GOALS OF PRESENTATION

• Discuss risks of welding fume exposure and benefits of ventilation.

• Provide information about how ventilation works to help you solve smoke problems when welding.
WELDING SMOKE EXPOSURES

Hazardous Components
WELDING SMOKE EXPOSURES

Hazardous Components

Carbon Monoxide
Lead
NO\textsubscript{x}
Zinc
Hexavalent Chromium
Copper
Manganese

?
SHORT-TERM HEALTH EFFECTS
Short-TERM HEALTH EFFECTS

- Shortness of breath
- Cough
- Headache
- Nausea
- Metal Fume Fever
LONG-TERM HEALTH EFFECTS
LONG-TERM HEALTH EFFECTS

Lung disease
Cancer risk
Nervous system problems
Increased risk of infection
Washington state has limits on how much exposure you can have to various components of welding smoke.

Most exposures UW has measured in shipyard confined spaces are over these limits.

Workers exposed over these limits have to be protected by their employers.
GOALS OF VENTILATION

Remove the highest concentrations of smoke in the work area

Areas of concern

• Breathing zone
• Spaces where you and your coworkers may be exposed
OVERCOMING BARRIERS TO VENTILATION
OVERCOMING BARRIERS TO VENTILATION

- Getting equipment
- Set up
- Weld quality
- Space restraints
BENEFITS OF VENTILATION
BENEFITS OF VENTILATION

- Reduces risk of health effects
- Improves visibility
- Improves comfort
- Can reduce smoke damage to ships
- May reduce need for respiratory protection
  - Maybe not for welder, but for nearby workers
  - Respirators may still be required
## VENTILATION IN AN IDEAL WORLD

<table>
<thead>
<tr>
<th>How many welders?</th>
<th>How large a space?</th>
<th>How much fresh air?</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Image" /></td>
<td><img src="image2.png" alt="Image" /></td>
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</tbody>
</table>
How many blowers do I need?

Rule of thumb
1 confined space blower moves about 750 cubic feet of air per minute

How much is 750 cubic feet?
About a 9 ft x 9 ft x 9 ft room
1 blower will “change” the air in this size room every minute
HOW MANY BLOWERS DO I NEED?

Number of blowers needed goes up quickly with space size

9 ft x 9 ft x 9 ft = 1 blower
12 ft x 12 ft x 12 ft = 2 blowers
15 ft x 15 ft x 15 ft = 5 blowers
Blowing and sucking have a different "reach"

Amount of air is affected by hose
Amount of air is affected by bends in the duct...

- 1967 cfm
- 1704 cfm
- 1531 cfm
- 1423 cfm
VENTILATION DETAILS

and by the length of the duct...

No duct

2445 cfm

25' duct

2238 cfm

50' duct

1917 cfm
BUT WHAT ABOUT THE REAL WORLD?

Smoke is highest nearest the source.

Smoke rises to the ceiling.
WHAT CAN YOU DO IN THE REAL WORLD?

Blow the smoke away from you (crossdraft)

Mix the smoke around the entire room

Avoid directing the smoke toward your breathing zone
SHORT CIRCUIT = BAD

How could you fix these problems?
Blowing “fresh air” in may make smoke less concentrated.
Local or regional exhausting captures the smoke

No exhaust | Regional exhaust | Local exhaust
Remember: you can’t pull air from very far.
WORKING NEAR OTHERS

Room mixing works well when you’re alone.

Mixing can increase exposure for others in room.
VENTILATING SHORT JOBS: What do you need to consider?
# VENTILATING SHORT JOBS: What do you need to consider?

- Length of time
- Amount of welding
- Size of space
- Mixing of space
- Number of people in space
- Use of respirators
- Welding process
- Base metal
REVIEW
Things to consider when selecting ventilation

How much welding is happening in the space?
How big is the space?
REVIEW
Things to consider when selecting ventilation

How much “fresh air”? 

[Diagram showing different ventilation scenarios]
MIXING
How can you spread the smoke around the place?
SMOKE
Where is the smoke going in the space?
Can you move it away from you?
Can you keep your head out of the smoke?
SHORT-CIRCUITING
Where is your “fresh air” supply in relation to your exhaust?