SF Region OTI Safety Fest • March 17, 2026

CONFINED SPACES SAFETY

Surviving the Unseen: Standards, Science, and Survival

Jon Cordoba • Founder, P3 Safety Solutions

P3 SAFETYSOLUTIONS

NotebookLM

Who I Am: Jon Cordoba

- Founder, P3 Safety Solutions
- 25+ years in construction, telecom & infrastructure Safety
- OTI Instructor at OSHA Education Center at ASU (8 years)
- SPRAT Level 1 / PADI Dive Instructor

Focus: Hands-on, practical safety training and technical writing in real-world, high-risk environments.

NotebookLM

The Stakes of Confined Space Entry

1.5 MILLION workers enter confined spaces each year.
On average, 96 never make it out alive.

60%

of confined space fatalities are WOULD-BE RESCUERS.

4% of all entrants experience severe claustrophobia.

NotebookLM

The Rulebook: OSHA 29 CFR 1910.146

Origination: ANSI/ASSP Z117.1-2022

Protects employees in general industry from the hazards of entry into permit-required confined spaces. (Excludes agriculture, construction, and shipyard employment).

Employer Mandates

1. **Identify and evaluate known confined spaces.**
2. **Inform employees of their existence.**
3. **Use confined space entry permits.**
4. **Provide mandatory training for those engaged in work.**

NotebookLM

Classification: Is a Permit Required?

Confined Space (CS)

- ✓ Limited means of egress
- ✓ Can be bodily entered
- ✓ Not designed for continuous human occupancy

Permit-Required (PRCS)

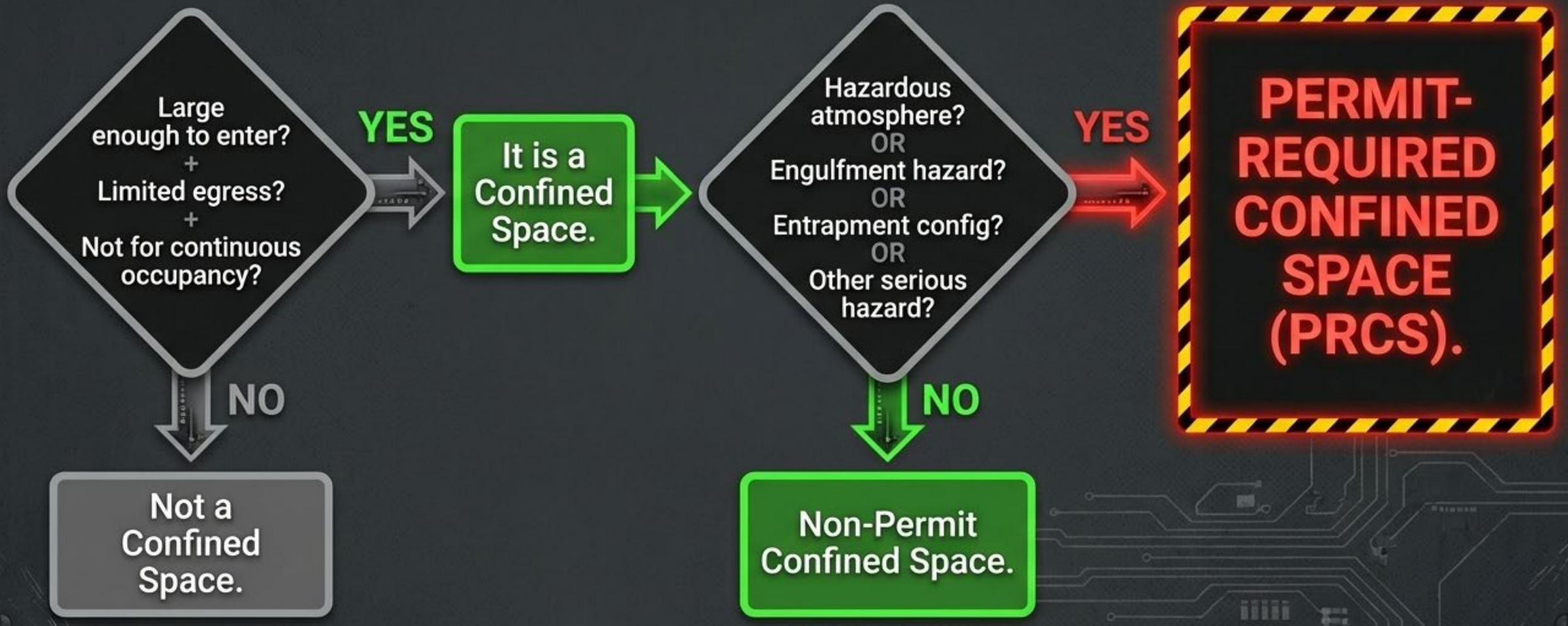
Meets ALL definitions of a CS, PLUS ONE OR MORE of the following:

