



# VENTILATION IN SHIPYARD WELDING



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UNIVERSITY OF WASHINGTON  
HEALTH SCIENCES



# 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



# **SHORT-TERM HEALTH EFFECTS**

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**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**



# **EXPOSURE LIMITS**

**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**

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- **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

How many welders?



How large a space?



How much fresh air?



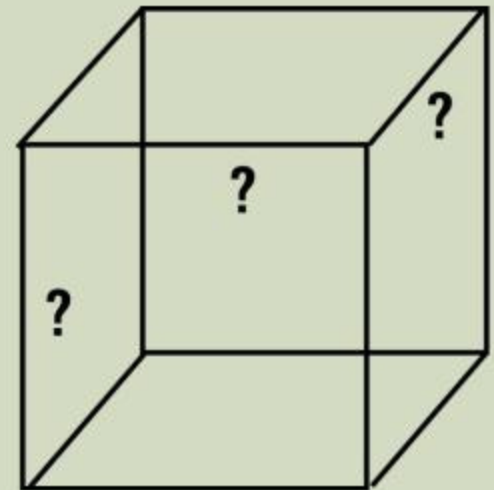
# HOW MANY BLOWERS DO I NEED?

## 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



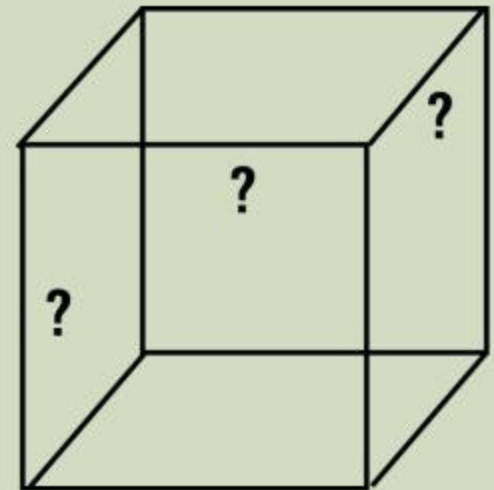
# HOW MANY BLOWERS DO I NEED?

