CONFINED SPACE ENTRY PROCEDURES

CONFINED SPACE NAME:	ID #	LOCATION:	EP #	1
Sanitary & Storm Sewer Manholes	N/A	City wide (over 1800)	DATE:	November 2012
HAZARDOUS ATMOSPHERIC RATING:	**Moderate**			

SCOPE OF WORK *(From Hazard Assessment)*

This Hazard Assessment (HA) refers to entry for the purpose of inspection (mostly from the outside of the space) and manual removal of objects (such as branches) or removal of objects with a sucker truck from outside the space. Minor rare repairs include removing and replacing damaged fixed ladder rungs (short duration task), which involves cutting steel ladder rungs with an angle grinder, drilling holes (one inch) with an electric powered-drill (e.g., Hilti-type drill) and pressure fitting new ladder rungs into the drilled-holes with an impact device (e.g., impact driver).

Hot work and other atmospheric contaminant generating activities are not included in this Hazard Assessment.

SUMMARY OF POTENTIAL HAZARDS

	Hazards	Undisturbed Space	Work Tasks	Additional Comments
ATMOSPHERE	Oxygen (O_2) Deficiency	**Yes**	No	See Hazard Assessment for additional details.
	O_2 Enrichment	No	No	
	Chemical	**Yes**	**Yes**	
	Biological Hazards	**Yes**	No	
	Fire/Explosion	**Yes**	No	
SAFETY HAZARDS	Structural	No	No	
	Engulfment	**Yes**	No	
	Entrapment	No	No	
	Electrical	No	**Yes**	
	Access/egress	No	No	
	Fall	**Yes**	**Yes**	
	Slip/Trip	**Yes**	**Yes**	
	Visibility/Light Level	**Yes**	No	
	Baffles/internal arrangement	No	No	
	Floor openings in space	No	No	
PHYSICAL AGENTS	Noise/Vibration	No	**Yes**	
	Temperature	**Yes**	**Yes**	
	Non/Ionizing Radiation	No	No	
	Laser	No	No	
OTHERS	Ingestion/Skin Contact	**Yes**	No	
	Mechanical	No	No	
	Traffic Hazard	**Yes**	No	
	Hydraulic/ Pneumatic	**Yes**	No	

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SOURCE: Paul Elsoff & Dave Cooper

Topics	No.	Tasks/ Equipment Required
Prior to Entry		

Equipment Required	1.	Ensure the following is available:
		
		• Pick up gas detector (with pump). Gas detector must be bump tested and/or calibrated prior to use and have the following sensors:
		  ○ oxygen (O_2),
		  ○ flammable/combustibles (LEL),
		  ○ carbon monoxide (CO), and
		  ○ hydrogen sulphide (H_2S)
		(City standard)
		
		• Blower with a minimum of 64 cfm
		• Two-way radio and/or cellular telephone (for Standby Person and Entry Supervisor)
		• Sucker truck/vacuum truck (if required)
		• Portable lighting (flashlight or portable lighting with GFCI)
		• Fall protection (harness and lifeline)
		• Portable ladder (if fixed ladder condition is poor)
		• Primary barriers/pylons

	2.	**General PPE:** • Coveralls • Safety boots • Work gloves • Hard hat • Safety glasses with side shields For sanitary sewers, disposable Tyvek coveralls and disposable nitrile gloves are recommended. **Grinding & Drilling PPE:** • Full face shield (grinding only) • Hearing protection (e.g., earplugs) • Disposable dust mask (e.g., N95 type) • Half face respirator with P100 cartridges (if multiple ladder rungs are required to be repaired)
	3.	**Rescue equipment:** • Harness (worn) • Lifeline (attached at all times) • Tripod • Winch
Entry	4.	Complete and post the ***Confined Space Entry Permit*** at the entrance. (NOTE: Update the Permit accordingly.)

