

Landfill Gas and Confined Spaces

With Lock - Out

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Garbage to Gas

(Anaerobic Bacteria)



◆ Up to 60% Methane (CH_4)_v

◆ Variable amounts of:

-water vapor,

-carbon dioxide (CO_2),

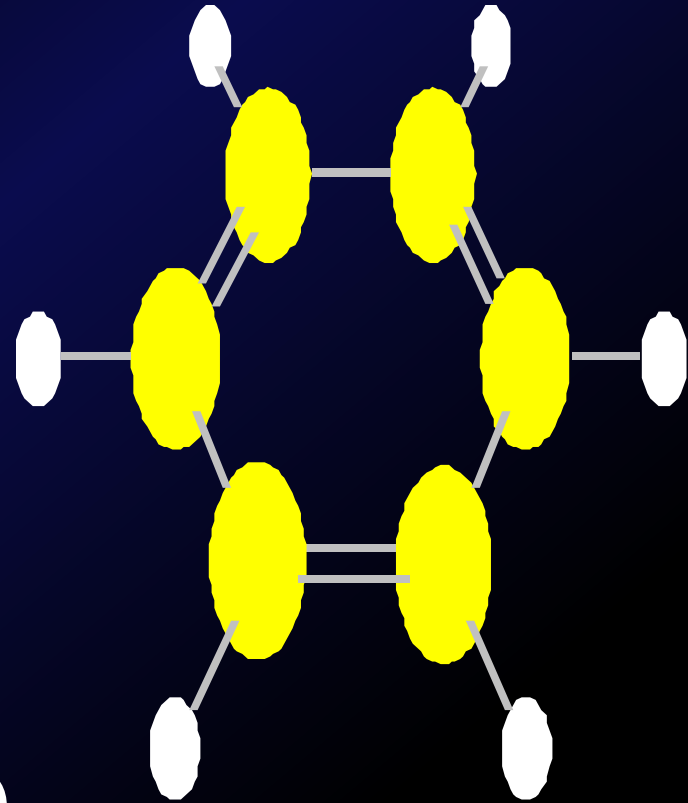
-hydrogen sulfide (H_2S),

-carbon monoxide (CO)

Components of Landfill Gas

Traces of:

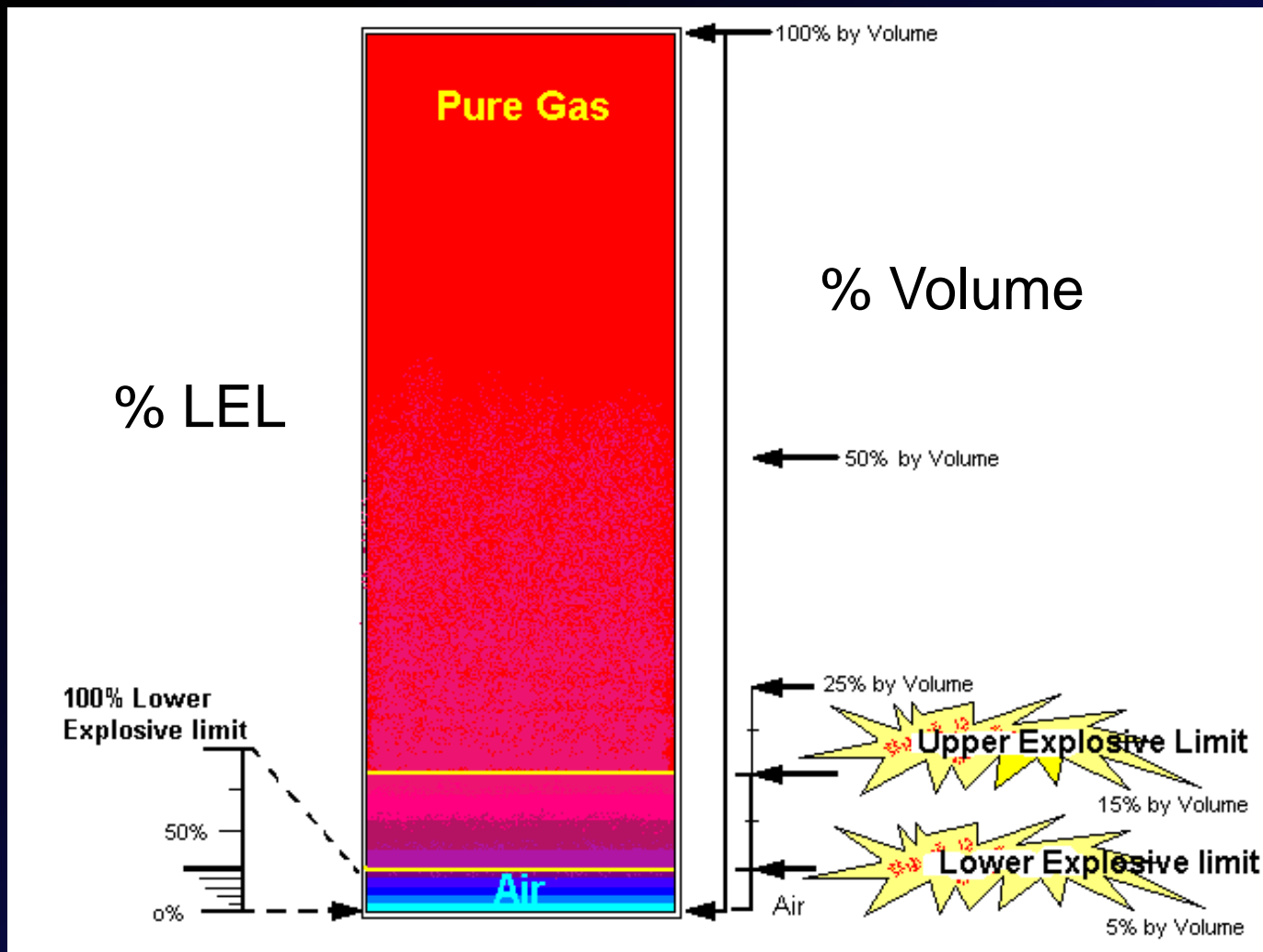
- ◆ Benzene
- ◆ Ethyl Benzene
- ◆ Toluene
- ◆ Vinyl Chloride
- ◆ Dichloromethane
- ◆ Trichloroethylene (TCE)
- ◆ 1,2, Dichloroethylene
- ◆ Tetrachloroethylene(PCE)