- ✗ Contains or has potential for a hazardous atmosphere.
- ✗ Contains potential for engulfment.
- ✗ Internal configuration leading to entrapment/asphyxiation (converging walls, sloping floor).
- ✗ Contains any other serious safety or health hazard.

NotebookLM

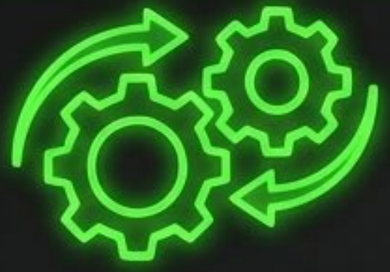
The Field Decision Matrix

Applies to: Tanks, Manholes, Boilers, Furnaces, Sewers, Silos, Vaults, Trenches, Bins, Pipes.



NotebookLM

Hazard Profiles in Confined Spaces



Physical Hazards

Engulfment in loose materials.

Entrapment from inwardly converging walls or sloping floors.

Active machinery.

Atmospheric Hazards

Oxygen deficiency or enrichment.

Flammable gases and combustible dusts.

Toxic gases (H2S, CO).

Work processes that actively change the space's atmosphere.

Psychological Hazards

Severe claustrophobia (affects 4% of entrants).

Panic responses.

Stress exacerbated by high heat and heavy PPE.

NotebookLM

Gas Detection: Calibration vs. Bump Test

Calibration

Action: Checking instrument accuracy against a known concentration of test gas.

Execution: Done by the manufacturer or by strictly following the manufacturer's guidelines.

Bump Test

Action: A functional check passing a challenge gas over the sensors to activate audio, visual, and other alarms.

Execution: MUST be done before daily use.

"NOT BELIEVING THE INSTRUMENT READINGS IS ONE OF THE BIGGEST MISTAKES YOU CAN MAKE."

NotebookLM

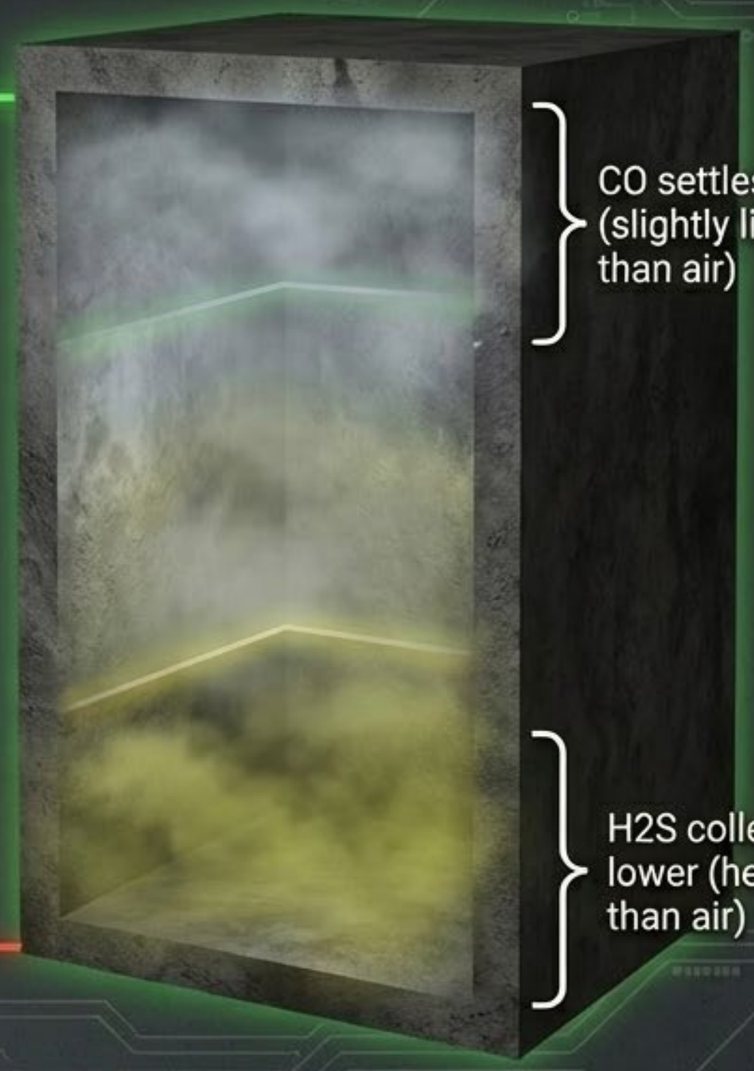
Atmospheric Testing Protocol & Stratification

