27th California Unified Program
Annual Training Conference
March 24-27, 2025

8 – HOUR HAZWOPER REFRESHER TRAINING

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Tu-K1
March 25, 2025

Thank you to all our 2024 State Sponsors

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AGENDA

- What is refresher training
- Fire Debris Heavy metal issues
- Outdoor and Indoor Heat Stress - June 20, 2024
- Lithium Ion Battery safety
- 2024 Emergency Response Guidebook usage
- Using the ERG to model releases
- ASKRAIL for train information - June 24, 2025.
- Kahoot
- Exam and Evaluation 🙂

ADMINISTRATIVE ANNOUNCEMENTS

- Cell phone and computer usage
  - –Place phones on vibrate
  - –Mute your microphones when you are not talking
- Breaks:
- Lunch: 12:00pm
- Class completes: 5pm
- Post test and Evaluations
- Hazwoper refresher certs

QR CODES FOR SIGN IN SHEET: HTTPS://TINYURL.COM/HMITSIGNIN

You will be asked for:

- First Name
- Last Name
- Email
- Instructor's Name NICK
- Which day are you attending? 1

INTRO & WELCOME

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REGULATIONS

Hazardous Waste Operations and Emergency Response (Hazwoper)

29 CFR 1910.120(q)(6)(i) Awareness Level

DOT – Hazardous Materials Regulations

49 CFR (Parts 171 - 180)
Emergency Response 172.604

Hazard Communications Standard

29 CFR 1910.1200 w/ Global Harmonization

OSHA HAZWOPER STANDARD
29 CFR 1910.120 AND GISO TITLE 8 SECTION 5192

HAZWOPER applies to:

- **Corrective actions involving clean-up at Resource Conservation and Recovery Act (RCRA) and Superfund sites.**
- **Cleanup operations** required by a governmental body at uncontrolled hazardous waste sites.
- **Voluntary clean-up operations** at governmentally recognized uncontrolled hazardous waste sites.

OSHA HAZWOPER STANDARD
29 CFR 1910.120 AND GISO TITLE 8 SECTION 5192

HAZWOPER applies to:

- **Hazardous waste operations** at treatment, storage and disposal (TSD) facilities.
- **Emergency response operations** for releases of, or substantial threats of releases of, hazardous substances without regard to the location of the hazard.

OSHA HAZWOPER

- **HAZWOPER Training**
  - General Site Worker:
    - Minimum of 40 hours initial training off site
    - Minimum 3 days field experience under direct supervision
  - Occasional workers
    - Receive 24 hours off site training with one day field experience
  - Workers at fully characterized sites may receive 24 hours off site training with one day field experience
  - Annual refresher training of 8 hours
    - Various ways to accomplish this

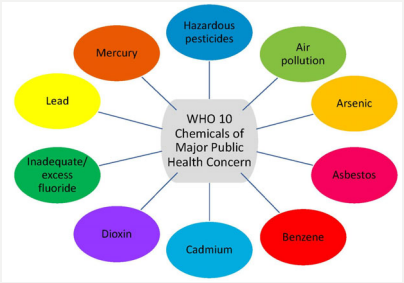
OSHA HAZWOPER

- **HAZWOPER Training**
  - Skilled support personnel
    - Essential personnel without HAZWOPER certification may enter hot zone in an emergency if they receive a safety briefing:
      - Instruction on use of appropriate PPE
      - Chemical hazards involved
      - Duties to be performed
    - Examples:
      - Heavy equipment operators
      - Oils Spill response from civilians

HAZARDS FOR FIRE DEBRIS

CALIFORNIA CODE OF REGULATIONS, TITLE 8, SECTION 5141.1

WHAT IS "HAZARDOUS"?



Covered as CCR Title 8 §5155 Airborne Contaminants.

WORKER PROTECTION FROM WILDFIRE SMOKE

- California Code of Regulations, title 8, section 5141.1 applies to most outdoor workplaces where the
- Current Air Quality Index (current AQI) for airborne particulate matter 2.5 micrometers (PM2.5) or smaller is 151 or greater,
- and where employers should reasonably anticipate that employees could be exposed to wildfire smoke.

§5141.1 PROTECTION FROM WILDFIRE SMOKE

- Wildfire smoke is composed of harmful chemicals and tiny particles suspended in the air that present a significant health hazard for workers exposed to it.
- These particles can irritate the lungs and cause serious or even fatal health effects, such as:
  - Reduced lung function
  - Bronchitis
  - Worsening of asthma
  - Heart failure

HEAVY METALS ARE PREVALENT IN WILDFIRE SMOKE AND DEBRIS

- NIOSH's study from the Carr Fire showed
  - Based on previous soil and air sampling exceedances, Arsenic, Cadmium, Lead, Mercury, Manganese, and Nickel have been identified as metals of concern. Arsenic, Lead, Cadmium, and Nickel are carcinogenic. Manganese is known to be a neurotoxin.
- Trees, bushes (but not grasses) can burn and turn chromium III into chromium VI: https://thehill.com/policy/energy-environment/4355682-california-wildfires-cancer-causing-compounds-hexavalent-chromium-6-study/

WILDFIRE SMOKE

Categories	Visibility in Miles	Particulate matter levels* (1-hour average, $\mu g/m^3$)
Good	10 miles and up	0 - 40
Moderate	6 to 9	41 - 80
Unhealthy for Sensitive Groups	3 to 5	81 - 175
Unhealthy	1 1/2 to 2 1/2	176 - 300
Very Unhealthy	1 to 1 1/4	301 - 500
Hazardous	3/4 mile or less	over 500

*In wildfire smoke, most particles are less than one micrometer, so the values obtained by measuring either PM_{10} or $PM_{2.5}$ are virtually interchangeable, and are treated as such in this document. Therefore, in the table above, the different particle levels can be measured using either PM_{10} or $PM_{2.5}$ monitors.

Measurements are particles 2.5 microns or larger

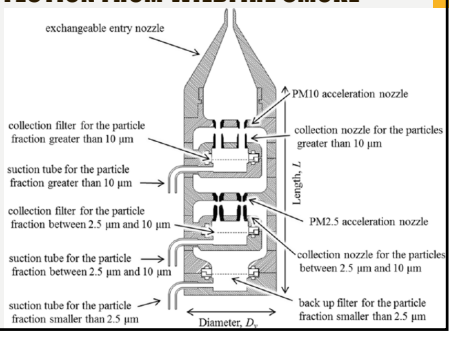
§5141.1 PROTECTION FROM WILDFIRE SMOKE

- **Identification of Harmful Exposures (subsection c)** – For worksites covered by the regulation, employers (with certain exceptions) must determine employee exposure to PM2.5 at the start of each shift and periodically thereafter, as needed.

AIR QUALITY INDEX - PARTICULATE MATTER	
301+	HAZARDOUS
201-300	VERY UNHEALTHY
151-200	UNHEALTHY
101-150	UNHEALTHY FOR SENSITIVE GROUPS
51-100	MODERATE
0-50	GOOD

WORKER PROTECTION FROM WILDFIRE SMOKE

- 24 hr sample at a measured volume of air.
- Weigh the mass of particles collected and report the results



WORKER PROTECTION FROM WILDFIRE SMOKE

§5141.1 PROTECTION FROM WILDFIRE SMOKE

- **Communication (subsection d)** – Employers must implement a system for communicating wildfire smoke hazards in a language and manner readily understandable by employees.

§5141.1 PROTECTION FROM WILDFIRE SMOKE

- **Training and instruction information (subsection e and Appendix B)** – For worksites covered by the regulation, employers must provide effective training that includes at least the information contained in Appendix B.
  - (a) The health effects of wildfire smoke.
  - (b) The right to obtain medical treatment without fear of reprisal.
  - (c) How employees can obtain the current Air Quality Index (AQI) for PM2.5.
  - (d) The requirements of Title 8, section 5141.1.
  - (e) The employer's two-way communication system.
  - (f) The employer's methods to protect employees from wildfire smoke.
  - (g) The importance, limitations, and benefits of using a respirator when exposed to wildfire smoke.
  - (h) How to properly put on and use the respirators provided by the employer.

§5141.1 PROTECTION FROM WILDFIRE SMOKE

- **Control of harmful exposures to employees (subsection f)** – With certain exceptions, employers must reduce workers' exposure to wildfire smoke in the following ways:
  - If feasible, by providing an enclosed location with filtered air so that employee exposure to PM2.5 is less than a current AQI of 151, or to the extent feasible.
  - If that is not feasible or adequate, by relocating to another outdoor location where the current AQI for PM2.5 is lower, changing work schedules, reducing work intensity, or providing more rest periods.

§5141.1 PROTECTION FROM WILDFIRE SMOKE

- **Control of harmful exposures to employees (subsection f)** – With respiratory protective equipment if employers cannot reduce workers' exposure to PM2.5 to a current AQI of less than 151.
  - Where the current AQI for PM2.5 is from 151 to 500, employers must provide a sufficient number of NIOSH-approved particulate respirators, such as N95 masks, to all employees for voluntary use, and training on the regulation, the health effects of wildfire smoke, and the safe use and maintenance of respirators.

§5141.1 PROTECTION FROM WILDFIRE SMOKE

- **Control of harmful exposures to employees (subsection f)**
  - Where the current AQI for PM2.5 is higher than 500, the employer must provide and require employees to use NIOSH-approved particulate respirators that will reduce employee exposure to PM2.5 to an equivalent of an AQI less than 151.

ASBESTOS STANDARD

- Currently about 125 million people in the world are exposed to asbestos at the workplace.
- In 2004, asbestos-related lung cancer, mesothelioma and asbestosis from occupational exposures resulted in 107,000 deaths and 1,523,000 Disability Adjusted Life Years (DALYs).
- In addition, several thousands of deaths can be attributed to other asbestos-related diseases, as well as to non occupational exposures to asbestos.
- Asbestos (fire debris, construction and demolition facilities, some landfills)

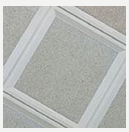
ASBESTOS TERMS

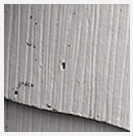
- ACM: Asbestos-containing material with more than 1% asbestos
- PACM: Presumed asbestos containing material
- Fiber: Particulate form of asbestos 5 microns or longer with a length-to-diameter ratio of at least 3 to 1 (3:1).

- Thermal System Insulation (TSI): ACM applied to pipes, fittings, boilers, breeching, tanks, ducts or other structural components to prevent heat loss or gain

ASBESTOS CONTAINING MATERIALS

- Building Materials such as:
  - → Roofing shingles
  - → Ceiling and floor tiles
  - → Paper products
  - → Asbestos cement products
- Friction Products:
  - → Automobile clutch
  - → Brake pads
  - → Transmission parts
- Heat-resistant fabrics, packaging, gaskets, and coatings





FRIABLE ASBESTOS

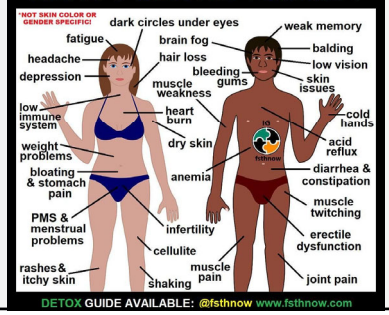
- Friable asbestos = any asbestos containing material that, when dry, is easily crumbled or pulverized to powder by hand
- Use of asbestos in these products banned by 1978; those already in marketplace remained on shelves used in construction for many years after.
  - –Any home built prior to 1982 should be considered to contain asbestos

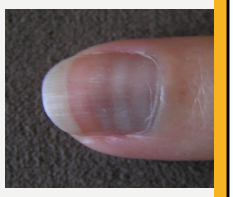
HEALTH EFFECTS

- All types of asbestos cause lung cancer, mesothelioma, cancer of the larynx and ovary, and asbestosis (fibrosis of the lungs).
- Asbestos fibers enter alveoli in lungs, irritate thin membrane.
- Leaves scar tissue that oxygen can't penetrate.
- As more alveoli are affected oxygen starvation sets in – severe disability or death.
- Pleura – membrane lining in lungs – can also be affected.
- Asbestos fibers may migrate from lungs into pleura causing mesothelioma
- Many harmful effects do not appear for 20 or more years.

SUSPECT ASBESTOS PRESENT

- Do not disturb!
- Notify supervisor immediately.
- Isolate the area.
- Area/material should be tested by qualified personnel.
- Material removed & disposed of by qualified abatement personnel.
- Exposure to wet/water-logged material possibly containing asbestos doesn't pose the problems exposure to "friable" asbestos does.



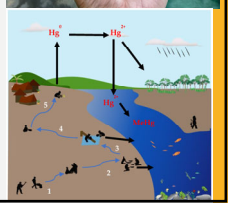


MERCURY STANDARD

- Mercury is toxic to human health, posing a particular threat to the development of the child in utero and early in life.
- Mercury exists in various forms: elemental (or metallic); inorganic (e.g. mercuric chloride); and organic (e.g., methyl- and ethylmercury), which all have different toxic effects, including on the nervous, digestive and immune systems, and on lungs, kidneys, skin and eyes.

MERCURY STANDARD

- Mercury releases in the environment result mainly from human activity, particularly from coal-fired power stations, residential heating systems, waste incinerators and as a result of mining for mercury, gold and other metals.
- Once in the environment, elemental mercury is naturally transformed into methylmercury that bioaccumulates in fish and shellfish.



MERCURY STANDARD

- Human exposure occurs mainly through inhalation of elemental mercury vapors during industrial processes and through consumption of contaminated fish and shellfish.
- Interventions to prevent environmental releases and human exposure include:
  - –eliminating mercury production and use in mining and industry;
  - –promoting use of clean energy sources that do not rely on burning of coal;
  - –switching to non-mercury thermometers and sphygmomanometers in health care; and
  - –implementing safe handling, use and disposal of mercury-containing products and waste.

LEAD STANDARD § 1532.1. (C) LEAD

- Lead is a toxic metal and has caused extensive environmental contamination and health problems in many parts of the world.
- It is a cumulative toxicant that affects multiple body systems, including:
  - –neurologic, (Central Nervous System)
  - –hematologic, (Blood)
  - –gastrointestinal, (Digestive System)
  - –cardiovascular, (Heart)
  - –and renal systems. (Kidney)
- Children are particularly vulnerable

LEAD STANDARD

- Reductions resulted in a substantial lowering in population-level mean blood lead concentrations.
- Recent reductions in the use of lead in:
  - –petrol,
  - –paint,
  - –plumbing
  - –and solder
- Significant sources of exposure still remain, particularly in developing countries.

LEAD POISONING SYSTOMS

- Lead poisoning symptoms in children
- Signs and symptoms of lead poisoning in children include:
  - Developmental delay
  - Learning difficulties
  - Irritability
  - Loss of appetite
  - Weight loss
  - Sluggishness and fatigue
  - Abdominal pain
  - Vomiting
  - Constipation
  - Hearing loss
  - Seizures
  - Eating things, such as paint chips, that aren't food (pica)

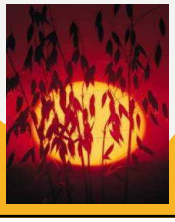
Mayo Clinic Website

§ 1532.1. (C) LEAD PERMISSIBLE EXPOSURE LIMIT (PEL).

- (1) The employer shall ensure that no employee is exposed to an airborne concentration of lead at concentrations greater than 10 (changed from fifty) micrograms per cubic meter of air (10 µg/m3) calculated as an 8-hour time-weighted average (TWA) period.
- The 8-hour TWA shall be calculated in accordance with the appendix to section 5155.

HEAT ILLNESS PREVENTION IN THE INDOOR AND OUTDOOR WORKPLACE

WHAT YOU NEED TO KNOW



CAL/OSHA HEAT ILLNESS PREVENTION STANDARD

- The California Occupational Safety and Health Administration (Cal/OSHA) recently passed a heat illness prevention standard
- Adopted June 15, 2005

- Found in Title 8 California Code of Regulations Section 3395 (http://www.dir.ca.gov/title8/3395.html)

- New Indoor standard June 20, 2024

CAL/OSHA HEAT ILLNESS PREVENTION STANDARD

- Standard applies to **outdoor places of employment** (staff spending a "significant amount" of time outdoors performing their job)
- Cal/OSHA does not define a "significant amount of time"

- We will talk outdoor standard first then Indoor standard

FACTS ABOUT HEAT RELATED ILLNESS

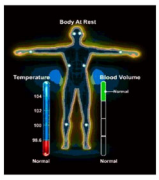
- Heat illness is:
  - –Overheating of the body
  - –Inability of the body to cool itself
- Why is it important to know about and address heat illness?
  - –Heat illness is dangerous
  - –Heat illness can kill
  - –Heat illness is preventable

TRAINING OBJECTIVE

- At the end of this training, you should know:
  - –The environmental factors and personal factors that contribute to the risk of heat-related illness
  - –The different types of heat-related illness and their signs and symptoms
  - –The preventive measures to reduce potential for heat related illness
  - –The Hazardous Material Division's procedures for identifying, evaluating, and controlling exposure including procedures for responding to heat related illness

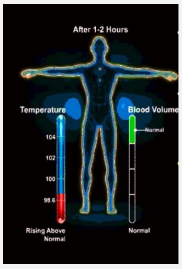
PHYSIOLOGY OF HEAT STRESS

- During both rest and activity, the human body tries to maintain an internal temperature of 98.6 ° F
- Not everyone has the same body temperature



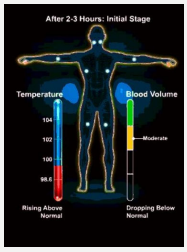
PHYSIOLOGY OF HEAT STRESS

- Hot weather, heat sources, and hard work raise the body's core temperature
- Heated blood is pumped to the skin's surface, where body heat transfers to the environment, if cooler
- If heat has to be shed faster, sweat carries it to outside skin and evaporates to aid cooling



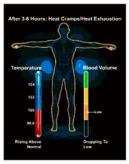
PHYSIOLOGY OF HEAT STRESS

- During heavy work, a body can lose 1-2 liters of water per hour.
- You can only reabsorb 1 liter per hour.
- After 2-3 hours of fluid loss, a person is likely to:
  - –Lose endurance
  - –Become uncomfortable
  - –Feel hot
  - –Become thirsty



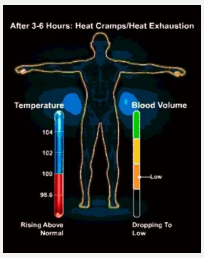
PHYSIOLOGY OF HEAT STRESS

- The longer a body sweats, the less blood there is to carry excess heat to the skin or oxygen and nutrients to muscles.
- After 3 hours, a dehydrated worker may experience;
  - –**Headaches**
  - –**Muscle fatigue**
  - –**Loss of strength**
  - –**Loss of accuracy and dexterity**
  - –**Heat cramps**
  - –**Reduced alertness**
  - –**Nausea**



PHYSIOLOGY OF HEAT STRESS

- Water is key to cooling body and combating heat stress
- Without fluid replacement during an extended period of work, the body is at risk of exhaustion
- Untreated heat exhaustion may lead to heat stroke



ENVIRONMENTAL RISK FACTORS

- Air Temperature (convective heat)
- Relative Humidity
- Air movement
- Workload severity/duration
- Protective clothing and PPE
- Radiant heat (e.g., from the sun)
- Conductive heat (e.g., standing on hot ground)

ENVIRONMENTAL RISK FACTORS

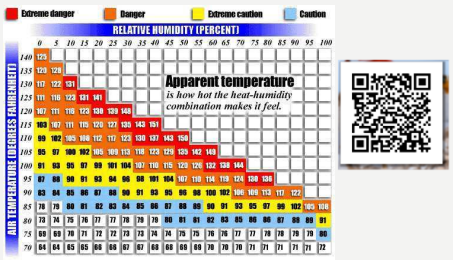
- Air Temperature and humidity
  - –The higher the air temperature, the higher the humidity, the hotter it feels and the higher the risk for heat related illness
  - –Air temperature and humidity, taken together, can be expressed as the heat index (or apparent temperature) which is a measure of how hot it really feels to your body.

HEAT INDEX

- TLVs for heat stress use WBGT index measure WBGT index with WBGT monitor
- Use index to manage work/rest duration

The WetBulb Globe Temperature (WBGT) is a measure of the heat stress in direct sunlight, which takes into account: temperature, humidity, wind speed, sun angle and cloud cover (solar radiation). This differs from the heat index, which takes into consideration temperature and humidity and is calculated for shady areas.

HEAT INDEX

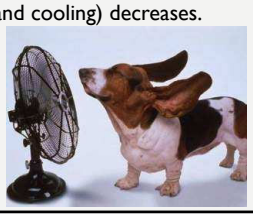


HEAT INDEX

Heat Index	General Effect of Heat Index on People in Higher Risk Groups
80-89 Caution	Fatigue possible with prolonged exposure and physical activity.
90-104 Extreme Caution	Heat stroke, heat cramps, and heat exhaustion possible.
105-129 Danger	Heat stroke, heat cramps, and heat exhaustion likely.
130 or higher Extreme Danger	Heat stroke highly likely with continued exposure.

ENVIRONMENTAL FACTORS

- Limited air movement
  - –Air movement increases the evaporation of sweat from your skin and cools the body. Little or no wind is a risk factor as this evaporation (and cooling) decreases.

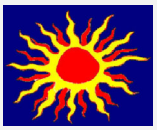


ENVIRONMENTAL FACTORS

- Workload severity duration (physical exertion)
  - –The more physical exertion, the higher the risk
- Personal protective equipment (PPE)
  - –PPE decreases evaporation of sweat from your skin (and, therefore, decreases cooling)

ENVIRONMENTAL FACTORS RADIANT HEAT

- Heat generated when solar electromagnetic radiation hits the body



- Heat that radiates from hot equipment or objects

ENVIRONMENTAL FACTORS CONDUCTIVE HEAT

- Conductive Heat is transfer of heat by contact of two objects at different temperatures.
- In this slide, higher heat from the hot asphalt (white area on slide) is entering the cooler person through their feet.

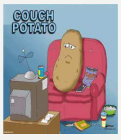
WATCH OUT FOR YOUR PETS ALSO THEY ARE NOT WEARING SHOES

Simply touch the pavement with the back of your hand for seven seconds. If you can't hold out for the full seven seconds because the surface is too hot, then it's also too hot for your dog's paws.

Time	Grass in shade	Grass in sun	Air Temp	Cement	Red Brick	Blacktop
7am	70	74	76	78	78	80
8	72	77	77	80	81	81
9	78	85	88	93	95	89
10	82	86	90	99	105	103
11	85	98	92	105	115	121
12pm	88	100	93	112	125	130
1	90	103	94	115	130	135
2	91	105	95	125	135	140
3	91	105	95	124	134	140
4	89	102	95	118	131	137
5	87	98	93	112	122	131
6	85	96	91	106	110	122
7	83	86	90	100	105	112
8	80	80 (dusk)	87	95	98	103
9	78	78 (dark)	84	90	92	93

PERSONAL RISK FACTORS

- **Health Status**
  - –Weight
  - –Fitness
  - –Age
  - –Other medical conditions



PERSONAL RISK FACTORS

- **Diet**
  - –Eating habits
  - –Alcohol/caffeine consumption
- **Medications**
  - –Certain medications make people more prone to heat illnesses



PERSONAL RISK FACTORS

- **Water Consumption**
  - –Frequency/amount of water consumption
- **Acclimatization**
  - –Temporary adaptation of the body to work in the heat which occurs gradually when a person is exposed to heat


TYPES OF HEAT ILLNESS

There are five main types of heat illness:

- Heat rash
- Heat cramps
- Fainting (syncope)
- Heat exhaustion
- Heat stroke

HEAT RASH

- Also know as "prickly heat"
- Occurs when sweat cannot freely evaporate from the skin and sweat ducts become plugged
- Can be prevented by wearing clothes that allow sweat to evaporate as well as bathing regularly and drying the skin

HEAT CRAMPS

- Cramps in the arms, legs, or abdomen
- Occurs in individuals who sweat profusely, but do not adequately replace the body's salt loss.
- To prevent, ensure that salts are replaced during and after heavy sweating (e.g. salt food, drink sports drinks).

FAINTING

- Fainting (syncope) is caused by the brain not receiving enough oxygen because blood pools in the extremities
- Onset of fainting is rapid and unpredictable
- Can be prevented by gradual acclimatization

HEAT EXHAUSTION

- Mild form of shock caused when the circulatory system begins to fail as a result of the body's inadequate effort to give off excessive heat
- Although not an immediate threat to life, if not properly treated could evolve into heat stroke

HEAT EXHAUSTION

- Symptoms
  - –Skin is clammy and moist
  - –Profuse Sweating
  - –Extreme weakness or fatigue
  - –Nausea
  - –Headache
  - –Fainting
  - –Complexion pale or flushed
  - –Body temperature normal or slightly elevated

HEAT EXHAUSTION

- **Treatment**
  - –Move person to cooler/shaded area to rest and if possible, lay the worker down.
  - –Fan the person, spray/mist with cool water, or apply a wet cloth to his or her skin but if the worker begins to shiver, stop cooling.
  - –Loosen and remove heavy clothing that restricts evaporation and cooling.
  - –If worker is alert and not nauseated, provide fluids such as cool water, juice, sports drinks, or non-caffeinated soft drinks. (About a cup every 15 minutes)

HEAT EXHAUSTION

- **Treatment (cont'd)**
  - –Contact your first aid trained person.
  - –Do not leave him or her alone.
  - –Call 911 if person does not feel better in about 15 minutes or if unconscious
  - –Do not further expose the person to heat that day. Have them rest and continue to drink cool water and electrolyte drinks.

