ABSTRACT
Agriculture operations by nature can be inherently dangerous. Avoiding accidents and surviving one, should it occur, both require training. This presentation enables you to recognize common hazards that exist during grain bin operations, understand steps that reduce or eliminate these hazards, and identify initial actions that should be taken in the event of an accident at a grain handling facilities.

Oklahoma State University – Fire Service Training
Grain Bin Emergencies – Awareness
On March 23, 2009, Nolan Schmidt, volunteer fire chief for the Hydro, Oklahoma fire department died fighting a fire inside a Hydro grain bin. Fire Chief Schmidt was one of at least five firefighters who climbed into a bin half full of burning soybeans. Fellow firefighters later cut through the side of the metal bin to remove Schmidt and four other colleagues, who were overwhelmed by thick smoke.

Chief Schmidt and the members of his fire department had been dispatched to a report of a possible fire in a large grain bin. Firefighters entered the bin to investigate. Chief Schmidt ordered firefighters to exit the bin. In order to get out of the bin, firefighters had to climb up a long ladder. One of the firefighters in the bin was fatigued and could not complete the climb. Chief Schmidt entered the bin to assist the firefighter. Both firefighters subsequently lost consciousness.

Firefighters on the exterior cut a hole in the metal wall of the bin and extricated the two firefighters. Chief Schmidt was transported to the hospital but was pronounced dead. The cause of death was listed as asphyxiation due to probable carbon monoxide toxicity.

Accidents occur in every occupation. When they occur in agriculture operations or emergency response these accidents can be disastrous. This presentation is intended to prevent such incidents from occurring.
Module 1
Introduction

Goal
To recognize common hazards that exist during grain bin operations, understand steps that reduce or eliminate these hazards, and identify initial actions that should be taken in the event of an accident at a grain handling facilities.

Objectives
• Identify the OSHA Regulations that directly affect Grain Bin Rescue.
• Identify the NFPA Standards that directly affect Grain Bin Rescue.
• List the potential hazards associated with grain bin operations.
• Identify avenues to mitigate the risk of injury or death from working around grain bin operations.
• Summarize what steps to take in the case of someone getting injured within a grain bin.
Slide 5

ACTIVITY

ACTIVITY 1.1

- Name
- Employer
- Related Experience
- Current assignment and responsibilities
- Family
- Hobbies

Slide 6

WARNING!

Agriculture operations by nature can be inherently dangerous. The best way to avoid injuries and death comes from training, experience, proper use of equipment, repeated practice, and sound judgment. It is up to you to obtain competent instruction and practice sound safety procedures.

Slide 7

OSHA Regulations

29 CFR 1910.272 - Grain Handling Facilities
29 CFR 1910.272 App B - National Consensus Standards
29 CFR 1910.272 App C - References for Further Information
Slide 8

**NFPA Standards**

**Rescue Standards**

- Awareness
- Operations
- Technician

- Technician Level I
- Technician Level II

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Slide 9

**NFPA 1670**

  - Awareness
  - Operations
  - Technician

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Slide 10

**Other Standards**

**Other Standard Setting Organizations**

- The National Institute of Occupational Safety and Health (NIOSH) www.cdc.gov/niosh
- The American Society for Testing and Materials (ASTM) www.astm.org
- The American National Standards Institute (ANSI) www.ansi.org
- American Society of safety Engineers (ASSE) www.asse.org
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**Agricultural – Danger, Disability, Death**

- 60+ corporate grain handling facility sites operating in Oklahoma
- Oklahoma Farms 2012 Census
  - Number of Farms in Oklahoma 85,000
  - Land in Production 34,800,000 acres
  - Cash Receipts From Farms $7,038,174,000

Slide 12

**Grain Bins and Facilities**

- Bins
- Flat Storage
- Gravity Wagons
- Grain Buggies
- Hopper Bottom Trailers
Slide 13

Module 2

Good Grain Quality
Equals
Safety and Profit
Management, Quality and Safety

Slide 14

Module 2 Goal

The Grain Bin Emergency Awareness responder will be able to accurately identify the presence of hazards associated with the characteristics of poor grain quality, hazardous structures and dust collection.

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Module 2 Objectives

- Identify the presence of hazards at grain bins and facilities
- List the potential hazards associated with grain bin operations
- List the dangers of working around poor quality grain
- Answer questions about engulfment
- Understand what to look for on farms and at facilities
- Identify the factors associated with dust explosions
- Understand the method for creating a “Culture of Safety”
**The Facts**

- Farming is in the top 3 on US Bureau of Labor Standards' list of most dangerous occupations (adults and children).
- Estimated 300+ children die each year in farming accidents in the USA.
- Under 16 years old account for 20% of farm fatalities.
- Not to mention permanent disabilities (estimated 1000 each year).

**Agricultural – Danger, Disability, Death**

Information taken from the Census of Fatal Occupational Injuries.
Slide 18

Agricultural – Danger, Disability, Death

What can be done?

• What can we do to lower these numbers?
• Awareness thru education and interaction?
• FFA
• 4H
• Farm, Ranch and Rural Publications

Slide 19

Grain Handling

2010-11….50+ entrapments and 24 deaths
This year (14-15) on target to exceed that...
77% of grain bin incident victims are unloading bins with out-of-condition grain
Trapped in 4-5 seconds, buried in 20 seconds.

Slide 20

How does it happen?

Three ways it can happen; all are associated with unloading poor quality grain:
• Flowing Grain
• Collapse of a Grain Bridge
• Avalanche of a Vertical Grain Wall
• Grain Bin or Gravity Wagon...
• Trapped in 4-5 sec, buried in 20 sec!!!
Slide 21

**Flowing Grain**

- 2 – 3 seconds for engulfment
- Why is this worker in the bin??????

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Slide 22

**Collapse Of Grain Bridge**

- Out of Condition Grain
- Victim may travel 5’ or more

---

Slide 23

**Avalanche of grain wall**

- Vibration!!!
- Out of condition grain stuck to the bin wall
If Grain is in good condition:

- Reclaim systems work properly
- No need to enter the bin!!!
- If workers aren’t in the bin, entrapment doesn’t happen!

Major Cause:

Out-of-Condition Grain!!!

What to look for...

- Poor grain quality going into the bin
- Quality NEVER improves in storage
- Management of temperature changes and moisture
What to look for...

- Leaky structures
- Aeration systems not designed properly
- Aeration system mismanagement
- Temperature cable malfunctions

Inadequate or Plugged Roof Vents

- Inadequate or plugged roof vents
  - Passive
  - Powered
  - Sliding vents
  - Elevated fans
What To Look For...

