

California Department of Public Health
Occupational Health Branch

**FATALITY ASSESSMENT AND CONTROL EVALUATION PROGRAM
(CA/FACE)**

A maintenance diver died from hyperthermia as he was preparing to do routine maintenance on a water tank
Case Report: 20CA003

SUMMARY

A maintenance diver died from hyperthermia as he was preparing to do routine maintenance on a 150,000 gallon steel water tank that was 150 feet tall. The three-person work crew was preparing to conduct routine maintenance inside the tank when the incident occurred. The victim had climbed 100 feet to the water tank catwalk when he was found collapsed by a co-worker. The autopsy report indicated the victim died from a combination of hyperthermia and the presence of methamphetamine. The CA/FACE investigator determined that, in order to prevent future incidents, water tank maintenance companies should:

- Develop and implement a Heat Illness Prevention Plan.
- Implement a Workplace Supported Recovery Program using evidence-based policies and programs to reduce multiple risk factors for substance use.

INTRODUCTION

On Wednesday, June 24, 2020, a 27-year-old male maintenance diver died from hyperthermia as he prepared to clean the inside of an aboveground water tank. The CA/FACE investigator received notification on July 8, 2020, from the Cal/OSHA Weekly Fatality Report. On April 17, 2021, contact was made with the employer of the victim. Interviews were conducted via phone and email with the company general manager, and the co-worker and supervisor who were onsite the day of the incident. The county coroner, fire department, and sheriff's department reports of the incident were also obtained and reviewed.

EMPLOYER

The employer of the victim was a water tank maintenance company that had been in business for over 35 years and had six employees. The company provided commercial diving services to maintain water systems. On the day of the incident, there were three employees onsite.

WRITTEN SAFETY PROGRAMS AND TRAINING

The company had a written safe practices manual for the work being performed and a written Injury and Illness Prevention Program (IIPP) with all the required elements, but did not have a complete Heat Illness Prevention Plan. Before hire, all employees must have graduated from an accredited dive school and received certification. In addition, members of the dive maintenance team received annual and ongoing dive training from the founder of the company. All workers received periodic and on-the-job safety training from their supervisor, but this did not include in-depth heat illness prevention education.

WORKER INFORMATION

The victim was a 27-year-old male maintenance diver who was hired by the company in January 2020 but, due to COVID-19, his start date was delayed until June 1, 2020. According to the employer, he had received all required trainings and certifications prior to the incident. His previous work experience prior to this job is unknown.

WEATHER

The temperature and humidity at the time of the incident was 87 degrees Fahrenheit with 33% humidity, and a heat index of 90 degrees Fahrenheit [[Weather Underground 2020](#)].

INVESTIGATION

On the day of the incident, the victim, his co-worker, and onsite supervisor arrived at the worksite at approximately 7:30 a.m. Knowing the temperature would exceed 100 degrees Fahrenheit that day, the supervisor checked in with the crew to confirm the high heat forecast. He reminded them to drink lots of water throughout the day, and also witnessed them hydrating prior to the start of work. The victim and co-worker took multiple bottles of water (237 ounces total) with them up on the tower, but it is unknown how much they consumed. The supervisor mentioned that the water tank provided shade on portions of the catwalk for workers when needed.

The victim was assigned to be the diver that day, performing maintenance inside the 150,000 gallon steel water tank. The co-worker worked as the tender and was responsible for dressing the diver before he enters the tank, controlling the hose assembly, and maintaining communications between the diver and the supervisor. The supervisor was planning to work from the ground, controlling the equipment.

The victim and the co-worker climbed approximately 100 feet up a ladder to the catwalk, and then the victim began to set up hose lines. The co-worker then climbed another 40 feet to the top of the tank where he began setting up the hose lines needed to enter the tank. After he finished setting up the hoses on the catwalk, the victim was supposed to join the co-worker on

the top of the tank to get dressed for the dive. The supervisor on the ground tried to communicate with the victim through the radio but was unsuccessful, so he immediately stepped out of the trailer to visually check on him. Because the victim was partially hidden by the ladder and he couldn't see him, the supervisor got on the radio and asked the co-worker to check on him. The co-worker climbed down from the top of the tank to the catwalk and found the victim slumped behind the ladder, unable to stand up on his own. When the co-worker lifted the victim up to lean against the railing, he began vomiting and then became unresponsive. The co-worker called the supervisor via cell phone and requested medical assistance, stating there was a medical issue with the victim. The supervisor told a facility maintenance worker to call for medical help and the fire department was dispatched at 10:47 a.m. The supervisor then he climbed the catwalk to assist the co-worker with the victim. Realizing the victim was suffering from a heat-related injury, the supervisor and co-worker gave medical aid and tried to cool the victim by removing some of his clothing and pouring cool water from their water bottles onto his skin.