Basic Principle

- ◆ Never Allow Flammable Mixtures of
 - ◆ air
 - ◆ fuel and
 - ◆ energy



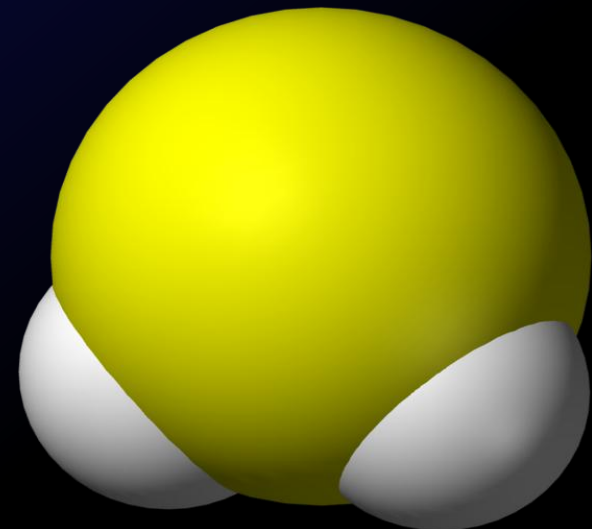


LEL= 5% Gas by Volume = 50,000 ppm

UEL=15% Gas by Volume = 150,000 ppm

Hydrogen Sulfide

- ◆ Absorbed through the lungs
- ◆ Strong odor, but
 - ◆ Olfactory Fatigue
- ◆ Heavier than air (drops to ground)
- ◆ Test for H_2S before going
 - ◆ in or
 - ◆ down



Hydrogen Sulfide in Landfills

- ◆ H_2S is usually below 100 ppm
- ◆ High sulfate (e.g. gypsum) levels produce high levels of H_2S
- ◆ Construction debris containing wallboard



NIOSH IDLH

- ◆ Immediately Dangerous to Life and Health (IDLH)
- ◆ Irreversible health effects or Escape impairing symptoms
- ◆ Within 30 minutes
- ◆ Hydrogen Sulfide's IDLH
 - ◆ 300 ppm



Explosion Control Measures

- ◆ Perform work while wet
- ◆ Minimize sparks
- ◆ Minimize exposure of fill
- ◆ Use temporary flare
- ◆ Monitor gas all the time
- ◆ Stop spark-producing work when levels $> 10\%$ of LEL