- Insect Activity
- Do you know your bugs????

What To Look For...

- Poor sanitation practices
- Reclaim system malfunction or poor design
- Inadequate dust management

Be Prepared

- Use proper equipment if you do have to enter a bin
  - Harness
  - Anchor Points in Bins
  - Bin Entry Kit
  - How about the air quality??
  - Lock out Tag out...ALWAYS
- Never...ever....ever.... work alone!
Slide 33
What to look for...
- Poor sanitation practices
- Reclaim system malfunction or poor design
- AND......
- Inadequate dust management

Slide 34
And what about explosions?
Requires 5 things...ALWAYS!
- Fuel
- Ignition
- Dispersion
- Confinement
- Chain reaction

Slide 35
And what about explosions?
- Dust settles on flat surfaces
- Some event disturbs the settled dust, into a cloud
- Dust cloud is ignited and explodes
Grain Bin Emergencies Awareness

What Bulb???

Digital Pictures

Digital Pictures... spots are dust

The Remedy?

Keep it CLEAN!

The Remedy
Slide 39

**Dust Control**
- 1/8" inch maximum in priority areas
- Vacuum preferred with unit outside
- Compressed air only when ignition sources in the area removed or controlled

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Slide 40

**Potential Ignition Sources**
- Lightening strikes
- Open Flames
- Welding
- Cutting
- Electric arc and sparks
- Electrostatic Discharges
- Frictional heating
- Smoking
- Self-heating/decomposition/spontaneous combustion
- Grinding
- Hot surfaces
- Exothermic runaway chemical reactions
- Mechanical impacts

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Slide 41

**The Remedy**
Eliminate heat source
Slide 42

The Remedy

Eliminate heat source

Slide 43

Dust Chamber

Slide 44

Dust Chamber (slow motions)
Slide 45

The Remedy?
In other words...
- Keep grain in good condition
- Maintenance
- Caution and Training

Slide 46

NOT a “Culture of Safety”
- Rushed work habits
- Seasonal or young workers with little training
- “Seasoned” workers getting sloppy
- Lack of a “safety culture”

Slide 47

How do we fix it...
- Develop “Safety Always” mindset
- Follow Best Management Practices
- Train yourself, workers and family
- Brainstorm and talk about “what-ifs”
Slide 48

How do we fix it...

Focus on the details...

Manage **GRAIN QUALITY** AND Be Prepared through

- Communication....
- Teamwork....
- Training.....it's EVERYONE'S job

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Slide 49

**If Grain is in good condition....**

Accidents can be prevented

The only good accident is one that is prevented ..... AND....we have a product to sell...for more $$$

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Slide 50

**Questions?**

Jcarol@okstate.edu

Dr. Carol L. Jones

is currently an associate professor in the Biosystems and Agricultural Engineering Department at Oklahoma State University. Her appointment to the BAE faculty began in 2006 after 25+ years in the energy and agricultural fields. Her area of research, extension and teaching is in postharvest technology and material handling of biological products.

Further questions regarding grain condition and proper storage can be directed to Dr. Jones at Jcarol@okstate.edu.
Module 3
Hazard Recognition

Module 3 Goal
The First Responder – Grain Bin Awareness level, will understand his/her role and responsibilities as an emergency responder associated with detecting the presence of chemicals and will be able to discuss the dangers involved with grain bin entry.

Module 3 Objectives
• Identify the presence of hazards at grain bins and facilities
• List the potential hazards associated with pesticides
• Answer questions about grain bin entry permits
• Define Lock out/Tag out
• Discuss the differences: Entanglement, Entrapment and Engulfment
• Identify incident priorities
• Understand the emergency procedures if you are trapped
Slide 54

**Pesticides**

- NASS survey shows only 15% of grain was treated
- PDP surveys show 80-91% of the grain had detectible residues

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Slide 55

**Pesticides**

- Aluminum Phosphate
- Chlorpyrifos
- Lindane (seed treatments)
- Diatomaceous Earth

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Slide 56

**Pesticides**

- What are the potential health effects of pesticides?
Slide 57

Chemical Hazards

Slide 58

Aluminum Phosphide

- Fumitoxin
- PhosFume
- PhosFume
- Weevil-Cide

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Phosphine Gas

Permissible Exposure Limit (PEL) is maximum amount a person can tolerate without becoming a life-threatening condition unless using personal protective equipment.

PEL for Phosphine = 0.3 ppm
Health Effects

- Once a toxic substance has contacted the body, it may have either acute (immediate) or chronic (long-term) effects. Example: Spilling acid on your hand will cause immediate harm, i.e. a burn to the skin.

Material / Safety Data Sheets

Safety Data Sheets (SDS) contain information on the product’s ingredients as well as outlining emergency procedures. SDS should be read and understood before using hazardous chemicals and kept readily accessible in case of an emergency.

Routes of Entry
Slide 63

Electrical Hazards

Slide 64

Fall Hazards

- Belt Manlifts
- Hand Rails
- Ladders
- Cage Lifts

Slide 65

Grain Moving Equipment

- Drive Shafts
- PTOs
- Belts
- Chains
- Pulleys
**Slide 66**

**Oxygen Deficient Atmospheres**

- 23.5% Maximum for Safe Entry
- 20.9% Normal Oxygen Level In Air
- 19.5% Minimum for Safe Entry
- 16% Impaired Judgment and Breathing
- 14% Faulty Judgement, Rapid Fatigue
- 6% Difficulty Breathing - Death Within Minutes

**Slide 67**

**Testing the Atmosphere**

- Never trust your senses!
- Many toxic gases are odorless and cannot be seen.
- The level of oxygen can not be determined without a monitoring device.
- Test from Outside – Top to Bottom

**Slide 68**

**Bin Aeration Systems**

- Grain bins are commonly equipped with aeration systems which:
  - Cool grain for safe storage
  - Dry grain
  - Prevent moisture accumulation
  - Reduce loss to insect damage
Characteristics of a Confined Space

- Oxygen less than 19.5%
- Present/Potential flammable
- Combustible or explosive atmosphere
- Present/Potential toxic atmosphere
- Engulfment
- Assistance needed against entry of substances which may be possible hazards
- Poor natural ventilation
- Restricted entry for rescue

Lockout/Tagout

Except for fans and lighting, turn off and lock out all powered equipment:
- Heaters
- Augers
- Conveyor belts
- Other grain moving equipment

Grain Bin Entry and Permits

Never enter a bin without a “bin entry permit”
- Lockout/Tag Out energy sources
- Perform atmospheric monitoring
- Use a safety harness and lifeline
- Provide adequate lighting
- Train for safe entry and emergency egress
- ALWAYS have someone monitoring the entry from outside the bin
Entanglement

- Most occur during unloading
- Most bins have an auger
- Grain flow is from the top and down the center
- Complete entrapment may occur in a few seconds if the auger is running

Entrapment

Grain Engulfment

- Most occur during unloading
- Most bins have an auger
- Grain flow is from the top and down the center
- Complete entrapment may occur in a few seconds if the auger is running
**Crushed Tissue Syndrome**

One of the most dreaded injuries in delayed response emergencies. Severe compressive injury to muscles resulting in muscle cell death. As cells die they produce toxins that can have fatal effect when the compressing load is released.

