



FIREFIGHTER SAFETY & SURVIVAL MESSAGE



COLORADO STATE FIRE CHIEFS' ASSOCIATION

Responder Safety: Hydrogen Sulfide Gas (H₂S) Suicides on the Rise
Responders Who Fail to Take Proper Precautions Can Quickly Become Victims Themselves

Last week the CSFCA distributed responder safety information from the Wake County (NC) EMS Divisionⁱ concerning a 30-year-old Cary, NC man who committed suicide with hydrogen sulfide by mixing chemicals in a 5-gallon bucket inside his Toyota Camry. On February 21st, fire and EMS personnel were dispatched to a report of an unconscious party in a car. Upon arrival, the man was found slumped over the wheel of his car in his apartment complex parking lot but he had left warning signs on the dashboard and seats that read, “HAZMAT TEAM NEEDED” and “DO NOT OPEN!!! POISON GAS!!! Hydrogen sulfide.”

When Hazmat arrived they donned Level B PPE and SCBA and opened the door to the vehicle – the monitors showed 340 ppm of Hydrogen Sulfide (H₂S) – more than three times the lethal concentration (the IDLH of H₂S is 100 ppm).

Since distributing that information, it has become abundantly clear that this method of suicide, sometimes called detergent suicide, is being seen with increasing frequency in the United States. The process involves mixing common household chemicals to create hydrogen sulfide gas in a small space. Instructions to do this are readily available on the internet and most encourage anyone planning to use this method to provide appropriate warnings to people who might encounter or respond to their situation about the presence of the deadly gas.

Responders Who Fail to Take Proper Precautions Can Quickly Become Victims Themselves

So deadly is hydrogen sulfide that it is considered a major occupational safety hazard for workers in municipal sewage services, industrial manure management on factory farms, and the growing aquaculture industry – the US National Oceanographic and Atmospheric Administration (NOAA) provides detailed background and training videos.ⁱⁱ

Now we can add first responders to the list of those at risk.

- On February 14, 2010, a St. Petersburg police officer was hospitalized after responding to a suicide where a man released a deadly gas in his car. The officer was overcome by the fumes and had trouble breathing. He was taken to a nearby hospital and later released.ⁱⁱⁱ
- On December 22, 2009 in Sugar Creek, Missouri four first responders were transported to the hospital after being exposed to the toxic chemicals a man used to kill himself in a confined pickup truck.^{iv}

First responders who fail to take proper precautions can quickly become victims themselves.

Hydrogen sulfide is a highly toxic and flammable gas - explosive between 4% and 45% (concentration in air). Being heavier than air, it tends to accumulate at the bottom of poorly ventilated spaces. Although very pungent at first, it quickly deadens the sense of smell, so potential victims may be unaware of its presence until it is too late.^v

Toxicity

Hydrogen sulfide is considered a broad-spectrum poison, meaning that it can poison several different systems in the body, although the nervous system is most affected. The toxicity of H₂S is comparable with that of hydrogen cyanide. It forms a complex bond with iron in the mitochondrial cytochrome enzymes, thereby blocking oxygen from binding and stopping cellular respiration.^{vi}

- 0.0047 ppm is the recognition threshold, the concentration at which 50% of humans can detect the characteristic odor of hydrogen sulfide, normally described as resembling "a rotten egg".
- Less than 10 ppm has an exposure limit of 8 hours per day.
- 10–20 ppm is the borderline concentration for eye irritation.
- 50–100 ppm leads to eye damage.
- At 150–250 ppm the olfactory nerve is paralyzed after a few inhalations, and the sense of smell disappears, often together with awareness of danger,
- 320–530 ppm leads to pulmonary edema with the possibility of death.
- 530–1000 ppm causes strong stimulation of the central nervous system and rapid breathing, leading to loss of breathing;
- 800 ppm is the lethal concentration for 50% of humans for 5 minutes exposure (LC50).
- Concentrations over 1000 ppm cause immediate collapse with loss of breathing, even after inhalation of a single breath.

Chemical Suicides in the News

Following are news reports of chemical suicides that were found through an internet search. While it appears the predominant method is hydrogen sulfide gas, at least two of these incidents involved other chemicals (sodium cyanide and hydrogen cyanide).