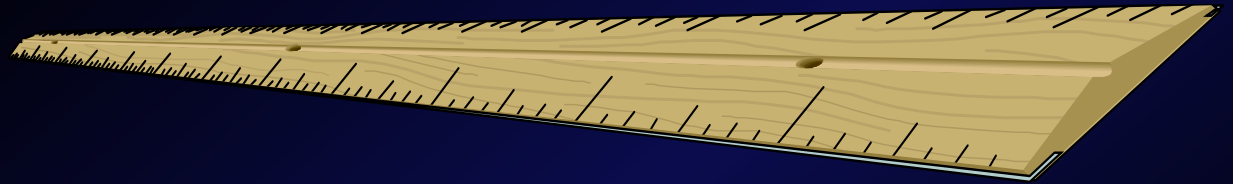


Air Monitoring

- ◆ Monitor continuously for
 - ◆ Dust emissions
 - ◆ Gas and vapor emissions
 - ◆ Combustible gases
- ◆ In work zone



Action Levels



- ◆ Triggers for changes in
 - ◆ operation,
 - ◆ evacuation, or
 - ◆ more PPE
- ◆ Base triggers on
 - ◆ OELs and
 - ◆ instruments you will use



Work Area Action Levels

Contaminant	Action Level	Action Required
Combustible Gas	25% LEL	Prevent Sparks
Hydrogen Sulfide	10 ppm	Respirator
Total Dust	500 $\mu\text{g}/\text{m}^3$	Respirator
Organic Vapor	5 ppm	Respirator

Oxygen Deficiency



<u>Concentration</u>	<u>Action Taken</u>
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<19.5% O ₂	Enter only with Air
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19.5 - 23.5%	Work continues
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>23.5% O ₂	Work must stop
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NOTE: What dilutes O₂ to 20%, is at
44,700 ppm

A COMPILATION OF LANDFILL GAS FIELD PRACTICES AND PROCEDURES

HEALTH AND SAFETY SECTION

SWANA LANDFILL GAS DIVISION

HEALTH & SAFETY TASK FORCE

VACUUM IS YOUR FRIEND

- ◆ Vacuum in the system means that small leaks are inward
- ◆ Leaks appear as higher oxygen levels at the flare
- ◆ Enough air can extinguish the flame
- ◆ Protect the vacuum



When adding a sampling port

- ◆ Combustible gas indicator
- ◆ Explosion-safe drill
- ◆ Manual drill
- ◆ 0.3 millijoule of static electricity is enough to ignite methane



Safety Plans and Programs

- ◆ Accident Prevention Program
- ◆ Noise Control.
- ◆ Dust Control.
- ◆ Respiratory Protection
- ◆ Confined Space Entry Safety
- ◆ Medical Surveillance
 - ◆ Often optional
- ◆ Safety Training
 - ◆ hazardous materials
 - ◆ hazardous waste training?



HEALTH AND SAFETY PLAN FORM		<i>This document is for the use of CDM and its subcontractors</i>
CDM Health and Safety Program		
PROJECT NAME	<u>Adams Brush Manufacturing</u>	PROJECT NUMBER
JOB SITE ADDRESS	<u>94-02 104th Street</u> <u>Queens, New York 11416</u>	CLIENT NAME
<input type="checkbox"/> AMENDMENT TO EXISTING APPROVED H&SP? <input type="checkbox"/> H&SP AMENDMENT NUMBER? _____		<input type="checkbox"/> DATE _____
OBJECTIVES OF FIELD WORK: (e.g. collect surface soil samples):		Type Check as many as apply
To drill soil borings with a Geoprobe, as well as a hollow stem auger drill rig; to obtain soil samples from both the Geoprobe and auger rig; to install monitoring wells; to collect groundwater samples from the monitoring wells.		Active
		Inactive
		Secure
		Unsecure

Personal Protection

- ◆ Full-length trousers.
- ◆ Shirt with sleeves and a collar
- ◆ Steel toe and shank footwear:
- ◆ Hardhat:
- ◆ High-visibility vest
 - ◆ (for heavy equipment)
- ◆ Safety glasses with side shields:



Well Drilling and Construction

- ◆ Owner's representative all the time
- ◆ Avoid the borehole
 - ◆ You could fall in
- ◆ Buddy system
- ◆ Subsurface surprises
- ◆ Cover every night.



Figure 10.47. Bucket auger rigs can be used to construct water wells in weakly consolidated formations. (Gus Pech Manufacturing Co., Inc.)