**Incident Priorities:**

- Life Safety
- Incident Stabilization
- Property Conservation
Factors Leading To Poor Decisions

Accidents are normally caused by a chain of events. Many of these events are the result of POOR DECISIONS. Factors leading to POOR DECISIONS include:

**“THE DIRTY DOZEN”**

- Lack of Communication
- Lack of Knowledge
- Lack of Teamwork
- Lack of Resources
- Lack of Assertiveness
- Lack of Awareness
- Complacency
- Distractions
- Fatigue
- Pressure
- Stress
- Norms

Modes of Operation

Don’t leave blind spots, Check Your Six!

Emergency Actions If You Are Trapped

- If you’re sinking up to your chest – cross your arms in front of your chest so that you can breathe
- Placing a light cloth over your face to keep grain and dust out of your airway
- Do not continue to struggle against grain. Additional movement can pack the grain tighter around your body.
- Stay calm and listen for the arrival of help.
Slide 81

**Emergency Actions**

**If SOMEONE ELSE is Trapped**

Time is of the essence.

- TURN OFF all augers, off-loading equipment, and heaters.
- Call 911 and summon any help near you.
- If bin fans are on, leave them on.
- DO NOT enter the bin alone.

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**Rescue Procedures**

- Be sure auger is off
- Ventilate the bin with bin ventilation fan
- Turn on fan only
- Don’t activate heat source
- Trapped victims may survive total submersion

Slide 83

**Rescue Procedures**

- Prevent further pressure on victim by:
  - Staying away from area around victim
  - Use a ladder, plywood, or other materials to distribute weight
- Rescue protection should be a concern
  - Provide safety lines
  - Consider respiratory protection
Rescue Procedures

- If grain can’t be hand scooped:
  - Cut holes in the bin across opposite sides
  - Holes should be semi-circular or V-shaped
  - 30-40 inches across within the bolt lines
  - Victims location dictates location of holes
  - Cut just below victim who is submerged
  - As low as possible if victim is not visible

Remember:

Each grain-handling facility is unique in layout, design, construction, operations, equipment, and personnel.

Each facility warrants individual preplanning.

Be Prepared!

Video – Grain Bin Safety

This video may be viewed at www.youtube.com/watch?v=DQSqWbn-3XO
The Technical information presented in this program is in no way meant to qualify the participants as experts in the field of GRAIN BIN EMERGENCIES. Participation in this program should be considered a learning and sharing experience. The instructors and assistants share with the students information they have gained through actual experience as well as training sessions they have attended. THE IMPORTANCE OF REPEATED PRACTICE AND ADDITIONAL TRAINING CANNOT BE OVER STRESSED. The methods and procedures presented in this program are NOT to be considered absolute.

Grain Bin Emergencies Awareness

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Summary

Avoid entering grain bins whenever possible!

If entry must be made:

• TURN OFF and lock out all grain moving equipment and dryers
• Use a body harness and anchored lifeline
• Test the bin’s air (oxygen, flammability, toxic)
• DO NOT walk down grain
• DO NOT enter below bridged grain or wall build ups
• HAVE a trained/equipped observer outside

Program Support

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“This material was produced under grant SH-276655-15-60-F-40 from the Occupational Safety and Health Administration, U.S. Department of Labor. It does not necessarily reflect the views of policies of the U. S. Department of Labor, nor does it mention of trade names, commercial product, or organizations imply
endorsement by the U. S. Government...”
Identification

Product identifier


Relevant identified uses of the substance or mixture and uses advised against

Product description Fumigant for Insect & Rodent Control

Application of the substance / the mixture

Fumigants used to treat raw agricultural commodities, processed foods, non-food commodities and rodent burrows.

Details of the supplier of the safety data sheet

Manufacturer/Supplier: DEGESCH America, Inc.
153 Triangle Dr.
P.O. Box 116
Weyers Cave, VA 24486 USA
Telephone: (540) 234-9281 / 800-330-2525
Telefax: (540) 234-8225
www.degeschamerica.com
degesch@degeschamerica.com

Emergency telephone number:

For human or animal emergencies: 1-800-308-4856 (Rocky Mountain Poison and Drug Center)
For all other chemical emergencies: 1-800-424-9300 (Chemtrec)
Emergency and Information - DEGESCH America, Inc. (540) 234-9281 / 800-330-2525

Classification of the substance or mixture

GHS02 Flame

Water-react. 1 H260 In contact with water releases flammable gases which may ignite spontaneously.

GHS08 Skull and crossbones

Acute Tox. 2 H300 Fatal if swallowed.
Acute Tox. 2 H330 Fatal if inhaled.

GHS05 Corrosion

Eye Dam. 1 H318 Causes serious eye damage.

GHS09 Environment

Aquatic Acute 1 H400 Very toxic to aquatic life.

(Contd. on page 2)
Safety Data Sheet (SDS)

OSHA HazCom Standard 29 CFR 1910.1200(g) and GHS Rev 03.

Printing date 04/02/2015 Reviewed on 04/02/2015


![GHS07]

Skin Irrit. 2 H315 Causes skin irritation.

Label elements
- GHS label elements
  - The product is classified and labeled according to the Globally Harmonized System (GHS).
  - Hazard pictograms
    - GHS02 GHS05 GHS06 GHS08 GHS09

Signal word Danger

Hazard-determining components of labeling:
- Aluminum Phosphide
- Ammonium Carbamate
- Proprietary

Hazard statements
- In contact with water releases flammable gases which may ignite spontaneously.
- Fatal if swallowed or if inhaled.
- Causes skin irritation.
- Causes serious eye damage.
- Very toxic to aquatic life.