HEAT STROKE

- Severe and sometimes fatal condition resulting from the failure of the body to regulate its core temperature.
- The body's normal cooling mechanisms stop functioning, **sweating stops**.
- True medical emergency requiring immediate medical attention.

HEAT STROKE

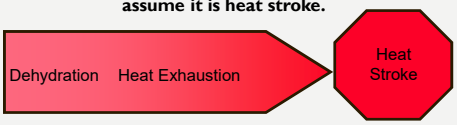
- Symptoms
  - –Stop Sweating
  - –Rapid Pulse
  - –Mental Confusion
  - –Loss of Consciousness
  - –Convulsions
  - –Body Temperature ≥ 103.5°F.
  - –Hot, dry skin
  - –Can die unless treated promptly

HEAT STROKE

- **Treatment**
  - –Call 911
  - –While waiting for medical help
    - –Remove victim to a cool area
    - –Remove clothing that restricts cooling
    - –Cool the person with whatever means you can (see next slide)
    - –Have the person drink sips of cool water if he is alert enough to drink anything and not feeling sick to his stomach.
    - –If emergency medical personnel are delayed after calling 911, call the hospital emergency room for further instruction.
    - –Monitor vital signs

HEAT STOKE OR HEAT EXHAUSTION?

How do you tell the difference?
The telling difference is mental confusion/disorientation in ALL heat stroke victims.
You can ask these 3 questions.
1. "What is your name?"
2. "What day is this?"
3. "Where are we?"
If a worker can't answer these questions, assume it is heat stroke.



Untreated heat exhaustion may progress to heat stroke.

PREVENTING HEAT ILLNESS

- Drink water frequently. Thirst is not an indicator. Drink small cup (every 15 minutes).
- Consider sports drinks when sweating a lot
- Avoid alcohol, caffeinated drinks, and heavy meals before or during work

PREVENTING HEAT ILLNESS

- **Work smart**
  - –Avoid hot times of day
  - –Take breaks in a cool shaded area
- Wear appropriate clothing
  - –Light colored
  - –Light weight
  - –Natural fibers
  - –Hat with a brim
  - –Cooling vest may be helpful in some cases.
- Keep an eye on your buddy for possible signs of heat stress

PREVENTING HEAT ILLNESS

- **Acclimatization**
  - **–People need to adjust (acclimate) to hot working conditions over a few days (peaks in 4-14 days of regular work for at least 2 hours per day in the heat).**
  - **–In severe heat, gradually build up exposure time especially if work is strenuous.**
  - **–Adjust work routines as needed so employees are able to adjust and increase their tolerance**

Pay special attention to:
- New employees
- People just back from being sick
- Anyone absent for more than 2 weeks
- People who have just moved from a cooler climate
- Everyone during heat wave events

PREVENTING HEAT ILLNESS

- Outdoor employees must have access to potable water.
- If water is not plumbed or otherwise continuously supplied, water shall be provided in sufficient quantity;
  - –at the beginning of the shift
  - –to provide one quart per hour for the entire shift.

PREVENTING HEAT ILLNESS

- Frequent consumption of water, up to 4 cups per hour, is extremely important and is encouraged when the work environment is hot and the employee is sweating.
- Employees are encouraged to drink frequently to replenish fluids lost during outdoor activities:

PREVENTING HEAT ILLNESS

- Employees suffering from a heat illness or believing a preventive recovery period is needed will be provided access to an area of shade or be provided with ventilation/cooling for at least 5 minutes

SHADE

- If staff will be in more rural areas (without access to permanent shade), they are advised to designate an area(s) that has naturally occurring shade.
  - **If natural shade is unavailable, staff will bring canopies with them and/or rest inside their air conditioned vehicle with the engine running**
- If staff will be outside buildings conducting their activities, remind them that breaks can be taken inside the building where there is shade and often air conditioning.

MEDICAL SERVICES

- Procedures need to be in place for responding to symptoms of possible heat illness:
- Including how emergency medical services are contacted

MEDICAL SERVICES

- The Supervisor will evaluate employees with respect to their acclimatization status prior to assigning outdoor work.
- The employee will call 911 in the event of a medical emergency.
- A list/map of hospitals and other emergency medical services is provided to all staff. In more rural areas, the specific hospital/emergency medical provider will be identified prior to outdoor work
- When performing outdoor work, staff will have their cell phones.

HEAT ILLNESS PREVENTION IN THE INDOOR WORKPLACE

INTEGRATED INTO HEAT ILLNESS PREVENTION PLAN
(AS REQUIRED UNDER SECTION 3395)

NEW SECTION TITLED: CCR TITLE 8 SECTION 3396

CALIFORNIA'S HEATING UP- CAL/OSHA'S NEW INDOOR HEAT ILLNESS REGULATIONS

- On June 20, 2024, the Occupational Safety and Health Standards Board approved California Code of Regulations, Title 8, section 3396,
- "Heat Illness Prevention in Indoor Places of Employment"

CALIFORNIA'S HEATING UP- CAL/OSHA'S NEW INDOOR HEAT ILLNESS REGULATIONS

- This standard applies to most workplaces where the indoor temperature reaches 82°F.
  - –regulation applies to any indoor work area where "the temperature equals or exceeds 82 degrees Fahrenheit when employees are present
  - –**Generally, any workplace with a roof and enclosed sides is considered an indoor workplace.**

CALIFORNIA'S HEATING UP- CAL/OSHA'S NEW INDOOR HEAT ILLNESS REGULATIONS

- It establishes required safety measures for indoor workplaces to prevent worker exposure to risk of heat illness.
- The Office of Administrative Law (OAL) has 30 working days to review the proposal.
- The Standards Board requested that the regulation take effect immediately after OAL approval.

CALIFORNIA'S HEATING UP- CAL/OSHA'S NEW INDOOR HEAT ILLNESS REGULATIONS

- Industries excluding:
  - –prisons,
  - –local detention facilities,
  - –and juvenile facilities.
- The regulations do not apply in certain circumstances, such as where the employee is working remotely.

PROVISION OF WATER AND COOL-DOWN AREAS

1. Employees must be granted access to potable drinking water that is pure, suitably cool, and fresh for free.
2. The water station must be as close to the work area as feasible. In the instance when water is not plumbed or capable of being continuously supplied, employers are required to provide sufficient quantities.
3. Under these new regulations, any time employees are present, an employer must ensure that they always have one or more cool-down areas.

PROVISION OF WATER AND COOL-DOWN AREAS

1. Employees should be permitted to take preventative cool-down rest breaks to prevent overheating.
2. However, if individual employees do take these preventative cool-down breaks, an employer should:
   - monitor them for symptoms of heat illness,
   - encourage them to stay in the cool-down area,
   - and not be required to resume work until the signs of heat illness have abated,
   - but no less than 5 minutes in addition to the time needed to access the cool-down area.
3. If an employee displays or reports symptoms of heat illness, the employer must provide appropriate first aid or emergency response according to their emergency response procedures.

ACCLIMATIZATION

- In instances where the employer cannot effectively use engineering controls,
  - –like air conditioning,
  - –mist fans,
  - –cooling fans,
  - –or other applicable methods,
  - –to control the impact of the outside temperature on the indoor temperature,
- employers must require a supervisor or designee to closely monitor employees throughout a heatwave.

IMPLEMENT ASSESSMENT AND CONTROL MEASURES

- To minimize heat illness, employers must use "control measures."
- Employers are required to measure the temperature or head index to record the greater number.
- These records must be maintained by the employer, and include
  - –the date,
  - –time,
  - –and exact location of measurement.
- These regulations require routine checking of temperature and maintenance of tools used to take such measurements.

TRAIN YOUR EMPLOYEES:

- Employers are required to train both their supervisory and non-supervisory employees before the employee starts work that may reasonably expose them to risk of heat illness.
- The regulations require extensive training on the different subsections, and requirements.

TRAIN YOUR EMPLOYEES:

- Employers are required to implement emergency response procedures, which includes:
  - –ensuring that there are effective communication measures (i.e. through an electronic device with good reception);
  - –responding to signs and symptoms of potential heat illness;
  - –contacting emergency medical services;
  - –and providing clear and precise directions to the worksite.
- It is critical that employers ensure they have an effective response plan.

IMPLEMENT PROCEDURES FOR EMERGENCY RESPONSE:

- **Procedures need to be in place for transporting employees and providing clear and precise directions to the worksite:**
- If staff will be working alone outdoors,
  - they will notify their supervisors with respect to location
  - and directions
  - and expected time of field work.
- All staff are to have a map in their vehicles.
  - when communicating with the emergency medical provider.

LET'S TALK ABOUT LITHIUM BATTERY PROBLEMS

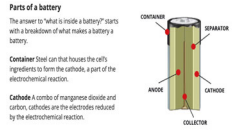
MANY OF THESE SLIDES COMPLIMENTS OF SAN DIEGO FIRE DEPARTMENT

Battery Types – Non Rechargeable

Non-rechargeable Batteries (Alkaline)
Stable, no significant energetic releases.
Consistent energy, long-term power, but loses strength over time.
Long shelf life.

Non-rechargeable Batteries (Lithium Metal)
Stable, large energy density.
Can provide strong energy surges even after a period of low discharge
Lithium metal found inside is **extremely water reactive**

Battery Types



Alkaline Battery (Inside)

Lithium Metal Battery (Inside)


Inside a lithium metal cell

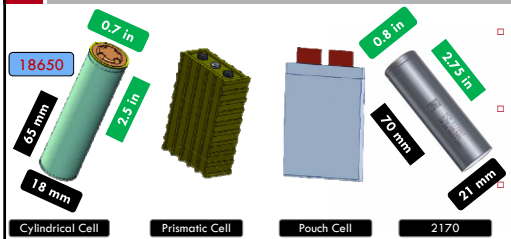
Lithium Metal Battery (Inside)

Battery Types - Rechargeable

Lead Acid Batteries
Stable, low energy density.
Contains Lead and Sulfuric Acid.
Risk of explosion due to Oxygen and Hydrogen generation during charging

Nickel Cadmium (NiCad)/Nickel Metal Hydride (NiMH) Batteries
Rechargeable and stable
Suffers from "memory effect"
Can be smothered (METAL-X, Sand, etc.)
Water application can cause hydrogen gas release

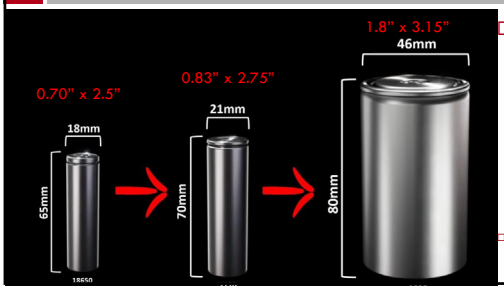
Lithium-Ion Battery Types



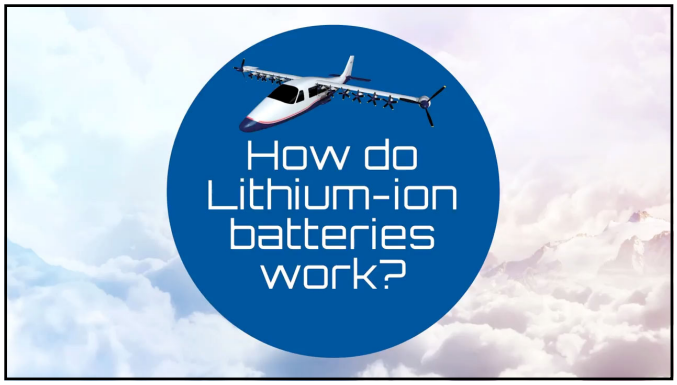
- Cylindrical Cells (18650) are the most common battery in most mobile applications (bikes, scooters, etc.)
- Cylindrical Cells are also used by electric vehicles, where you can find anywhere from 3K-7K individual cells
- Prismatic and Pouch Cells are found in all other electric vehicles

Lithium-Ion Batteries Good memory resistance Very stable High energy density
Toxic, corrosive, flammable, and explosive gas generation during thermal runaway

Evolution of the Cylindrical Cell



- Here is an example of how the cylindrical cell size has evolved over time
- Exponential power increase with volume increase



Voltage in Lithium-Ion Battery Tech

Cell Phones = 3.4 to 4.5V
E-Scooter = 28 to 48V
E-Bike = 48 to 52V
Prius = 200V
Tesla = 350 to 400V
F150 Lightning = 400V
GMC Hummer = 400V
Ford Mach-e = 450V
Trolley = 600V
Tesla Truck = 800V (reported)
Tesla Semi = 1000V (reported)

Exponential Increase – Infrastructure

Federal Infrastructure Investment and Jobs Act (11/15/2021)

- $6 Billion
  - Battery Storage
- $7.5 Billion
  - Rapid charging stations – 500,000 along highways and in communities
- $1 Billion
  - School Buses

School Buses?

