Respiratory Protection?
Permissible Practice Engineering
Specific Effects of Grain Dust

The effects of inhaling grain dust have been known since at least 1713 (Rammazini)

“Disease of sifters and measureers of grain”

Grain dust is a complex mixture of:

- Husk particles
- Bacteria
- Molds
- Spores of fungi
- Insect parts
- Pollens
Definition of Dust

- Solid particles that are degenerated in some way by a work practice
- Common work practices are: grinding, blasting, crushing or movement of material
- Dust can be organic or inorganic (grain, wood, metal or rock)
- Grain dust is composed of approximately 70% organic matter
How Much Dust is Emitted

- IEPA
- 27 pounds of dust are emitted for every ton of grain handled
- Roughly, every 1 million bushels of grain handled = 12,000 lbs of dust
Dust Size

- Dust can be 0.1 micron to 100 microns in size
- 25,400 microns = 1 inch
- 85 microns = edge of a piece of paper
- 40 microns = minimum human eye can see
Dust continued

- Dust particles smaller than 10 microns are considered respirable.
- These can penetrate deep into the lung cavity and are the most hazardous.
Particulate Size EPA

- Particulate (PART) = Total dust
- PM 10 (10 microns) = 25% of grain dust
- PM 2.5 (2.5 microns) = 17% of grain dust
- Handling corn produces twice as much dust as wheat
- Corn also produces smaller particle sizes than wheat
Respiratory Hazards in Grain Handling

Dust, molds and allergens are common respiratory exposures in the world of ag business, particularly in the grain business arena.
What are the risks?

**Chronic lungs disease:**
- Chronic bronchitis
- Asthma
- Emphysema
- Allergic reactions
- Hypersensitivity pneumonitis (Farmer’s Lung)

**Acute lung disease:**
- Organic Toxic Dust Syndrome
- Acute bronchitis
- Acute Hypersensitivity pneumonitis (Farmer’s Lung)
ORGANIC DUST TOXIC SYNDROME (ODTS)

• Can occur after ONE heavy exposure to dust contaminated with fungi and other agents – mycotoxins, endotoxins, glucans, bacteria

• INHALATION FEVER

• FOG OF PARTICULATES OR THICK AIRBORNE DUST – not found usually in home

• SYMPTOMS: Flu-like, ache, pain, headache, lethargic feelings
What causes these problems?

**Dust:**

- It is impossible to avoid
- Particulates can be very small and are easily inhaled
- Most grain dust particles are biologically active and can contain mold, pollens, and bacteria
- 30%-40% of this dust are in the respirable range
- \( \leq 10 \) microns is the respirable range
What causes these problems?

Mold:
- Results from decomposition of organic sources
- Produces tiny spores that are easily inhaled
- Moldy grain is considered the most dangerous exposure because of the inhaled fungus spores
What are the symptoms of respiratory problems?

- Coughing
- Nasal congestion
- Shortness of breath
- Chills
- Fever
- Unusual fatigue
Lungs Defenses

- Almost any type of dust can become a hazard when it is airborne.
- Once inhaled into the lungs, small particles of the dust can become trapped in the alveoli.
- Alveoli are small air passages and air sacs in the lungs.
- The dust particles must be very small to get this far.
- These can penetrate deep into the lung cavity and are the most hazardous.
Lungs Defenses

- The larger particles become lodged in the nasal passages, throat, trachea, and larger passages of the lung.
- From there the larger particles are picked up by mucous and removed from the respiratory tract as a expectorant or they are swallowed.
Lungs Defenses

- The finer dust particles (≤10 microns) are inhaled with each breath and are carried into the lungs.
- Some of this fine dust stays in the larger passages of the lungs and the alveoli.
- The rest of the dust is carried back out during exhalation.
HOW PARTICULATE MATTER ENTERS THE BODY

1. Particulate matter enters the body through the nose and mouth when we breathe.

2. The body eliminates most of the larger particles we inhale. Smaller particles like PM2.5 continue to the lungs.

3. PM2.5 can penetrate deep into the lungs, having serious health consequences for the lungs and heart.
What do I do to prevent these issues?