Precautionary statements
- Keep away from any possible contact with water, because of violent reaction and possible flash fire.
- Do not breathe dust/fume/gas/mist/vapors/spray.
- Wear respiratory protection.
- Wear protective gloves / eye protection / face protection.
- Avoid release to the environment.
- Wash thoroughly after handling.
- Do not eat, drink or smoke when using this product.
- If swallowed: Immediately call a poison center/doctor.
- If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
- Specific treatment is urgent (see supplementary first aid instructions on this Safety Data Sheet).
- If INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
- If skin irritation occurs: Get medical advice/attention.
- In case of fire: Use for extinction: CO2, sand, extinguishing powder.
- If on skin: Wash with plenty of water.
- Collect spillage.
- Store locked up.
- Store in a well-ventilated place. Keep container tightly closed.
- Store in a dry place. Store in a closed container.
- Dispose of contents/container in accordance with local/regional/national/international regulations.

(Contd. on page 3)
Unknown acute toxicity:  
13.3 percent of the mixture consists of ingredient(s) of unknown toxicity.

Classification system:
NFPA ratings (scale 0 - 4)

Health = 4  
Fire = 4  
Reactivity = 2

The substance demonstrates unusual reactivity with water.

HMIS-ratings (scale 0 - 4)

Health = *4  
Fire = 4  
Reactivity = 2

Other hazards: None known

3 Composition/Information on ingredients

- Chemical characterization: Mixtures
- Description: Mixture of substances listed below with nonhazardous additions.

Dangerous Components:

<table>
<thead>
<tr>
<th>CAS.</th>
<th>RTECS: BD</th>
<th>Substance</th>
<th>Properties</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>20850-73-8</td>
<td>14000000</td>
<td>Aluminum Phosphide</td>
<td>Water-react. 1, H260; Acute Tox. 2, H300; Aquatic Acute 1, H400</td>
<td>55% Proprietary</td>
</tr>
<tr>
<td>1111-78-0</td>
<td>12000000</td>
<td>Ammonium Carbamate</td>
<td>Eye Dam. 1, H316; Acute Tox. 4, H302; Skin Irrit. 2, H315; Aquatic Acute 3, H402</td>
<td>2-12%</td>
</tr>
<tr>
<td></td>
<td>Proprietary</td>
<td>STOT SE 3, H335</td>
<td>2-12%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Proprietary</td>
<td>STOT SE 3, H335</td>
<td>2-12%</td>
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</tr>
<tr>
<td></td>
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<td>STOT SE 3, H335</td>
<td>2-12%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Proprietary</td>
<td>Acute Tox. 4, H302; Skin Irrit. 2, H315; STOT SE 3, H335; Eye Irrit. 2B, H320</td>
<td>2-12%</td>
<td></td>
</tr>
</tbody>
</table>

Additional information:
Phostoxin Tablets, Phostoxin Pellets, Phostoxin Tablet Prepac, Phostoxin Prepac Ropes, DetiaPhos Tablets and DetiaPhos Pellets react with water to produce phosphine (hydrogen phosphide, PH3; CAS No. 7803-51-2) as shown in Equation 1. Phostoxin and DetiaPhos products are formulated with 55% aluminum phosphide and also contain ammonium carbamate (AC) and inert ingredients. Ammonium carbamate decomposes to liberate ammonia (CAS No. 7664-41-7) and carbon dioxide (CAS No. 124-38-9) as shown in Equation 2.

1) \[ AlP + 3H2O \rightarrow Al(OH)3 + PH3 \]
2) \[ NH2COONH4 \rightarrow 2NH3 + CO2 \]

(Contd. on page 4)
4 First-aid measures

- Description of first aid measures
  - General information:
    Symptoms of overexposure are headache, dizziness, nausea, difficult breathing, vomiting, and diarrhea. In all cases of overexposure, get medical attention immediately. Take victim to a doctor or emergency treatment facility.
    Have product container label and applicator’s manual with you when calling a poison control center, doctor, or when going for treatment.
  - After inhalation:
    Get exposed person to fresh air. If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably by mouth to mouth, if possible. Contact a poison control center or doctor for treatment advice.
  - After skin contact:
    Take off contaminated clothing immediately. Rinse skin immediately with plenty of water for 15-20 minutes. Call a poison control center or doctor for treatment advice.
  - After eye contact:
    Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eyes. Call a poison control center or doctor for treatment advice.
  - After swallowing:
    Call a poison control center or doctor immediately for treatment advice. Have person sip a glass of water if able to swallow. Do not give anything by mouth to an unconscious person. Do not induce vomiting unless told to by a poison control center or doctor.
  - Information for doctor:
    Most important symptoms and effects, both acute and delayed
    Aluminum phosphide fumigant products react with moisture from the air, acids and many other liquids to release phosphine gas (hydrogen phosphide, PH₃). Mild exposure by inhalation causes malaise (indefinite feeling of sickness), headache, ringing in the ears, fatigue, nausea and pressure in the chest which is relieved by removal to fresh air. Moderate poisoning causes weakness, vomiting, pain just above the stomach, chest pain, diarrhea and dyspnea (difficultly breathing). Symptoms of severe poisoning may occur within a few hours to several days resulting in pulmonary edema and may lead to dizziness, cyanosis, unconsciousness, and death.
    Indication of any immediate medical attention and special treatment needed
    No further relevant information available.

5 Fire-fighting measures

- Extinguishing media
  - Suitable extinguishing agents: CO₂, sand, extinguishing powder. Do not use water.
  - For safety reasons unsuitable extinguishing agents: Water
  - Special hazards arising from the substance or mixture
    Phosphine (hydrogen phosphide, PH₃)-air mixtures at concentrations above the LEL of 1.8% v/v (18,000 ppm) may ignite spontaneously. Ignition of high concentrations of phosphine gas (hydrogen phosphide, PH₃) can produce a very energetic reaction. Explosions can occur under these conditions and may cause severe personal injury. Never allow the buildup of phosphine gas (hydrogen phosphide, PH₃) to exceed explosive concentrations. Open containers of metal phosphides in open air only and never in a flammable atmosphere. Do not confine spent or partially spent dust from metal phosphide fumigants as the slow release of phosphine gas (hydrogen phosphide, PH₃) from these materials may result in the formation of an explosive atmosphere. Spontaneous ignition may occur if large quantities of aluminum phosphide are piled in contact with liquid water. This is particularly true if quantities of these materials are placed in an environment which can provide (Cont. on page 5)
Safety Data Sheet (SDS)
OSHA HazCom Standard 29 CFR 1910.1200(g) and GHS Rev 03.

Printing date 04/02/2015 Reviewed on 04/02/2015


partial confinement of the hydrogen phosphate gas liberated by hydrolysis.

If incinerated, product will release the following toxic materials: Oxides of aluminum, phosphorous, nitrogen (NOx), carbon, phosphate gas (hydrogen phosphate, Ph₃), ammonia and phosphoric acid.