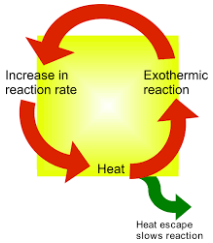
Rapid smoke and flame production

Differences in Batteries

- Storage Batteries
  - When used up they are dead
- Alkaline batteries
  - When used up it is dead
- Ni-Cad batteries
  - Rechargeable and stable Suffers from "memory effect"
  - When they won't hold a charge, they are dead
- Lithium batteries
  - Do NOT fully go dead

Differences in Lithium-Ion Battery Fires

- Very toxic atmospheres
- Burn temperatures are higher than normal
- Fires can burn without Oxygen – can't smother!
- Explosive potential – Hydrogen Gas
- Thermal Runaway reaction
  - Chemical reaction – rapid degradation
  - Does not require Oxygen
  - Nearly impossible to stop once it starts
  - Could happen in seconds or days
- Re-ignition is common – as much as 30 days or more!



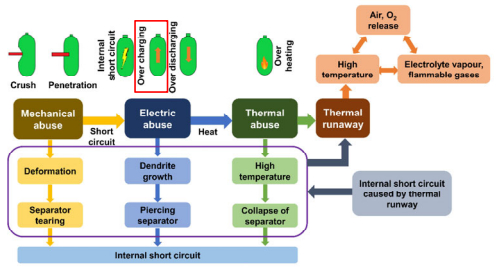
Thrown away incorrectly it's a problem

The RED color is the Lithium

Propagation

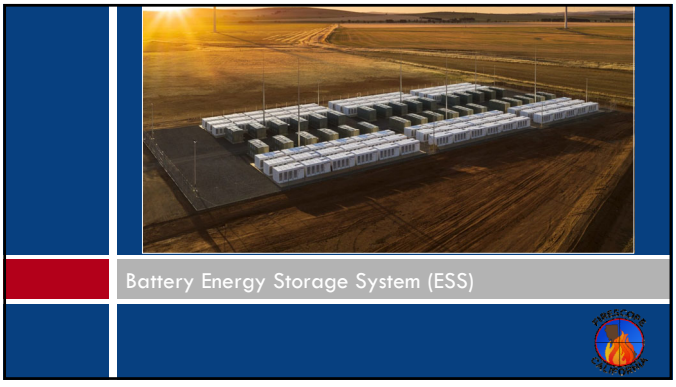
- Propagation
  - Domino effect
  - Thermal Runaway heat in one battery will trigger Thermal Runaway in neighboring cells
- Limiting propagation is primary goal
  - Cooling neighboring cells may prevent propagation
  - Removing exposed cells (i.e., removing other e-bikes, loose cells, etc.)

Why do batteries fail?

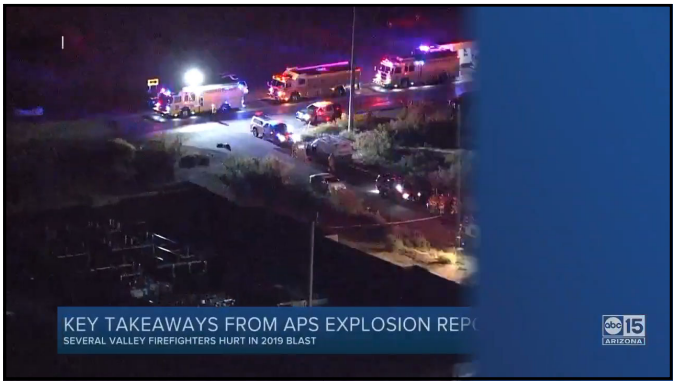


Three Primary Presentations of Lithium Ion Batteries (LIB)

- Energy Storage Systems
- Electric Vehicles
- Micro-mobility



Battery Energy Storage System (ESS)

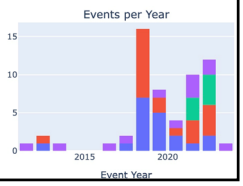


Battery Energy Storage System (ESS)

- Large Systems
- Multiple racks of batteries
- Surprise, AZ – 2019
- Regulations
  - NFPA 855
    - Safety measures
  - UL 9540 & 9540A
    - Testing of system

BESS – Failure Events

- China
  - 2 FF Dead
- Surprise, AZ
  - 8 FF injured
- Chandler, AZ
- Victoria, Australia
- Moss Landing, CA
- Valley Center, CA



BESS Current and Planned for SD County

Enersmart – 55 locations planned.

- Chula Vista – 2 systems (6 MW_{AC})
- Murray – 7 systems (21 MW_{AC})
- Mesa Heights – 1 system (3 MW_{AC})
- Imperial Beach – 2 systems (6 MW_{AC})
- Alpine – 2 systems (6 MW_{AC})
- Spring Valley – 12 systems (36 MW_{AC})
- San Diego/Carmel Mtn – 10 systems (30 MW_{AC})
- Border (Otay Mesa) – 6 systems (18 MW_{AC})
- Ramona - 13 systems (39 MW_{AC})

BESS TACTICAL CONSIDERATIONS IF BATTERIES ARE INVOLVED

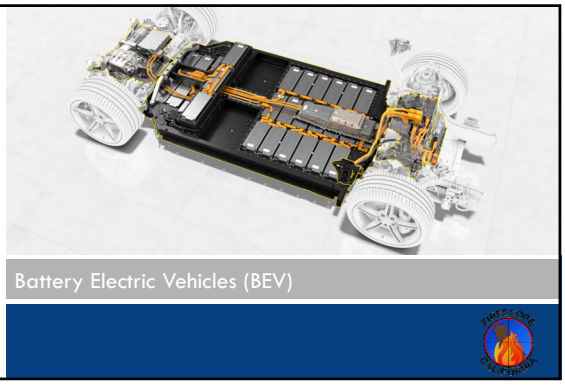
- Defensive Operations!
- Life safety
  - PPE
  - Rescue
  - Evacuate / Shelter-in-Place
- Property Conservation
  - Allow system safety devices to operate as designed
  - Monitor alarm panel and manually activate any safety devices if appropriate

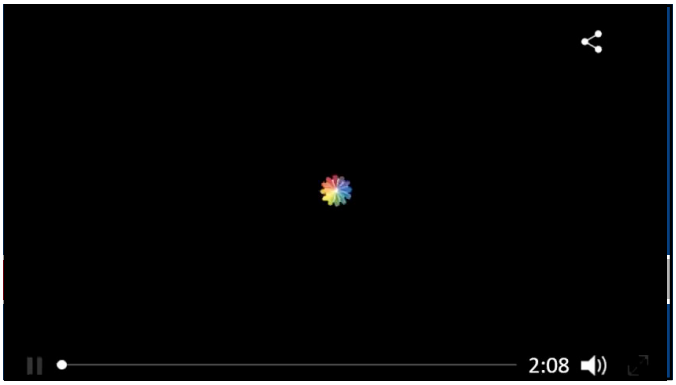
BESS TACTICAL CONSIDERATIONS IF BATTERIES ARE INVOLVED

- Prevent propagation
  - Water curtains and unstaffed lines
  - Apply from a distance and upwind if possible
    - Protect exposed pods
    - Extinguish and protect other infrastructural exposures
  - Electrical hazard has not been demonstrated in testing at battery fires
    - Avoid direct water application to any exposed electrical components
    - Use 30-degree fog for water curtains
- Protect other exposures
  - Neighboring structures
  - Vegetation

BESS TACTICAL CONSIDERATIONS IF BATTERIES ARE INVOLVED

- Incident Stabilization
  - Let it burn!
    - May take multiple operational periods
- Environmental Protection
  - Minimize/contain/redirect runoff if possible
- Resources (some considerations)
  - BESS Personnel / Technicians
  - EPA
  - Hazmat
  - Gas/Electric





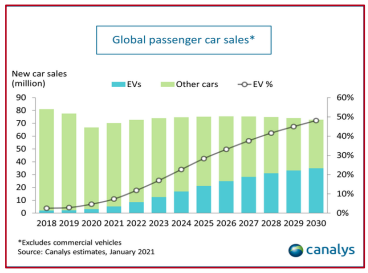
Exponential Increase – Battery Electric Vehicles (BEV)

% of EVs Global Auto Sales

- 4.7% - 2020
- 15% - 2025
- 48% - 2035

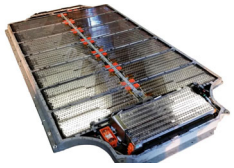
California forecasted to be much higher.

By 2035 100% of all vehicle sales in CA must be battery or hydrogen powered



Battery Electric Vehicles (BEV) – Battery Packs

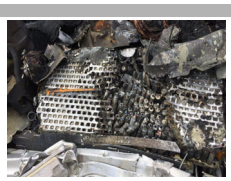
GM Battery Pack
Pouch Cells



Tesla Battery Pack
Cylindrical Cells

Battery Electric Vehicle Damage

- Lithium-Ion Batteries primarily located in underside of vehicle
- Identification of battery involvement is key:
  - White smoke
  - Battery cell projectiles
  - Hissing/popping sounds

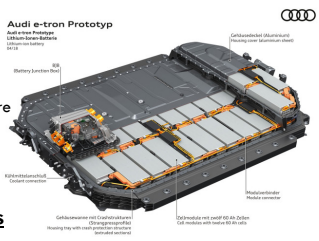


Tesla – Cylindrical Cell Batteries
18650 cell generation

LOTS OF WATER to cool the other batteries not involved

BEV – Fire Department Offensive Operations

- Water is considered best cooling agent
  - If offensive operation engaged:
    - Water should be applied under the vehicle and up at the batteries.
    - For pouch cell vehicles (i.e., GM), there may be access points near the wheel wells
    - Water application into access points to battery compartment can prevent propagation (manufacturer specific)
- **Rekindle can occur days or weeks later!**



3 Keys to Success

BEV Identification

Let it Burn
PROTECT EXPOSURES!

Secure a Water Supply

BEV Fire Tactical Considerations

- Life safety
  - PPE
  - Rescue / Check for victims
  - Chock wheels
  - Evacuate / Shelter-in-Place
- Incident Stabilization
  - Attack the fire like a normal vehicle fire. Foam is NOT recommended
    - Most EV fires do not involve the batteries
  - After confirming it is an EV and batteries are involved, if possible, allow the batteries to burn and evacuate the area 330' in all directions and protect exposures

BEV Fire Tactical Considerations

- If extinguishment/cooling is required:
  - Secure a water supply
  - Consider tilting the vehicle to gain access to the underside of the vehicle
    - This will require training prior to placing into operations
    - Lifting points must be referenced
  - Consider directing spray into side vents of battery pack
  - Use a thermal imager to check for continued heating
  - Never cut, crush, puncture, or open a high voltage battery to extinguish it
  - If the cells are visible due to damage, you can direct a hose stream directly on the cell
  - Observe the battery and watch for evidence of thermal runaway

BEV Fire Tactical Considerations

- Other considerations
  - Refer to the Emergency Response Guide (ERG) for the specific make and model of the vehicle for guidance on securing power to the lithium-ion battery. www.NFPA.org
    - Some battery cooling mechanisms are powered by the 12-volt system
  - Once the lithium-ion battery has been cooled, stand-by at least one hour and continue monitoring the lithium-ion battery using the thermal imager and observe for any other signs of thermal runaway
- Tow Company
  - Make sure it's towed on a flatbed.
    - Regenerative braking sends power to batteries. This may cause a fire with rotational force on wheels
  - Store 50 ft away from all exposures

Garage explosion

BEV Fire Tactical Considerations – Inside (underground/garage)

BEV Fire Tactical Considerations – FSRI Testing

- FSRI estimated the amount of gas released from a residential BESS and what would happen if it caught a source of ignition.

