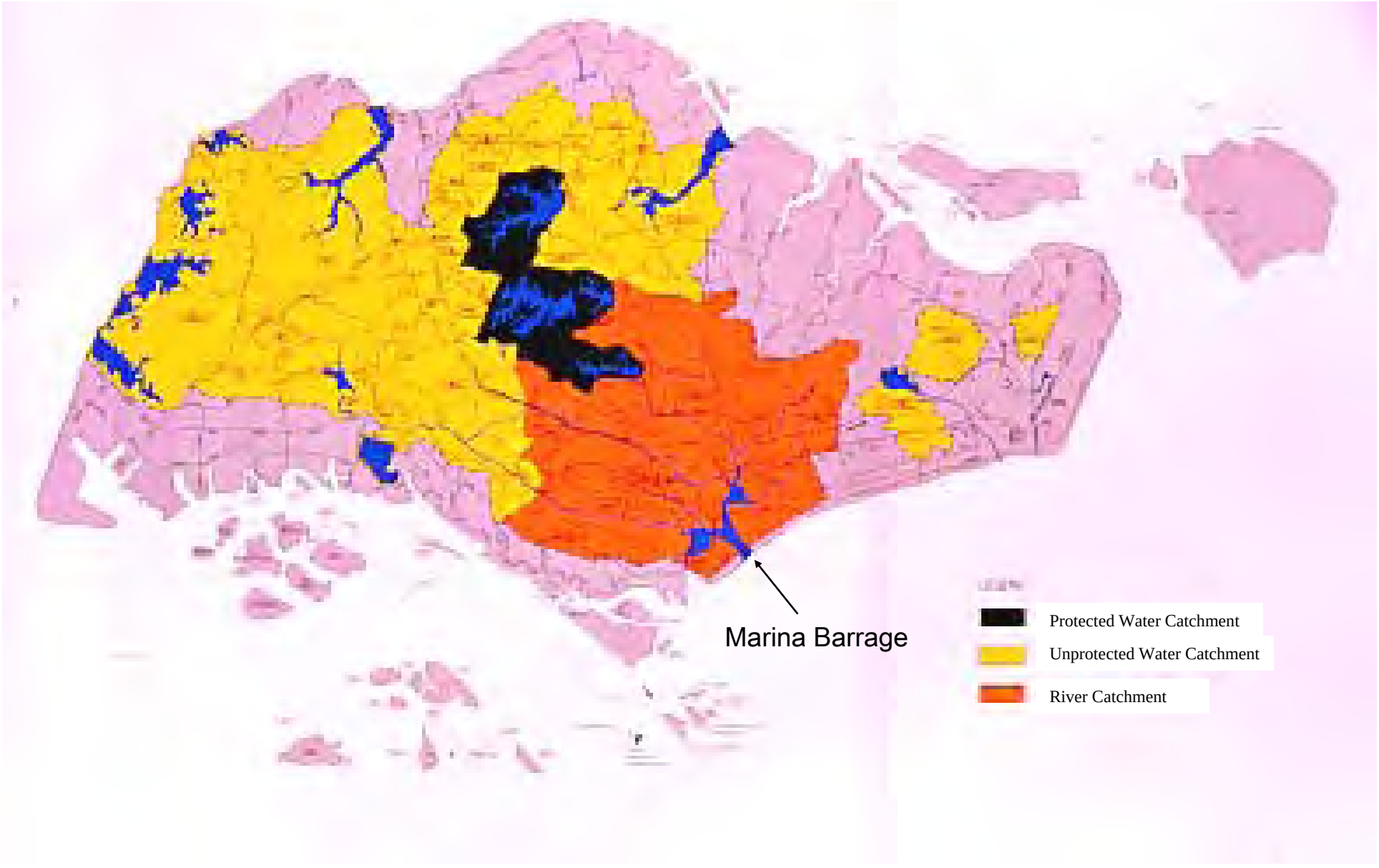
National Environment Agency

Planning & Building Plan Control

- Avoid potential disaster through proper land use planning and control.
- Vet industrial proposals at planning stage.
- Impose Health & Safety buffers
- Site industries handling large quantities of hazardous chemicals away from residential estates and outside water catchments.

National Environment Agency

National Environment Agency



National Environment Agency

Planning & Building Plan Control

- **Routes for transportation of hazardous chemicals are specified.**
- **Require major projects such as chemical and petrochemical plants, oil refineries, etc, to conduct a Quantitative Risk Assessment (QRA) studies.**

National Environment Agency

Planning & Building Plan Control

Quantitative Risk Assessment

- **Identify causes of possible accidents**
- **Determine risks, hazards and potential consequences**
- **Recommend measures to keep risks at low level and minimise impact zones**

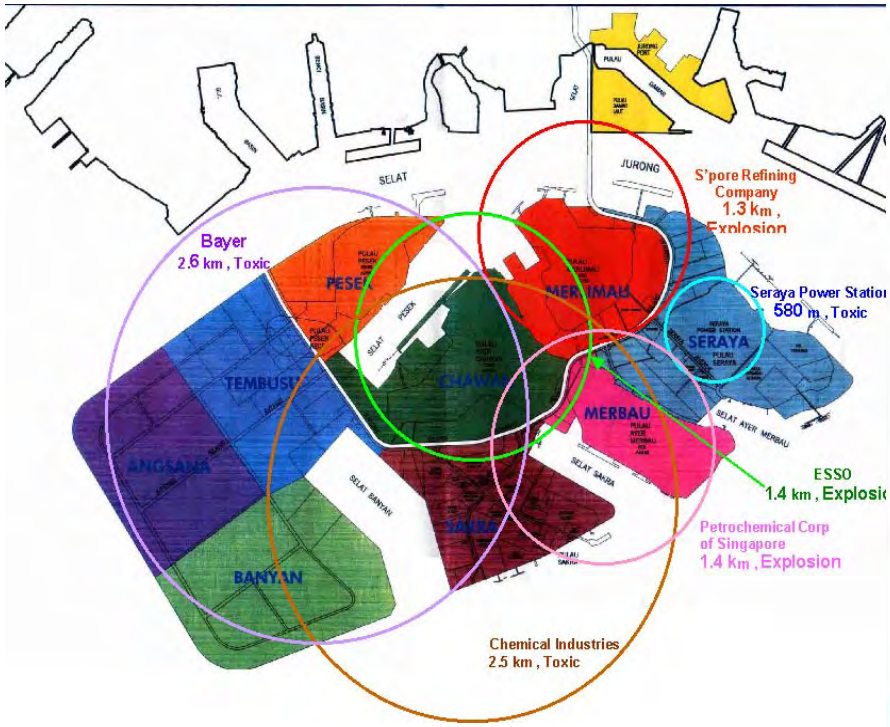
NEA website **...**

*www.**nea**.gov.sg/cms/pcd/qra_guidelines.pdf*

National Environment Agency

Quantitative Risk Assessment

HAZARD ZONES



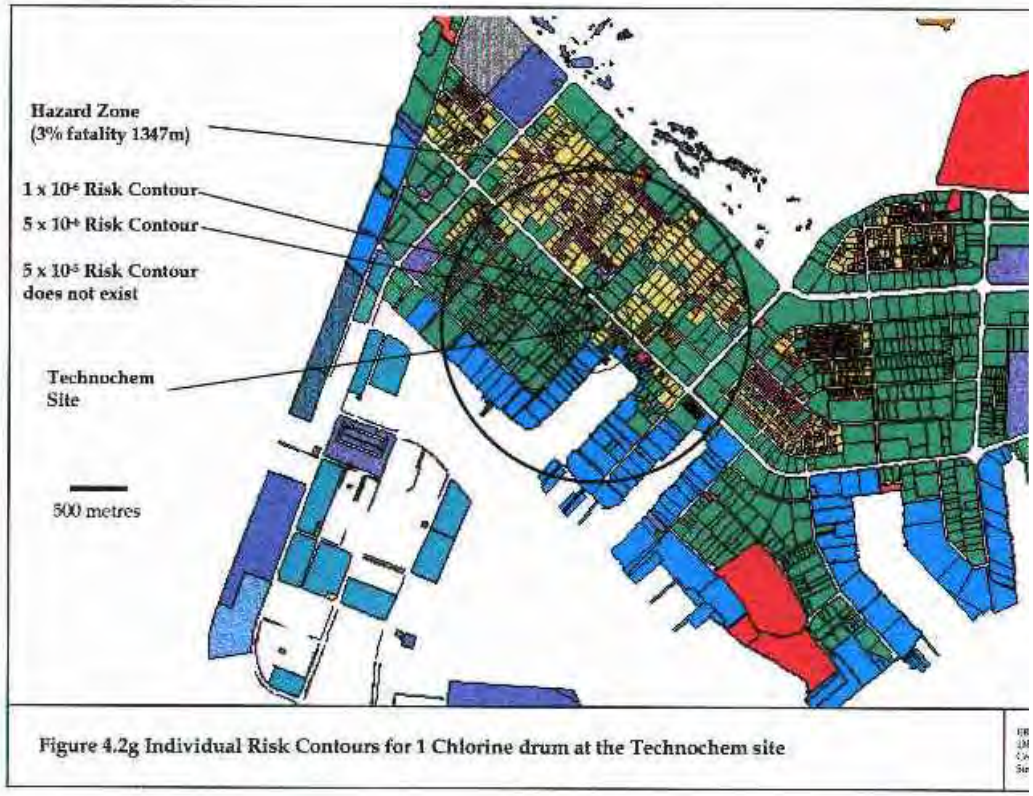


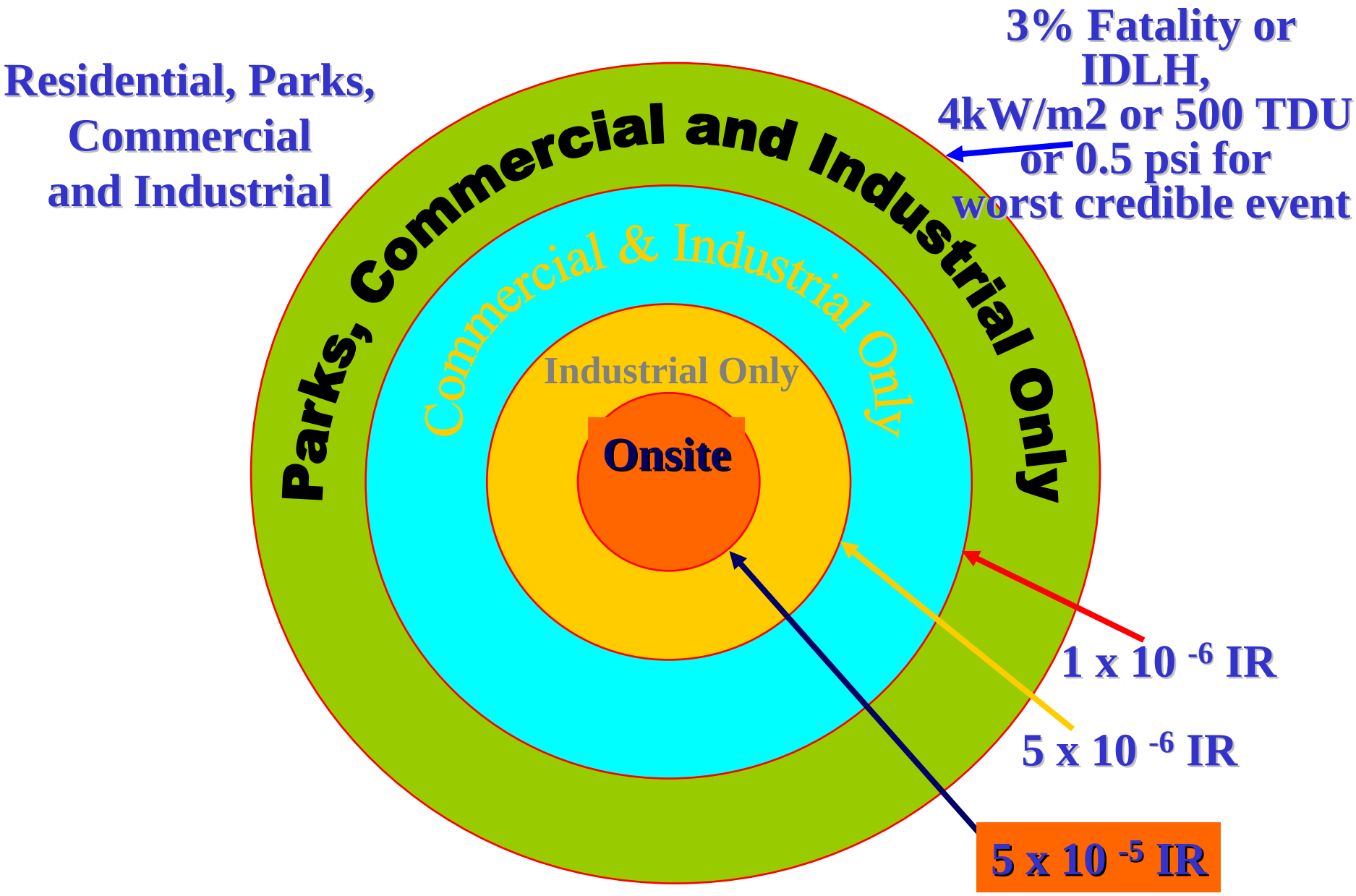
Figure 4.2g Individual Risk Contours for 1 Chlorine drum at the Technochem site

National Environment Agency

Planning & Building Plan Control

- No housing developments within the hazard zones.
- NEA vets the building plans of all proposed developments.

National Environment Agency



Hazard Zones & Risks Contours for Land Use Planning

Licensing Control

- **Objectives**
  - **Prevent unauthorised persons from handling hazardous chemicals**
  - **Ensure proper precautions are taken at all times**
- **The Environmental Protection & Management Act (EPMA) and EPM (Hazardous Substances) Regulations**

National Environment Agency

Licensing Control

- Import, export, sale, storage, transportation and use of hazardous chemicals – requires **Hazardous Substances Licence**

- Chemicals listed in the Environmental Protection & Management Act, Part 1 of the 2nd Schedule

http://app.nea.gov.sg/cms/htdocs/article.asp?pid=1428

National Environment Agency

Licensing Control

- Purchase, storage and local use – requires **Hazardous Substances Permit**

- Chemicals listed in the Environmental Protection & Management (Hazardous Substances) Regulations, The Schedule

http://app.nea.gov.sg/cms/htdocs/article.asp?pid=1664

National Environment Agency

Licensing Control

Conditions

- Approved storage location and proper storage facilities
- Types and quantities of chemicals commensurate with processes used
- Adequate measures such as containment areas, leak detection, warning devices, etc
- Emergency plan and response capabilities
- Personnel to attend training course on Management of Hazardous Substances

National Environment Agency

Other Requirements for Storing Hazardous Substances

- Adequate safety and fire prevention, fire alarm system & fire fighting facilities
- Proper labelling of hazardous chemicals
- Proper segregation of incompatible classes of hazardous chemicals
- Authorised access with proper lock & key
- Updated records of stock movements of hazardous substances
- In-house emergency response drills

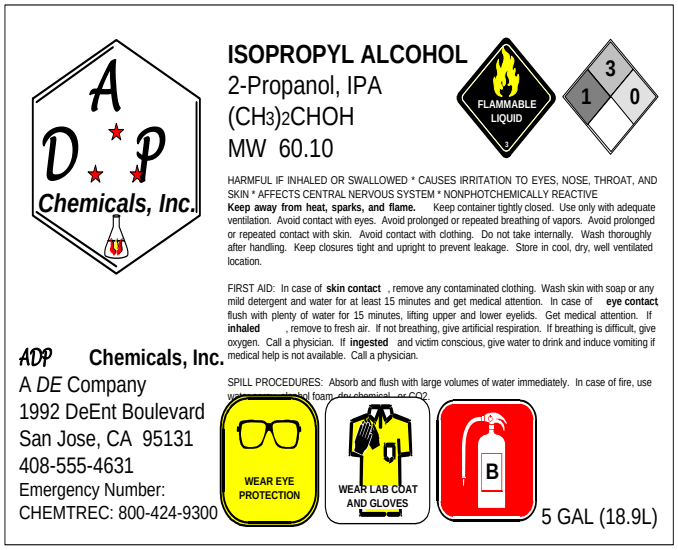
National Environment Agency

Acrobat Document

Acrobat Document

Labelling

- **Containers must be labelled according to an approved Code of Labelling, such as the Singapore Standard 586, which is based on the United Nations Model Regulations (Orange Book).**



National Environment Agency

IMDG TRANSPORTATION PLACARDS

1 EXPLOSIVES

2.1 FLAMMABLE GASES

2.2 NON-FLAMMABLE NON-TOXIC GASES

2.2 OXIDIZING GAS
SUB RISK
5.1 (NITROUS OXIDE & OXYGEN ONLY)

2.3 TOXIC GASES

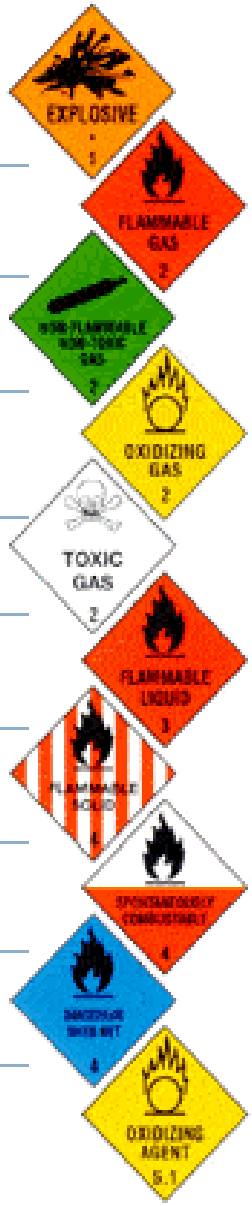
3 FLAMMABLE LIQUIDS

4.1 FLAMMABLE SOLIDS
(and other reactive substances)

4.2 SUBSTANCES LIABLE TO SPONTANEOUS COMBUSTION

4.3 SUBSTANCES THAT IN CONTACT WITH WATER EMIT FLAMMABLE GASES

5.1 OXIDIZING SUBSTANCES



5.2 ORGANIC PEROXIDES

6.1 TOXIC SUBSTANCES

6.2 INFECTIOUS SUBSTANCES

7 RADIOACTIVE MATERIAL
(CATEGORY I)

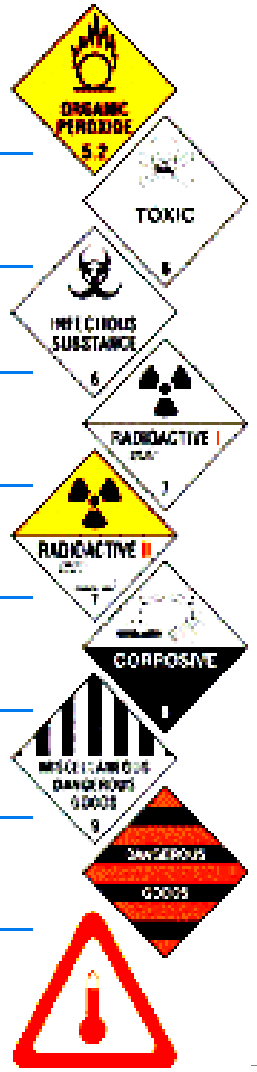
7 RADIOACTIVE MATERIAL
(CATEGORY II or III)

8 CORROSIVE SUBSTANCES

9 MISCELLANEOUS DANGEROUS GOODS AND ARTICLES

MIXED CLASS LABEL FOR ROAD AND RAIL TRANSPORT

SUBSIDIARY RISK LABEL TO BE USED WITH ELEVATED TEMPERATURE SUBSTANCES



National Environment Agency

SEGREGATION OF DANGEROUS GOODS IN VEHICLES AND FREIGHT CONTAINERS

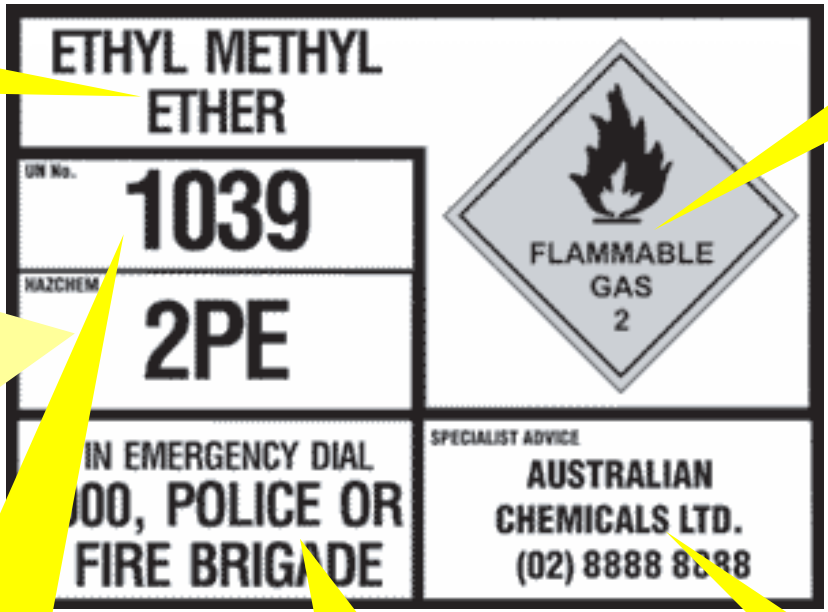
	CLASS	HAZARD DIAMOND	1	2.1	2.2	2.3	3	4.1	4.2	4.3	5.1	5.2	6	7	8	9	FOODSTUFF & FOODSTUFF EMPTIES	FIRE RISK SUBSTANCES
IF YOU HAVE	Class 1 Explosives	DO NOT LOAD WITH	①													N	①	①
IF YOU HAVE	Class 2.1 Flammable Gas	DO NOT LOAD WITH					②											
IF YOU HAVE	Class 2.2 Non-Flammable Non-Toxic Gas	DO NOT LOAD WITH																
IF YOU HAVE	Class 2.3 Poison Gas	DO NOT LOAD WITH															N	
IF YOU HAVE	Class 3 Flammable Liquid	DO NOT LOAD WITH		②									⑤					
IF YOU HAVE	Class 4.1 Flammable Solid	DO NOT LOAD WITH																
IF YOU HAVE	Class 4.2 Spontaneously Combustible	DO NOT LOAD WITH																
IF YOU HAVE	Class 4.3 Dangerous When Wet	DO NOT LOAD WITH																
IF YOU HAVE	Class 5.1 Oxidizing Agent	DO NOT LOAD WITH											③			④		N
IF YOU HAVE	Class 5.2 Organic Peroxide	DO NOT LOAD WITH											③			④		N
IF YOU HAVE	Class 6 Poison	DO NOT LOAD WITH					⑤				③	③			⑤		N	
IF YOU HAVE	Class 7 Radioactive	DO NOT LOAD WITH															N	
IF YOU HAVE	Class 8 Corrosive	DO NOT LOAD WITH											⑤				N	
IF YOU HAVE	Class 9 Miscellaneous Dangerous Substances	DO NOT LOAD WITH									④	④						

N - Means not to be loaded into the same vehicle or freight container

Note:

① - Refer to explosives legistration
② - N - When both classes are in bulk
③ - N - When class 6 substances are fire risk substances
④ - N - When class 9 substance is a fire risk substance
⑤ - N - See next page

EMERGENCY INFORMATION PANEL REQUIRED TO BE PROMINENTLY DISPLAYED ON CHEMICAL TRANSPORT (AT SIDE & REAR)



CHEMICAL CARRIED

CHEMICAL HAZARD CLASS

EMERGENCY ACTION CODE

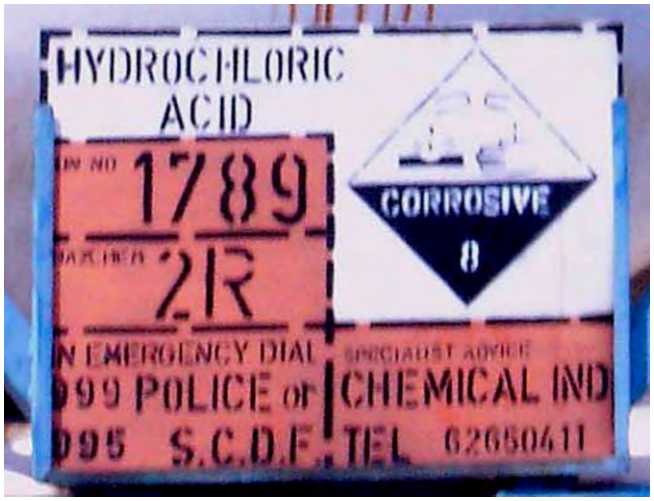
INTERNATIONAL CHEMICAL CODE

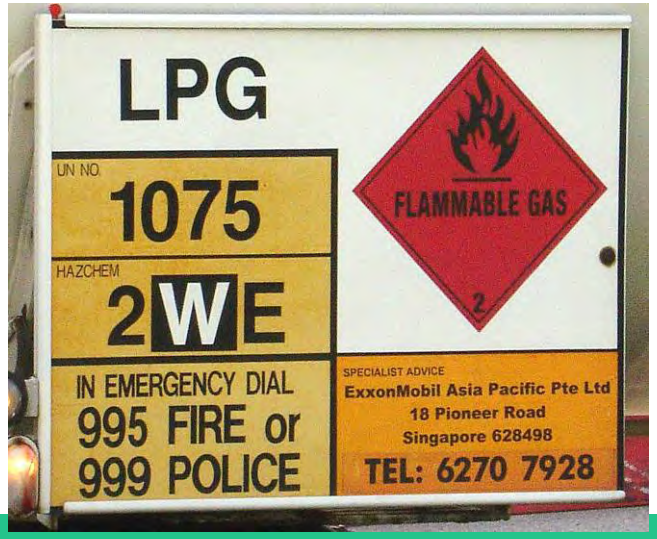
EMERGENCY CONTACT NO

COMPANY'S PARTICULAR

National Environment Agency

PROMINENT EIP DISPLAYED ON CARRIERS





Hazmat Transportation

- Transport Approval is needed for transportation of hazardous chemicals.
- Transport Approval is granted only to those with a Hazardous Substances Licence.

http://app.nea.gov.sg/cms/htdocs/article.asp?pid=1432

National Environment Agency

MOBILE BOMBS: Fuel tankers could be used to create catastrophic damage.

PHOTO: BLOOMBERG

AL-QAEDA'S NEW TERROR WEAPON?

High alert: Fuel trucks may be hijacked and exploded in US and London

WASHINGTON

AL-QAEDA terrorists are plotting to drive hijacked fuel tankers into petrol stations in a bid to cause mass casualties in London and US cities in the next few weeks, American intelligence chiefs have warned.

Britain's Sunday Times newspaper reported yesterday that the warning was contained in a bulletin issued last week by the United States Department of Homeland Security.

It said the attacks would aim to create catastrophic damage around the time of the fourth anniversary of the Sept 11 attacks on New York and Washington.

The warning came as it emerged that the British Department for Transport has, for the first time, issued guidelines ordering a tightening of security around the country's road-tanker fleet.

The US warning has been circulated among law-enforcement agencies and fuel-transport agencies, The Sunday Times reported.

Although a preamble stated that "no other intelligence exists to corroborate this specific threat", the newspaper said the intelligence report was highly specific.

"Al-Qaeda leaders plan to employ various types of fuel trucks as vehicle-borne improvised explosive devices (VBIED) in an effort to cause mass casualties in the US (and London) prior to Sept 19," the paper quoted the US Department of Homeland Security warning as saying.

"Attacks are planned specifically for New York, Chicago and Los Angeles. It is unclear whether the attacks will occur simultaneously or be spread over a period of time. The stated goal is the collapse of the US economy," it added.

The Sunday Times said the document went on to suggest that the proposed methods would involve suicide drivers.

"Some of the vehicles used will be hijacked. The type of vehicle may be anything from petrol tanker trucks to trucks hauling oxygen and gas cylinders," it said.

"Water trucks filled with gasoline or other highly combustible material may also be used. The detonation of the vehicles will be carried out by driving them into petrol stations or ramming explosives-laden vehicles into the trucks carrying the fuel."

The intelligence report said the terrorist cells thought to be planning the attack would "execute the plan upon receipt of an order".

It went on to speculate that the videotape released recently by Ayman al-Zawahiri, Al-Qaeda's deputy leader, may have been meant as "the activation signal to the cells".

In the video, al-Zawahiri warned that attacks would continue in Britain until it pulled out of Iraq.

The report said that Khalid Sheikh Mohammed, one of the alleged masterminds of the Sept 11 attacks, had told US interrogators he had developed plans for targeting petrol stations.

This was "due to their apparent vulnerability and the potential destructive force of a fuel-driven explosion", it said.

The use of petrol tankers as mobile bombs is a well-tested Al-Qaeda tactic in the Middle East.

Terrorists in Tunisia, Saudi Arabia and Iraq have all used large fuel tankers against military and civilian targets.

A fuel tanker attack on the Khobar Towers in Saudi Arabia in 1996 killed 19 US servicemen.

Last month, terrorists exploded a fuel tanker in a busy market town 40km south of Baghdad, killing

National Environment Agency

San Francisco's City officials have called for a review of the rules that allowed an inexperienced truck driver with multiple felony convictions to pass a criminal background check and get clearance to drive the tanker that brought down one of Northern California's most traveled highways in a fiery blaze.

Court records show that James Mosqueda, 51, was given a commercial trucker's license despite a criminal record that included convictions for heroin possession and burglary.

National Environment Agency

Transportation

Conditions for Transport Approval

- Approved routes and timing
- Approved maximum quantity
- Certified road tankers
- Emergency Response Plans and equipment
- Screened & Trained Drivers (HTDP)

National Environment Agency

NATIONAL ENVIRONMENT AGENCY

PCD/HS/ PAGE : 1
Serial No. TA TEL: 67719853

ENVIRONMENTAL POLLUTION CONTROL ACT

ENVIRONMENTAL POLLUTION CONTROL (HAZARDOUS SUBSTANCES) REGULATIONS

Transport Approval is hereby granted to
holder of Hazardous Substances Licence No: and presently
engaged by LIMITED to transport
between the hours of 9.00am to 5.00pm (Mon to Sat) along the routes of :-

the following hazardous substances :-

CHLORINE (99.50 %) (Max 5.00 MTON
cylinders in 1.0 MTON each) for 934
CHLORINE (99.50 %) (Max 34.00 MTON
cylinders in 1.0 MTON each) for 92, 995

contained in the following cylinders No/Nos :-

Cylinder No.	Expiry Date	Hazardous Substances
1/81	15/02/2003	CHLORINE
1/82	10/02/2003	CHLORINE
1/88 TO 20/88	15/10/2002	CHLORINE
1/98 TO 10/98	23/02/2003	CHLORINE
10/81	31/01/2003	CHLORINE
10/82	11/02/2003	CHLORINE
100	12/12/2003	CHLORINE
100/81	11/02/2003	CHLORINE
100/84	17/04/2002	CHLORINE
101/84	22/02/2003	CHLORINE
101/98 to 110/98	03/03/2003	CHLORINE
102/84	20/02/2003	CHLORINE
103/84	22/12/2002	CHLORINE
104/84	22/12/2002	CHLORINE
105/84	17/04/2002	CHLORINE
106/84	22/12/2002	CHLORINE
107/84	01/05/2004	CHLORINE
108/84	18/02/2003	CHLORINE
109/84	01/05/2004	CHLORINE
11/81	23/11/2002	CHLORINE
11/82	23/11/2002	CHLORINE
110/84	28/04/2004	CHLORINE
111/84	01/05/2004	CHLORINE
111/98 to 120/98	04/03/2003	CHLORINE
112/84	17/04/2002	CHLORINE
113/84	23/12/2002	CHLORINE
114/84	22/12/2002	CHLORINE
115/84	16/02/2003	CHLORINE
116/84	23/12/2002	CHLORINE
117/84	21/12/2002	CHLORINE
117/88 TO 120/88	18/12/2002	CHLORINE
118/84	28/04/2004	CHLORINE
119/84	26/02/2003	CHLORINE

National Environment Agency

NATIONAL ENVIRONMENT AGENCY

PCD/HS/
Serial No. TA

TEL: 67319652

THA 1697	22/02/2003	CHLORINE
THA 1720	22/02/2003	CHLORINE

Conditions :

ONLY THE ROUTES BETWEEN PSA PORT AT KEPPEL ROAD TO JURONG / TUAS INDUSTRIAL AREA SHALL BE USED FOR TRANSPORTATION OF 14 CYLINDERS IN 1000KG EACH FOR CHLORINE.

ESCORT SERVICE SHALL BE PROVIDED FOR THE TRANSPORTATION OF CHLORINE.

THE TRANSPORTATION VEHICLE SHALL BE EQUIPPED WITH NEUTRALISING AGENTS / LEAK DETECTORS, CHEMICAL FIRE EXTINGUISHERS, FIRST AID KIT AND WARNING SIGNS.

The cylinders and vehicles used shall be labelled in accordance to Singapore Standards 286 'Caution Labelling for Hazardous Substances'.

The licensee must ensure that only drivers who have attended a course and a refresher course once every 3 years conducted by PSA on 'Handling & Transportation of Dangerous Goods' are allowed to drive the tankers/tank containers.

The licensee is reminded that it is his responsibility to ensure that the transportation is carried out safely and in compliance with all technical and legal requirements. The licensee shall also be the emergency co-ordinator for immediate response to any chemical emergency.

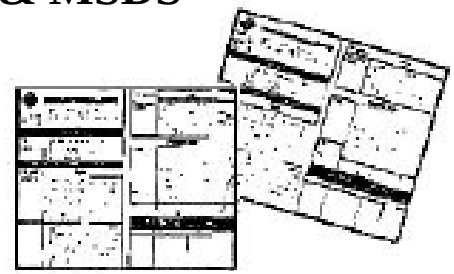
This Transport Approval takes effect from 23/10/2001 and expires on 15/10/2003 or the above shown dates whichever is earlier.

23/10/2001
Date

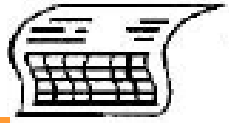
LEONG KWAI YIN
for Director-General
Environmental Protection

National Environment Agency

SCDF's Transportation Emergency Response Plan, Transport Approval & MSDS

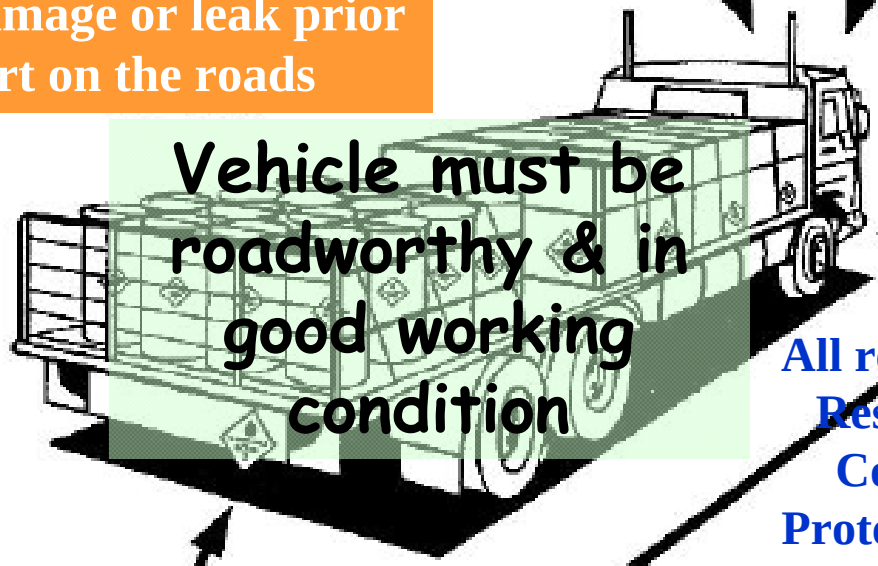


Shipping Document



All approved packages should be secured, properly labelled and checked for damage or leak prior to transport on the roads

Trained Driver with valid Hazmat Transport Driver Permit



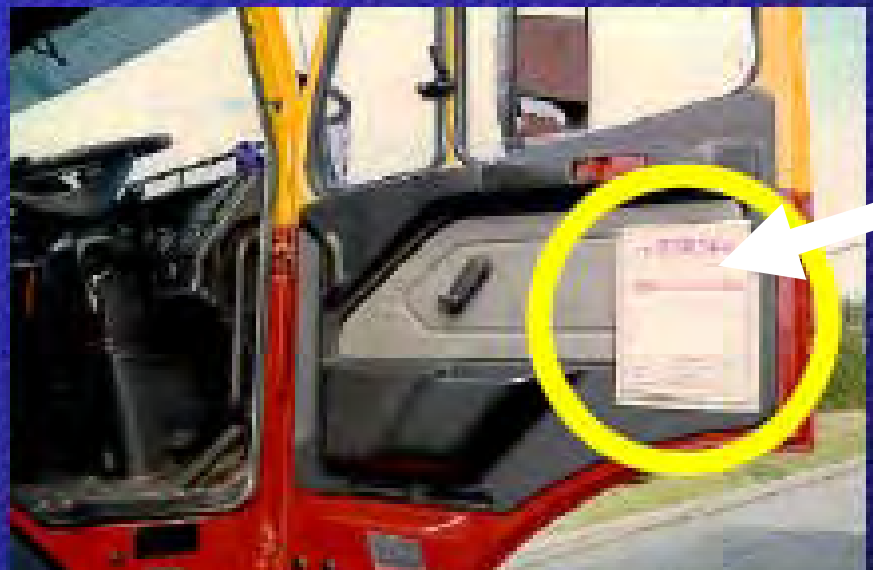
All required Emergency Response, Spill/Leak Control, Personnel Protective and First Aid Equipment to be kept within ready reach for emergency use

Correctly displaced Hazmat Placards

National Environment Agency

Emergency Information Holder

- Holder location
  - inside door of cab, or
  - conspicuous position adjacent to door
- Holder must be labelled



Safety Equipment on Vehicles

For placard loads:

- fire extinguishers
- eyewash
- breakdown triangles
- PPE Items
  - faceshield,
  - gloves,
  - torch etc.