Advice for firefighters
Aluminum phosphate is not flammable by itself. However, it reacts readily with water to produce phosphine gas (hydrogen phosphate, Ph₃) which may ignite spontaneously in air at concentrations above its LEL of 1.8% V/V (15,000 ppm). The UEL of phosphine gas (hydrogen phosphate, Ph₃) is unknown.

Protective equipment:
As in any fire, wear self-contained breathing apparatus pressure-demand (NIOSH approved or equivalent), and full protective gear to prevent contact with skin and eyes. Wear a NIOSH/MSHA approved full-face gas mask - phosphine gas canister combination may be used at levels up to 15 ppm or following manufacturers' use conditions instructions for escape. Above 15 ppm or in situations where the phosphine gas concentration is unknown, a NIOSH/MSHA approved SCBA must be worn.

6 Accidental release measures

Personal precautions, protective equipment and emergency procedures
Respiratory protection will most likely be required during cleanup of spilled aluminum phosphate fumigants. If the concentration of phosphine (hydrogen phosphate, Ph₃) is unknown, NIOSH/MSHA approved SCBA or its equivalent must be worn. Full-face gas mask canister combinations may only be worn at concentrations no higher than 15 ppm.

Environmental precautions:
Inform respective authorities in case of seepage into water course or sewage system.

Methods and material for containment and cleaning up:
If possible, dispose of spilled material by use according to label instructions. Freshly spilled material which has not been contaminated by water or foreign matter may be placed back into its original or other air-tight container. Punctured flasks, pouches or containers may be temporarily repaired using aluminum tape. If the age of the spill is unknown or if the product has been contaminated with soil, debris, water, etc., gather up the spillage in small open buckets having a capacity no larger than about 1 gallon. Do not add more than about 1 to 1.5 kg (2 to 3 lbs.) to a bucket. If on-site wet-deactivation is not feasible, transport the uncovered buckets in open vehicles to a suitable area.

Small amounts of spillage, from about 4 to 8 kg (9 to 18 lbs.) may be spread out over the ground in an open area to be deactivated by atmospheric moisture. Alternatively, spilled aluminum phosphate fumigants may be deactivated by the wet method as described in the following:

Wet Deactivation of Spilled Phostoxin & DetiaPhos Products:
1. Deactivating solution is prepared by adding the appropriate amount of low sudsing detergent to water in a drum or other suitable container. A 2% solution or 4 cups of detergent in 30 gallons is suggested. The container should be filled with deactivating solution to within a few inches of the top.
2. The material is added slowly to the deactivating solution and stirred so as to thoroughly wet all of the product. This should be carried out in open air and respiratory protection may be required. At no time should the deactivation drum be covered.
3. No more than about 45 to 50 lbs. of Phostoxin or DetiaPhos should be added to 15 gallons of water-detergent mixture. Prepacs and Ropes may ignite during wet deactivation if they are allowed to float to the surface. Add weights or otherwise ensure that Phostoxin or DetiaPhos products stay submerged until deactivation is completed.
4. Allow the mixture to stand, with occasional stirring, for about 36 hours. The resultant slurry of dust or packaged product will then be safe for disposal.
5. Dispose of the slurry of deactivated material, with or without preliminary decanting, at a sanitary landfill or other suitable site approved by local authorities. Where permissible, this slurry may be poured into a storm

(Contd. on page 6)

sewer or out onto the ground.
If possible, dispose of spilled material by use according to label instructions. Freshly spilled material which has not been contaminated by water or foreign matter may be placed back into its original or other air-tight container. Punctured flasks, pouches or containers may be temporarily repaired using aluminum tape. If the age of the spill is unknown or if the product has been contaminated with soil, debris, water, etc., gather up the spillage in small open buckets having a capacity no larger than about 1 gallon. Do not add more than about 1 to 1.5 kg (2 to 3 lbs.) to a bucket. If on-site wet-deactivation is not feasible, transport the uncovered buckets in open vehicles to a suitable area.

Small amounts of spillage, from about 4 to 8 kg (9 to 18 lbs.) may be spread out over the ground in an open area to be deactivated by atmospheric moisture. Alternatively, spilled aluminum phosphide fumigants may be deactivated by the wet method as described in the following:

Wet Deactivation of Spilled Phostoxin & DetiaPhos Products:
1. Deactivating solution is prepared by adding the appropriate amount of low sudsing detergent to water in a drum or other suitable container. A 2% solution or 4 cups of detergent in 30 gallons is suggested. The container should be filled with deactivating solution to within a few inches of the top.
2. The material is added slowly to the deactivating solution and stirred so as to thoroughly wet all of the product. This should be carried out in open air and respiratory protection may be required. At no time should the deactivation drum be covered.
3. No more than about 45 to 50 lbs. of Phostoxin or DetiaPhos should be added to 15 gallons of water-detergent mixture. Prepac and Ropes may ignite during wet deactivation if they are allowed to float to the surface. Add weights or otherwise ensure that Phostoxin or DetiaPhos products stay submerged until deactivation is completed.
4. Allow the mixture to stand, with occasional stirring, for about 36 hours. The resultant slurry of dust or packaged product will then be safe for disposal.
5. Dispose of the slurry of deactivated material, with or without preliminary decanting, at a sanitary landfill or other suitable site approved by local authorities. Where permissible, this slurry may be poured into a storm sewer or out onto the ground.

Reference to other sections
See Section 7 for information on safe handling.
See Section 8 for information on personal protection equipment.
See Section 13 for disposal information.

7 Handling and storage

- Handling:
  - Precautions for safe handling: Store in a cool, dry place in tightly closed containers.
  - Information about protection against explosions and fires:
    - Protect from heat.
    - Keep ignition sources away - Do not smoke.
    - Protect against electrostatic charges.
    - Keep protective respiratory device available.

- Conditions for safe storage, including any incompatibilities
  - Store away from water, acids, bases, strong oxidizing agents and strong reducing agents.

- Storage:
  - Requirements to be met by storerooms and receptacles:
    - Store products in a locked, dry, well-ventilated area away from heat. Post as a pesticide storage area. Do not store in buildings inhabited by humans or domestic animals.
  - Information about storage in one common storage facility: Not required.

(Contd. on page 7)

Further information about storage conditions:
Keep container tightly sealed.
Store in cool, dry conditions in well-sealed containers.
Protect from heat and direct sunlight.
Specific end use(s) No further relevant information available.

8 Exposure controls/personal protection

Additional information about design of technical systems: No further data; see section 7.