March 1, 2010 (Bethlehem, PA) – A man's body found in a car in Bethlehem prompted a hazardous materials response when officials said his death was linked to inhaling chemicals. The victim, a 40 year

old man from Hanover Township, committed suicide by inhaling toxic chemicals, the Northampton County Coroner said. Police said the victim parked his car in a lot posted signs stating he was committing suicide and what types of chemicals were mixed together.^{vii}

February 26, 2010 (Castaic, CA) -- A woman whose body was found inside a car in a remote area near Castaic was likely the victim of hydrogen sulphide gas poisoning, commonly known as "detergent suicide," investigators say. The woman's body was found slumped in the back seat of a blue Honda Civic by a pair of L.A. County Sheriff's Deputies while on a routine patrol. The windows of the vehicle were covered with stickers that read "Stay Away," "Dangerous Gas," and "Don't Open," according to a L.A. County Sheriff's spokesman.^{viii}

February 22, 2010 (Clarksville, IN) - Firefighters responded on a reported unconscious, unresponsive victim at a local motel that turned out to be a suicide by Hydrogen Sulfide. The hydrogen sulfide was created by the combination of common household cleaning products. The victim had sent letters to family members in advance of the suicide and had posted a hazmat warning sign on the motel room door. While no emergency responders were injured on this run, it's important to understand that several could have been very easily killed or seriously injured had they not seen the warning signs.^{ix}

February 21, 2010 (Cary, NC) – Police and firefighters spent hours dealing with a very unusual suicide. It happened on Cary Reserve Drive around 11 a.m. Police found a car with signs all over it warning of a dangerous chemical inside. A hazardous materials team from Raleigh was called in to help, and the car was carefully opened. Inside, emergency workers found the body of a 31-year-old Cary man who apparently mixed some household chemicals together in order to take his own life.^x

February 14, 2010 (St. Petersburg, FL) - A St. Petersburg police officer was hospitalized after responding to a suicide where a man released a deadly gas in his car. Police say a 23-year-old man called his girlfriend and told her he was going to kill himself. He reportedly told his girlfriend he learned how to make the gas on the Internet. The girlfriend called police, and officers responded to his home. They found the car with its windows up and signs on the outside warning of poisonous gas. The officer was overcome by the fumes and had trouble breathing. He was taken to a nearby hospital and later released. Police determined that the gas was made by mixing two household chemicals.^{xi}

February 11, 2010 (Grand Junction, CO) – A 33-year-old woman whose body was found inside a parked car on Orchard Mesa committed suicide, according to the Mesa County Coroner's Office. Grand Junction police received a report that a person was inside the car and not moving. Police called out the Grand Junction Fire Department's hazardous materials team which found **sodium cyanide** held in a container in a powder form, inside the woman's vehicle. A note had been posted on a window in the car, warning others about the deadly chemical.^{xii}

February 6, 2010 (Siesta Key, FL) – For the second time in about two months, a person has parked a car at Siesta Key Beach, placed a warning note in the window and then committed suicide by exposure to a fatal mix of chemicals inside the car. Residents of a nearby apartment building were evacuated as authorities prepared to open the car and release the chemical contents, a Sarasota Sheriff's spokesperson said.^{xiii}

January 9, 2010 (Bloomfield, CT) – Sunday night or early Monday, a middle-aged woman parked her car in a secluded spot in Bloomfield, affixed signs to a window warning of poison gas, then breathed in hydrogen sulfide gas produced by a cocktail of common household chemicals in what appears to be Connecticut's first instance of "chemical suicide."^{xiv}

December 22, 2009 (Sugar Creek, MO) – Four first responders on a suicide call went to the hospital after being exposed to the toxic chemicals a man used to kill himself. The man used what is called detergent suicide, using **hydrogen cyanide** in a confined pickup truck. The chemical released toxic gases, which the four responders and a family member were exposed to. All five were just taken to the hospital as a precaution.^{xv}

December 7, 2009 (North Ogden, UT) – A suicide in North Ogden, Utah has the state putting first responders on notice about possible hazards. North Ogden Police and North View firefighters responded to the report of a suicide on November 20. The victim had used hydrogen sulfide to kill himself. According to fire officials the victim had posted a note warning them and others of the dangers. One police officer and several firefighters who were at the scene were tested for possible exposure, but they were unharmed.^{xvi}

