Prepared by TRC JUNE 2016

Large Volume/High Concentration Ethanol Incident Response Quick Reference

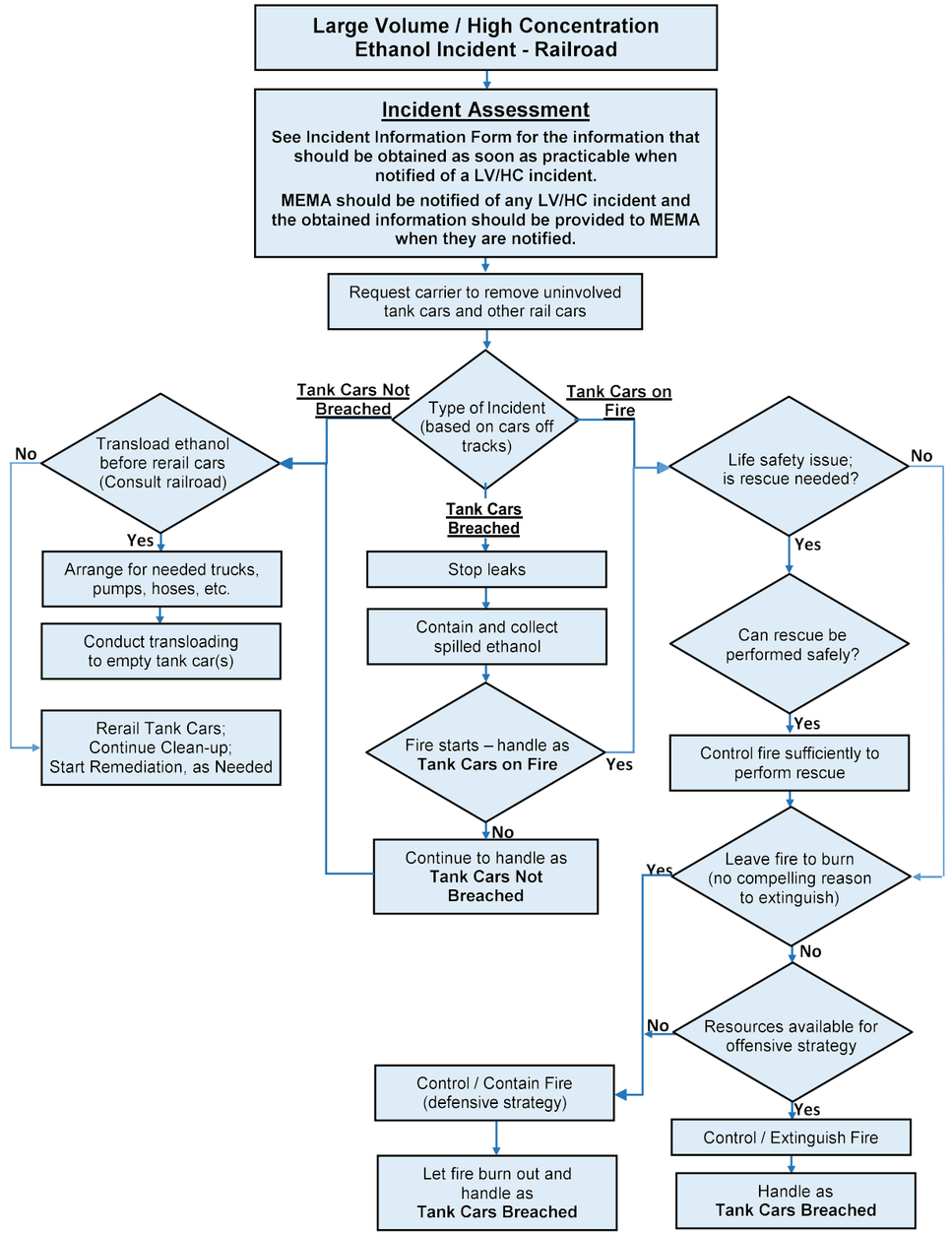
Emergency Contacts for Incident

Critical Information
Ethanol or Denatured Ethanol Incident

- Plan for response effort to last up to 72 to 96 hours.
- Preferred to control and contain a LV/HC ethanol fire and let it burn out. Only attempt fire suppression for life safety (i.e., rescue) and only if it can be done safely.
- There are less than two hours after railroad tank cars breach and fire starts before incident growth expected to make efforts to suppress fire ineffective.
- Placards on shipments: Typ. 1987 (denatured ethanol; 95% to 99% ethanol), 3475 (ethanol/gasoline mixture; ≤ 94% ethanol), 1170 (ethanol; 100% ethanol).
- Large quantities of AR AFFF and huge amounts of water are needed to fight an ethanol fire and AR-AFFF is effective only with a Type II discharge to minimize plunging or submergence.
- 500 gallons of foam concentrate mixed at 3% (mixed with 16,300 gallons of water) can handle a spill about 75 ft by 75 ft (5,600 sq ft; 370 gallons, 6 inches deep). Required foam application rate of 1,100 gpm for 15 minutes.
- In water, the ethanol component will readily mix with water and the denaturant will separate and float on the water surface.
- Ethanol and ethanol mixed with water are good electrical conductors. Electrocution and ignition hazards (e.g., static electricity) may be present.

See the MEMA LV/HC Ethanol Incident Response Planning Guidance for additional information

- Ethanol vapors (vapor density 1.59) heavier than air; vapors ignite easily in air - flammable range: 3.3% to 19%.
- Ethanol burns with a nearly invisible flame and has less visible smoke than burning gasoline or crude oil.
- Radiant heat flux from a burning ethanol fire can be 2 to 5 times greater than radiant heat flux from a gasoline fire.
- Prevent ethanol spills from entering storm water systems, sewers, and waterways (and basements and confined spaces); vapors in confined spaces are explosion hazard.
- Oil-only absorbents do not work for denatured ethanol, use universal absorbents or water absorbing material.
- Contain ethanol on land by diking and/or damming with dirt, sand, plastic sheeting, or portable containment systems. Fire-resistant booms laid on the ground may be used to contain burning ethanol. **Note:** containment booms not effective on water since ethanol does not float.
- The HMRT are trained and equipped to stop leaks and MassDEP technicians are trained and equipped for spill containment and collection, so both agencies may be needed for the incident response.