Control parameters
All ventilation should be designed in accordance with OSHA standard (29 CFR 1910.94). Use local exhaust at filling zones and where leakage and dust formation is probable. Use mechanical (general) ventilation for storage areas. Use appropriate ventilation as required to keep Exposure Limits in Air below TLV & PEL limits.

Components with occupational exposure limits:

<table>
<thead>
<tr>
<th>Substance</th>
<th>REL Long-term value:</th>
<th>as Al</th>
<th>TLV Long-term value:</th>
</tr>
</thead>
<tbody>
<tr>
<td>20059-73-8 Aluminum Phosphide</td>
<td>2 mg/m³</td>
<td></td>
<td>1* mg/m³</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>as Al; *as respirable fraction</td>
</tr>
<tr>
<td>Proprietary</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PEL Long-term value:</td>
<td>15*; 15** mg/m³</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>*Total dust; ** Respirable fraction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>REL Long-term value:</td>
<td>10*; 5** mg/m³</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>as Al; *Total dust; ** Respirable/powd/welding f.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TLV Long-term value:</td>
<td>1* mg/m³</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>as Al; *as respirable fraction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proprietary</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>REL Long-term value:</td>
<td>2 mg/m³</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>as Al</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TLV Long-term value:</td>
<td>1* mg/m³</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>as Al; *as respirable fraction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proprietary</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PEL Long-term value:</td>
<td>20 mppcf ppm</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(containing &lt;1% Quartz)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>REL Long-term value:</td>
<td>2* mg/m³</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>*respirable dust</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TLV Long-term value:</td>
<td>2* mg/m³</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>*as respirable fraction; E</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

7803-51-2 phosphine

<table>
<thead>
<tr>
<th>Substance</th>
<th>REL Long-term value:</th>
<th>Short-term value:</th>
<th>Long-term value:</th>
</tr>
</thead>
<tbody>
<tr>
<td>PEL Long-term value:</td>
<td>0.4 mg/m³; 0.3 ppm</td>
<td>1 ppm</td>
<td>0.4 mg/m³; 0.3 ppm</td>
</tr>
<tr>
<td>REL Long-term value:</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(Contd. on page 8)
Change in condition
  Melting point/Melting range: AIP = >1000 °C (AIP = >1832 °F) (PH3 = -133.5 °C)
  Boiling point/Boiling range: AIP = >1000 °C (AIP = >1832 °F) (PH3 = -87.7 °C)

Flash point: Not determined

Flammability (solid, gaseous): Contact with water or acids liberates extremely flammable gases.

Ignition temperature: Not determined

Decomposition temperature: Decomposes at ambient conditions when moisture is present.

Auto igniting: Spontaneously flammable in air.

Danger of explosion: Not determined.

Explosion limits:
  Lower: 1.8 Vol % (for PH3)
  Upper: Not established Vol % (for PH3)

Vapor pressure:
  AIP = 0 mm Hg
  PH3 = 40 mm Hg @ -129.4 °C
  AC = 100 mm Hg @ 26.7 °C

Density @ 20 °C (68 °F):
  AIP = 2.85 g/cm³ (AIP = 23.783 lbs/gal) (PH3 = 1.17 g/cm³)

Relative density: Not determined.

Vapor density: Not applicable.

Evaporation rate: Not applicable.

Solubility in / Miscibility with Water:
  AIP = Insoluble, reacts
  PH3 = 26 cc in 100 ml at 17 °C
  AC = Very soluble, reacts

Partition coefficient (n-octanol/water): Not determined.

Viscosity:
  Dynamic: Not applicable.
  Kinematic: Not applicable.

Solvent content:
  Organic solvents: 0.0 %
  Solids content: 100.0 %

Other information: No further relevant information available.

10 Stability and reactivity

Reactivity: No further relevant information available.

Chemical stability:
  Products are stable to most chemical reactions, except for hydrolysis. Products will react with moist air, liquid water, acids and some other liquids to produce toxic and flammable phosphine (hydrogen phosphide, PH3) gas.

Thermal decomposition / conditions to be avoided: No decomposition if used according to specifications.

Possibility of hazardous reactions:
  Contact with water releases flammable gases.
Safety Data Sheet (SDS)
OSHA HazCom Standard 29 CFR 1910.1200(g) and GHS Rev 03.

Printing date 04/02/2015 Reviewed on 04/02/2015


Contact with water releases toxic gases.
- **Conditions to avoid:** Avoid prolonged exposure to air.
- **Incompatible materials:** Water, acids, bases, strong oxidizing agents and strong reducing agents.
- **Hazardous decomposition products:** Oxides of aluminum, phosphorous, nitrogen (NOx), carbon, phosphine gas (hydrogen phosphide, PH3), ammonia and phosphoric acid.
- **Additional information:** Phosphine (hydrogen phosphide, PH3) gas may react with certain metals and cause corrosion, especially at higher temperatures and relative humidity. Metals such as copper, brass and other copper alloys, and precious metals such as gold and silver are susceptible to corrosion by phosphine. Small electric motors, smoke detectors, brass sprinkler heads, batteries and battery chargers, fork lifts, temperature monitoring systems, switching gears, communication devices, computers, calculators and other electrical equipment may be damaged by this gas. Phosphine (hydrogen phosphide, PH3) will also react with certain metallic salts and, therefore, sensitive items such as photographic film, some inorganic pigments, etc., should not be exposed.

### 11 Toxicological information

- **Information on toxicological effects**
- **Acute toxicity:**

<table>
<thead>
<tr>
<th>LD/LC50 values that are relevant for classification:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>20859-73-8 Aluminum Phosphide</strong></td>
</tr>
<tr>
<td>Oral</td>
</tr>
<tr>
<td>Inhalative</td>
</tr>
<tr>
<td><strong>1111-78-0 Ammonium Carbamate</strong></td>
</tr>
<tr>
<td>Oral</td>
</tr>
<tr>
<td>Inhalative</td>
</tr>
<tr>
<td><strong>7803-51-2 phosphine</strong></td>
</tr>
<tr>
<td>Inhalative</td>
</tr>
<tr>
<td><strong>7664-41-7 ammonia, anhydrous</strong></td>
</tr>
<tr>
<td>Oral</td>
</tr>
<tr>
<td>Inhalative</td>
</tr>
</tbody>
</table>

- **Primary irritant effect:**
  - **on the skin:**
    - May be irritating.
    - Irritant to skin and mucous membranes.
  - **on the eye:**
    - Direct contact may cause eye irritation.
    - Strong irritant with the danger of severe eye injury.
    - Causes serious eye irritation.
  - **Additional toxicological information:**
    - The product shows the following dangers according to internally approved calculation methods for preparations:
      - Irritant
      - Very toxic

- **Carcinogenic categories**
  - IARC (International Agency for Research on Cancer)
    - Group 1 - Carcinogenic to humans
    - Group 2A - Probably carcinogenic to humans

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Safety Data Sheet (SDS)
OSHA HazCom Standard 29 CFR 1910.1200(g) and GHS Rev 03.
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Group 2B - Possibly carcinogenic to humans
Group 3 - Not classifiable as to its carcinogenicity to humans
Group 4 - Probably not carcinogenic to humans

Proprietary 2B

- **NTP (National Toxicology Program)**
  None of the ingredients are listed.