November 29, 2009 (Denver, CO) – Police called in a hazmat team to remove the body of a man found dead in a car downtown. Polices say the male found dead in the car on Tennessee near Huron was a suspected suicide. Because of the method of suicide there was concern about a substance in the car. Denver Fire hazmat was called as a precaution. No one else was injured in the incident. Denver Fire said the substance was labeled as "Hydrogen Sulfide" a toxic compound used in the separation of metals.^{xvii}

November 24, 2009 (Siesta Key, FL) – A hazardous materials team closed half of the Siesta Key Beach parking lot after a man committed suicide in his car using a dangerous mix of chemicals, the Sheriff's Office said. A note on the window warned others to stay away from the car because there was a chemical inside.^{xviii}

November 3, 2009 (East Bloomfield, NY) – A 21-year-old man was found dead at a park in East Bloomfield, 20 miles southeast of Rochester. The first officer to respond to the scene opened the door and found the body, along with noxious fumes, inside the vehicle. The officer also found a note reading "Keep Out" and "Stay Away" affixed to a window of the car. An autopsy determined the victim intentionally mixed chemicals to create lethal hydrogen sulfide gas.^{xix}

October 28, 2009 (Cayuga, NY) Cayuga County Sheriff's deputies are investigating the apparent suicide of a 22-year-old California man in the Village of Cayuga. Deputies say he used a mixture of hazardous chemicals to take his own life in a car parked outside a cemetery, which led a hazardous materials crew to respond to the scene. The car had signs in the windows warning others that hazardous materials were inside.^{xx}

May 10, 2009 (Toronto, Canada) – Toronto was the scene of a suicide by poisonous gas when a York woman released what is believed to be hydrogen sulfide into the air killing herself and threatening

others. The woman had called the police mid-morning to say she was taking her life using a chemical cocktail. When the police and fire department arrived the smell of rotten eggs was coming from the residence, prompting the evacuation of nearly 50 homes.^{xxi}

February 14, 2009 (San Jose, CA) – An 18 year old boy who was found unconscious in his San Jose home Thursday morning and transported to Santa Clara Valley Medical Center's emergency room, triggering a hazardous materials lockdown of the facility, died Friday afternoon, according to the Santa Clara County medical examiner's office. The cause of death has not been confirmed, though two pans containing hydrogen sulfide were found on a table in the teenager's bedroom, where he was found unconscious by his mother.^{xxii}

December 24, 2008 (Bartow, GA) – A man was found in his car at the Cooper Branch day use area of Lake Allatoona. Bystanders who discovered the vehicle did not open the door because of a sign taped inside the window reporting “Caution” and the name of the chemical. The responding sheriff noticed two buckets inside the vehicle with a yellow substance inside and a young man who did not appear to be breathing. County HAZMAT mitigated the scene and removed and deconned the body.^{xxiii}

August 26, 2008 (Pasadena, CA) - A 20 year old man parked his vehicle behind the Ethan Allen store on Rosemead Ave. and pasted a sign in the window of the vehicle warning others of “Danger” with a skull and crossbones. Inside the vehicle Hazmat crews found household cleaners along with the body of the victim. The victim was confirmed dead by the corner at the scene.^{xxiv}

May 27, 2008 (Mesa, AZ) - A former Theater Critic for the East Valley Tribune was found dead at his Mesa apartment. Mesa police were called to the apartment by friends and co-workers who hadn't seen him since Wednesday. His body was inside, and he apparently committed suicide. According to police reports, the 29 year old victim apparently inhaled a fatal combination of potassium cyanide and muriatic acid. The discovery required neighbors to evacuate their residences while hazmat teams investigated.^{xxv}

While many of these incidents involved victims who were willing to isolate themselves from the public and attempted to warn would-be responders of the danger, there is no room for complacency. The result may be fatal for anyone who enters a contaminated space without proper protection.

Responding to Chemical Suicides^{xxvi}

- Dispatchers and call takers should be alert for this type of call.
- Dispatchers and call takers should warn callers not to approach, or enter, vehicles, rooms or apartments where unresponsive people may have attempted chemical suicide.
- The caller may say there are warning signs on the vehicle but may not volunteer this information.
- The caller may not say anything about a strange smell (like rotten eggs or almonds) unless prompted when they call 9-1-1.