Emergency Preparedness

- ◆ Federal OSHA regulations followed for emergencies
- ◆ You'll require
 - ◆ Community Communication Plan
 - ◆ Emergency Alerting
 - ◆ Response Procedures



When is a Space **Not** Confined?



CONFINED SPACES ARE:

- Big Enough to Enter,
and
- Not Designed for People,
and
- Hard to Enter or Exit

Big Enough to Enter

- Your Whole Body Would Fit Both:
 - Inside the Space, and
 - Through the Opening



Definition of Entry

Occurs, “As soon as any part of the entrant's body breaks the plane of an opening into the space.”

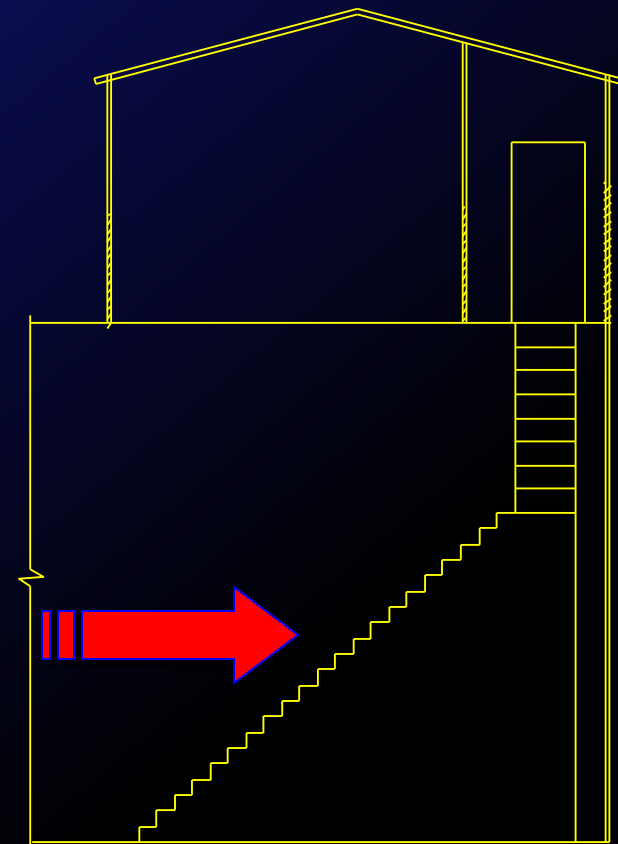


Not Designed for People

- Never Filled with Dense Material
- Heat, Light, & Ventilation
- Tall Enough to Stand up
- Meets Building Codes
- You Could Put Your Desk There

Hard to Enter or Exit

- Doorways are Easy
- Stairs are Easy
- Ladders are Hard
- Hatches are Hard
- Crouching is Hard
- Crawling is Hard



MPI BLDG.

CONFINED SPACE DANGERS

- Oxygen deficient,
- Toxic, or
- Explosive
- Engulfing
- Entrapping
- Mechanical



No Hazard Spaces

- Most Valve Vaults
- New Pipelines without
 - Connection
 - Gassy soil
 - Concrete sealant
 - Water present



29 CFR 1910.146 (c)(5)(i)

Alternate procedures allowed if

- Bad air is the only hazard
- Ventilation alone is sufficient
- Monitoring & inspection prove that
- Entry follows special permit

Summary Conclusion

- Many small spaces are not confined per OSHA
- Many large spaces are
- Many confined spaces require no permit
- Special permits will suffice for many confined spaces

Lock - Out and Tag - Out

**Use Lockout
Devices**



**MACHINE
LOCKOUT
POINT**

Lockout / Tagout

Unexpected equipment start-ups account for 100 injuries each day

Some fatal.



Lockout/Tagout

- Types of Personnel
 - “Authorized”
 - “Affected”
 - “Other”
- “Tagout” Procedure



Lockout Procedure

- Each Person Has His or Her Own Safety Lock(s)
 - Use Special Locks
 - Stock Lock Out Equipment
- Flexible Cord and Plug
 - Plug in Your Possession



Step 1 - Prepare for shutdown.

- What kind of energy is used?
- Which energy sources need lock - out?
- Tell other workers you are shutting down.

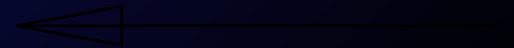
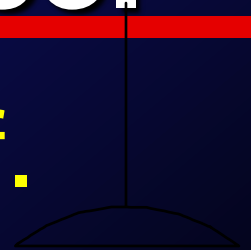
Step 2 -

Shut the equipment Off



Step 3 - Isolate equipment from every power source.

