Overview

Damage to tank cars occurs infrequently, but when it does occur, personnel must respond appropriately. This is the preferred priority for handling damaged tank cars:

1. Make the necessary repairs and forward the car to its destination.
2. Move the car a short distance to a fixed loading/unloading facility for unloading.
3. Conduct a field transfer — tank car to tank car.
4. Conduct a field transfer — tank car to cargo tank or intermodal tank container.
5. Provide on-site disposal by flaring, neutralizing, or other treatment method.
6. Hot tap the tank car to facilitate the transfer, flare, or other offloading of the contents.
7. Vent and burn the contents on site.

Handle damaged tank cars during daylight.

Verify your response options with the shipper, the carrier, or other tank car specialist. Also, verify your response options with the environmental authority.
### Table 7-1
Handling Tank Car Problems

<table>
<thead>
<tr>
<th>Problem</th>
<th>Objectives</th>
<th>Actions</th>
<th>Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Leaking fittings</td>
<td>• Stop release;</td>
<td>• Close</td>
<td></td>
</tr>
<tr>
<td>- Not secure</td>
<td>forward to</td>
<td>• Tighten</td>
<td></td>
</tr>
<tr>
<td>- Wear</td>
<td>destination</td>
<td>• Replace part</td>
<td></td>
</tr>
<tr>
<td>- Damage</td>
<td>- Stop release;</td>
<td>• Repair/Replace</td>
<td></td>
</tr>
<tr>
<td></td>
<td>obtain movement</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>approval;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>forward for</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>further action</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Overloaded tank</td>
<td>• Reduce load;</td>
<td>• Product removal</td>
<td>• Transfer</td>
</tr>
<tr>
<td></td>
<td>forward to</td>
<td>- Fixed facility</td>
<td></td>
</tr>
<tr>
<td></td>
<td>destination</td>
<td>- Field</td>
<td></td>
</tr>
<tr>
<td>• Tank Damage or</td>
<td>• Off-load; forward</td>
<td>• Product removal</td>
<td>• Transfer</td>
</tr>
<tr>
<td>car structure damage</td>
<td>for further action</td>
<td>- Fixed facility</td>
<td>• Flare</td>
</tr>
<tr>
<td></td>
<td>- Field</td>
<td></td>
<td>• Vent</td>
</tr>
<tr>
<td></td>
<td>• Reduce internal</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>pressure</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Gain access to product</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Hot tap</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Cold tap</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Section 1: Methods for Plugging and Patching Damaged Tank Cars

Overview

The purpose of plugging, patching, or sealing is to reduce or stop the flow of a leaking material at the point of its release from the container. This activity limits the size of the release.

It is possible to contain some leaks temporarily by patching. The effectiveness of patching depends on the position and condition of the leaking container. In special situations, some plugs are useful on pressurized containers. As a general rule, however, use plugs, patches, and seals only in cases involving little or no pressure.

Patches, plugs, and seals are relatively simple to apply, but take care to ensure that the patching material will not deteriorate rapidly when it contacts the leaking material.

Gasket material must be the proper size, well constructed, and able to withstand contact with the leaking material. You also must consider the container type and its construction. Insulated containers may disguise the actual leak location, or the insulation material may not allow a good fit for the patch or plug. High pressure containers may blow out typical plugging devices.

Other considerations include the location and type of leak, the way you will secure the patch or plug, and the final disposition of the container. For example, jagged tears may be more difficult to plug than gouges or punctures. Leaks along seams frequently require more effort to get a good seal. In many cases, you must clean the area around the leak to remove any paint, rust, grease, or other foreign materials that might interfere with the patch’s or plug’s holding ability.

Reference

Plugging and Patching Materials

These materials may help control leaks in damaged tank cars. Personal safety is paramount. Appropriate personal protective equipment is a must when the hazards of the material warrant it.

**Wood**

Hammer wooden cones and wedges into leaking containers (drums, tanks, pipes, etc.). Soft woods, in particular, are easy to saw or turn on a lathe, and they conform well to irregular shapes. Soft wood may absorb liquid and swell, which enhances its capacity to seal a leak. Wedges or cedar shingles apply especially well to splits, gouges, rips, and tears.

Fasten rigid plywood sheets over a damaged area with “T” bolts, toggle/molly/butterfly bolts, straps, or mechanical bracing and wedging. To minimize leakage between the plywood and the container, use a gasket of rubber or plastic sheeting, putty, butyl rubber, caulk, lead wood, oakum, or chemical protective garment material (especially from slightly used or damaged garments).