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- Proper initial questioning may yield information vital to the safety of the first responders.
- The information must be immediately passed on to the first responders by the 9-1-1 personnel.
- Responders should be aware that these situations commonly occur in vehicles, residential bathrooms and other small spaces where a small amount of gas can quickly reach lethal concentrations.

- Carefully size up any situation involving an unresponsive person in an enclosed space.
- If a chemical substance is suspected, responders should follow their agencies' hazardous materials operational protocol and procedures, including requesting assistance from the appropriate HazMat team.
- Responders should wear appropriate PPE, including positive pressure self-contained breathing apparatus, whenever they are dealing with a suspected chemical suicide.



Warning signs taped to the window of the vehicle involved in a recent chemical suicide in New York State (NYSOFP&C)

- Consider wind speed and direction when determining the need to evacuate nearby structures.
- In an apartment building, consideration should be given to evacuating the entire building.
- IC will need to make an immediate decision for "life rescue" or "wait and hold". If believed to be an "unconscious victim" rescue responders should don appropriate PPE and SCBA to breach window or door to affect a quick rescue.
- If there's a possibility the victim is sleeping, attempt to wake them with a vehicle public address system, bullhorn or siren.
- If they cannot be awakened, responders should perform a thorough recon before entering the space to assist the victim.
- Individuals who initiate chemical suicide may, or may not, place warning signs on doors or windows to indicate the presence of deadly gas inside the space.

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- Warning signs may not be easily detected or understood by other people –including responders!
- Warning signs may be hidden or obscured by condensation, frost, snow, or vapors produced by the reaction.
- Warning signs may be removed, become detached or dislodged, or blow away before emergency personnel arrive.
- Interview anyone who may have approached the scene to learn what they saw or smelled.
- A “rotten egg” smell would indicate hydrogen sulfide.
- An almond odor is typical of cyanide compounds.
- Look for indications a chemical reaction has been initiated.
- Typically you will find containers of household chemicals and pails, buckets, pots or other containers where the chemicals have been mixed.
- Improvised “containers”, such as a sink or the glove box of an automobile, could be used to mix the chemicals.
- If chemical containers are present, attempt to identify the chemicals from labels or a sales receipt.
- The reaction utilizes an acid, such as muriatic or hydrochloric found in many common cleaning compounds, and a sulfide present in many fungicides, paints, insecticides, and shampoo to produce Hydrogen Sulfide.
- The presence of containers of potassium cyanide, or cyanide compounds would indicate a reaction that produces hydrogen cyanide.
- This is less common than the hydrogen sulfide reaction as the cyanides are not as easily obtained.
- Air sampling equipment can be used to determine the presence or absence of hydrogen sulfide or hydrogen cyanide.
- A small hole may be punched in a car or home window, or a probe, or colorimetric tube inserted in the gap between a door to the room and the floor.
- A hydrocyanic acid tube will detect hydrogen cyanide.
- Hydrogen sulfide is heavier than air, but hydrogen cyanide is slightly lighter.

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- If the vapor in the space cannot be identified, or the presence of hydrogen cyanide is confirmed entry should only be made by individuals protected by fully encapsulated chemical protective clothing (level A).
- Hydrogen cyanide is immediately dangerous to life and health at concentrations above 50 parts per million.
- Both hydrogen sulfide and hydrogen cyanide are flammable.
- The Lower Explosive Level of hydrogen sulfide is 4% and the LEL of hydrogen cyanide is 5.6%.
- There have been no incidents of fire reported with the chemical suicide incidents reported to date.
- It is believed that concentrations do not typically reach the LEL except at close proximity to the mixing container.
- Responders should eliminate ignition sources whenever possible.
- Vapors inside the space should be ventilated to the outside.
- Ensure no one will be endangered by the vapors before using natural or forced ventilation to air the space out.
- Anyone who has been exposed to the vapors should be decontaminated with soap and water.
- Clothing should be removed and double-bagged.
- Contaminated clothing and PPE should be laundered before being re-used.
- If alive, the victim should be stripped and decontaminated with soap and water before being transported from the scene.
- Deceased victims should be covered by a sheet, body bags are not recommended.