**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**

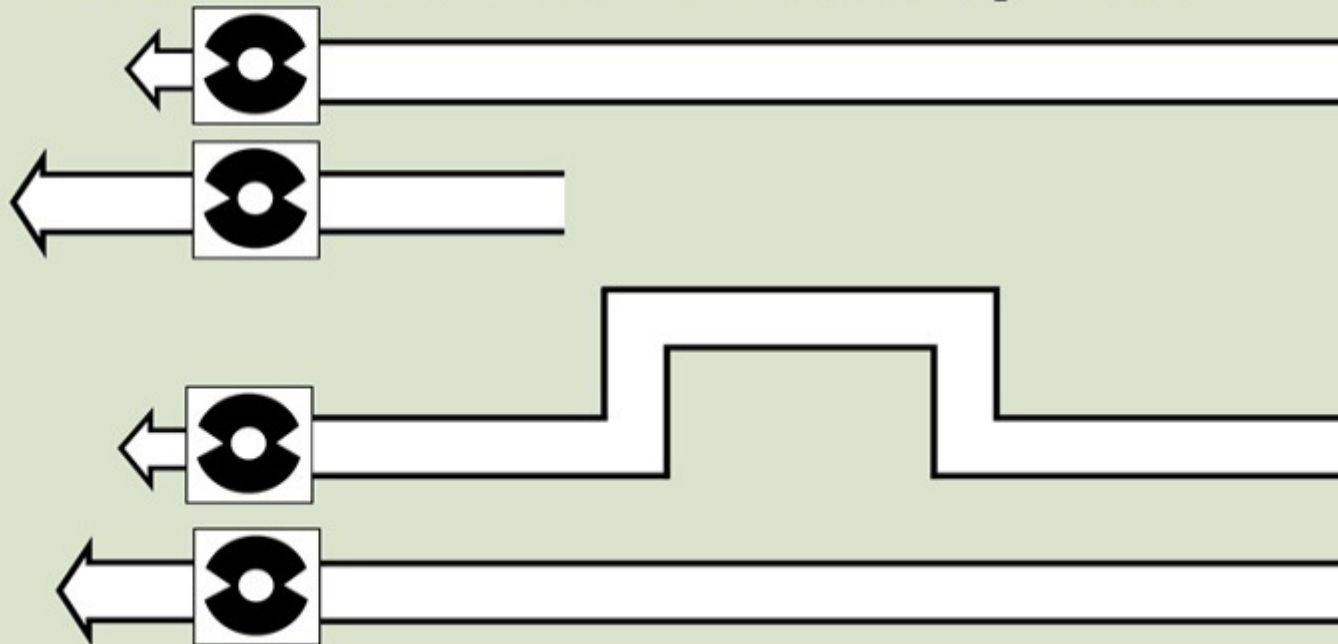


# VENTILATION DETAILS

**Blowing and sucking have a different “reach”**



**Amount of air is affected by hose**





# VENTILATION DETAILS

**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.

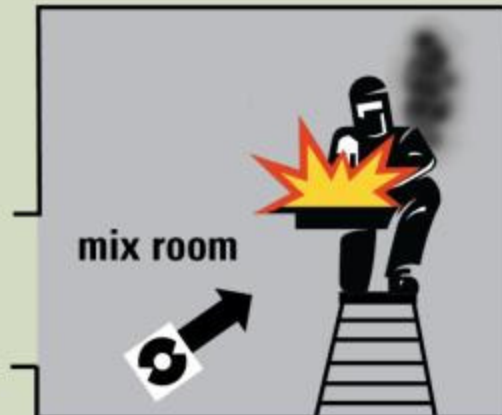


# WHAT CAN YOU DO IN THE REAL WORLD?

**Blow the  
smoke away  
from you  
(crossdraft)**



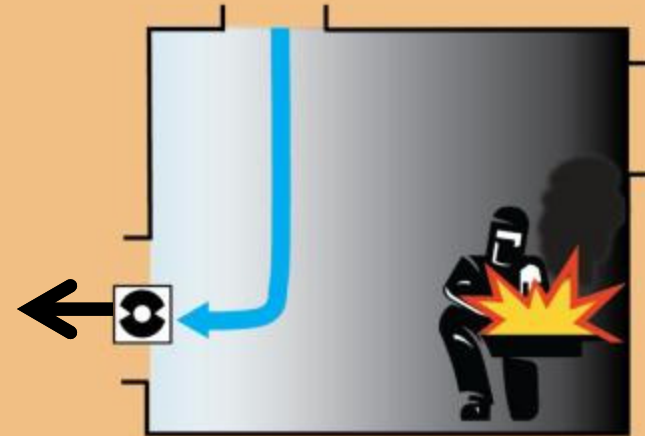
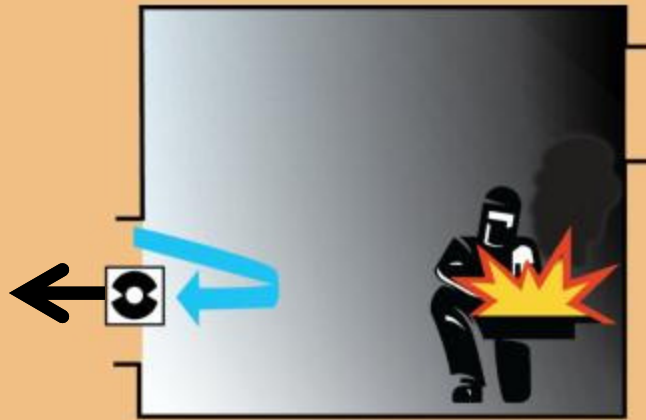
**Mix the smoke  
around the  
entire room**



**Avoid directing the smoke toward your breathing zone**



# SHORT CIRCUIT = BAD

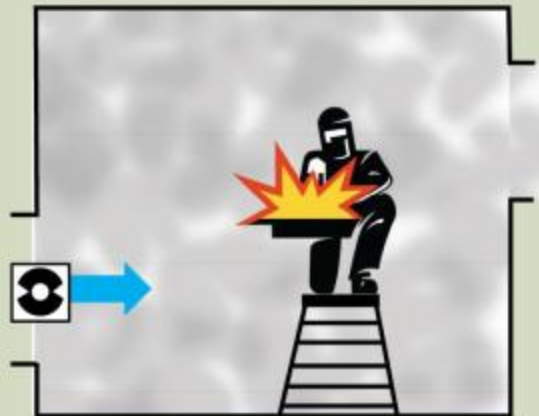
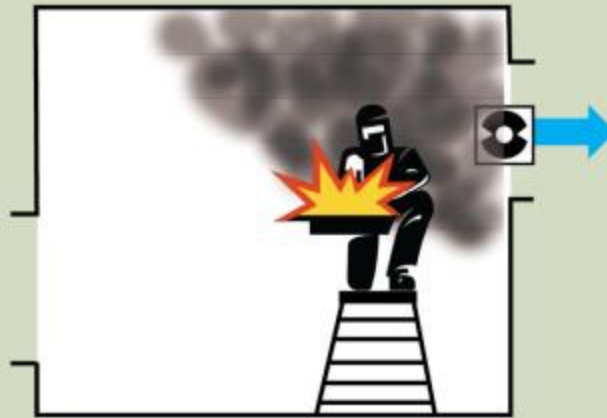


**How could you fix these problems?**



# BLOWING AIR

Blowing “fresh air” in may make smoke less concentrated.



