Alternate Measures of Control (AMC)

for Bio-reactors (2) Confined Space Entries

Medium Hazard Atmosphere

City of Penticton AWWTP

March 7, 2017

**Alternate Measures Submission Elements:**

1. The two confined spaces are open air (no covers, open to atmosphere) rectangular concrete tanks that each house 11 separate cells (Bio-reactors). The Bio-reactors are located between the secondary clarifiers and the Primary effluent splitter box. Each Bio-reactor has a full volume of 4,800 m3, cells 1-5 are 200 m3 each, cells 6 & 7 are 500 m3 each and cells 8-11 are 700 m3 each. There is one 750 mm inlet pipe feeding cell one by gravity containing primary effluent and one outlet channel 1 m wide x 2 m deep that is gravity flow from the bio-reactor to the secondary clarifiers which contains mixed liquor suspended solids (MLSS) (Typical Water Level (TWL) 343.2 m
2. The space is isolated by:
   1. The concrete inlet gravity feed 750 mm concrete pipe is connected to a concrete splitter box which houses a 1200mm x 1150 mm Armtec aluminum fabricated self-contained flat back gate w/LC 2.3 lift. The gates were installed in 2012, and are exercised at a minimum annually (no provision for double block and bleed or blanking) see attached drawing. The total head pressure of the water from the upstream channel (341.6) to the bottom of the bio-reactor (339.2 m) is 2.4 m or 3.4 psi of head pressure
   2. The outlet gravity feed channel has a concrete wall with a weir that the water has to overflow prior to entering the second downstream channel. The weir elevation is 343.2m, and the second downstream channel TWL is 342.77 allowing for 430 mm of free board (no provision for double block and bleed or blanking). For an added safety precaution we will lock out 3 fontaine isolation gates (installed in 1990) to cells 9, 10 & 11 that will add another layer of safety for the workers in the bio-reactor. There is no head pressure downstream; downstream water level is 430 mm lower than the outlet channel.
   3. Return Activated Sludge (RAS) line (200mm sch 10 SS) will be isolated in the basement of the RAS pump gallery. Discharge pressure against the single isolation valve (Victaulic Plug Valve rated at 175 psi, attached drawing) is 5 psi.
   4. Fermenter return line into cell 1 (150 mm buried plug valve) will also be locked out at a road valve (Installed in 2015). Less than 1 m of head pressure or ~ 1.5 psi will be against the valve which is rated at 250 psi. See attached drawing for the buried plug valve.
3. Glenn Robertson, CRSP the City’s Safety Coordinator 250-490-2553 [glenn.roberston@penticton.ca](mailto:glenn.roberston@penticton.ca) administers the Confined Space program for the City of Penticton. Glenn Robertson and Randy Craig (AWWTP Supervisor) prepared the Alternate Measures and Hazard Identification/Risk Assessment (HIRA). This AMC includes information from Gary Marsden (Op III) and Gord Austrom (Op III), workers health and safety representatives at the AWWTP
4. For the hazards that need to be addressed see the attached HIRA and supplemental safe work procedure. The characteristic of the water on both the upstream is typical of primary treated sanitary wastewater and downstream side of the bio-reactors is typical of secondary biomass or MLSS from a typical Biological Nutrient Removal (BNR) facility. No work will be performed that will contribute to the likelihood of material flowing into the space. Work to be performed under this AMC includes both corrective and preventative maintenance as per the equipment manufacturers Operation and Maintenance Manuals as well as installing some 750 mm piping in cell 1 of both trains, extending a de nitrification channel between cell 4 and cell 2, coring some holes between cells and setting effluent weirs on both trains.
5. Alternate Measures;

* The analysis of valves as a control measure should assume that all valves leak. However, there is no expectation that a properly installed and maintained valve will fail catastrophically if no work is being performed on it. It is recognized that systems will often permit some leakage; a means of pumping out the fluid will be undertaken.
* Any potential leakage from the upstream 750mm concrete pipe (entering cell 1) will be continuously monitored by the standby person, if any leakage enters into cell 1 the confined space will be evacuated and the issue will be addressed prior to re-entry. A secondary measure will also be in place, the upstream channel level will be continuously monitored with a local audio/visual high level float set to 200 mm (Normal freeboard is 500 mm) of freeboard below top of splitter box slab while space is occupied, if the water level rises to less than 200 mm freeboard in the splitter box the alarm will sounds and light will flash and the confined space will be evacuated and the issue will be addressed prior to re-entry. See attached drawings.
* The water level in the downstream channel will be continuously monitored with a local audio/visual high level float set to 200 mm of freeboard above the weir while space is occupied, if the water level rises above 230 mm in the downstream vault, the alarm will sounds and light will flash and the confined space will be evacuated and the issue will be addressed prior to re-entry. There is 430 mm of freeboard from the downstream channel top of weir to the TWL in the second downstream channel. The three outlet gates will also be closed and lock out as an added safety measure, which will prevent any potential leakage from entering the bio-reactor. See attached drawings



* See HIRA for atmospheric monitoring requirements
* Communication will be verbal between worker and stand-by person. The stand-by person will have radio and cell phone contact
* See attached emergency procedures

1. Workers will be orientated to this AMC and required to sign off on their orientation.
2. AMC will be supervised by AWWTP Supervisor and regular visits documented.
3. Time frame that the AMC is needed is 2 years, with engineering reviews.
4. Up to four workers will be allowed in the space and will enter the space via a ladder, see HIRA for fall protection requirements.
5. The standby person will attend the confined space continuously.
6. Decontamination of worker; worker in space will be wearing long sleeve coveralls and all pertinent PPE and if any contamination occurs, coveralls and PPE will be removed and laundered by our coverall service provider (Unifirst). There will also be an emergency wash station available to the worker at the site. Worker can shower if any area of their body gets contaminated.
7. Admin controls included in HIRA are; 3 point stance when on ladder, clean bio-reactor floor, good housekeeping, source of CO away from blower, pre flushing of space & sharps, electrical cord safety.
8. If we had to extract the worker it would take <300 sec, to either winch him out or send a second person in to hook the worker to the winch and remove the worker.
9. Response time by the Fire Department is from Station 201 the response time from time of call would be 7min depending on traffic and road conditions.
10. Portable gas detector (Industrial Scientific Ventis MX4 <http://www.indsci.com/products/multi-gas-detectors/ventis> ) used to monitor the confined space. The alarm set points are set at; H2S low 5 ppm, high 10 ppm. LEL low 5%, high 10%. CO Low 13 ppm, high 25 ppm, STEL 100 ppm, TWA 25 ppm. O2 low 20.5%, high 23.5 %.
11. Evacuation will be by a Pelsue davit arm <http://www.pelsue.com/product/davit-arm-retrieval-system-2/> top mounted to the concrete channel. Rescue Winch is a DBI Self Retracting Lifeline (SRL) model # 23403-1 s/n # 033794, it was certified by Carleton Rescue on Dec. 16th 2016.
12. See supplemental safe work procedure for ventilation requirements for each size of cell.
13. Historical air monitoring of past entries (2009-2011) show nothing but clean respirable air, records available upon request.

Prepared by,

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