The fire department arrived at the site at 10:52 a.m., and rescuers climbed the 100 feet to the catwalk and set up for a high angle technical rescue. It took approximately one hour to lower the victim from the catwalk to the awaiting transport units on the ground. No advanced life support (ALS) care was given during the technical rescue. Once on the ground, the victim was identified as pulseless and non-breathing. Rescuers started CPR and transported the victim by private ambulance approximately three miles to the nearest hospital. The victim arrived at the hospital at approximately 12:15 p.m. with a core temperature of 106.8 degrees Fahrenheit. As the emergency room staff treated the victim, he had a return of circulation followed by pulselessness several times before he was pronounced dead at 5:45 p.m.

CAUSE OF DEATH

The cause of death, according to the death certificate, was the combined effects of heat exhaustion/heat stroke and acute methamphetamine toxicity.

RECOMMENDATIONS

The CA/FACE investigator determined that, to prevent future incidents, water tank maintenance companies should:

Recommendation #1: Develop and implement a Heat Illness Prevention Plan.

Discussion: On the day of this incident, the supervisor told everyone they would be working in high heat, reminded them to stay hydrated, and that portions of the water tank could provide shade. However, there was no written Heat Illness Prevention Plan, and heat illness prevention was not included in worker trainings.

A Heat Illness Prevention Plan can be integrated into the employer's Injury and Illness Prevention Program or may be maintained separately, and should include:

- Procedures for providing sufficient water
- Procedures for providing access to shade
- Monitoring weather and temperatures
- High-heat procedures
- Acclimatization methods
- Emergency response
- Proper handling of sick employees
- Training all employees on the Heat Injury and Illness Prevention Plan

It is likely that several factors contributed to the risk of hyperthermia in this incident, including direct thermal effects, heat radiation from the structure, and physical exertion. The victim reported he had hydrated prior to beginning work that day, but it is unknown if he had acclimatized to the heat during the days prior to the start of this job. Methamphetamine also likely increased the risk of hyperthermia by impairing the ability of the victim to sweat and dissipate heat. Individuals with heat stroke and elevated body temperature need to be treated as soon as possible. In this incident, the co-worker poured water onto the victim's skin, but he was not treated with emergency cooling measures (ice packs/wet sheets or towels) until he arrived at the hospital emergency room almost three hours after he collapsed.

Recommendation #2: Implement a Workplace Supported Recovery Program using evidence-based policies and programs to reduce multiple risk factors for substance use.

Discussion: In this case, the post-mortem toxicology report was positive for methamphetamine. The coroner's report stated that the cause of death was the combined effects of heat exhaustion/heat stroke and acute methamphetamine toxicity. Among several mechanisms, methamphetamine increases body temperature by promoting heat generation and retention and suppressing responses that would facilitate heat dissipation, and likely contributed to the risk of heat stroke.

In this incident, there was no program to ensure that employees who work at heights or with dangerous equipment are free from drugs that could endanger themselves or others. Pre-employment, periodic, and random drug testing programs can be effective in identifying employees who are at risk of drug-related work impairment or at greater risk of injury and illness. Some dive training programs, such as [National Oceanic and Atmospheric Administration](#) (NOAA), require a drug test prior to certification with subsequent random drug testing after hire. Employers implementing applicant or employee drug testing programs should develop and communicate clear policies that are permissible under the law, and legal consultation is recommended. Had such a program been in place, the risk of methamphetamine contributing to his death may have been minimized.