The big take home message is maintaining a heightened sense of situational awareness.

Resources

Advisory - New York State Office of Homeland Security, Emergency Managers Advisory, Subject: (U) Hydrogen Sulfide: A Potential First Responder Hazard (September 26, 2008). See: <http://cryptome.org/dhs-hyd-sul.pdf>.

Chemical Suicide Memo, New York State Office of Fire Prevention & Control Hazardous Materials/Homeland Security Bureau (November 6, 2009). See: <http://www.colofirechiefs.org/ffsafety/chemicalsuicidememo.pdf>.

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Responder Safety Information - Hydrogen Sulfide Suicide, Wake County, NC EMS Division (February 22, 2010). See: http://www.colofirechiefs.org/ffsafety/H2S_Suicide_Warning.pdf.

Ada County Sheriff's Office (Idaho) Officer/Emergency Responder Safety Bulletin (May 14, 2009). See: <http://www.vleoa.org/Content/Documents/Document.ashx?DocId=86676>.

Medical Management Guidelines for Hydrogen Sulfide, Agency for Toxic Substances and Disease Registry (ATSDR), Department of Health and Human Services. See: <http://www.atsdr.cdc.gov/Mhmi/mmg114.html>.

NIOSH Pocket Guide to Chemical Hazards - Hydrogen Sulfide, National Institute for Occupational Safety and Health (NIOSH), Centers for Disease Control and Prevention. See: <http://www.cdc.gov/niosh/npg/npgd0337.html>.

Chemical Suicides - First Responder Safety (PPT), Saline County Sheriff's Department, Missouri. See: http://www.colofirechiefs.org/ffsafety/Chemical_Suicides.pdf.

Hydrogen Sulfide (PPT) Shelby County EMS Training Division. See: http://www.colofirechiefs.org/ffsafety/Hydrogen_Sulfide_PPT.pdf.

These and other resources are posted on the CSFCA's Responder Safety: Chemical Suicide webpage, at: http://www.colofirechiefs.org/chemical_suicides.htm.

Endnotes

ⁱ Responder Safety Information - Hydrogen Sulfide Suicide, Wake County, NC EMS Division (February 22, 2010). See: http://www.colofirechiefs.org/ffsafety/H2S_Suicide_Warning.pdf.

ⁱⁱ Safety Issues in Aquaculture -- Hydrogen Sulfide, US National Oceanographic and Atmospheric Administration. See: www.lib.noaa.gov/retiredsites/docaquasafety.html.

ⁱⁱⁱ St. Pete Man Commits Suicide with Homemade Gas, Sarasota Herald Tribune, February 14, 2010. See: <http://www.heraldtribune.com/article/20100214/BREAKING/100219880?Title=St-Pete-man-commits-suicide-with-homemade-gas>.

^{iv} Chemical Suicide Sends First Responders To Hospital, KCTV Channel 5, December 22, 2009. See: <http://www.kctv5.com/news/22033404/detail.html>.

^v Medical Management Guidelines for Hydrogen Sulfide, Agency for Toxic Substances and Disease Registry (ATSDR), Department of Health and Human Services. See: <http://www.atsdr.cdc.gov/Mhmi/mmg114.html>.

^{vi} Ibid.

^{vii} Man kills self in Bethlehem by inhaling chemicals, The Allentown Morning Call, March 01, 2010. See: http://articles.mcall.com/2010-03-01/news/all-cnsuicide-03012010_1_bethlehem-police-chemicals-inhaling.

^{viii} Woman Found in Castaic Car Likely Victim of 'Detergent Suicide', KTLA News, February 26, 2010. See: <http://www.ktla.com/news/landing/ktla-body-in-car-castaic,0,749896.story>.

^{ix} Hydrogen Sulfide Suicide Close Call, FirefighterCloseCalls.com, February 22, 2010. See: <http://www.firefighterclosecalls.com/fullstory.php?102518>.

^x Cary Police Deal With Unusual Suicide, WTVD-TV Raleigh-Durham, NC, February 22, 2010. See: <http://abclocal.go.com/wtvd/story?section=news/local&id=7290459>.