- Don't just shut the power off.
 - Close valves.
 - Throw main disconnects
- Block or blank auxiliary systems.
 - (hydraulic or pneumatic)

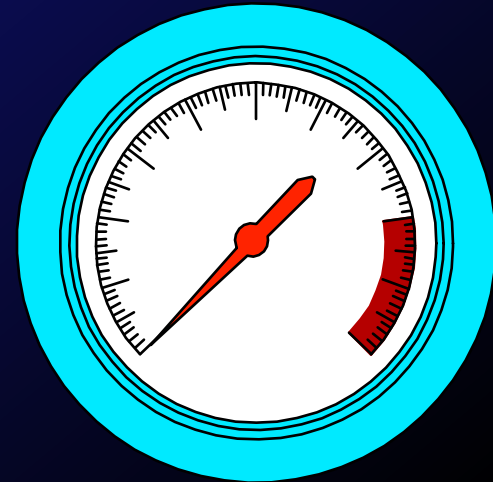


Step 4 - Lock and tag primary & secondary energy sources.



Step 5 - Control stored energy.

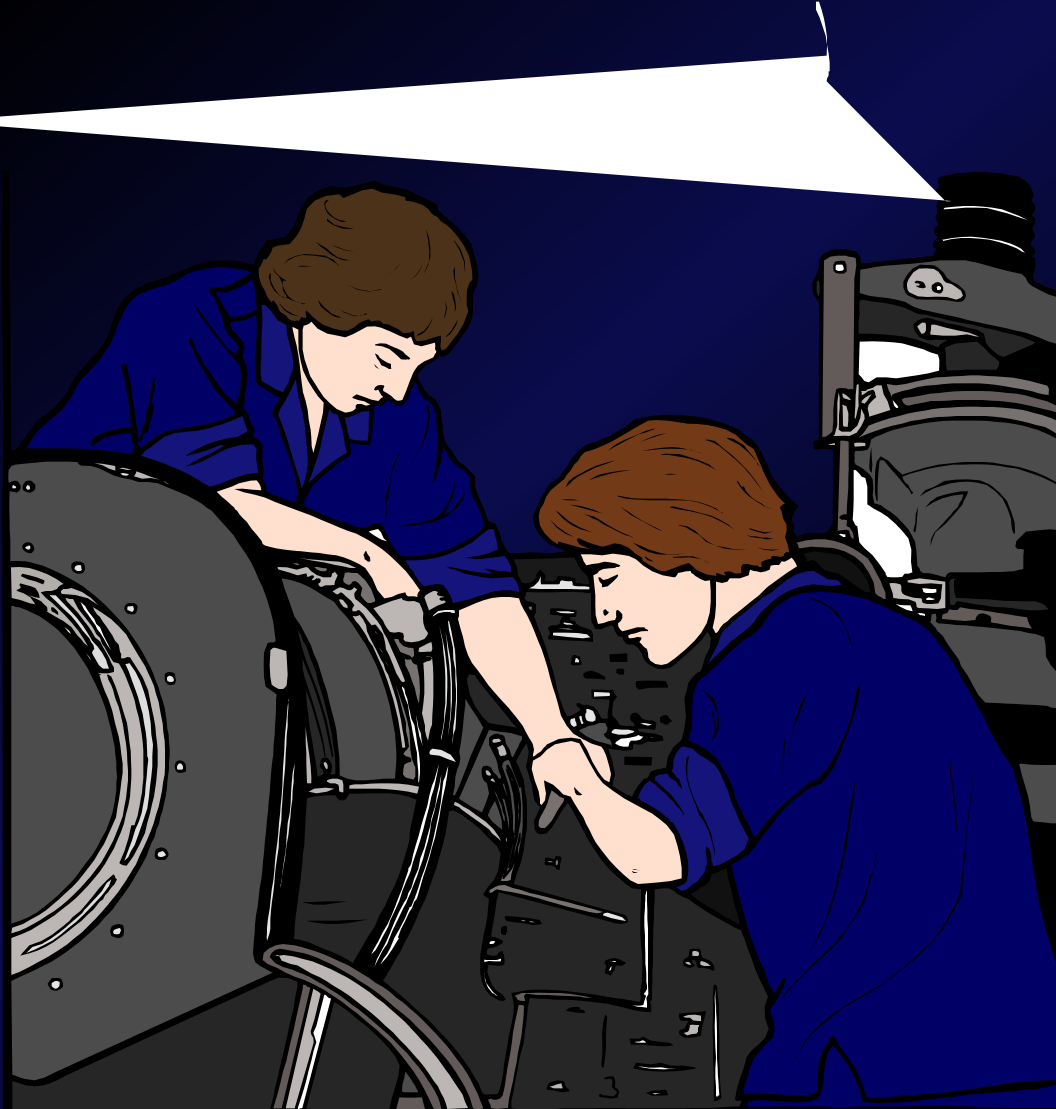
- Even with power off:
 - Consider residual energy
 - Check for moving parts
 - Vent or drain trapped pressure.
 - Install electrical ground wires
 - Block or support elevated equipment.