BEV Fire Tactical Considerations – Inside (underground/garage/warehouse)

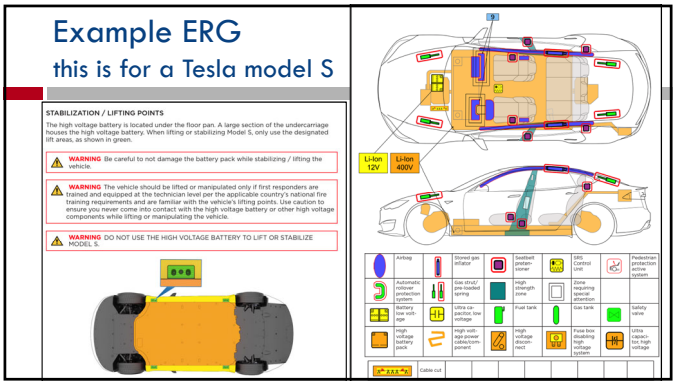
- Considerations: Garage
  - Approach from an angle to avoid possible door explosion/over pressurization
  - If no active fire, be concerned with possible explosive atmosphere
- Warehouse
  - Careful cutting into rollup doors without knowing what's inside
- Underground Parking
  - Toxic atmosphere hazard
  - Explosive atmosphere less likely due to available space
  - Allowing vehicle to burn is an option, with significant consequences to the structure
    - EV fires do not release more heat energy than internal combustion engine (ICE) fires
  - Identification of EV will be difficult, if not impossible. Follow your department SOP for underground vehicle fires
  - Perform thorough PPE and personal decontamination procedures

Example Emergency Response Guides from various manufacturers

Review at you convenience

Example ERG

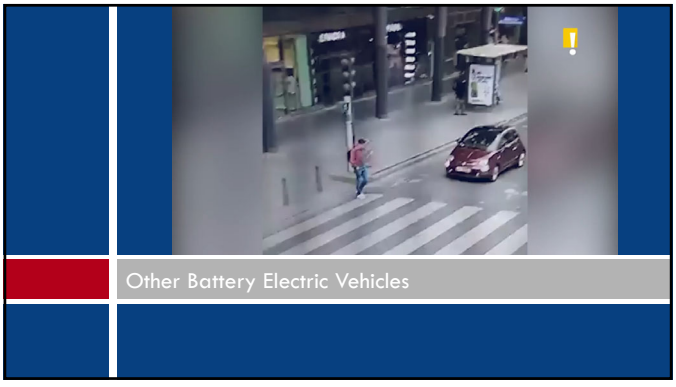
this is for a Tesla model S



BEV Vehicle Extrication

- Charged and STAFFED hoseline!
  - Fog pattern for hydraulic ventilation
    - Does not require full GPM
- "RIC" Team with SCBA?
  - Consider a standby team to take over operations on SCBA

3. Disable direct hazards / safety regulations
Thermal Runaway Mitigation
⚠ The vehicle is equipped with a battery management system with internal fault detection, including thermal runaway mitigation. In the event of a "**Battery Danger Detected**" notification, **DO NOT cut or disable the 12-volt system, unless you need to disable the airbags for occupant extrication**.
Automatic safety systems are enabled when 12-volt power is available, including a battery thermal runaway mitigation system that internally cools the High Voltage battery when a thermal event is detected; this feature is available in non-crashed, static situations.



Other Battery Electric Vehicles

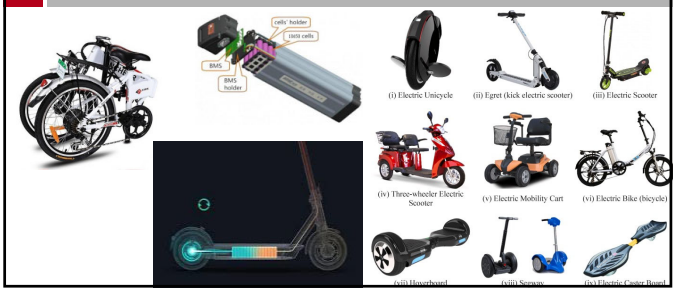
Micro-Mobility Devices

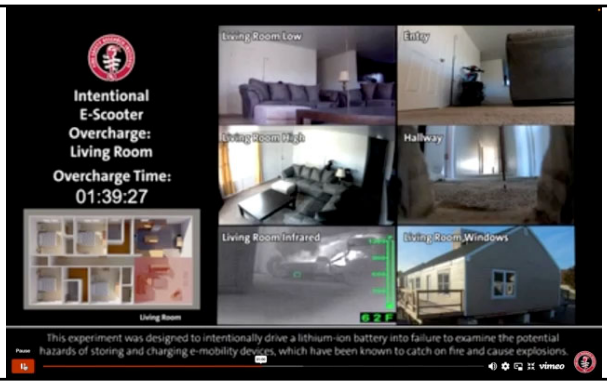
E-BIKES, SCOOTERS, HOVER BOARDS, ETC.

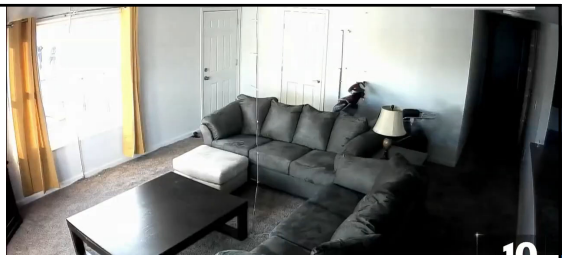
Micro-Mobility Devices

- Largest number of LIB incidents
- FDNY LIB fires:
  - 44 in 2020
  - 220 in 2022
- Public exposure concerns
  - Stored and charged inside occupied residences and businesses
  - Stored near entry and exit ways
  - Can ignite with little-to-no warning
  - **Rekindle is likely.**

Micro-Mobility Devices







Inside View

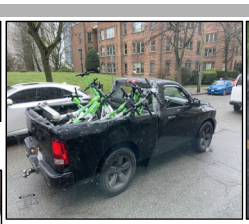
How Many GPMs?

- Lithium-Ion batteries do not require Oxygen to burn.
- Smothering also does not work
- Cooling to prevent cell propagation may be successful if water can be placed into battery pack
  - **DO NOT** force open the battery pack

Can you have more GPMs than this?

Micro Mobility Concerns

- Elevators



- "Farming"

- Large volume of smoke production

Micro Mobility Concerns

Rapid failure

Overhaul

Toxic atmosphere

Rekindle

Explosive

Micro Mobility Tactical Considerations

- Life safety
  - PPE/SCBA
  - Rescue
  - Evacuate area
- Incident Stabilization
  - If outdoors
    - Allow micro mobility to burn to completion
    - Prevent propagation to other devices/battery packs
  - If indoors
    - Attack residential fire like normal
    - **During fire attack, uninvolved micro mobility device may ignite behind you!!**

Micro Mobility Tactical Considerations

- Move all lithium-ion battery cells and devices to a safe location, away from firefighting operations, **PRIOR to overhaul**
  - Use shovel with wooden handle
  - Outside is preferred
  - Consider bathroom, bathtub, sink, or metal bucket and fill with water if outdoor not an option
- Wear SCBA during overhaul
- Advise Investigators of possible LIB presence
- Request Hazmat to assist with battery stabilization, mitigation, overpacking, and disposal
- Provide protection line during overpacking procedures

So you have batteries that are still a problem Neutralization Considerations

- Prepare monitoring equipment- Thermal Imaging Camera for reaction temps, CGI for H2, pH paper for HCl or sulfuric acid, FI paper for HF. For smoke consider also RAE for Cl2 vapors, RAE or Draeger for HCl vapors
- Other Equipment needed- Battery removal tools, Bucket/Drum, Salt and water
  - Rapid (minutes/hrs) Discharge: Mix Solid salt (e.g. Morton's) into container for +/- 20% solution:
  - 6-8 pounds to 3-4 gallons of water in 5 gallon bucket,

Neutralization Considerations

- Sodium Chloride (SALT) will act an electrolyte to draw the power out of the Lithium Battery and corrode the metal.
- This will render it inert but takes time

Neutralization Considerations

- 50 pound salt bag for 25 gallons water (leaves space for batteries in 30 gallon drum)
- 2 x 50 pound bags for 50 gallons water , or if there are days to weeks available you can,
- Slow (days/weeks) discharge: Mix Solid salt (e.g. Morton's) for 1% NaCl solution as follows:
  - - 4 ounces (1/2 cup) for 5 gallons,
  - - 1 pound for 25 gallons water (need space for batteries in 30 gallon drum)
  - - 2 pounds for 50 gallons water

Lab packing of batteries

- Request Hazmat to assist with battery stabilization, mitigation, overpacking, and disposal

DDR Kits

Disposal

1. Classify the Hazard - DDR

2. Contain the Hazard – Inner Packaging

Disposal

Example DDR Kits

Disposal

2. Contain the Hazard – DDR

3. Communicate the Hazard - DDR

Disposal

Here are some examples of proper labeling for transport of batteries:

Guide 1: UN3480 Proper Shipping Name: Lithium Ion Batteries. Hazard Class Label: Class 9 Lithium Battery

Guide 2: UN3480 Proper Shipping Name: Lithium ion batteries Hazard Class Label: N/A

Guide 3: UN3481 Proper Shipping Name: Lithium ion batteries packed with or contained in equipment Hazard Class Label: Class 9 Lithium Battery

Guide 4: UN3481 Proper Shipping Name: Lithium ion batteries packed with or contained in equipment Hazard Class Label: N/A

Guide 5: Proper Shipping Name: Lithium metal batteries Hazard Class Label: Class 9 Lithium Battery

Guide 6: Proper Shipping Name: Lithium metal batteries Hazard Class Label: Class 9 Lithium Battery

- **Guide 7**: Proper Shipping Name: Lithium metal batteries packed with or contained in equipment Hazard Class Label: Class 9 Lithium Battery
- **Guide 8**: Proper Shipping Name: Lithium metal batteries packed with or contained in equipment Hazard Class Label: N/A
- **Guide 9**: Proper Shipping Name: Battery-powered vehicle Hazard Class Label: Class 9 Miscellaneous
- **Guide 10**: Proper Shipping Name: Lithium batteries installed in cargo transport unit lithium ion batteries or lithium metal batteries Hazard Class Label: N/A (see Required Hazard Communication for additional details)

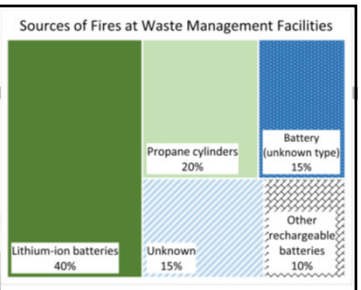
Disposal

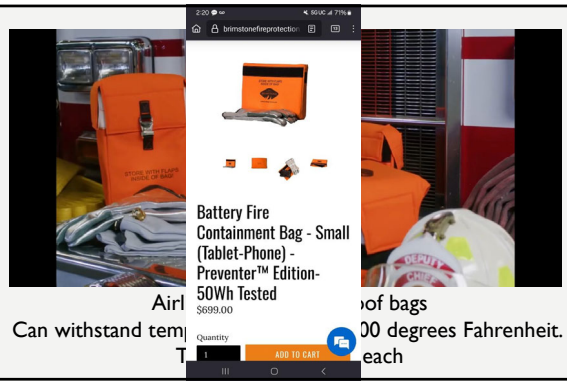
Where Do We See Them?

They are everywhere! Increasing fire behavior.

Disposal Challenge

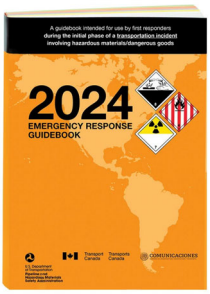
- Trash trucks/recycling facilities
- 60% of trash truck load fires





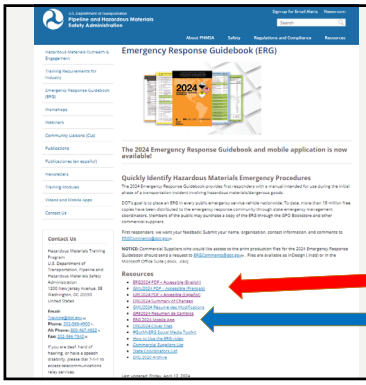
Airl… …of bags
Can withstand tem… …00 degrees Fahrenheit.
T… …each

Right way and Wrong way



DOT EMERGENCY RESPONSE GUIDEBOOK (ERG)

INTENDED USE - "INITIAL PHASE" FOR PERIMETERS



https://www.phmsa.dot.gov/training/hazmat/erg/emergency-response-guidebook-erg

Books in Three Languages

Mobile Apps = Apple and Android only

ERG MOBILE APP Free!!

ERG2024 MOBILE APPS

The ERG2024 is also available as a mobile application, for both iOS and Android devices, in English, French, and Spanish!

NEW TO THE ERG APP?

To download the app, use the QR code (below) which corresponds to your device, or you can locate the app by name in either the App Store (iOS) or Google Play (Android).

ERG FOR iOS

ERG2024 FOR ANDROID

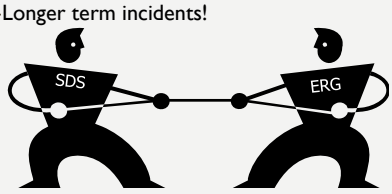
ALREADY HAVE THE APP?

If you have already downloaded ERG for iOS or ERG2020 for Android, published by the Pipeline and Hazardous Materials Safety Administration (PHMSA), no action needed! Your app will update automatically to ERG2024.