**Metal**

Use mechanical methods (“T” bolts, toggle bolts, bracing, strapping, etc.) to fasten various sizes of steel and aluminum sheets over a damaged area. The gasket material between the metal and the container generally provides more positive sealing.

**Inflatable or Expandable Plugs/Bags**

Insert reinforced rubber and coated fabric plugs into an opening and inflate them with gas (air, nitrogen, carbon dioxide) or water to form a seal. Secure leak-sealing bags with straps, chains, cables, fire hoses, or bands to seal a leaking container.

**Fabric**

Over leaks, position fabrics, such as neoprene-coated nylon or other chemical protective garment material that may be compatible with the contents, and hold them in place with bands, chains, straps, etc. You may need wood, plastic, or metal reinforcements.

**Formed Plugs**

Inject polymeric foam (e.g., polyurethane or polyethylene), epoxy putty, or quick-setting hydraulic cement into a rigid concave form through a tubular handle, or trowel it onto the form and place it against the damaged area. Once the patching material hardens, you may remove the support form.

**Caulking**

Spread, trowel, or hammer epoxy, plastic steel or aluminum, lead wood, clay-polymer mixtures, and oakum into cracks and small holes. Rapid-curing materials are available.

**Foam Plugs**

Open a package of compressed, vacuum-packed polyethylene, polyurethane, or low-density neoprene rubber foam (all closed-cell), allowing the foam to expand and fill the leak area.

**Magnetic Patches**

Strap magnetic sheets (rubber-bonded barium ferrite composite with or without adhesive), backed by a thin sheet of steel foil, over the damaged area.
**Mechanical Patches**

Mechanically hold neoprene stoppers, rubber balls, and plywood or spring steel sheets with neoprene gaskets in or on the damaged area. Toggle and “T” bolts, washers, and wing nuts are useful attachments.

**Adhesive Patches**

Adhesive patches sometimes work but usually require tedious surface preparation. Tape (duct, lead, aluminum, or stainless steel) is useful for holding a wooden or rubber plug before applying epoxy to create a relatively permanent repair.

**Bladder Wraps**

Use Velcro, fire hoses, or banding/strapping material to secure coated fabric or reinforced rubber pipe patches (similar to Dresser clamps) with integral inflation bladders around a pipe or small round container.

**Clamp Pipe Coupling**

Use a split, sleeve-type coupling (similar to a Dresser or “G” clamp) with a bolted flange assembly to cover a rusted or damaged pipe section.

**Pinch Pipe**

Use a “C” shaped clamp device with hydraulically or explosively operated ram to flatten a section of pipe to pinch off the fluid flow.

**Other**

Numerous other plugs and patches, fashioned with items available at the scene, may serve as temporary measures to contain low vapor pressure leaks. However, you must verify that the type of plug or patch you intend to use will not react dangerously with the material(s) with which it will come in contact.
Section 2: Methods for Removing Product

Overview

Methods for removing the contents from a damaged or overloaded tank car include:

- Transfer
- Flaring
- Venting (method of reducing the pressure in a tank car)
- Vent and burn.

This chapter presents hot tap and “cold” tap as techniques for gaining access to a tank’s contents when damage to valves and fittings precludes access.

Note: All of these methods are outside the legitimate responsibility of the local emergency responder. However, oversight of their planning and implementation is within the responsibility of local emergency response agencies. Remember, protecting yourself and the community are your primary responsibilities.

References


Transfers

A transfer is the movement of the contents of a damaged or overloaded tank car into a receiving tank (e.g., a tank car, cargo tank, intermodal tank, or fixed tank).

In rail transportation, transfers may be used when:

- the tank car tank itself is sound, but, due to bolster or other mechanical damage, the car cannot be safely mounted on its trucks and re-railed
- the site conditions prevent re-railing the damaged tank car (e.g., the terrain does not permit use of cranes or other re-railing equipment)
- the tank car tank is overloaded
- the damage to leaking valves and fittings cannot be repaired
- the tank car tank has been damaged to the extent that it cannot be safely re-railed and moved to an appropriate unloading point.

Potential Risks

These risks accompany a transfer:

- failure of the tank or transfer equipment could expose people, property, and the environment to the tank car’s contents
- failure of the damaged tank car tank may occur, due to pressure rise from use of compressor or compressed gas
- contamination of the damaged car’s contents with residues in the transfer equipment or receiving tanks could result in an undesired reaction.