- **OSHA-Ca (Occupational Safety & Health Administration)**
  None of the ingredients are listed.

**12 Ecological information**

- **Toxicity** The hazards for the aquatic environment are unknown.
- **Aquatic toxicity:**
  Avoid release into the environment. Runoff from fire control or dilution water may cause pollution.

<table>
<thead>
<tr>
<th>1111-78-0 Ammonium Carbamate</th>
</tr>
</thead>
<tbody>
<tr>
<td>EC50 129.1 mg/l (Green algae)</td>
</tr>
<tr>
<td>63 mg/l (Water flea)</td>
</tr>
</tbody>
</table>

- **Persistence and degradability** No further relevant information available.
- **Behavior in environmental systems:**
- **Bioaccumulative potential** No further relevant information available.
- **Mobility in soil** No further relevant information available.
- **Ecotoxic effects:**
  - **Remark:** Very toxic for fish
- **Additional ecological information:**
  - **General notes:**
    Do not allow product to reach ground water, water course or sewage system.
    Danger to drinking water if even small quantities leak into the ground.
    Also poisonous for fish and plankton in water bodies.
    Very toxic for aquatic organisms
  - **Results of PBT and vPvB assessment**
    - **PBT:** Not applicable.
    - **vPvB:** Not applicable.
  - **Other adverse effects** No further relevant information available.

**13 Disposal considerations**

- **Waste treatment methods**
  - **Recommendation:**
    Must not be disposed of together with household garbage. Do not allow product to reach sewage system.
    When being disposed of, spilled or partially reacted Phostoxin or DotiaPhos products are considered hazardous wastes under existing Federal Regulations. If properly exposed, the grayish-white residual dust after a fumigation will not be a hazardous waste and normally contains only a very small amount of unreacted aluminum phosphate. This waste will be safe for disposal. However, the spent residual dust from incompletely exposed Phostoxin or DotiaPhos products may require special care. Triple rinse tablet and pellet flasks and stoppers with water and then offer for recycling or reconditioning; or puncture and dispose of in a sanitary landfill, or by other procedures approved by state and local authorities. Rinse may be disposed of in a storm sewer, sanitary landfill or by other approved procedures. Or, it is permissible to remove lids and expose empty flasks to atmospheric conditions until the residue in the flasks is reacted. Then puncture and dispose of in a sanitary landfill or other approved site, or by other procedures approved by state and local authorities.

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Safety Data Sheet (SDS)
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Printing date 04/02/2015 Reviewed on 04/02/2015


authorities. Some local and state waste disposal regulations may vary from the following recommendations. Disposal procedures should be reviewed with appropriate authorities to ensure compliance with local regulations. Contact your State Pesticide or Environmental Control Agency or Hazardous Waste Specialist at the nearest EPA Regional Office for guidance.

1. Confinement of partially spent residual materials, as in a closed container, or collection and storage of large quantities of dust may result in a fire or explosion hazard. Small amounts of phosphine (hydrogen phosphate, PH3) may be given off from unreacted aluminum phosphate, and confinement of the gas may result in a flash.

2. In open areas, small amounts of spent residual dust or spent packaged products may be disposed of on site by burial or by spreading over the land surface away from inhabited buildings.

3. Residual dust from Phostoxin or DetiaPhos products may also be collected and disposed of at a sanitary landfill, or other approved sites or by other procedures approved by Federal, State or Local authorities.

4. From 3 to 5 kg (7 to 10 lbs.) of spent dust from 2 to 3 flasks of Phostoxin or DetiaPhos may be collected for disposal in a 1-gallon bucket. Larger amounts, up to about one-half case, may be collected in burlap, cotton or other types of porous cloth bags for transportation in an open vehicle to the disposal site. Do not collect dust from more than 7 flasks of tablets, 10 flasks of pellets (about 11 kg or 25 lbs.) in a single bag. Do not pile cloth bags together. Do not use this method for partially spent or “green” dust. Caution: Do not collect dust in large drums, dumpsters, plastic bags or other containers where confinement may occur.

Uncleaned packagings:

Recommendation:
Triple rinse tablet and pellet flasks and stoppers with water and then offer for recycling or reconditioning; or puncture and dispose of in a sanitary landfill, or by other procedures approved by state and local authorities.

<table>
<thead>
<tr>
<th>UN-Number</th>
<th>UN1397</th>
</tr>
</thead>
<tbody>
<tr>
<td>DOT, ADR, IMDG, IATA</td>
<td>DOT</td>
</tr>
<tr>
<td>UN proper shipping name</td>
<td>Aluminum phosphate</td>
</tr>
<tr>
<td>DOT</td>
<td>UN1397 Aluminum phosphate, ENVIRONMENTALLY HAZARDOUS</td>
</tr>
<tr>
<td>ADR</td>
<td>ALUMINIUM PHOSPHIDE, MARINE POLLUTANT</td>
</tr>
<tr>
<td>IMDG</td>
<td>ALUMINIUM PHOSPHIDE</td>
</tr>
<tr>
<td>IATA</td>
<td></td>
</tr>
<tr>
<td>Transport hazard class(es)</td>
<td>4.3 Substances which, in contact with water, emit flammable gases</td>
</tr>
<tr>
<td>DOT</td>
<td></td>
</tr>
<tr>
<td>Class</td>
<td>4.3, 6.1</td>
</tr>
</tbody>
</table>

(Contd on page 13)

- **ADR**
  - **Class 4.3 (W/T2)** Substances which, in contact with water, emit flammable gases
  - **Label 4.3, 6.1**

- **IMDG**
  - **Class 4.3** Substances which, in contact with water, emit flammable gases
  - **Label 4.3/6.1**