- Ventilation
- Limit unnecessary exposure
- Dust system/pressurization
- Use a proper OSHA approved respirator when working in and around grain.
General Requirement
1910.134(d)

The employer “shall” select and provide an appropriate respirator based on the respiratory hazard to which the worker is exposed to and workplace and user factors that affect respirator performance and reliability.
Selection of Respirators

1910.134(d)(1)(ii)

ONLY USE

NIOSH

CERTIFIED RESPIRATORS
Respiratory Protection
What type of respirator do I need?

- Respirator choice depends on the exposure
- Minimum protection is an **N95 respirator with 2 straps**
- Respirator choice depends on fit – not everyone can wear the same type.
- Respirators vary from disposable to half and full face cartridge designs
## Potential Respiratory Hazards

What respiratory hazards are you concerned with?

<table>
<thead>
<tr>
<th>SUBSTANCE</th>
<th>OSHA PEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grain Dust - Barley, Oats, Wheat</td>
<td>10 mg/m³</td>
</tr>
<tr>
<td>Grain Dust - PNOR (Corn, Soybean)</td>
<td>15 mg/m³</td>
</tr>
<tr>
<td>Phosphine</td>
<td>0.3 ppm</td>
</tr>
<tr>
<td>Ammonia</td>
<td>50 ppm</td>
</tr>
<tr>
<td>Chlorine</td>
<td>1 ppm</td>
</tr>
</tbody>
</table>
Selection of Respirators

How do you make a “Reasonable Estimates” of employee exposure?

Monitoring -
Composite Data -
Mathematical Approaches -
Respiratory Protection Program

Program is required whenever:

- Concentration > PEL,
- Employer requires respirator use.
How much dust is this worker exposed to?
The employer is to provide basic information on respirators to employees wearing respirators on a voluntary basis (Appendix D).
Voluntary Use Of Respirators

You should do the following:

1. Read and heed all instructions provided by the manufacturer on use, maintenance, cleaning and care, and warnings regarding the respirators limitations.

2. Choose respirators certified for use to protect against the contaminant of concern. NIOSH, the National Institute for Occupational Safety and Health of the U.S. Department of Health and Human Services, certifies respirators. A label or statement of certification should appear on the respirator packaging. It will tell you what the respirator is designed for and how much it will protect you.
Voluntary Use Of Respirators

3. Do not wear your respirator into atmospheres containing contaminants for which your respirator is not designed to protect against. For example, a respirator designed to filter dust particles will not protect you against gases, vapors, or very small solid particles of fumes or smoke.

4. Keep track of your respirator so that you do not mistakenly use someone else’s respirator.

Should you have any questions concerning the respirator you will use, check with your supervisor or safety director.
1. Prestretch top and bottom straps before placing respirator on the face (8210/07048). Not necessary for 8110S.

2. Cup the respirator in your hand, with the nosepiece at your fingertips, allowing the headbands to hang freely below your hand.

3. Position the respirator under your chin with the nosepiece up. Pull the top strap over your head resting it high at the top back of your head. Pull the bottom strap over your head and position it around the neck below the ears.

4. Place your fingertips from both hands at the top of the metal nosepiece. Using two hands, mold the nose area to the shape of your nose by pushing inward while moving your fingertips down both sides of the nosepiece.

   ! Pinching the nosepiece using one hand may result in improper fit and less effective respirator performance. Use two hands.

5. Perform a User Seal Check prior to each wearing. To check fit, place both hands completely over the respirator and exhale. Be careful not to disturb the position of the respirator. If air leaks around nose, readjust the nosepiece as described in step. If air leaks at the respirator edges, work the straps back along the sides of your head. If you CANNOT achieve a proper fit, DO NOT enter the contaminated area. See your supervisor.
Don’t forget!!!!

- A respirator is only as good as its fit.

- A respirator only works when you use it!

- Wearing the wrong respirator is like taking a knife to a gun fight. You may be armed, but the odds of coming out of the fight in good condition is poor.
So always select the appropriate respirator for the task you will be performing!

Questions

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