Preferred Conditions

These optimal conditions should exist or be met (though they may not be practical in all cases) before performing a transfer:

- suitable systems are in place for monitoring for exposures and for protecting persons and property in the event of an accidental release during the transfer
- suitable transfer equipment is available
- personnel experienced in transfer operations are available
- a receiving tank(s) of the proper specification is available with sufficient capacity to receive the contents of the damaged tank car [any residue in the receiving tank(s) must be compatible with those contents]
- the liquid and vapor valves are accessible and operable, or the use of a hot or cold tap is possible
- the tank car’s position will allow the transfer (e.g., check valves have not seated, or, if they have, tools are available to unseat them)
- a delayed rupture is not likely
- the tank is not exposed to fire.

Safety Precautions

These safety precautions must be taken when performing a transfer:

- secure the car(s) from movement — tighten the hand brakes and chock the wheels, if necessary
- place blue flags, if required
- limit site access to required personnel only
- perform transfer using only qualified personnel
- check to see that the transfer equipment is clean and appropriate for the material being transferred
- clean and wrap all pipe threads with pipe joint tape before making connections
- clean all hose connections before joining them, replacing “O” rings if necessary
- use an emergency shut-off system (“emergency shut-off” and “back check valves”) to either automatically or manually shut down the transfer in case of an unintentional release which a hose break or other malfunction could cause.

Note: The use of the emergency shut-off system reduces the need for personnel on the tank during the transfer.
General Procedures

1. Plan the transfer operation.
   a. Obtain a compatible (clean and empty) receiving tank of sufficient capacity.
   b. Check the receiving tank for damage.
   c. Identify the transfer method to be used.
   d. Develop a list of required equipment for the selected transfer method.
   e. Prepare a plan for setting up, implementing, and shutting down the transfer operation.
   f. Prepare a site safety plan.
   g. Obtain the required transfer equipment.

2. Set up the transfer operation.
   a. Hold a safety briefing.
   b. Position the receiving tank and transfer equipment.
   c. Connect the fittings.
   d. Attach the required hoses and/or piping.
   e. Set up and activate the emergency shut-off system, if used.
   f. Purge the liquid and vapor hoses and test for leaks.

3. Implement the transfer operation.
   a. Adjust the pressure differential, if necessary.
   b. Start the flow of material from the damaged tank car.
   c. Monitor the operation.

4. Shut down the transfer operation.
   a. Stop the flow of material.
   b. Purge the hoses and/or piping.
   c. Disassemble and decontaminate the transfer equipment.
   d. Secure the cars.

5. Determine the disposition of the cars, and prepare them for transportation (hazard communication and readiness for transportation).

Transfer Methods

Typically, the basic equipment used to move the contents from a damaged or overloaded tank car distinguishes transfers in the field. A gas or liquid transfer uses one of these methods:

- using a vapor compressor
- using a vapor compressor and a liquid pump
- using compressed air or an inert gas
- using a liquid pump
- using vapor pressure (with or without flaring).

- use personal protective equipment for toxic materials
- monitor the site with vapor monitoring equipment
- in transferring flammable materials using an open system, ground and bond the car. Note: NFPA 77, Recommended Practice on Static Electricity, does not require protective measures (e.g., grounding and bonding) when loading and unloading tank cars through a closed system.
- control ignition sources within 25 feet of operations:
  - do not permit smoking on site
  - eliminate or shut off electrical equipment that is not intrinsically safe
  - shut off any internal combustion engines that are not intrinsically safe.

Transfer Method Selection Chart

<table>
<thead>
<tr>
<th>Transfer Method</th>
<th>Use of transfer method when an increase in internal pressure is:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vapor compressor</td>
<td>Acceptable</td>
</tr>
<tr>
<td>Vapor compressor and liquid pump</td>
<td>Acceptable</td>
</tr>
<tr>
<td>Compressed (inert) gas</td>
<td>Acceptable</td>
</tr>
<tr>
<td>Liquid pump</td>
<td>Acceptable</td>
</tr>
<tr>
<td>Internal vapor pressure (with or without flaring)</td>
<td>Acceptable</td>
</tr>
</tbody>
</table>

* Unacceptable - heavily damaged tank car tanks
Gas Transfer Using a Vapor Compressor

This method for removing product uses a vapor compressor to move the contents of a damaged or overloaded tank car into a receiving tank (e.g., a tank car, cargo tank, or portable tank).