For more ERG resources, visit PHMSA's Emergency Response Guidebook (ERG) webpage: https://www.phmsa.dot.gov/training/hazmat/erg/emergency-response-guidebook-erg

ERG VERSUS SDS

- ERG – Initial transportation incidents
- Safety Data Sheet (SDS)
  - –all other incidents
  - –Longer term incidents!

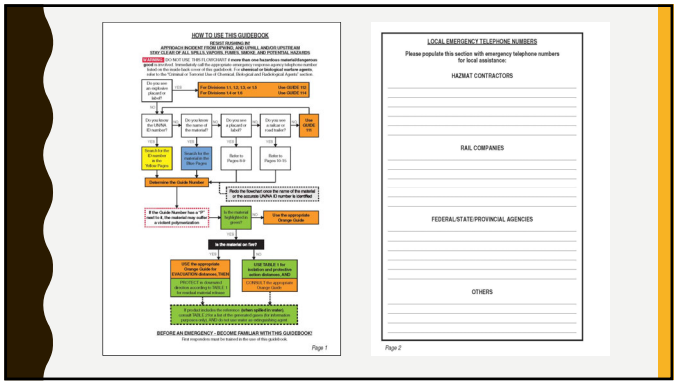


ERG ORGANIZATION

- White — Basic info & instructions
- Yellow — UN #, guide # & material name
- Blue — Material name, guide # and UN #
- Orange — Guide number pages
- Green — Isolation & Protective Actions
  - –Small and large quantity spills

NEW FOR 2024 ERG

LOCAL EMERGENCY TELEPHONE NUMBERS – blank page	Page 2
Expanding several guides, including: Especially 115 and 140	Orange Section
Updated the Marking, Labeling, and Placard ID charts	Page 8-9
First aid guidance moved from Orange section to:	Page 150
Information for responding to electric vehicles	Page: 356
BLEVE guidance and charts	Page 357 - 359
Criminal or Terrorist use of CBRN AGENTS	Page 360 – 366
Modified IED guidance	Page 367-368
Added/Removed several UN/ID numbers from the ERG	See handout
QR code for reporting incidents	See back Cover



HOW TO USE THIS GUIDEBOOK

LOCAL EMERGENCY TELEPHONE NUMBERS

Please populate this section with emergency telephone numbers for local assistance:

HAZMAT CONTRACTORS

RAIL COMPANIES

FEDERAL/STATE/PROVINCIAL AGENCIES

OTHERS

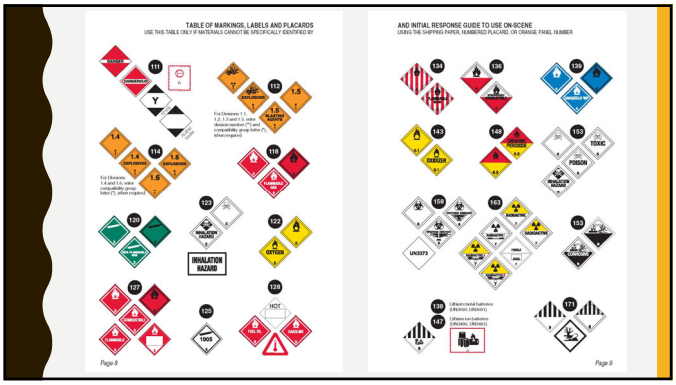
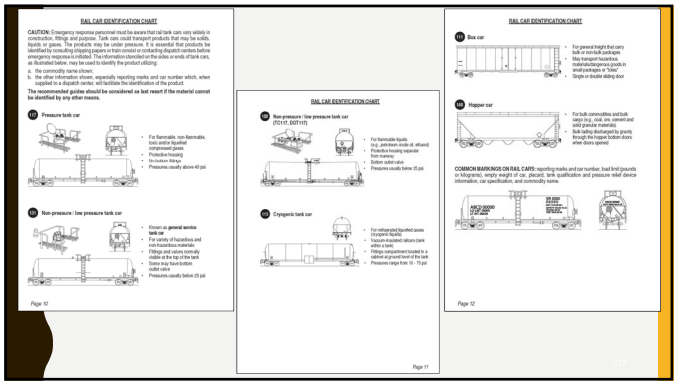
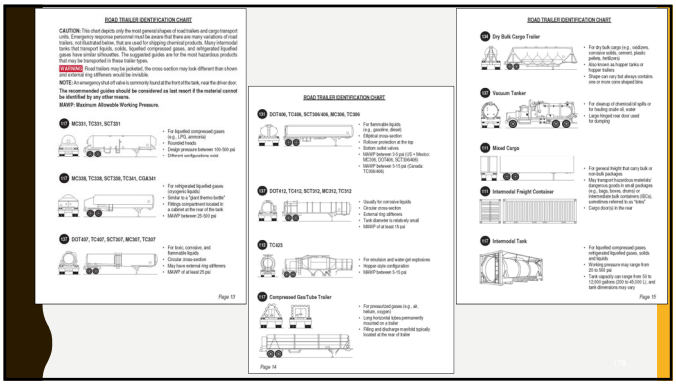


TABLE OF MARKINGS, LABELS AND PLACARDS

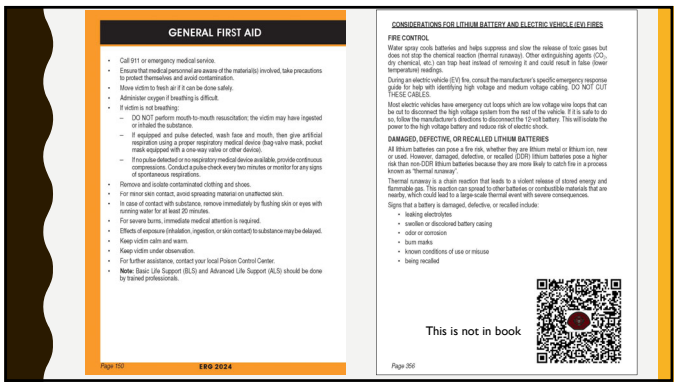
AND INITIAL RESPONSE GUIDE TO USE ON-SCENE



RAIL CAR IDENTIFICATION CHART

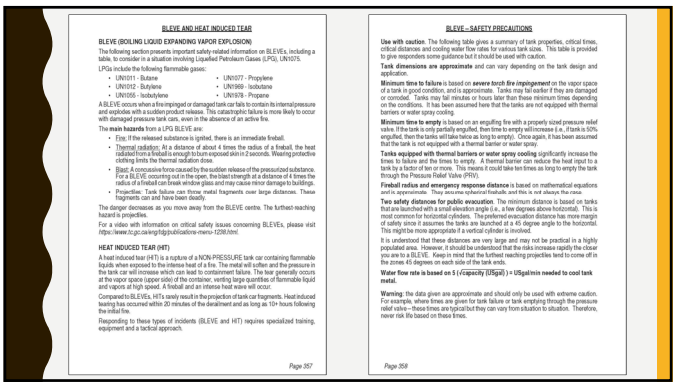


ROAD TRAILER IDENTIFICATION CHART



GENERAL FIRST AID

CONSIDERATIONS FOR LITHIUM BATTERY AND ELECTRIC VEHICLE (EV) FIRES



BLEVE AND HEAT INDUCED TEAR

BLEVE – SAFETY PRECAUTIONS

WARNING: The data given are approximate and should only be used with extreme caution. These times can vary from situation to situation. LPG tanks have been known to BLEVE within minutes. Therefore, never risk life based on these times.

BLEVE (USE WITH CAUTION)

Capacity		Diameter		Length		Propane Mass	Minimum time to failure for severe torch	Approximate time to empty for engulfing fire	Fireball radius	Emergency response distance		Minimum evacuation distance		Protective evacuation distance		Cooling water flow rate	
Litres	(Gallons)	Meters	(Feet)	Meters	(Feet)	Kilograms (Pounds)	Minutes	Minutes	Meters	(Feet)	Meters	(Feet)	Meters	(Feet)	Meters	(Feet)	Litres/min	USgal/min
100	(26.4)	0.3	(1)	1.5	(4.9)	40	(88)	4	0		10	(33)	30	(100)	154	(505)	307	(1007)	37	29
400	(106)	0.61	(2)	1.5	(4.9)	160	(353)	6	12		16	(52)	80	(260)	244	(801)	488	(1601)	195	52
2000	(528)	0.76	(2.5)	3	(9.8)	800	(1764)	5	18		20	(92)	111	(364)	417	(1368)	834	(2736)	435	115
4000	(1057)	1	(3.3)	4.9	(16.1)	1600	(3527)	5	20		25	(115)	140	(459)	525	(1722)	1050	(3445)	915	163
6000	(2113)	1.25	(4.1)	6.5	(21.3)	3200	(7055)	6	22		44	(144)	176	(577)	661	(2169)	1323	(4341)	870	230
22000	(5813)	2.1	(6.9)	6.7	(22)	8800	(19401)	7	38		62	(203)	247	(810)	926	(3038)	1852	(6076)	1443	381
42000	(11095)	2.1	(6.9)	11.6	(38.7)	16800	(37000)	7	52		77	(253)	306	(1004)	1149	(3770)	2299	(7541)	1914	507
83000	(21982)	2.75	(9)	13.7	(45)	33200	(73212)	8	80		96	(315)	383	(1257)	1435	(4708)	2869	(9416)	2786	736
140000	(36984)	3.3	(10.8)	17.2	(56.4)	56000	(123478)	9	93		114	(374)	457	(1499)	1713	(5622)	3260	(7218)	3940	992

Slide 183

Una guía destinada al uso de los primeros respondedores durante la fase inicial de un incidente en el transporte que involucre materiales peligrosos/mercancías peligrosas

ESTE DOCUMENTO NO DEBERÁ SER USADO PARA DETERMINAR EL CUMPLIMIENTO CON LAS REGULACIONES DE MATERIALES PELIGROSOS/ MERCANCÍAS PELIGROSAS O PARA CREAR DOCUMENTOS DE SEGURIDAD PARA QUÍMICOS ESPECÍFICOS

NO PARA LA VENTA

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A guidebook intended for use by first responders during the initial phase of a transportation incident involving hazardous materials/dangerous goods

THIS DOCUMENT SHOULD NOT BE USED TO DETERMINE COMPLIANCE WITH THE HAZARDOUS MATERIALS/ DANGEROUS GOODS REGULATIONS OR TO CREATE WORKER SAFETY DOCUMENTS FOR SPECIFIC CHEMICALS

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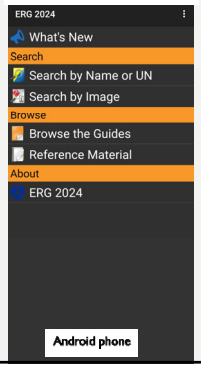
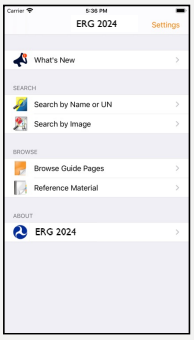
http://phmsa.dot.gov/hazmat/erg-mobile-app





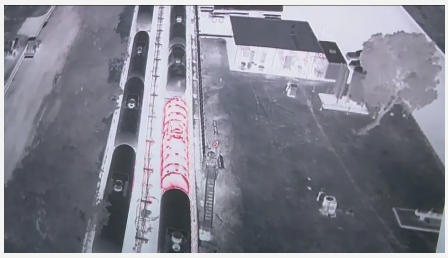
Apple phone

Slide 184

RIVERSIDE INCIDENT THURSDAY AUGUST 11, 2022

Slide 185

WHAT IS INSIDE THIS TANKER?