Topics	No.	Tasks/ Equipment Required
Permit/Gas Testing Log	5.	Entry Supervisor to sign Confined Space Entry Permit once all equipment is ready to be installed and observe initial entry.
Space Preparation	6.	Erect primary barriers around opening to the space to isolate space from vehicular and pedestrian traffic.
	7.	If required (storm sewer entry), rinse space prior to entry if space contains large amounts of bacteria/fungi/sludge. For sanitary sewer entry rinse space prior to entry. Remove objects from outside the space with sucker truck.
Pre-Work Coordination	8.	Entry Supervisor to evaluate liquid level prior to entry. Entry prohibited if the flow level is surcharging (the flow level must be stabilized or receding in order to enter) and entry prohibited when significant precipitation is forecasted in the catchment area during entry.
	9.	Inspect fixed ladder condition. Use portable ladder if fixed ladder is insufficient.
	10.	Inspect all equipment for damage before use. Remove damaged equipment from service.
	11.	Standby and Entry Supervisor must have a two-way radio and/or cellular telephone.
	12.	Standby must have training in monitoring duties, initiating emergency response, operation of retrieval equipment and removal of injured victims using this equipment.
	13.	Rescue personnel must have training in first aid and CPR.
	14.	Rescue equipment must be available and worn (harness, lifeline).
	15.	Harness and lifeline must be worn at all times.
Isolation and Lockout	16.	Isolation is not possible. Entry Supervisor to evaluate liquid level prior to entry. Entry prohibited if the flow level is surcharging (the flow level must be stabilized or receding in order to enter) and entry prohibited when significant precipitation is forecasted in the catchment area during entry.
Gas Testing	17.	Persons calibrating/bump testing and operating the instrument must have appropriate training.
	18.	Test the atmosphere no more than 20 minutes prior to entry; continuously during entry and if the space is left vacant for more than 20 minutes. Record the results on the Confined Space Entry Permit every 20 minutes.
	19.	Measure gas concentrations at the top, middle and bottom of the space (using pump and tubing). *Remember there is a delay in response as air is pumped into the instrument (approx. 1 sec per foot) and there is additional sensor response time.*
	20.	**Allowable gas concentrations (before and during entry):** Entry and work in the space can occur only if the following conditions are met:

Topics	No.	Tasks/ Equipment Required
		• O_2: 19.5 – 23 % • LEL: ≤ 2 % (since methane is a concern) • CO: ≤ 25 ppm • H_2S: ≤ 10 ppm If these criteria cannot be met then the space must be evacuated. **NOTE:** The space cannot be re-entered until levels are brought within the acceptable concentrations listed above (adjust ventilation, re-calibrate gas tester etc.). *If the problem persists contact Entry Supervisor for further instructions, see Entry Permit.*
	21.	The entrant must wear the atmospheric testing instrument.
Ventilation	22.	Set up blower (minimum 64 cfm) with duct through the entrance hole discharging at approx. 2 feet from bottom of the space. Air intake of blower must be positioned away from and upwind from nearby combustion exhaust. Minimum ventilation requirements are based on achieving 20 air changes per hour. The atmosphere inside the space will be controlled through air pressurization achieved by providing increased mechanical ventilation (over-ventilating the space). Ducting may be temporarily removed to allow entrant access – replace ducting inside space immediately after entry.
	23.	Ventilation must be operating for 20 minutes prior to entry to allow 'clean respirable air' to circulate throughout the space.
During Entry		
Gas Testing	24.	Continuous monitoring required – as above.
	25.	Record the gas testing results on the Confined Space Entry Permit at least every 20 minutes.
Ventilation	26.	Ventilation must be running during the entire entry. Ducting may be temporarily removed to allow entrant from exiting/entering– replace ducting inside space immediately after exiting/entering.
Standby Person	27.	Standby person must remain at or near the entrance to the space during the entry. Harness and lifeline must be worn at all times.
	28.	Standby person or designated traffic crew must monitor traffic in the area.
	29.	Standby person must monitor the flow for debris and for water levels above the stated threshold values.
	30.	Standby must order the evacuation of the confined space if an alarm sounds.
Personal	31.	All entrants must wear **General PPE** and if required **Grinding & Drilling PPE** (see equipment required list above).

Topics	No.	Tasks/ Equipment Required
Protective Equipment (PPE)		
	32.	Harness must be worn and lifeline attached at all times during entry.
Task/Additional Requirements	33.	Portable lighting (flashlight or portable light with GFCI) required.
Rescue Plan	34.	To activate the emergency response, Standby Person contacts 911 if first aid is required.
	35.	Standby Person contacts the Entry Supervisor using radio/cell phone and advises them of the situation and Entry Supervisor will respond to the scene.
	36.	Ventilation can be removed temporarily to allow extraction from space since there is only one entry point.
	37.	**Self-rescue** if possible
	38.	If self-rescue is not possible: **Lifeline attached:** • Standby Person removes person from space using lifeline and winch.
After Entry Has Been Completed		
Gas Testing	39.	After the entry, record the peak, TWA, STEL, occurrence of alarms on the Confined Space Entry Permit.
	40.	Entry Supervisor to return the completed Confined Space Entry Permit to the Confined Space Program Administrator for filing (must be kept for 1 year).
Work Coordination	41.	Ensure all entrants and tools have been removed from the space and secure the opening.
Equipment	42.	Return all equipment to its proper location.
	43.	Return gas detector to the storage location.