The vapor compressor pulls the vapors from the receiving tank, compresses them, and forces them into the damaged tank car. The higher pressure in the damaged tank car pushes the liquefied gas into the receiving tank.

Using the vapor compressor causes a pressure increase in the damaged tank car. Use this transfer method only when an increase in pressure in the damaged tank car is acceptable.

![Diagram of a gas transfer using a vapor compressor.](image-url)
Gas Transfer Using a Vapor Compressor and a Liquid Pump

This method for removing product uses a vapor compressor and a liquid pump to move the contents of a damaged or overloaded tank car into a receiving tank (e.g., a tank car, cargo tank, or portable tank). The vapor compressor accelerates the rate of transfer by withdrawing vapors from the receiving tank, compressing them, and forcing them into the damaged tank car. The higher pressure in the damaged tank car pushes the liquefied gas into the pump.

Using the vapor compressor causes a pressure increase in the damaged tank car. Use this transfer method *only* when an increase in pressure in the damaged tank car is acceptable. This method is justified when the receiving tank is a greater distance from the damaged or overloaded tank car.

**Legend**

1-Liquid Valve  
2-Vapor Valve  
3-Sample Line  
4-Thermometer Well  
5-Gauging device  
6-Safety relief valve

**Figure 7-2.2: Diagram of a gas transfer using a vapor compressor and a liquid pump.**


**Gas Transfer Using a Compressed Gas (Inert Gas)**

This method for removing product uses a compressed gas (e.g., nitrogen or carbon dioxide) to move the contents of a damaged or overloaded tank car into a receiving tank (e.g., a tank car, cargo tank, or portable tank). The compressed gas creates a positive pressure differential in the damaged tank car that pushes the liquid into the receiving tank. Vapor from the receiving tank may have to be vented into the atmosphere or scrubbed.

Using compressed gas causes a pressure increase in the damaged tank car. Use this transfer method *only* when an increase in pressure in the damaged tank car is acceptable. Check with the shipper to determine the compatibility of the compressed gas.

---

**Figure 7-2.3: Diagram of a gas transfer using compressed gas.**

Legend

1-Liquid Valve  
2-Vapor Valve  
3-Sample Line  
4-Thermometer Well  
5-Gauging device  
6-Safety relief valve

---
Gas Transfer Using a Liquid Pump

This method for removing product uses a liquid pump to move the contents of a damaged or overloaded tank car into a receiving tank (e.g., a tank car, cargo tank, or portable tank). The material in the damaged or overloaded tank car is then pumped into the receiving tank.

Using a liquid pump does not increase the pressure in the damaged tank car. However, using another means of creating positive pressure differential may cause a pressure increase.

---

**Figure 7-2.4: Diagram of a gas transfer using a liquid pump.**

**Legend**

1. Liquid Valve
2. Vapor Valve
3. Sample Line
4. Thermometer Well
5. Gauging device
6. Safety relief valve
Gas Transfer Using Product Vapor Pressure with or without Flaring

This method for removing product uses the material’s own vapor pressure to move the contents of a damaged or overloaded tank car into a receiving tank (e.g., a tank car, cargo tank, or portable tank). In addition, a vapor flare maintains the necessary positive pressure differential between the damaged or overloaded tank car and the receiving tank, by burning off vapors in the receiving tank at the outlet of a flare pipe (see the section on Vapor Flaring). The pressure in the receiving tank is kept as low as possible.

![Diagram of gas transfer using product vapor pressure and flaring.](image)

**Legend**

1-Liquid Valve  
2-Vapor Valve  
3-Sample Line  
4-Thermometer Well  
5-Gauging device  
6-Safety relief valve

**Figure 7-2.5:** Diagram of gas transfer using product vapor pressure and flaring.
**Liquid Transfer Using a Liquid Pump**

This method for removing product uses a liquid pump to move the contents of a damaged or overloaded tank car into a receiving tank (e.g., a tank car, car-go tank, or portable tank). Gravity, an inert gas, a vacuum (e.g., vacuum truck), or any combination thereof may supplement the liquid pump.