As described by the National Institute for Occupational Safety and Health (NIOSH), a Workplace Supported Recovery (WSR) Program can be valuable in preventing and responding to substance

abuse problems in the workplace (see [Centers for Disease Control and Prevention – Workplace Supported Recovery Program](#)). A WSR Program can:

- Prevent work-related injuries and illnesses that could lead to the initiation of substance misuse.
- Decrease difficult working conditions or work demands that might lead to daily or recurrent pain.
- Promote the use of alternatives to opioids for pain management associated with a workplace injury or illness.
- Provide information and access to care for a substance use disorder when it is needed, including access to medication-based or medication-assisted treatment, together with individual counseling.
- Support second-chance employment.
- Provide workplace accommodations and other return-to-work assistance.
- Provide peer support and peer coaching to bolster the social supports available to workers in recovery.
- Promote a work culture and climate that is supportive of workers in recovery (for example, awareness building, stigma reduction, and alcohol-free and health-focused work social events).

Workplaces can engage in several activities to mitigate the risk factors for initiation or perpetuation of a substance use disorder, help maximize the likelihood that employees in need will seek treatment, and support employees in their recovery efforts.

Policy. Workplace policies regarding substance use should be clear and transparent, defining the reasons for the policy, the prohibited substances and behaviors, the persons covered by the policy, and disciplinary consequences and appeals. Workplace substance use policies should be sensitive to the nature of recovery efforts. For example, a recovery-supportive policy will recognize that recovery may involve one or more recurrences and, therefore, additional or modified treatment. Also, because employment increases the likelihood of entering treatment and maintaining recovery efforts, workplace policies should support recovering individuals attempting to maintain employment and those hoping to enter or return to the workforce.

Education. Recovery-supportive workplaces can provide training to all supervisors and employees. Trainings cover types of drugs (including alcohol), the health impacts of misusing them, how substance use can impact behavior, performance at work, and implementation of workplace policies involving substance use. In-person training is recommended as a best practice and online training should be provided when in-person training is not feasible.

Work environment. Recovery-supportive workplaces evaluate their work environments to minimize adverse working conditions that may contribute to higher levels of employee substance misuse. These include but are not limited to excessive work demands, exposure to interpersonal aggression at work, and dangerous working conditions. Workplaces may promote a quality work environment by establishing and maintaining potentially protective working

conditions, such as fair and equitable treatment, respectful supervision, and promotion of supportive social connections and friendships among co-workers.

Stigma reduction. Individuals with a substance use disorder experience extreme levels of stigmatization (negative attitudes and stereotypes) that lead to prejudice, discrimination, social exclusion, and limited opportunities to participate fully in employment and other life roles. Stigmatization is also experienced by individuals who have recovered from a substance use disorder. Therefore, visible educational materials, as well as consistent discussions of the actual nature of substance use disorders, treatment, and recovery, may help reduce stigma and encourage entry into treatment and recovery. A key talking point in these materials and discussions is that a substance use disorder is not a moral failing and recovery is possible. The Center on Addiction provides [recommendations](#) for reducing stigma related to substance use disorders.

Resources and support. Inform employees about resources available through the employer or union for the treatment of substance misuse and disorders and recovery support. These resources may be part of a company employee assistance program and health insurance. If an employee assistance program and health insurance are not available, an information sheet on available resources in the community can be made available.

- Employers should consider evaluating their employee assistance and health insurance programs to make sure they have adequately trained personnel to deal effectively with substance use problems and have adequate coverage for multiple episodes of treatment (inpatient, outpatient, medication-assisted treatment), long-term follow-up, and recovery support (such as recovery coaching).
- Support programs utilizing co-workers or peers, with appropriate training, may offer valuable and confidential support such as sharing information and providing referrals, advocacy, and accountability. Peers are not usually formally trained to provide clinical services, but their skills and support may help lower barriers for seeking help and following through with treatment. Peer-based approaches or links to peer-based organizations and their programs may be of significant value to workers and employers when developing WSR programs.

Sensitivity to disparities. Workers across all age ranges, races, ethnicities, and organizational levels within the workforce can engage in substance misuse and develop substance use disorders. However, barriers to treatment and willingness to enter treatment and recovery may vary across these groups, based on factors such as religious and cultural norms or expectations, family history, age, and education. Employers should consider having expertise available in their employee assistance or health insurance programs to address differences across various demographic groups as needed.