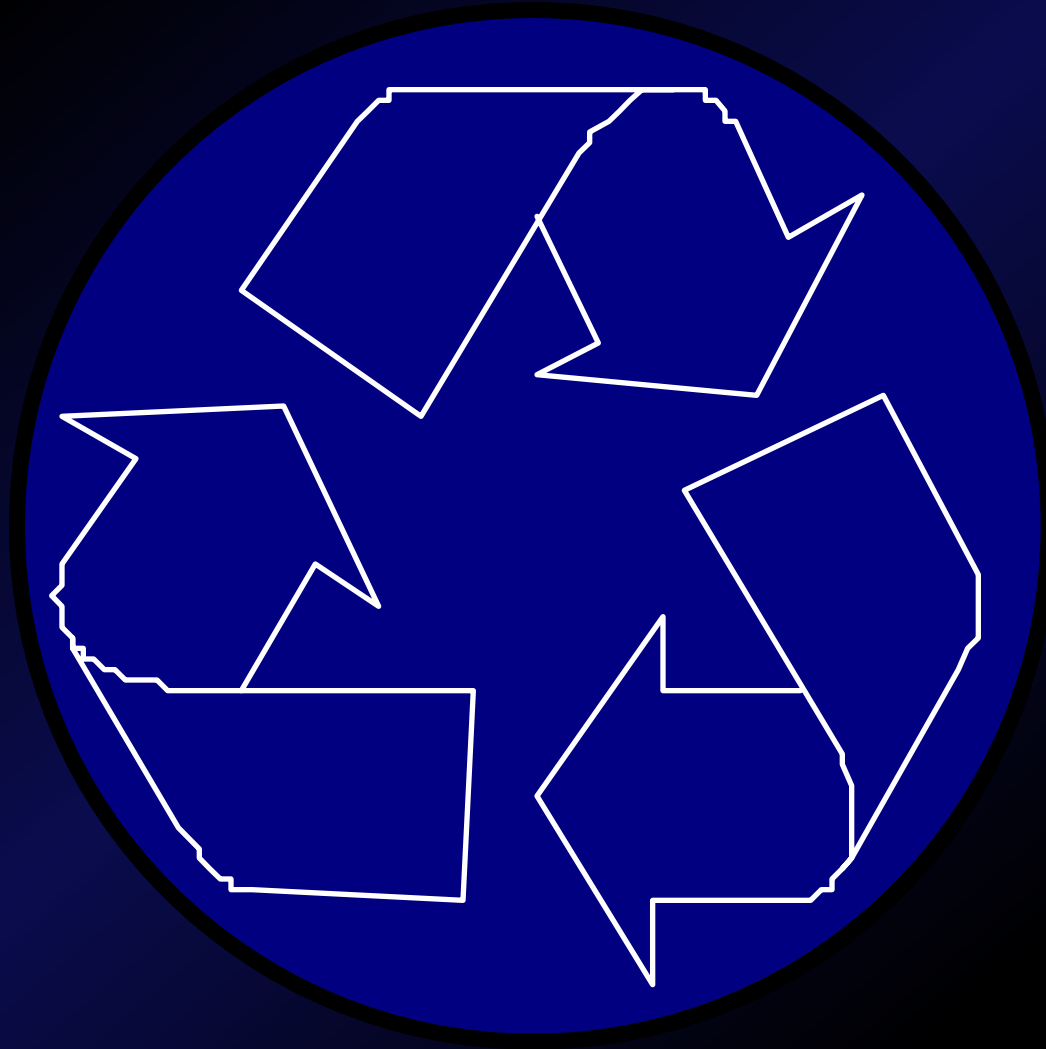
Step 6 - Clear the area and double-check your steps.

- Warn other employees
- Make sure the area is clear.
- Ensure that all:
 - equipment is locked out
 - energy has been contained or released.

Perform Work



Reverse the Order



Any Questions?