*Figure 7-2.6: Diagram of liquid transfer using a pump.*
Liquid Transfer Using a Compressed Gas

This method for removing product uses a compressed gas (e.g., nitrogen or carbon dioxide) to move the contents of a damaged tank car to a receiving tank (e.g., a tank car, cargo tank, or intermodal tank). The compressed gas creates a pressure differential and pushes the liquid into the receiving tank. Vapor from the receiving tank may require scrubbing or venting.

Using the compressed gas will result in a pressure increase in the damaged tank car. Use this transfer method only when an increase in pressure in the damaged tank car is acceptable.

Figure 7-2.7: Diagram of liquid transfer using a compressed gas.
Flaring

Flaring is the controlled release and disposal of flammable materials by burning them from the outlet of a flare pipe (horizontal or vertical). It reduces the pressure or disposes of the residual vapors in a damaged or overloaded tank car.

Railroads use flaring for three purposes:
- to reduce the pressure inside a tank car
- to dispose of vapors remaining in a tank car during or after transfer of the liquid
- to burn off liquid when transfer is impractical.

Flaring also may help expedite recovery operations or function as an interim method until a transfer can begin.

Potential Risks

These risks accompany flaring:
- failure of the tank or flaring equipment could expose people, property, and the environment to the contents of the damaged tank car
- released vapors may ignite if the flare is extinguished without shutting off the flow of the product
- heat which the flare generates may cause an improperly shielded flare hose to fail, resulting in a product discharge and possible fire
- heat which the flare generates may cause a fire — for liquids, this fire may be difficult to control
- products of combustion could be harmful.

Preferred Conditions

Exercise extreme care in a flaring operation, and begin it only after consultation with the shipper, carrier, or other tank car specialist. These conditions are preferred for flaring:

- suitable systems are in place for protecting persons and property in the event of an accidental release during the transfer
- suitable flaring equipment is available
- personnel experienced in flaring are available
- the liquid and vapor valves are accessible and operable, or the use of a hot or cold tap is possible
- the tank car is in a position that allows the flaring (e.g., check that the valves have not seated or, if they have, that tools are available to unseat the valves)
- the tank is not exposed to fire
- a delayed rupture is not likely.
Safety Precautions
Take these safety precautions when performing vapor or liquid flaring:
- secure the car from movement — chock wheels and tighten hand brakes
- place blue flags, if required
- limit site access to required personnel only
- perform flaring using only qualified personnel
- use appropriate personal protective equipment
- monitor the site with vapor monitoring equipment
- ground and bond the car
- control ignition sources within 15 feet of operations:
  - do not permit smoking on site
  - eliminate or shut off electrical equipment that is not intrinsically safe
  - shut off any internal combustion engines that are not intrinsically safe.
- use an emergency shut-off system (“Snappy Joe” and “back check valves”) to either automatically or manually shut down the flaring operation in case of an unintentional release caused by a hose break or other malfunction
- suspend all other work during flaring operations as necessary
- protect the tank and hoses from the heat which flaring generates.

General Procedures
1. Plan flaring operation.
   a. Identify the required equipment for the flaring operation.
   b. Prepare a plan for locating, setting up, implementing, and shutting down the flaring operation.
   c. Arrange for appropriate fire protection.
2. Set up the flaring operation.
   a. Obtain the required equipment.
   b. Hold a safety briefing.
   c. Set up the equipment on top of the tank car.
   d. Clear the area of vegetation and other combustible materials.
   e. Dig a pit for a liquid flaring operation.
   f. Position the flare stand or flare pipe upwind or crosswind:
      - flare stand for vapor - 150-200 feet or
      - flare pipe for liquid - 200-300 feet.
   g. Attach the flaring lines (hose and/or pipe).
   h. Test for leaks.
   i. Set up the ignitor.
   j. Protect the flaring operation from radiant heat.
3. Implement the flaring operation.
   a. Light the ignitor line.
   b. Start the flow of material from the damaged tank car.
   c. Monitor the flaring activities.
   d. Protect the exposed flare piping as necessary.
4. Shut down the flaring operation.
   a. Stop the flow of material.
   b. Dismantle and clean the flaring equipment as necessary.
Flaring Vapors

Vapor flaring is the burning of vapors of a liquefied compressed gas at the outlet of a vertical flare pipe as the gas exits it.

Figure 7-2.8: Diagram of a flare stand.

Figure 7-2.9: Diagram of a vapor flaring operation.
**Flaring Liquids**

Liquid flaring is the vaporizing of a liquid product and burning of the vapors at the end of a horizontal flare pipe. A pit contains any product that is not completely burned.