Health and well-being programs. Providing programs that promote and support employee health, well-being, and work-life fit, as well as teach functional coping skills, may help employees develop and maintain their recovery efforts by building recovery capital.

Employment. Employment provides economic stability, a meaningful social role, and often direct access to treatment and recovery services. Employment also provides relevant sources of recovery capital that can motivate and maintain a desire for treatment and recovery. Recovery-supportive employers aim to preserve employment for those with a substance use disorder and provide second-chance employment for recovering individuals attempting to enter or reenter the workforce.

Workplace substance use climate. Evaluate and reduce current levels of physical availability of substances during the workday, as well as workplace norms and drinking rituals that support substance use. Physical availability includes the ease of obtaining alcohol and other drugs at work, bringing alcohol or other drugs into the workplace, or using substances during work hours or breaks. Substance use norms include descriptive norms, which represent the extent to which workers use substances while at work or work while impaired. Substance use norms also include injunctive norms, which represent the extent to which workers approve of using substances while at work or working while impaired. Although after-work drinking rituals are a way for co-workers to unwind and develop friendships, they can undermine the recovery efforts of co-workers who want to avoid alcohol use but, as a result, may experience social exclusion at work for not participating.

Focus on the future workforce. Roughly 90% of individuals with severe substance use disorders began using before the age of 18. Workplaces that employ adolescents and focus on prevention efforts aimed at employee substance misuse may circumvent problems in the next generation of workers. Additionally, a comprehensive WSR program could include prevention-focused resources specific to employees that are parents of adolescents.

REFERENCES

[Cal/OSHA §3395. Heat Illness Prevention in Outdoor Places of Employment](https://www.dir.ca.gov/title8/3395.html)
(<https://www.dir.ca.gov/title8/3395.html>)

[CDC NIOSH Workplace Supported Recovery Program.](https://www.cdc.gov/niosh/topics/opioids/wsrp/default.html)
(<https://www.cdc.gov/niosh/topics/opioids/wsrp/default.html>)

Matsumoto RR, Seminerio MJ, Turner RC, Robson MJ, Nguyen L, Miller DB, O'Callaghan JP. Methamphetamine-induced toxicity: an updated review on issues related to hyperthermia. *Pharmacol Ther.* 2014 Oct;144(1):28-40.

[NIOSH/CDC-Criteria for a Recommended Standard Occupational Exposure to Heat and Hot Environments. \(NIOSH\) Publication No. 2016-106.](https://www.cdc.gov/niosh/docs/2016-106/default.html) (<https://www.cdc.gov/niosh/docs/2016-106/default.html>)

[NOAA Scientific Diver Training and Certification Requirements](https://www.oma.noaa.gov) (<https://www.oma.noaa.gov>)
[Substance Abuse and Mental Health Services Administration, Drug-Free Workplace Programs](https://www.samhsa.gov/workplace)
(<https://www.samhsa.gov/workplace>)

[Weather Underground \[2020\]](#). (June 24, 2020 Weather History in Fresno, California, United States).

EXHIBITS:



Exhibit 1. The 150-foot water tower being serviced.



Exhibit # 2. Rescuers lowering the victim from the catwalk (photo courtesy ABC30).

TJ Welch
Safety Consultant

Robert Harrison, MD, MPH
FACE Project Officer

October 3, 2022

Laura Styles
FACE Research Scientist

FATALITY ASSESSMENT AND CONTROL EVALUATION PROGRAM

The California Department of Public Health, in cooperation with the Public Health Institute and the National Institute for Occupational Safety and Health (NIOSH), conducts investigations of work-related fatalities. The goal of the CA/FACE program is to prevent fatal work injuries. CA/FACE aims to achieve this goal by studying the work environment, the worker, the task the worker was performing, the tools the worker was using, the energy exchange resulting in fatal injury, and the role of management in controlling how these factors interact. NIOSH-funded, state-based FACE programs include: California, Kentucky, Louisiana, Massachusetts, Michigan, New York, Oregon, and Washington.

Additional information regarding the CA/FACE program is available from:

[California FACE Program](#)

**California Department of Public Health
Occupational Health Branch
850 Marina Bay Parkway, Building P, Third Floor
Richmond, CA 94804
(www.cdph.ca.gov/face)**