Notes:

Primary Activities

Primary objective for a LV/HC ethanol incident is life safety; secondary objectives are the protection of property and the environment. To achieve these objectives, the primary response activities include fire control and spill control.

Firefighting

It is preferred to control and contain a LV/HC ethanol fire and let it burn out. Only attempt fire suppression for life safety (i.e., rescue) and only if it can be done safely. Generally, the Incident Commander has less than approximately two hours to implement an effective offensive firefighting strategy; however, do not start an offensive strategy if there are not adequate water, AR-AFFF concentrate, and trained firefighters available for the estimated size and needs of a given incident.

After six to 12 hours, most of the ethanol will have burned, infiltrated into the ground, and/or become sufficiently diluted with water, and offensive tactics to extinguish any remaining fire may be appropriate.

Spill Response

To prevent potential serious environmental impacts and since ethanol is relatively clean burning, control and containment and allowing ethanol to burn off is preferred if it catches fire. Note that receiving permission from the regulatory agencies for in situ burning of released ethanol to re-ignite a fire after it has been suppressed is not expected to be granted in a timely manner.

Secondary Activities

Security - Establishing and maintain a perimeter, crowd control, and traffic control.

Communication - Primary communication between the Incident Command Post, the local EMAs, and SEOC is via radio, telephone, and e-mail. It is imperative that these systems be activated and/or installed as soon as practicable after the Incident Command Post (ICP) has been established.

Public Information - Warnings and on-going service announcements and/or information sharing, will be coordinated. In addition, the UC must approve information disseminated regarding the specific incident, including press releases and media interviews.

Evacuation/Shelter-in-Place - When a LV/HC ethanol incident impacts or has the ability to impact the nearby population, a shelter-in-place or evacuation decision must be made.

Clean-up, Remediation, and Recovery - Once the response phase of a LV/HC ethanol release is complete, recovery actions and remediation activities will begin. Depending on the incident, the recovery action process is usually overseen by MassDEP.