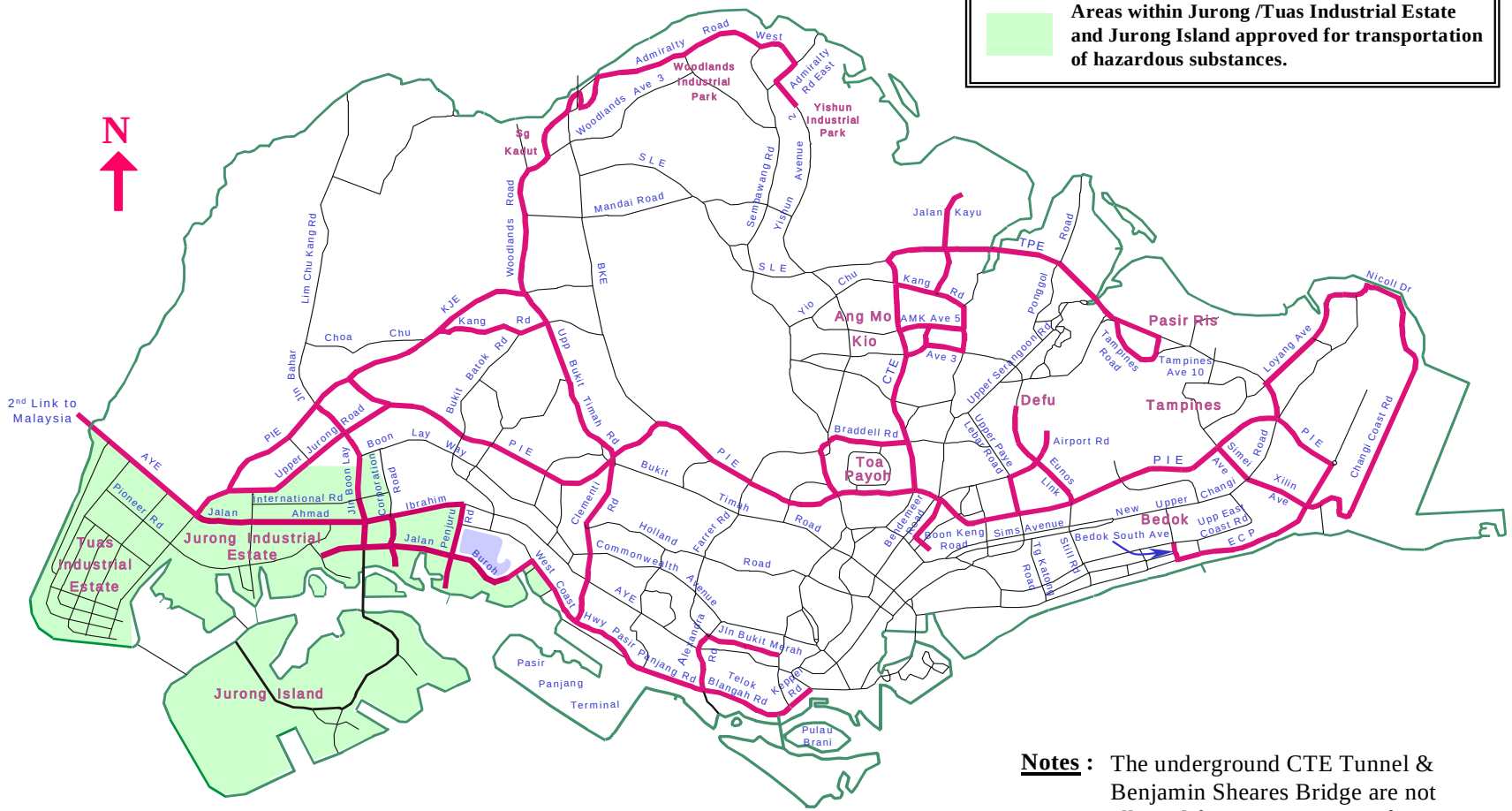
Transportation

International Standards

- International Carriage of Dangerous Goods by Road (ADR)
- UN Recommendations on the Transport of Dangerous Goods
- International Maritime Dangerous Goods Code
- US DOT Regulations for Transportation of HAZMAT

National Environment Agency

Approved Routes for Transportation of Hazardous Substances



Notes : The underground CTE Tunnel & Benjamin Sheares Bridge are not allowed for transportation of Hazardous Substances

Monitoring & Enforcement

- Import of hazardous chemicals via AutoTradeNet
- Random Checks
- Safety Audit Scheme
- Routine checks
- Enforcement checks (complaints)

National Environment Agency

Monitoring & Enforcement

Statistics for 2008

No. of Inspections	822
No. of Warning letters	35
No. of Prosecution	6

National Environment Agency

Monitoring & Enforcement

Common non-compliances/offences for HS

I. Failure to keep proper records of buy/store/use of hazardous substances;

II. Buy/store/use of hazardous substances without valid HS Permit;

III. Hazardous substances store/container were not properly labelled etc.

National Environment Agency

Monitoring & Enforcement

Common non-compliances/offences for HS

IV. Failure to report accidents involving the release or loss of hazardous substances

V. Import/ export or sell hazardous substances without a valid HS Licence

VI. Storage, use or dealing of hazardous substances in a manner which threatens the health or safety of any persons or causes pollution of the environment

National Environment Agency

Monitoring & Enforcement

Combined Road Checks

Monitoring & Enforcement

Transportation of HS using Unapproved Routes

National Environment Agency

Monitoring & Enforcement

Transportation of HS using Unapproved Routes

National Environment Agency

Monitoring & Enforcement

HAZMAT TRANSPORT VEHICLES TRACKING SYSTEM

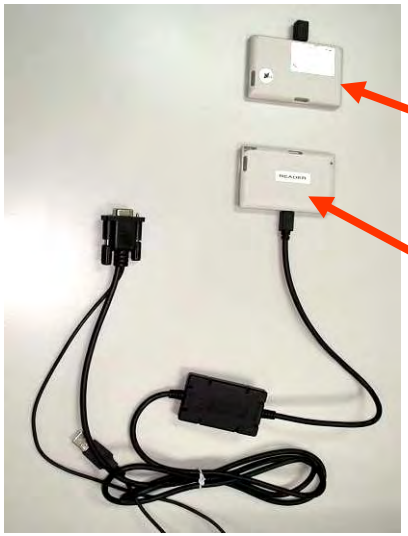
- For transportation of highly toxic gases with mass-disaster potential
- Such vehicles should be fitted with in-vehicle tracking device and orange licence plates

- Vehicles from Malaysia can rent portable tracking device at Tuas Checkpoint- security deposit and rental charge
- Payment by cheque to Commissioner SCDF, send to SCDF HQ, 91 Ubi Ave 4.
- Vendor for tracking system is Astrata (S'pore) Pte Ltd.

http://web4.internet.gov.sg/scripts/mha/scdf/search.asp?search=HTVTS&mode=allwords&go32.x=12&go32.y=7

