Chemical Homeland Security System

C-HoSS

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Regulated Hazardous Chemicals
Acute Hazard Orientation

Chemical Agents
- Neurotoxins
- Extreme Toxins
- Radioactives
- Explosives
- Shock Sensitive
- Corrosives
- Flammable
- Oxidizers
- Hazardous Air Pollutants
- Persistent Bioaccumulative Toxins
- Priority Pollutants

Chemical Security Risks List

ACGIH
DEA
DOT
EPA
OSHA
California
Iowa
Maryland
Nevada
New Jersey
European Community
CPSC Specialty Regulated Substances
Canada Export Control Lists
DEA Essential Chemicals
DEA Precursor Chemicals
DOC Export Restrictions
EU Black/Gray Lists
IATA Air Transport Forbidden
IATA Passenger Transport Forbidden
IATA Regulated Substances
UK The Red List (Water)
UN/FAO Prior Informed Consent

Precursor Chemical Security Risks List
Chemical Agents and Simulants

Properties
- Structure
- Chemical
- Physical

Toxicology Data
- Human
- Animal
- In Vitro

Hazards
- Protection
- Decontamination
- Persistence
- Use

Incompatibilities
- Chemical
- Conditions
- Containers

Storage Recommendations
- Container
- Conditions
- Distances
- HSAS\(^a\) Variables

\(^a\) HSAS = Homeland Security Advisory System
### Toxic Industrial Chemicals/Toxic Industrial Materials (TICs/TIMs)

#### Selected Examples

<table>
<thead>
<tr>
<th>Category</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industrial Feedstocks</td>
<td>Acrylamide, Chlorine, Hydrogen Chloride, Phosgene</td>
</tr>
<tr>
<td>Carboxylate Insecticides</td>
<td>Baygon, Mobam, Temik, Zectran</td>
</tr>
<tr>
<td>Organochlorine Insecticides</td>
<td>Aldrin, Dieldrin, Endrin, Lindane, Heptachlor</td>
</tr>
<tr>
<td>Organophosphorus Insecticides</td>
<td>Disulfotan, Mevnphos, Parathion, Methylparathion</td>
</tr>
<tr>
<td>Insecticide Synergists</td>
<td>Piperonyl Butoxide</td>
</tr>
<tr>
<td>Fungicides</td>
<td>Pentachlorophenol, Hexachlorobenzene, Maneb, Naban, Zineb</td>
</tr>
<tr>
<td>Fumigants</td>
<td>Calcium Cyanide, Methyl Bromide, Phosphine</td>
</tr>
<tr>
<td>Seed Disinfectants</td>
<td>Methylmercury Acetate, Methylmercury Cyanide</td>
</tr>
</tbody>
</table>

#### GOALS:

1. Identify all chemicals with severe to extreme acute toxicity
2. Identify all chemicals in product classes with similar mechanisms of action
# Incompatible Chemical Database

<table>
<thead>
<tr>
<th>Chemical Class</th>
<th>Chemical</th>
<th>Incompatible Chemical</th>
<th>I.C. Class</th>
<th>Interaction Hazard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrosives</td>
<td>Acetic Acid</td>
<td>Hydrogen Peroxide</td>
<td>Oxidizer</td>
<td>Explosion</td>
</tr>
<tr>
<td></td>
<td>Nitric Acid</td>
<td>Acetylene</td>
<td>Flammable</td>
<td>Explosion</td>
</tr>
<tr>
<td></td>
<td>Chlorine</td>
<td>Aluminum Powder</td>
<td>Metal</td>
<td>Spontaneous Fire</td>
</tr>
<tr>
<td>Flammables</td>
<td>Acetone</td>
<td>Chloroform</td>
<td>Carcinogen</td>
<td>Explosion</td>
</tr>
<tr>
<td></td>
<td>Benzene</td>
<td>Chlorine</td>
<td>Corrosive</td>
<td>Explosion</td>
</tr>
<tr>
<td></td>
<td>Carbon Disulfide</td>
<td>Potassium</td>
<td>Flammable</td>
<td>Violent Explosion</td>
</tr>
<tr>
<td>Reactives</td>
<td>Nitrotoluene</td>
<td>Sulfuric Acid</td>
<td>Corrosive</td>
<td>Explosion</td>
</tr>
<tr>
<td></td>
<td>Nitroethane</td>
<td>Hydrocarbons</td>
<td>Combustible</td>
<td>Explosion</td>
</tr>
<tr>
<td></td>
<td>Acrylonitrile</td>
<td>Bromine</td>
<td>Corrosive</td>
<td>Explosion</td>
</tr>
<tr>
<td>Products</td>
<td>Toilet Bowl Cleaner</td>
<td>Metal Powders</td>
<td>Metals</td>
<td>Explosion</td>
</tr>
<tr>
<td></td>
<td>Bleach</td>
<td>Ammonia</td>
<td>Product</td>
<td>Poisonous Gas</td>
</tr>
<tr>
<td></td>
<td>Paint Solvent</td>
<td>Chloroform</td>
<td>Carcinogen</td>
<td>Explosion</td>
</tr>
</tbody>
</table>
## Chemical Security Procedures