# EXHAUSTING AIR

**Local or regional exhausting captures the smoke**



**No exhaust**



**Regional exhaust**



**Local exhaust**

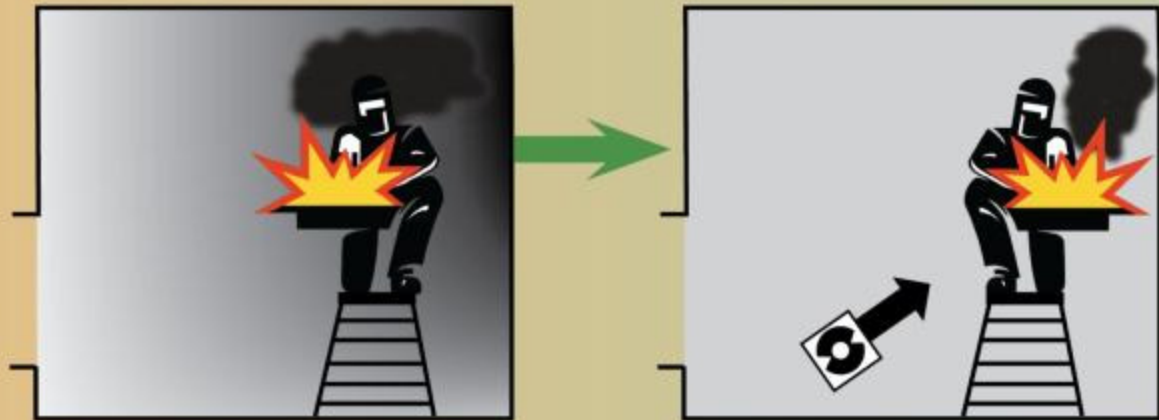
# EXHAUSTING AIR

Remember: you  
can't pull air  
from very far.

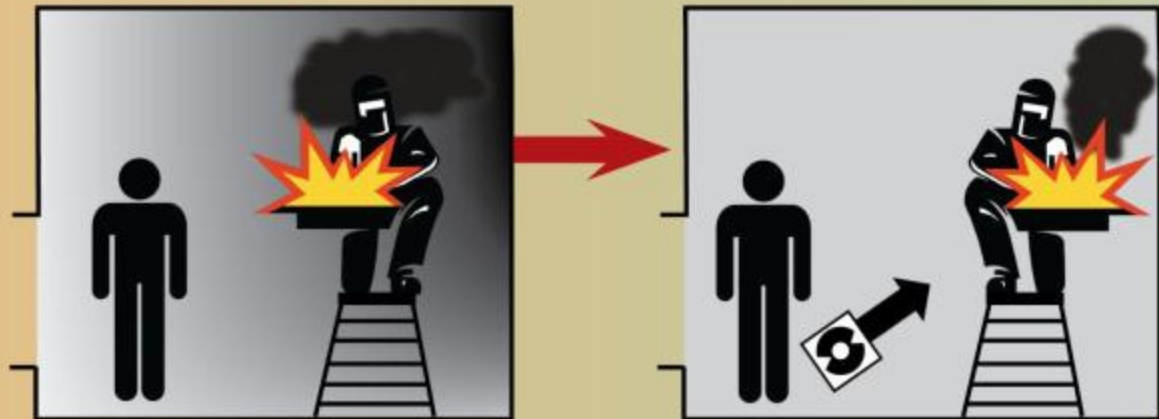


# WORKING NEAR OTHERS

**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?**



# REVIEW

## Things to consider when selecting ventilation

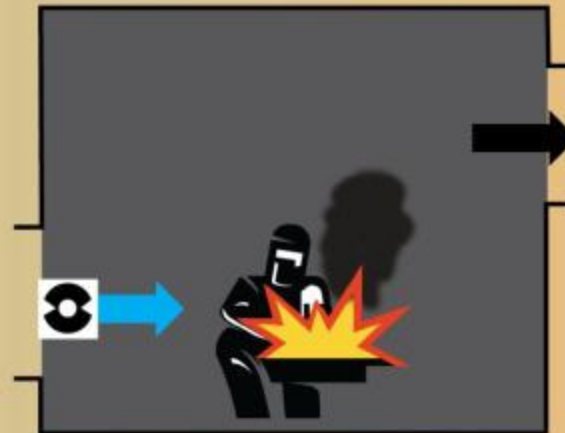
**How big is the space?**



# REVIEW

## Things to consider when selecting ventilation

How much “fresh air”?



# REVIEW

## MIXING

How can you spread the smoke around the place?



# REVIEW

## 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?**





# REVIEW

## SHORT-CIRCUITING

**Where is your “fresh air” supply in relation to your exhaust?**