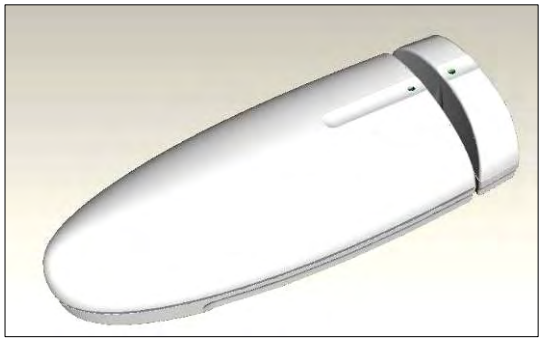
Hazmat Vehicle Tracking Device

In-Vehicle Tracking Device



RF Tag (trailer)

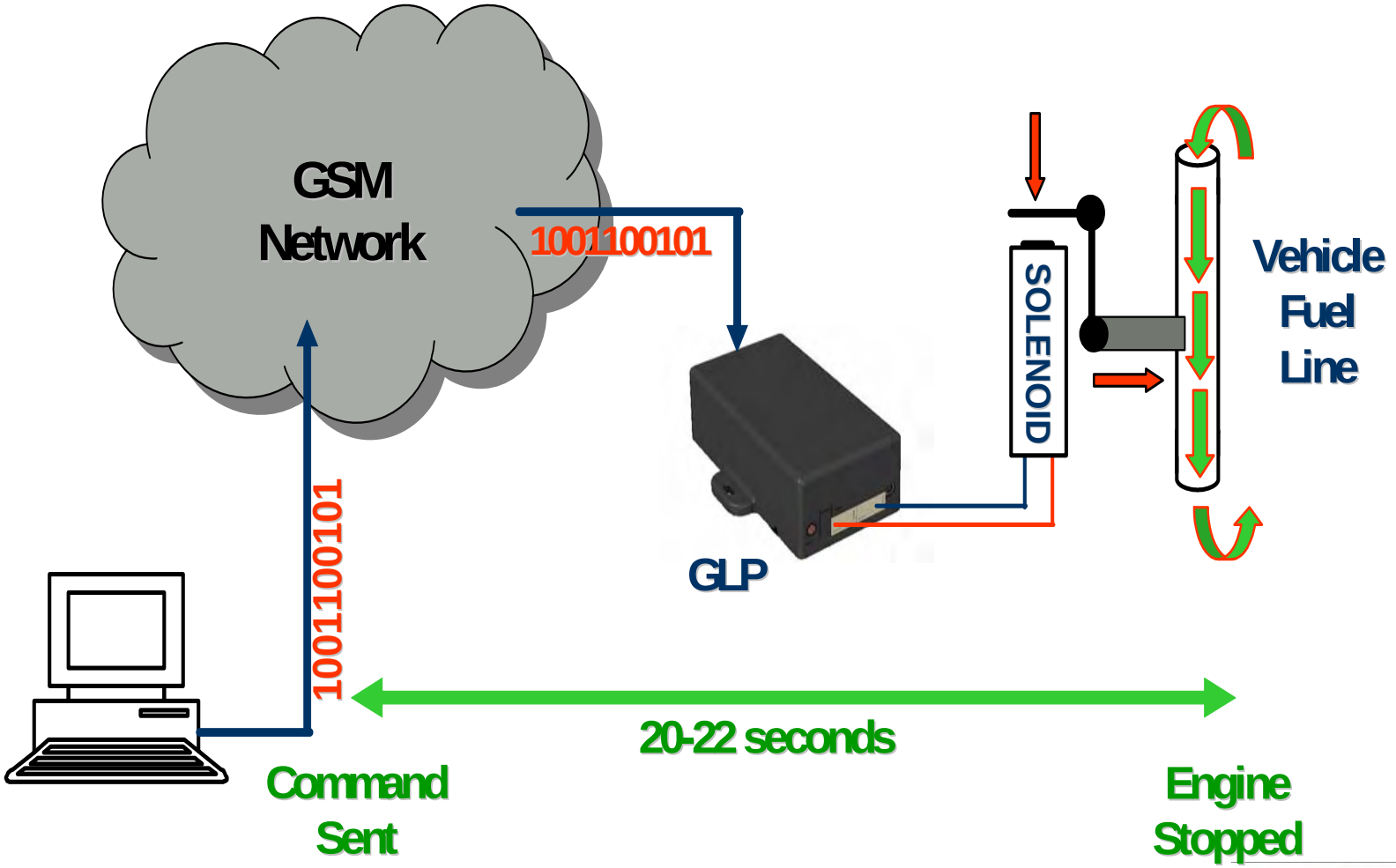
RF Reader (prime mover)



Portable tracking devices for foreign hazmat vehicle

National Environment Agency

Concept of Immobilizers



National Environment Agency

Partnership & Education

Partnership with private sector to improve the management and control system for hazardous chemicals

- **Singapore Chemical Industry Council**
- **Greater transparency**
- **Greater responsibility on the chemical industry through co-regulation**
- **Responsible Care Program since 1990**

National Environment Agency

Partnership & Education

Joint training programs with :

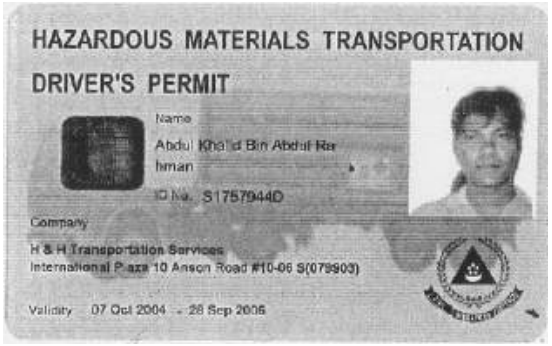
- SCIC and relevant government agencies on competence and awareness of chemical safety among the workers
- MOM on the “Management of Hazardous Substances” course
- MPA and SCDF on the “Hazmat Drivers Course”

http://app.nea.gov.sg/cms/htdocs/article.asp?pid=1942

National Environment Agency

HAZMAT DRIVER COURSE
HAZMAT TRANSPORT DRIVER PERMIT
(1 FULL DAY TRAINING COURSE by PSA Institute & SCDF)

- Describe the IMO classification of dangerous goods and the hazards associate with the classification;
- Describe the various International hazardous materials identification system;
- Describe the legislation and code of practice for handling and transportation of hazardous materials;
- Describe the roles and responsibilities of the driver during transportation;
- Describe the emergency procedures of the drivers; and
- Able to conduct immediate fire fighting involving incipient fires.



National Environment Agency

Conclusion

- Critical to ensure that hazardous chemicals are carefully managed at all times
- Cooperation of industries to manage their hazardous chemicals properly
- Support of the public

National Environment Agency

THE END

National Environment Agency