### Security Procedure Phases

<table>
<thead>
<tr>
<th>Phase</th>
<th>Description</th>
</tr>
</thead>
</table>
| Phase I | Vulnerability Assessment  
*Identify chemical hazards, security risks, mortality risks* |
| Phase II | Countermeasures Implementation  
*Reduce vulnerabilities* |
| Phase III | Verification Audit  
*Independently confirm counter measure adequacy* |
| Phase IV | Management System Integration  
*Integrate chemical security procedures into line management functions* |
C-HoSS Security Criteria and Standards

- Chemical Hazard Class Rankings (*by Hazard Class*)
- Chemical Hazard Grades (1-4) (*within each ranking*)
- Product Concentration Grades (1-4)

**Chemical Hazard Factor (CHF) = Ranking \( \hat{p} \) Grade \( \hat{p} \) Concentration**

- Theft Risk Grades (1-4) (*per product*)

**Chemical Security Risk Factor (CSRF) = Ranking \( \hat{p} \) Grade \( \hat{p} \) Concentration \( \hat{p} \) Theft Risk**

- Population at Risk Grades (1-4)

**Chemical Mortality Risk Factor (CMRF) = Ranking \( \hat{p} \) Grade \( \hat{p} \) Concentration \( \hat{p} \) Theft Risk \( \hat{p} \) Population Risk**

- Accessibility Factor Levels (*Storage Constraint Levels and Descriptors*) (0.5 - 4.5)

**CMRF ndef Accessibility Factor (AF) = Vulnerability Factor (VF)**
C-HoSS Security Risk Assessment Analytical Reports

**PRODUCT & CHEMICAL ANALYSES**
- Inventory by Product Type
- Product by Location
- Product by Container Size
- Product by Weight
- Product Hazard Classifications
- Product Hazard Rankings
- Product Hazard Grades
- Product Hazard Factors
- Product Security Risk Factors
- Product Accessibility Factors
- Product Accessibility Levels/Storage Codes
- Chemicals by Product
- Pure Chemicals by Location
- Pure Chemicals by Weight

**PRECURSOR CHEMICAL ANALYSES**
- Precursor Chemicals by Location
- Precursor Chemicals by Container Size
- Precursor Chemicals by Weight
- Precursor Chemicals Hazard Classifications
- Precursor Chemicals Hazard Rankings
- Precursor Chemicals Hazard Grades
- Precursor Chemicals Hazard Factors
- Precursor Chemicals Security Risk Factors
- Precursor Chemicals Accessibility Factors
- Precursor Chemicals Accessibility Levels/Storage Codes

**SPECIALTY MODULE ANALYSES**
- Air Releases
- Water Contaminants
- Toxics
- Pesticides
- Hazardous Waste
- Solid Waste
- Storage Tanks
- Munitions
- Chemical Safety
- Industrial Hygiene

**INCOMPATIBILITY ANALYSES**
- Prioritized Incompatibility Threats by Product
- Prioritized Incompatibility Threats by Room
- Prioritized Incompatibility Threats by Building
- Prioritized Incompatibility Threats by Facility

**SECURITY ANALYSES**
- Inventory by CHF
- Inventory by CSRF
- Inventory by AF
- Inventory by Storage Levels
- Inventory (shift) by HSAS

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\(^a\) Chemical, Precursor Chemical, Munition, Chemical Agent, Simulant.

\(^b\) Assigned by their worst classification: (1) innate classification, or (2) reaction product classification.
## C-HoSS Capabilities vs. Chemical Security Procedures

<table>
<thead>
<tr>
<th>Security Procedure Phases</th>
<th>C-HoSS Capabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Phase I</strong></td>
<td>Chemical Hazard Factor Report</td>
</tr>
<tr>
<td>Vulnerability Assessment</td>
<td>Chemical Security Risk Factor Report</td>
</tr>
<tr>
<td><em>Identify chemical hazards, security risks, mortality risks</em></td>
<td>Chemical Mortality Risk Factor Report</td>
</tr>
<tr>
<td></td>
<td>Chemical Vulnerability Risk Factor Report</td>
</tr>
<tr>
<td><strong>Phase II</strong></td>
<td>Accessibility Factor (Storage Constraint) Report (per chemical/material)</td>
</tr>
<tr>
<td>Counter measures Implementation</td>
<td></td>
</tr>
<tr>
<td><em>Reduce vulnerabilities</em></td>
<td></td>
</tr>
<tr>
<td><strong>Phase III</strong></td>
<td>Chemical Vulnerability Factor “Report Card”</td>
</tr>
<tr>
<td>Verification Audit</td>
<td><em>(to the local fire department)</em></td>
</tr>
<tr>
<td><em>Independently confirm counter measure adequacy</em></td>
<td></td>
</tr>
<tr>
<td><strong>Phase IV</strong></td>
<td>Integration of C-HoSS w/ the chemical tracking system</td>
</tr>
<tr>
<td>Management System Integration</td>
<td>Daily C-HoSS correlation w/ the Homeland Security Advisory System</td>
</tr>
</tbody>
</table>
For information, contact:

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