- **IATA**
  - **Class 4.3** Substances which, in contact with water, emit flammable gases
  - **Label 4.3 (6.1)**
    - **Packing group I**
    - **DOT, ADR, IMDG, IATA Environmental hazards:**
      - Product contains environmentally hazardous substances:
        - Aluminum Phosphide
      - Symbol (fish and tree)
    - **Special marking (ADR):**
      - Warning: Substances which, in contact with water, emit flammable gases
    - **Special precautions for user**
    - **Danger code (Kermit):** 462 F-G,S-N
    - **EMS Number:** Not applicable.
    - **Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code**
    - **Transport/Additional information:**
      - **DOT**
      - **Quantity limitations:** On passenger aircraft/rail: Forbidden
        On cargo aircraft only: 15 kg
    - **ADR**
      - **Excepted quantities (EQ)**
        - Code: E0
        - Not permitted as Excepted Quantity
Safety Data Sheet (SDS)


**IMDG**
- Limited quantities (LO) 0
- Exempted quantities (EO) Code: E0
  Not permitted as Exempted Quantity
- UN "Model Regulation": UN1397, Aluminum phosphide, ENVIRONMENTALLY HAZARDOUS, 4.3, 6.1, I

**15 Regulatory information**

- Safety, health and environmental regulations/legislation specific for the substance or mixture
  - SARA
    - Section 355 (extremely hazardous substances):
      20859-73-8 Aluminum Phosphide
    - Section 313 (Specific toxic chemical listings):
      20859-73-8 Aluminum Phosphide
      Proprietary
      Proprietary
      Proprietary
  - TSCA (Toxic Substances Control Act):
    20859-73-8 Aluminum Phosphide
    Proprietary
    Proprietary
    Proprietary
    Proprietary

- Proposition 65
  - Chemicals known to cause cancer:
    None of the ingredients are listed.
  - Chemicals known to cause reproductive toxicity for females:
    None of the ingredients are listed.
  - Chemicals known to cause reproductive toxicity for males:
    None of the ingredients are listed.
  - Chemicals known to cause developmental toxicity:
    None of the ingredients are listed.

- Carcinogenic categories
  - EPA (Environmental Protection Agency)
    Proprietary D, I, II

- TLV (Threshold Limit Value established by ACGIH)
  - Proprietary A4
  - Proprietary A4

- NIOSH-Ca (National Institute for Occupational Safety and Health)
  None of the ingredients are listed.

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- GHS label elements
  This product is labeled according to FIFRA.
  The product is classified and labeled according to the Globally Harmonized System (GHS).

- Hazard pictograms
  GHS02  GHS05  GHS06  GHS09

- Signal word Danger

- Hazard-determining components of labeling:
  Aluminum Phosphide
  Ammonium Carbamate
  Proprietary

- Hazard statements:
  In contact with water releases flammable gases which may ignite spontaneously.
  Fatal if swallowed or if inhaled.
  Causes skin irritation.
  Causes serious eye damage.
  Very toxic to aquatic life.

- Precautionary statements:
  Keep away from any possible contact with water, because of violent reaction and possible flash fire.
  Do not breathe dust/cover/gas/mist/vapors/spray.
  Wear respiratory protection.
  Wear protective gloves/eye protection/face protection.
  Avoid release to the environment.
  Wash thoroughly after handling.
  Do not eat, drink or smoke when using this product.
  Do not swallow.
  If swallowed: Immediately call a poison center/doctor.
  If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
  Specific treatment is urgent (see supplementary first aid instructions on this Safety Data Sheet).
  Take off contaminated clothing and wash before reuse.
  IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
  If skin irritation occurs: Get medical advice/attention.
  In case of fire: Use for extinguition: CO2, sand, extinguishing powder.
  If on skin: Wash with plenty of water.
  Collect spillage.
  Store locked up.
  Store in a well-ventilated place. Keep container tightly closed.
  Store in a dry place. Store in a closed container.
  Dispose of contents/container in accordance with local/regional/national/international regulations.

- National regulations:
  The product is subject to be labeled according to the prevailing version of the regulations on hazardous substances.

(Contd. on page 18)

State Right to Know

<table>
<thead>
<tr>
<th>CAS: 20659-73-8</th>
<th>Aluminum Phosphide</th>
<th>55%</th>
</tr>
</thead>
<tbody>
<tr>
<td>RTECS: BD 1400000</td>
<td>4 Water-react. 1, H2DO, 4 Acute Tox. 2, H300, 4 Aquatic Acute 1, H400</td>
<td></td>
</tr>
<tr>
<td>CAS: 1111-78-0</td>
<td>Ammonium Carbamate</td>
<td>Proprietary%</td>
</tr>
<tr>
<td>4 Eye Dam. 1, H318; 4 Acute Tox. 4, H302; Skin Irrit. 2, H315; Aquatic Acute 3, H402</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RTECS: BD 1200000</td>
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<td></td>
</tr>
<tr>
<td>4 STOT SE 3, H335</td>
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</tr>
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</tr>
<tr>
<td>Proprietary</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

All ingredients are listed.

Chemical safety assessment: A Chemical Safety Assessment has not been carried out.

Other Information

The information and recommendations in this safety data sheet are, to the best of our knowledge, accurate as of the date of issue. Nothing herein shall be deemed to create warranty, expressed or implied and shall not establish a legally valid contractual relationship. It is the responsibility of the user to determine applicability of this information and the suitability of the material or product for any particular purpose.

Date of preparation / last revision: 04/02/2015

Abbreviations and acronyms:

ADR: The European Agreement concerning the International Carriage of Dangerous Goods by Road
ADN: The European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways
IMDG: International Maritime Code for Dangerous Goods
DOT: US Department of Transportation
IATA: International Air Transport Association
ACGIH: American Conference of Governmental Industrial Hygienists
EINECS: European Inventory of Existing Commercial Chemical Substances
ELINCS: European List of Notified Chemical Substances
CAS: Chemical Abstracts Service (division of the American Chemical Society)
NFPA: National Fire Protection Association (USA)
HMIS: Hazardous Materials Identification System (USA)
LD50: Lethal concentration, 50 percent
Water-react: 1: Substances and mixtures which, in contact with water, emit flammable gases, Hazard Category 1

Acute Tox: 2: Acute toxicity, Hazard Category 2
Acute Tox: 4: Acute toxicity, Hazard Category 4
Skin Irrit: 2: Skin corrosion/irritation, Hazard Category 2
Eye Dam. 1: Serious eye damage/eye irritation, Hazard Category 1
Eye Irrit. 2A: Serious eye damage/eye irritation, Hazard Category 2
Carc. 2: Carcinogenicity, Hazard Category 2
STOT SE 3: Specific target organ toxicity - Single exposure, Hazard Category 3
Aquatic Acute 1: Hazardous to the aquatic environment - Acute Hazard, Category 1
Aquatic Acute 3: Hazardous to the aquatic environment - Acute Hazard, Category 3

Data compared to the previous version altered.

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