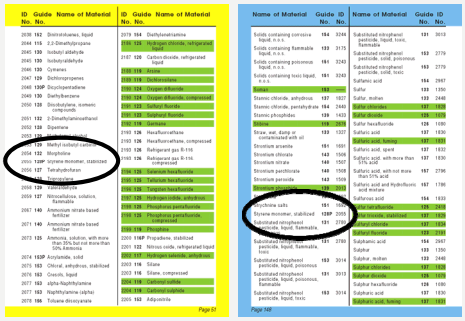
Styrene is chemically known as vinyl benzene

Slide 186

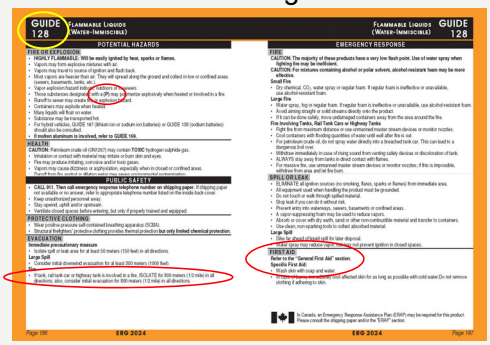
ERG

- Look up **Styrene monomer**
  - –How did you locate the entry? BLUE Section
  - –What is the UN ID#? 2055
  - –What is the guide number? 128P

Yellow section Blue Section

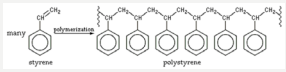


Guide Pages

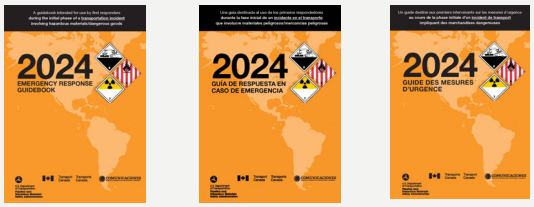


"P": POLYMERIZATION HAZARD

ERG page 381



ALSO, CONTROL F IF USING THE PDF VERSION



DEMO = what the app looks like

Green Pages
Initial Isolation and Protective Action Distances

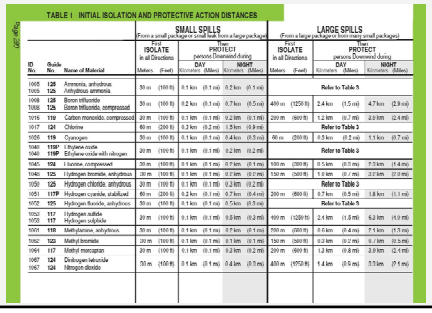


TABLE 1 INITIAL ISOLATION AND PROTECTIVE ACTION DISTANCES

ID No.	Guide No.	Name of Material	SMALL SPILLS (From a small package or small leak from a large package) First ISOLATE in all Directions Meters	(Feet)	Then PROTECT persons Downwind during DAY Kilometers	(Miles)	NIGHT Kilometers	(Miles)	LARGE SPILLS (From a large package or from many small packages) First ISOLATE in all Directions Meters	(Feet)	Then PROTECT persons Downwind during DAY Kilometers	(Miles)	NIGHT Kilometers	(Miles)
1005	125	Ammonia, anhydrous	50 m	(160 ft)	0.1 km	(0.1 mi)	0.2 km	(0.1 mi)			Refer to Table 5			
1005	125	Anhydrous ammonia												
1008	126	Boron trifluoride	50 m	(160 ft)	0.2 km	(0.1 mi)	0.7 km	(0.5 mi)	400 m	(1250 ft)	2.4 km	(1.5 mi)	4.7 km	(2.9 mi)
1008	126	Boron trifluoride, compressed												
1016	119	Carbon monoxide, compressed	20 m	(100 ft)	0.1 km	(0.1 mi)	0.2 km	(0.1 mi)	200 m	(600 ft)	1.2 km	(0.7 mi)	2.0 km	(2.4 mi)
1017	124	Chlorine	60 m	(200 ft)	0.3 km	(0.2 mi)	1.5 km	(0.9 mi)			Refer to Table 3			
1072	116	Oxygen	50 m	(160 ft)	0.1 km	(0.1 mi)	0.4 km	(0.3 mi)	80 m	(250 ft)	0.3 km	(0.2 mi)	1.1 km	(0.7 mi)
1040	119P	Ethylene oxide	30 m	(100 ft)	0.1 km	(0.1 mi)	0.2 km	(0.2 mi)			Refer to Table 3			
1040	119P	Ethylene oxide with nitrogen												
1045	124	Fluorine, compressed	30 m	(100 ft)	0.1 km	(0.1 mi)	0.7 km	(0.1 mi)	100 m	(300 ft)	0.5 km	(0.3 mi)	1.1 km	(0.4 mi)
1048	125	Hydrogen bromide, anhydrous	30 m	(100 ft)	0.1 km	(0.1 mi)	0.2 km	(0.2 mi)	150 m	(500 ft)	1.0 km	(0.7 mi)	2.2 km	(2.0 mi)
1050	125	Hydrogen chloride, anhydrous	30 m	(100 ft)	0.1 km	(0.1 mi)	0.2 km	(0.2 mi)			Refer to Table 3			
1051	117P	Hydrogen cyanide, stabilized	60 m	(200 ft)	0.2 km	(0.1 mi)	0.7 km	(0.4 mi)	200 m	(600 ft)	0.7 km	(0.5 mi)	1.8 km	(1.1 mi)
1052	125	Hydrogen fluoride, anhydrous	50 m	(160 ft)	0.1 km	(0.1 mi)	0.5 km	(0.3 mi)			Refer to Table 5			
1053	117	Hydrogen sulfide	30 m	(100 ft)	0.1 km	(0.1 mi)	0.8 km	(0.2 mi)	400 m	(1200 ft)	2.4 km	(1.5 mi)	4.2 km	(4.0 mi)
1053	117	Hydrogen sulphide												
1005	118	Methylamine, anhydrous	50 m	(160 ft)	0.1 km	(0.1 mi)	0.7 km	(0.1 mi)	700 m	(2000 ft)	0.6 km	(0.4 mi)	1.1 km	(1.0 mi)
1062	123	Methyl bromide	30 m	(100 ft)	0.1 km	(0.1 mi)	0.1 km	(0.1 mi)	150 m	(500 ft)	0.2 km	(0.2 mi)	0.7 km	(0.5 mi)
1064	117	Methyl mercaptan	20 m	(100 ft)	0.1 km	(0.1 mi)	0.2 km	(0.2 mi)	200 m	(600 ft)	1.2 km	(0.8 mi)	2.0 km	(2.4 mi)
1067	124	Dinitrogen tetroxide	50 m	(150 ft)	0.1 km	(0.1 mi)	0.4 km	(0.3 mi)	400 m	(1572 ft)	1.4 km	(0.9 mi)	3.5 km	(2.1 mi)
1067	124	Nitrogen dioxide												

Green Pages
Table 3

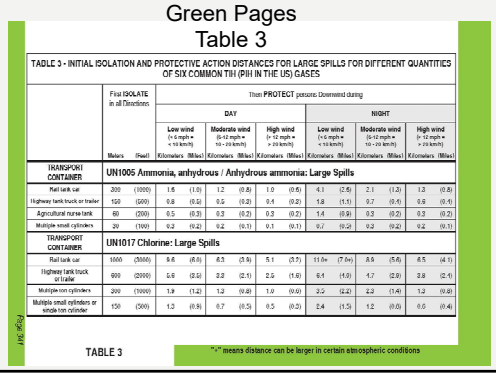


TABLE 3 - INITIAL ISOLATION AND PROTECTIVE ACTION DISTANCES FOR LARGE SPILLS FOR DIFFERENT QUANTITIES OF SIX COMMON TIH (PIH IN THE US) GASES

	First ISOLATE in all Directions		Then PROTECT persons Downwind during DAY Low wind (< 6 mph • < 10 km/h) Kilometers	(Miles)	DAY Moderate wind (6-12 mph • 10 - 20 km/h) Kilometers	(Miles)	DAY High wind (> 12 mph • > 20 km/h) Kilometers	(Miles)	NIGHT Low wind (< 6 mph • < 10 km/h) Kilometers	(Miles)	NIGHT Moderate wind (6-12 mph • 10 - 20 km/h) Kilometers	(Miles)	NIGHT High wind (> 12 mph • > 20 km/h) Kilometers	(Miles)
TRANSPORT CONTAINER	UN1005 Ammonia, anhydrous / Anhydrous ammonia: Large Spills													
Rail tank car	300	(1000)	1.6	(1.0)	1.2	(0.8)	1.0	(0.6)	4.1	(2.6)	2.1	(1.3)	1.3	(0.8)
Highway tank truck or trailer	150	(500)	0.8	(0.5)	0.5	(0.3)	0.4	(0.2)	1.8	(1.1)	0.7	(0.4)	0.6	(0.4)
Agricultural nurse tank	60	(200)	0.5	(0.3)	0.3	(0.2)	0.2	(0.2)	1.4	(0.9)	0.3	(0.2)	0.3	(0.2)
Multiple small cylinders	30	(100)	0.2	(0.2)	0.2	(0.1)	0.1	(0.1)	0.7	(0.2)	0.2	(0.2)	0.2	(0.1)
TRANSPORT CONTAINER	UN1017 Chlorine: Large Spills													
Rail tank car	1000	(3000)	9.6	(6.0)	6.3	(3.9)	5.1	(3.7)	11.0+	(7.0+)	8.5	(5.6)	8.5	(4.1)
Highway tank truck or trailer	600	(2000)	5.6	(3.5)	3.8	(2.1)	2.5	(1.6)	6.4	(4.0)	4.7	(2.9)	3.8	(2.1)
Multiple ton cylinders	300	(1000)	1.9	(1.2)	1.2	(0.8)	1.0	(0.6)	3.5	(2.4)	2.3	(1.4)	1.2	(0.8)
Multiple small cylinders or single ton cylinder	150	(500)	1.2	(0.9)	0.7	(0.5)	0.5	(0.3)	2.4	(1.5)	1.2	(0.8)	0.6	(0.4)

TABLE 3

"+" means distance can be larger in certain atmospheric conditions

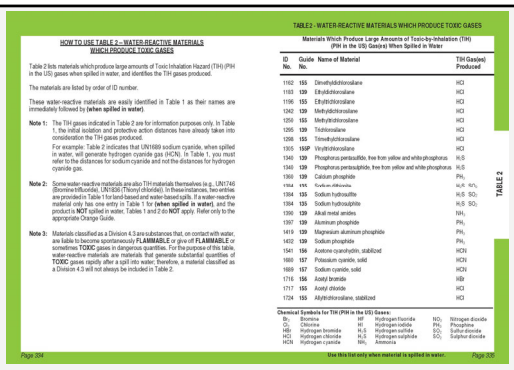


TABLE 2 - WATER-REACTIVE MATERIALS WHICH PRODUCE TOXIC GASES

HOW TO USE TABLE 2 – WATER-REACTIVE MATERIALS WHICH PRODUCE TOXIC GASES

Table 2 lists materials which produce large amounts of Toxic Inhalation Hazard (TIH) (PIH in the US) gases when spilled in water, and identifies the TIH gases produced.

The materials are listed by order of ID number.

These water-reactive materials are easily identified in Table 1 as their names are immediately followed by **(when spilled in water)**.

Note 1: The TIH gases indicated in Table 2 are for information purposes only. In Table 1, the initial isolation and protective action distances have already taken into consideration the TIH gases produced.

For example: Table 2 indicates that UN1689 sodium cyanide, when spilled in water, will generate hydrogen cyanide gas (HCN). In Table 1, you must refer to the distances for sodium cyanide and not the distances for hydrogen cyanide gas.

Note 2: Some water-reactive materials are also TIH materials themselves (e.g., UN1745 (Bromine trifluoride), UN1836 (Thionyl chloride)). In these instances, two entries are provided in Table 1 for land-based and water-based spills. If a water-reactive material only has one entry in Table 1 for **(when spilled in water)**, and the product is **NOT** spilled in water, Tables 1 and 2 do **NOT** apply. Refer only to the appropriate Orange Guide.

Note 3: Materials classified as a Division 4.3 are substances that, on contact with water, are liable to become spontaneously **FLAMMABLE** or give off **FLAMMABLE** or sometimes **TOXIC** gases in dangerous quantities. For the purpose of this table, water-reactive materials are materials that generate substantial quantities of **TOXIC** gases rapidly after a spill into water; therefore, a material classified as a Division 4.3 will not always be included in Table 2.