^{xi} First Responders to Suicide Attempts Face New Dangers, The Tampa Tribune, February 15, 2010. See: <http://www2.tbo.com/content/2010/feb/15/first-responders-suicide-attempts-facenew-dangers/life-health/>.

^{xii} Woman's Death on Orchard Mesa Ruled Suicide, Grand Junction Sentinel, February 11, 2010. See: http://www.gjsentinel.com/breaking/articles/womans_death_on_orchard_mesa_ruled_suicide.

^{xiii} Suicide by Chemicals on Siesta Key Beach, Herald Tribune, February 6, 2010. See: <http://www.heraldtribune.com/article/20100206/BREAKING/100209796>.

^{xiv} Bloomfield Suicide Fits Unsettling Trend, Hartford Courant, January 9, 2010. See: <http://www.colofirechiefs.org/ffsafety/Bloomfield010910.pdf>.

^{xv} Chemical Suicide Sends First Responders To Hospital, KCTV Channel 5, December 22, 2009. See: <http://www.kctv5.com/news/22033404/detail.html>.

^{xvi} Hydrogen-Sulfide Suicide in Utah Prompts Notice to First Responders, KSL Channel 5, December 7, 2009. See: <http://www.ksl.com/?sid=8947952&nid=148>.

^{xvii} Hazmat Called to Remove Body from Suspected Chemical Suicide, KDVR Denver, November 29, 2009. See: <http://www.kdvr.com/news/kdvr-carsuicide-112909,0,6856876.story>.

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^{xviii} Man Kills Himself Near Siesta Key Beach, Herald Tribune, November 24, 2009. See: <http://www.heraldtribune.com/article/20091125/ARTICLE/911251030?Title=Man-kills-himself-near-Siesta-Key-beach>.

^{xix} Death, Toxic Mix Probed in Bloomfield, Daily Messenger, November 2, 2009. See: <http://www.mpnnow.com/towns/bloomfield/x880801012/Body-found-in-Boughton-Park>.

^{xx} Chemical Suicide Causes Haz-Mat Scare, WSYR-TV Syracuse, October 28, 2009. See: <http://www.9wsyr.com/mostpopular/story/Toxic-chemicals-mixed-in-two-upstatesuicides/MRVZmXrGO0qR8yDCmdVHuA.csp>.

^{xxi} North York Neighborhood Evacuated After Suicidal Woman Releases Toxic Chemicals, National Post, May 10, 2009. See: <http://network.nationalpost.com/np/blogs/toronto/archive/2009/05/10/north-york-neighborhoodevacuated-after-suicidal-woman-releases-toxic-chemicals.aspx>.

^{xxii} SJ Teen Dies After Exposure To Hydrogen Sulfide, CBS-5, February 14, 2009. See: <http://cbs5.com/local/herrera.hydrogen.sulfide.2.935521.html>.

^{xxiii} Bartow HAZMAT Responds to Apparent Suicide Scene, The Daily Tribune, December 24, 2008. See: <http://www.colofirechiefs.org/ffsafety/Bartow122408.pdf>.

^{xxiv} 23 Year Old Man Commits Suicide with Chemicals Inside 2003 VW Bug, Pasadena Star News, February 26, 2009. See: <http://www.colofirechiefs.org/ffsafety/Pasadena022609.pdf>.

^{xxv} Former Tribune Theater Critic Found Dead in Home, East Valley Tribune, May 27, 2008. See: <http://www.eastvalleytribune.com/story/117240>.

^{xxvi} Adapted from "Chemical Suicides - First Responder Safety" (PPT), Saline County Sheriff's Department, Missouri. See: http://www.colofirechiefs.org/ffsafety/Chemical_Suicides.pdf; and Chemical Suicide Memo, New York State Office of Fire Prevention & Control Hazardous Materials/Homeland Security Bureau (November 6, 2009). See: <http://www.colofirechiefs.org/ffsafety/chemicalsuicidememo.pdf>.

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About the Colorado State Fire Chiefs' Association

The mission of the Colorado State Fire Chiefs' Association is to provide leadership, education, and support to the Chief Officers of Colorado fire departments, in order to reduce the loss of life and property and to protect Colorado's citizens and institutions from all types of emergencies.