Step 1 **Oxygen (O2):** Must test first. Combustible sensors require baseline O2 to function.

Step 2 **Combustibles (LEL):** Test for flammable gases.

Step 3 **Toxics:** Test for H2S, CO, and other specific threats.

- Test every 4 feet of depth (Top, Middle, Bottom, and Side-to-Side).
- Add one second of testing delay for every foot of sample hose.



NotebookLM

The Margin of Life: Safe Concentration Limits

Oxygen - O2

Safe Zone: 19.5% - 23.5%. (Ambient Air = 20.9%).

Combustibles - LEL

Track specific ranges based on threat (Methane, Kerosene, Gasoline).

Hydrogen Sulfide - H2S

OSHA Limit: 10 ppm. (IDLH: 100 ppm).

Carbon Monoxide - CO

OSHA Limit: 50 ppm. NIOSH Limit: 25/35 ppm. (IDLH: 1200 ppm).

NotebookLM

Clearing the Air: Ventilation Standards

Why Ventilate? Remove Toxics • Increase O2 • Control Thermal Hazards • Improve Worker Comfort.

The Golden Rules

- Size the blower for the space's volume.
- Require at least seven (7) air changes per hour.
- Prevent re-circulation (exhaust away from intake and other workers).

Space Volume (cu.ft.) × 7 / 60 = Required CFM

Alert: In flammable/explosive atmospheres, blowers MUST be Class I or II rated.

NotebookLM

The Vanguard: Entry Team Roles

The Entry Supervisor

The absolute authority.
In charge of overall safety.
Signs the Entry Permit prior to entry.
ANY operational changes must go through them.

The Attendant

Outside the space.
Monitors and protects entrants.
Maintains 100% control of what goes in and out.
NEVER enters to rescue.

The Entrant

Inside the hazard zone.
Communicates constantly with the Attendant.
Must evacuate immediately upon orders or alarms.

NotebookLM

The Entry Permit: The Contract for Survival

The entry permit sets the absolute boundaries of WHO, WHAT, and HOW things can go on inside the space.

- ☐ Must be signed by the Entry Supervisor prior to entry.
- ☐ Identifies hazards, testing results, and isolation methods.
- ☐ Lists all authorized Entrants and Attendants.
- ☐ Establishes rescue and emergency services protocols.

THE WRITTEN PERMIT MUST BE POSTED OR MADE IMMEDIATELY AVAILABLE TO ALL ENTRANTS.

NotebookLM

Breaking the Fatality Chain

Link 1: Identify

Know the arena.
Classify the space.
Respect the Permit.

Link 2: Test

Calibrate, Bump Test, and clear the atmosphere (O2 -> LEL -> Toxics).
Believe your instrument.

Link 3: Control

Ventilate mathematically (Vol x 7 / 60) and enforce rigid team roles.

96 lives a year. 60% are rescuers. Trust your gear.
Follow the permit. Don't let your team become a statistic.

NotebookLM

P3 SAFETYSOLUTIONS
PROACTIVE.PROTECTION.PARTNERSHIP

Questions?

Stay Safe. Stay Compliant.

Jon Cordoba
Founder, P3 Safety Solutions
Connect on LinkedIn

NotebookLM