Materials Which Produce Large Amounts of Toxic-by-Inhalation (TIH) (PIH in the US) Gas(es) When Spilled in Water

ID No.	Guide No.	Name of Material	TIH Gas(es) Produced
1162	155	Dimethyldichlorosilane	HCl
1183	139	Ethyldichlorosilane	HCl
1196	155	Ethyltrichlorosilane	HCl
1242	139	Methyldichlorosilane	HCl
1250	155	Methyltrichlorosilane	HCl
1295	139	Trichlorosilane	HCl
1298	155	Trimethylchlorosilane	HCl
1305	155P	Vinyltrichlorosilane	HCl
1340	139	Phosphorus pentasulfide, free from yellow and white phosphorus	H_2S
1340	139	Phosphorus pentasulphide, free from yellow and white phosphorus	H_2S
1360	139	Calcium phosphide	PH_3
1384	135	Sodium dithionite	H_2S SO_2
1384	135	Sodium hydrosulfite	H_2S SO_2
1390	139	Alkali metal amides	NH_3
1397	139	Aluminum phosphide	PH_3
1419	139	Magnesium aluminum phosphide	PH_3
1432	139	Sodium phosphide	PH_3
1541	156	Acetone cyanohydrin, stabilized	HCN
1680	157	Potassium cyanide, solid	HCN
1689	157	Sodium cyanide, solid	HCN
1716	156	Acetyl bromide	HBr
1717	155	Acetyl chloride	HCl
1724	155	Allyltrichlorosilane, stabilized	HCl

Chemical Symbols for TIH (PIH in the US) Gases:

Br$_2$	Bromine	HF	Hydrogen fluoride	NO$_2$	Nitrogen dioxide
Cl$_2$	Chlorine	HI	Hydrogen iodide	PH$_3$	Phosphine
HBr	Hydrogen bromide	H$_2$S	Hydrogen sulfide	SO$_2$	Sulfur dioxide
HCl	Hydrogen chloride	H$_2$S	Hydrogen sulphide	SO$_2$	Sulphur dioxide
HCN	Hydrogen cyanide	NH$_3$	Ammonia		

Page 334 — Use this list only when material is spilled in water. — Page 335

TABLE 2

THIS IS ONE OF THE BIG FEARS

NOTIFICATION REQUIREMENTS

- Responsible party must make "Mandatory" notifications
  - –To proper authorities
  - –Releases with potential adverse impact
    - Health
    - Safety
    - Environment

NOTIFICATION REQUIREMENTS CALIFORNIA

- "Mandatory" notifications are made immediately as soon as it is safe to do so.
  - **Local 911 — Local dispatch**
  - CUPA/Administering Agency — ???
  - State Warning Center — (800) 852-7550
  - **National Response Center — (800) 424-8802**
    - **If you have a Reportable Quantity (RQ)**
    - **Section 49CFR 172.101 Table 1 lists the RQ**
    - **Some SDS also list the RQ values**

WHERE ELSE WOULD YOU FIND REPORTABLE QUANTITIES (RQ)

- 40 Code of Federal Regulations
- § 302.4 Designation of hazardous substances.
- Table 302.4 - List of Hazardous Substances and Reportable Quantities

- 49 Code of Federal Regulations
- Section 172.101 App A
- Appendix A to §172.101 - List of Hazardous Substances and Reportable Quantities

RESPONSIBILITY FOR NOTIFICATIONS

- Business or Spiller makes mandatory notifications
  - **Your legal responsibly and not the responders**

- Responders:
  - Make these if no one else is around
  - May also call as backup
  - Some departments require them to make notifications also (Highway Patrol in some states)

§ 172.331 - Bulk packagings other than portable tanks, cargo tanks, tank cars and multi-unit tank car tanks. (a) Each person who offers a hazardous material to a motor carrier for transportation in a bulk packaging shall provide the motor carrier with the required identification numbers on placards or plain white square-on-point display configurations, as authorized, or shall affix orange panels containing the required identification numbers to the packaging prior to or at the time the material is offered for transportation, unless the

EXAMPLE US VS INTERNATIONAL

ERG (pages 18-21)

ERG—GOOD BUT LIMITED

- Look up **UN1760**
  - –What is this material?
  - –How did you find it?

ERG—GOOD BUT LIMITED

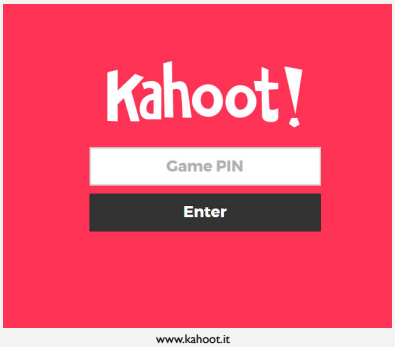
- Look up:

  - –What is this material?
  - –How did you find it?
  - –What Guide page?

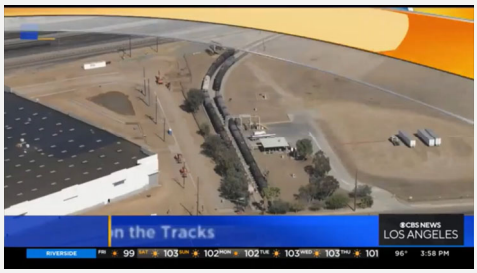
PLACARD LIMITS

- Multiple and subsidiary hazards
  - –More than one placard on the vehicle but only one product?
- "Dangerous" placard meaning
  - –Table 2 commodities
- 454kg or 1001 lb rule
- 1000kg or 2204 lb rules
- Compliance and enforcement

Let's Play a game for prizes regarding Hazard Classes



RECENT INCIDENT NEARBY



Fire crews responded to the leak at 7:41 p.m.
Thursday August 11, 2022

ASKRAIL® FOR FIRST RESPONDERS

Department of Transportation Pipeline and Hazardous Materials Safety Administration
49 CFR Parts 171, 174, and 180
Federal Register: June 24, 2024
Delayed Compliance Date:
For Class I Railroads **June 24, 2025**.
For Class II and III Railroads June 24, 2026

ASSOCIATION OF AMERICAN RAILROADS · RAILINC · AskRail

AskRail

ASKRAIL

"With the push of a button, AskRail equips first responders with accurate, real-time information to plan a swift, safe response to a rail incident. Combined with specialized on-the-ground training, the AskRail app ensures communities have the tools they need to keep people safe."

— AAR President and CEO Ian Jefferies

AskRail

ASKRAIL

AskRail provides immediate access to accurate, real-time information about railcars carrying hazardous materials on a train. AskRail was created as part of an initiative to improve communication of emergency response information to responders during incidents. Railinc developed the application in collaboration with the Class I railroads.

The AskRail application is free and available for Windows desktop at askrail.us. Mobile versions are available on the App Store and Google Play Store.

Through AskRail's easy-to-use interface, emergency responders can:

- Query the contents of a railcar with a simple railcar ID search
- View the make up of the train if the car is on an active train
- View emergency contact information for all Class I railroads
- Access reference resources that can support their incident response
- Access a list of emergency contact phone numbers for all seven Class I freight railroads

AskRail

HOW AND WHEN TO USE

- Upon arriving at a rail accident, an emergency responder should first attempt to locate the train's conductor and get the train consist, a document that describes the make-up of the train. If the conductor and/or train consist is unavailable, the emergency responder can use the AskRail application to query the Equipment ID for a specific railcar to determine its contents.
- The application serves emergency responders who arrive first at the scene of a rail emergency and need critical information about the contents of a railcar.
- It is recommended that emergency responders use AskRail *temporarily* for safety isolation, evacuation, and/or assessment from a distance while securing the proper shipping paper. The train consist or waybill should be secured before offensively approaching the railcar. **The AskRail application should only be utilized by industry-qualified hazmat emergency responders.**

AskRail

HOW IT WORKS

Enter Rail Car Initials and Numbers in the Car Query field.

Use RAIX1102 as pictured as a test car.

To check the contents of a container, enter the Container Number in the search field (do not enter the conveying railcar Equipment ID).

**The letters in a Container Number always end in "U" or "Z".*

AskRail has two security levels:

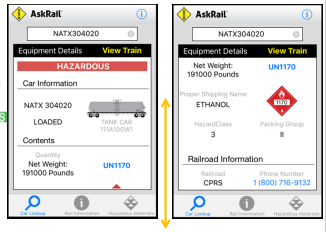
- Single Car Lookup
- Train Consist Lookup

AskRail

QUERY RESULTS (SINGLE CAR)

The query returns the following information:

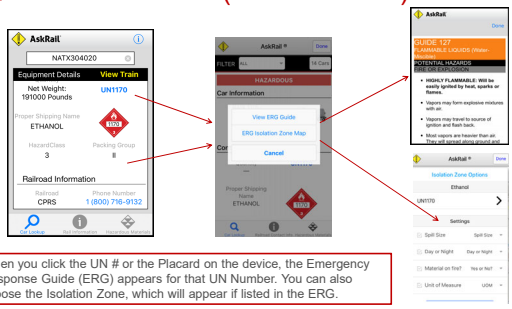
- Loaded or empty status
- If the car is Hazardous–a RED Hazardous Banner appears HAZARDOUS
- Green appears for non-hazardous NON-HAZARDOUS
- United Nations/North America (UN/NA) ID for any located hazardous materials
- Proper shipping name (PSN) for the railcar's contents
- Hazard class for the railcar's contents
- Railroad name
- Railroad's emergency contact information



Scroll up and down

AskRail

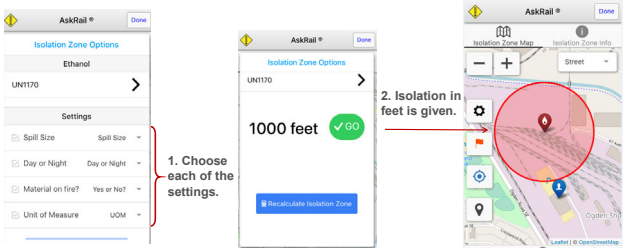
QUERY RESULTS (SINGLE CAR)



When you click the UN # or the Placard on the device, the Emergency Response Guide (ERG) appears for that UN Number. You can also choose the Isolation Zone, which will appear if listed in the ERG.

AskRail

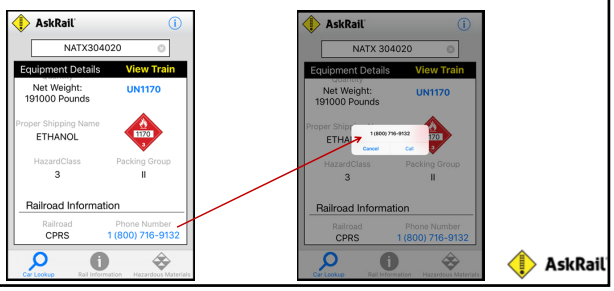
ISOLATION ZONE



AskRail

CLASS I EMERGENCY NUMBERS

To call the emergency number, touch the number (if using a mobile device) or **dial the number** (if using a desktop).



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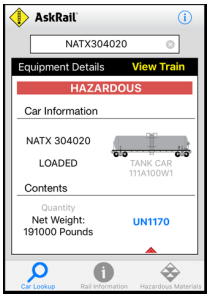
VIEW TRAIN QUERY



The *Train Details* screen displays the contents of the railcar associated with the entered equipment ID and allows you to scroll through a list showing the equipment IDs of each railcar in the consist.

If the equipment ID is red, the railcar contains hazardous material or hazardous residue.

Consist lookup is generally restricted to Department Chiefs, Directors, Chief Officers, Company Officers, and designees of the Chief such as firefighters in charge of a hazmat team (exceptions may apply due to regional differences).

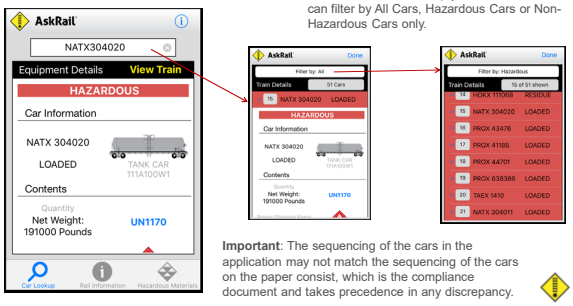
If you have permissions for the consist lookup functionality, a blue **View Train** link appears when you look up railcar contents.

Note that it may take 15 seconds or more for the View Train link to appear.

AskRail

VIEW TRAIN QUERY

The *Train Details* screen also allows you to see whether the railcar is loaded, empty, or contains residue. You can filter by All Cars, Hazardous Cars or Non-Hazardous Cars only.



Important: The sequencing of the cars in the application may not match the sequencing of the cars on the paper consist, which is the compliance document and takes precedence in any discrepancy.

AskRail

REQUEST THE APP

- AskRail is available to anyone, however, sponsor approval is required to access all areas of the application (Car Look-up and Top 125).
- The app can be requested and downloaded through the AskRail.US website which provides links to the App Store, Google Play Store, and a download to the Windows Desktop Application.

REQUEST THE APP

- Additionally, users must request access to the app.
- Authorization is managed by Class 1 railroad sponsors, including BNSF, CN, CPKC, CSX, NS, UP, and Genesee & Wyoming affiliated RRs.
- In addition, railroads can offer the app to known emergency responders along their routes.

Want to see a demo?

HOW TO APPLY

Go to: http://www.askrail.us/

1. Download the app from the Google Play store or the App Store, or download the Windows Desktop Application from the website.
2. Complete the registration process in the app on your device.
3. You will receive an email notification once your registration has been approved.
4. Once you have been approved to use the app, the app will become fully functional and ready for use.

AskRail

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Association of American Railroads
AVP Environment, Hazardous Materials and Climate Change
dsprinkle@aar.org
312.765.3180

LET'S TAKE THE POST TEST
HTTP://TINYURL.COM/SWAPOSTTEST

Do not click on the OPEN bar in the center

Click on the HTTPS: link to go to the pretest

- Enter your student name
- Enter you email
- Enter the Instructors name

- Start the 10 question post-test
- Submit Form when finished


SWA
SUSTAINABLE WORKPLACE ALLIANCE
Any Questions?
Nick Vent
Hazmatvent@gmail.com
619-778-9500
CALIFORNIA
CUPA
FORUM
27th California Unified Program
Annual Training Conference
March 24-27, 2025