Ethanol Spill Response Considerations

- Response effort for a LV/HC ethanol incident is expected to last up to 72 to 96 hours before the hazards from the incident are sufficiently reduced and the incident can enter remediation and recovery phases.
- Ethanol and denaturant (i.e., gasoline) will separate on contact with water (surface water, groundwater, or firefighting water); ethanol component will readily mix with water and the denaturant will typically separate and float on the water surface.
- Ethanol and ethanol fuel blends have different properties than gasoline and require different spill response techniques and equipment than gasoline or diesel fuel.
- Leaks should be stopped (e.g., valves closed, leaks plugged) if this can be done safely.
- Surface and underground (well) water sources (drinking water, process water, cooling water, aquaculture), can be severely impacted by an ethanol release. Rapid notification to shut down these water withdrawls is critical to protecting these systems' infrastructure.
- Spills should be prevented from entering storm water systems, sewers and waterways, as well as basements and confined spaces.
- Ethanol in storm water systems or sewers can damage wastewater treatment plants because the ethanol kills the bacteria used in wastewater treatment.
- Ethanol can be contained by diking and/or damming with dirt, sand, or portable containment systems.
- Ethanol readily mixes with water and once it enters waterways it is not easily recoverable by emergency responders.
- Ethanol in surface water bodies may cause significant fish kills and other damage by direct contact and/or depleting dissolved oxygen fish and other water life need.
- Aeration of water bodies may be effective in increasing the dissolved oxygen in the water and increasing thee biological degradation of ethanol.
- Most vacuum trucks will not work to recover ethanol, unless they have special filters designed for polar solvents.
- Absorb with water-absorbent materials (cat litter, pads, booms, etc.) – universal absorbents may be effective (check with manufacturer); "oil only" absorbents, pads, and booms will only absorb the gasoline component, but not ethanol.
- Use clean non-sparking tools to collect absorbed material.
- Ethanol may harm water supplies used for drinking, process, aquaculture, or cooling water, as well as WWTP, so warn owners/operators of water intakes and WWTP that may be threatened.

Ethanol Firefighting Considerations

- Ethanol and ethanol fuel blends have different properties than gasoline and require different firefighting techniques and equipment than gasoline or other hydrocarbons.
- Under fire conditions, high concentration ethanol has less visible smoke than a gasoline fire and ethanol burns with a virtually invisible flame after the denaturant (typically gasoline) burns off, so thermal imaging devices or other means (e.g., straw broom held above suspected areas) should be used to detect areas that may still be burning.
- Incident heat flux from an ethanol fire can be 2 to 5 times greater than the incident heat flux from a gasoline fire.
- Only AR-AFFF and copious amounts of water are effective fire suppression techniques for fire involving ethanol.
- 500 gallons of foam concentrate mixed at 3% (mixed with 16,300 gallons of water) can handle a spill about 75 ft by 75 ft (5,600 sq ft; 370 gallons, 6 inches deep). Required foam application rate of 1,100 gpm for 15 minutes.
- AR-AFFF appears to be effective only when using a Type II discharge scenario (i.e., fixed discharge applied to a vertical surface so as to provide a more gentle application that minimizes plunging or submergence).
- Foam does not work if material is too hot, so if foam is to be applied to an ethanol fire, surfaces may need to be cooled first.
- Massive quantities of foam concentrate and water, large application devices, and well-trained personnel are required to handle a large volume ethanol fire – do not expect to have adequate resources to fight a rail car fire.
- Although available AR-AFFF foam and other resources may not be sufficient to put out a LV/HC ethanol fire, foam may can be used in other ways to control an incident. For example, if ethanol enters a storm drain or sewer, AR-AFFF foam can be used to suppress vapors in the lines and minimize the potential for igniting the vapors and causing additional damage.
- Large foam caches of AR-AFFF strategically located and readily transportable in large volume containers are critical to successful fire control and extinguishment.
- In general, do not expect a local airport Aircraft Rescue and Firefighting vehicle to effectively fight an ethanol fire; the FAA requires airport firefighting vehicles to carry straight AFFF for aviation fuel fires, not AR-AFFF. Note that the Massachusetts Port Authority Fire Department has one fire engine (Engine 5) and a foam trailer (Foam Trailer 1) that have AR-AFFF foam concentrate and these units are located at Boston Logan International

Shipping Name / Description	Placard
Denatured alcohol; alcohols not otherwise specified; 95% to 99% ethanol	
Ethanol and gasoline mixture, with more than 10% ethanol (typically up to 94% ethanol)	
Ethanol or ethanol solution (typically 100% ethanol that has not been denatured)	
Alcoholic beverages (ethanol for consumption)	

Notes: