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RE: Compliance of Confined Space Monitoring System with Title 8 Subsections 5157(d)(6) and (i)

I write in response to your email received by the Cal/OSHA Research and Standards Safety Unit (R&S) on August 2, 2021. You requested clarification of California Code of Regulations, title 8 subsections 5157(d)(6) and 5157 (i) regarding the use of a centralized confined space monitoring (CCSM) system for employees entering permit-required confined spaces.

Occupational safety and health requirements are set by title 8 of the California Code of Regulations. This letter explains some of those requirements and how they may apply to particular circumstances, but this letter is not a general interpretation of the regulations and it does not create new, or remove or alter existing employer obligations under title 8.

Included in your inquiry were a slide presentation describing the components, functions and capabilities of the CCSM with a table comparing the system with the requirements of title 8 subsections 5157(d)(6), 5157(d)(7) and 5157(i). Also included was a standard operating procedure from TOTAL SAFETY detailing use of the system on site. Based on the documentation provided and subsequent discussion between TOTAL SAFETY and R&S staff, the CCSM system is identified as an integrated safety system that provides real-time monitoring and alerting of employees working in confined spaces. The components of the system include high-definition cameras, entry and exit badge readers, gas detection sensors, safety alarms and an intercom to monitor and communicate with entrants from a central control room.

Visual monitoring of the system is achieved via two Cameras per confined space. One camera is installed inside and one outside each confined space with dual lenses affording the capability to capture images in light and dark environments utilizing IR black light technology. The cameras currently have limited pan, tilt and zoom capabilities, however second-generation cameras with a full range of pan, tilt and zoom capabilities are to be integrated into the system in late 2021 to early 2022. The cameras also record video and maintain recorded data locally within the equipment but do not have audio capabilities.

Badge readers are located at every confined space entrance and exit and register the presence of personalized entrant badges that contain the employee's name and company name. The badge readers are also equipped with red and green lights labeled with the "OK" and "STOP" respectively alerting an entrant whether or not they are authorized to enter.

One gas sensor is located within each confined space for identifying a hazardous atmosphere. These sensors are equipped with a dust filter, can be moved to different locations as the work progresses and measure up to six air contaminants including but not limited to CO, H_2S, O_2, SO_2 and CH_4 (LEL).

The alarm system to alert entrants includes a 120-decibel audio alarm with an accompanying strobe light located within the confined space. This alarm is triggered automatically when a dangerous atmosphere is detected by the gas sensor or manually by operators in the control room.

The intercom system includes communication units located at each entrance and exit and inside of each confined space. These units may be activated inside or outside of the confined space as well as by an operator in the control room. Control units at the entrances, exits, and within the confined spaces are operated with activation buttons to open the line and the system provides uninterrupted two-way communication. Entrants are not equipped with communication units.

All of the CCSM components are hard-wired connected to a control unit which transmits data to the central control station located at the facility via a 128-bit encrypted wireless signal. This signal has a 6.2-mile line-of-sight range and is transmitted at either 10, 20, 40 or 80 MHz to the control center where it is monitored by CCSM operators.

According to the documentation provided, each CCSM operator must receive at least the following training:

- ARSC Basic Plus Training (OSCA)
- Dangers of Hot Work
- Fall Protection Usage Training
- Electrical Safety
- Lockout/Tagout Training
- Permit to Work Training
- GHS Standard Training
- Confined Space Entrant
- Confined Space Attendant
- Conflict Confrontation and Resolution

Additionally, all CCSM operators must have the following experience and training:

- At least 2 years Temporarily Abandoned (TA) well experience in Oil and Gas Refining
- Safety orientated with Intervention and mitigation experience
- Basic computer skills

- Training on computer monitoring soft and hardware
- Gas detection principles and techniques:
    - Calibrate, bump test, reporting, installation of sampling lines
- Access control, creating user badges, configuring zones, making roll calls, reporting
- Training on Monitoring software and hardware including
    - Introduction to the Centralized Confined Space Monitoring (CCSM) System
    - Camera units, badging, in/out and access control units
    - IP structure of monitoring system
    - Cable/Cord Make Ready
    - Hands on rig/down of system on field condition confined spaces
    - Training on integrated computer Suite software platform
    - Contractor Compliance Procedures Utilizing CCSM System
    - Install and Configuration of the Intercom System
    - Set Recording Path for Cameras Using a NAS Drive
- Live scenario training

One CSSM operator monitors 12 confined spaces from the central control center and two additional "roving" operators are present in the field and monitor their assigned confined spaces. Every operator is trained as a confined space attendant and the team rotates every two hours to reduce fatigue and complacency.

Based on this information, you ask the following question:

Question:

Does use the CCSM system meet the requirement of title 8 subsection 5157(d)(6) and referenced subsection 5157(i)?

Response:

Title 8 subsection 5157(d)(6) includes the following requirements as part of a confined space entry program:

> §5157. Permit-Required Confined Spaces.
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> * * * * *
>
> (d) Permit-required confined space program (permit space program). Under the permit required confined space program required by subsection (c)(4), the employer shall:
>
> * * * * *
>
> (6) Provide at least one attendant outside the permit space into which entry is authorized for the duration of entry operations;
>
> NOTE: Attendants may be assigned to monitor more than one permit space provided the duties described in subsection (i) can be effectively performed for each permit space that is monitored. Likewise, attendants may be

> stationed at any location outside the permit space to be monitored as long as the duties described in subsection (i) can be effectively performed for each permit space that is monitored.

Subsection 5157(d)(6) requires that at least one attendant be outside a permit-required confined space authorized for entry. A note included in this subsection states for the reader that an attendant may monitor more than one confined space and may be at any location outside the permit space provided that the duties included in subsection 5157(i) can be performed effectively. Notes are non-regulatory and unenforceable. Notes do not add any new requirements nor remove or alter any existing requirements.

Title 8 subsection 5157(i) includes the following requirements:

> §5157. Permit-Required Confined Spaces.
>
> * * * * *
>
> (i) Duties of attendants. The employer shall ensure that each attendant:
> (1) Knows the hazards that may be faced during entry, including information on the mode, signs or symptoms, and consequences of the exposure;
> (2) Is aware of possible behavioral effects of hazard exposure in authorized entrants;
> (3) Continuously maintains an accurate count of authorized entrants in the permit space and ensures that the means used to identify authorized entrants under subsection (f)(4) accurately identifies who is in the permit space;
> (4) Remains outside the permit space during entry operations until relieved by another attendant;
> NOTE: When the employer's permit entry program allows attendant entry for rescue, attendants may enter a permit space to attempt a rescue if they have been trained and equipped for rescue operations as required by subsection (k)(1) and if they have been relieved as required by subsection (i)(4).
> (5) Communicates with authorized entrants as necessary to monitor entrant status and to alert entrants of the need to evacuate the space under subsection (i)(6);
> (6) Monitors activities inside and outside the space to determine if it is safe for entrants to remain in the space and orders the authorized entrants to evacuate the permit space immediately under any of the following conditions;
> (A) If the attendant detects a prohibited condition;
> (B) If the attendant detects the behavioral effects of hazards exposure in an authorized entrant;
> (C) If the attendant detects a situation outside the space that could endanger the authorized entrants; or
> (D) If the attendant cannot effectively and safely perform all the duties required under subsection (i);
> (7) Initiate on-site rescue procedures and, if necessary, summon additional rescue and other emergency services as soon as the attendant determines that authorized entrants may need assistance to escape from permit space hazards;
> (8) Takes the following actions when unauthorized persons approach or enter a permit space while entry is underway:

> (A) Warn the unauthorized persons that they must stay away from the permit space;
> (B) Advise the unauthorized persons that they must exit immediately if they have entered the permit space; and
> (C) Inform the authorized entrants and the entry supervisor if unauthorized persons have entered the permit space;
> (9) Performs non-entry rescues or other rescue services as part of the employer's on-site rescue procedure; and
> (10) Performs no duties that might interfere with the attendant's primary duty to monitor and protect the authorized entrants.

Although the non-regulatory note of subsection 5157(d)(6) states that an attendant can be at *any* location outside the confined space, it is clear from the requirements of subsection 5157(i) that the attendant is to remain outside, but in close physical proximity to the confined space. Regulatory requirements in subsection 5157(d) and 5157(i) prevail over a non-regulatory and non-enforceable note.

The CCSM system does not meet the minimum requirements of title 8 subsections 5157(d)(6) and 5157(i) for the following reasons:

(1) Pursuant to subsection 5157(i)(4) an attendant must remain outside the permit space during entry operations until relieved by another attendant. Therefore, one of the specific duties of an attendant is to remain in close physical proximity to the confined space that they are monitoring until relieved. With the CCSM system, neither the central control room or roving operators are or can remain in close proximity to every confined space they are monitoring.

(2) The use of cameras inside and outside of the confined spaces is not sufficient to meet the requirements of subsection 5157(i)(6). This subsection requires the attendant to monitor activities inside and outside the confined space to determine if it is safe for entrants to remain in the space. Although modern high-definition cameras produce a very clear image, they do not provide the same quality of vision as the human eye, cannot change their view or move to react to potential hazards as readily as a human being and present narrow fields of vision and/or blind spots that would not be present with a physical attendant outside of the confined space.

(3) An attendant stationed outside of a confined space is able to hear potential hazards that the cameras are not capable of detecting. Since the CCMS cameras do not have audio capability, the CCMS is less effective than an attendant physically present near the confined space entry. Although the intercom system can provide open two-way communication, TOTAL SAFETY technical staff informed Cal/OSHA that it is not practical to keep the intercom system open due to the high noise levels inherent in the work. Regardless, even if the intercom system is open, it cannot provide effective monitoring as 12 simultaneous audio streams would be transmitted by the various intercom units inside and outside the confined space and make it very difficult for the operator to discern from which confined space the audio originates. In concert with the central station operators being responsible for 12 confined spaces thereby monitoring 24 video feeds from internal and external cameras, effective audio monitoring of the confined spaces by the CCMS would not be achieved.

(4) Pursuant to subsection 5157(i)(7), the attendant must initiate on site rescue procedures as soon as the attendant determines that authorized entrants may need assistance. This attendant duty includes detecting audible or other non-visible signs of distress or other indications of an incident (e.g., noise/vibration from a fall from height, unexpected machine or equipment noise, vibrations, and other non-visible signs of a problem) since there may be times with no visual contact with the entrant. The CCSM system is not capable of providing effective continuous monitoring to detect non-visible signs that entrants may need assistance and/or rescue.

(5) Pursuant to subsection 5157(i)(8), the employer must ensure that attendants take certain actions to prevent unauthorized persons from entering a confined space. The attendant must be physically present to effectively perform this duty. A remote attendant using an intercom or a roving attendant cannot effectively prevent unauthorized entry.

(6) Pursuant to subsection 5157(i)(9), the attendant must perform non-entry rescue or other rescue services as part of the employer's on-site rescue procedure. Non-entry rescue systems or methods are mandatory unless they would increase risks or not contribute to the rescue of the entrant. In the event of an emergency, the attendant must be physically present to perform timely non-entry rescue. A remote or roving attendant cannot effectively and timely perform non-entry rescue.

(7) Transmission of data to the central control station through a wireless signal is not as effective as an attendant physically present at the confined space entrance. Wireless communication is not 100 percent reliable and can be affected by environmental conditions such as solar flares, lightning, excessive moisture in the environment—including heavy rain, snow, rain clouds or steady evaporations from cooling towers combined with high wind. Wireless transmission can also be blocked or interfered with by other transmissions and certain physical obstacles.

Although the CCSM does not meet the requirements of 5157(i) as noted above, the system may be still be used in the following circumstances:

(1) When all hazards in the confined space are eliminated pursuant to subsection 5157(c)(7)(A)
(2) When the only hazard in the confined space is an actual or potential atmospheric hazard that is made safe by continuous forced air ventilation alone pursuant to subsection 5157(c)(5)(A) and 5157(c)(5)(B).

Thank you for your interest in occupational safety and health.

Sincerely,

Eric Berg

Eric Berg
Deputy Chief of Health

cc: Jason Denning, Clyde Trombettas