![Diagram of liquid flaring operation setup for a pressure tank car](image1)

**Legend**
1. Liquid Valve
2. Vapor Valve
3. Sample Line
4. Thermometer Well
5. Gauging device
6. Safety relief valve

![Diagram of liquid flaring operation setup for a non-pressure tank car](image2)

*Figure 7-2.10: Diagram of liquid flaring operation setup for a pressure tank car.*

*Figure 7-2.11: Diagram of liquid flaring operation setup for a non-pressure tank car.*
SECTION 2: METHODS FOR REMOVING PRODUCT

Venting

Overview
Venting is the process of reducing the pressure in a tank by releasing liquefied compressed gas vapors into the atmosphere. This release can be direct or, in case of toxic products, indirect, through an appropriate treatment system. Typically, venting is used with nonflammable gases.

Exercise extreme care in a venting operation, and begin it only after consulting with the shipper, carrier, or other tank car specialist.

Potential Risks
This risk accompanies venting:
• an improperly controlled rate of venting could expose people, property, and the environment to the contents of the damaged tank car.

Preferred Conditions
These optimal conditions should exist or be met (though they may not be practical in all cases) before performing venting:
• suitable systems are in place for protecting persons and property in the event of an accidental release during the venting
• the tank car is in a position that allows the venting (e.g., check that the valves have not seated or, if they have, that tools are available to unseat them)
• personnel experienced in venting are available
• the rate of venting can be controlled to minimize potential exposure to the local population, property, and the environment
• an appropriate treatment system for toxic vapors is available
• the tank is not exposed to fire.

Safety Precautions
Take these safety precautions when venting:
• place blue flags, if required, and secure the car from movement — chock the wheels and tighten the hand brakes
• limit site access to required personnel only
• perform venting using only qualified personnel
• use personal protective equipment
• monitor the site with vapor monitoring equipment in order to adjust the venting rate.
General Procedures

1. Plan the venting operation.
   a. Identify the required equipment for venting.
   b. Prepare a plan for locating, setting up, implementing, and shutting down the venting operation.
   c. Arrange for appropriate fire protection.

2. Set up the venting operation.
   a. Obtain the required equipment.
   b. Hold a safety briefing.
   c. Set up the equipment on top of the tank car.
   d. Set up the scrubber system for toxic vapors.
   e. Test for leaks.

3. Implement the venting operation.
   a. Start the flow of material from the damaged tank car.
   b. Monitor the airborne concentrations of product and adjust the venting rate as required.

4. Shut down the venting operation.
   a. Stop the flow of material.
   b. Dismantle and clean the venting equipment as necessary.

![Figure 7-2.12: Diagram of a venting operation.](image-url)
Vent and Burn

Overview
Vent and burn is the last resort. Only experienced personnel may perform it.

These circumstances may prompt the decision to perform a vent and burn operation:
- The tank car tank has been damaged to the extent that it cannot be re-railed safely and moved to an appropriate unloading point; and transfer, flaring, or venting are impractical, because the car cannot be repositioned safely to provide access to the required valves.
- The involved tank car was exposed to intense fire, which has been extinguished but which may have either elevated the temperature of the product, resulting in a dangerous increase in vapor pressure, or weakened the tank itself.

Vent and burn is another control operation considered outside the legitimate responsibility of the local emergency responder. However, oversight of vent and burn operations is the responsibility of local emergency response agencies.

Inherent Risks
These risks accompany vent and burn operations:
- if the vent and burn operation fails, a violent rupture of the tank may occur; the product may spread over a wide area on the ground or release into the atmosphere as unburned vapors, rather than transfer to a pit or flare from the car as intended
- failure of the vent and burn operation could expose people, property, and the environment to the contents of the damaged tank car.

Preferred Conditions
These optimal conditions should exist or be met (though they may not be practical in all cases) before performing a vent and burn operation:
- precautions have been taken to protect the local population
- the product is a flammable compressed gas, flammable liquid, or combustible liquid

Figure 7-2.13: Diagram of placement of charges on a tank car in preparation for vent and burn.
Preferred Conditions  (continued)

- the operation will not affect other cars adversely, especially those containing hazardous materials
- the required explosives and equipment are available
- personnel who are trained in vent and burn operations are available to perform the operation
- the environmental impact of the operation has been considered.

Safety Precautions

Take these safety precautions during vent and burn operations:

- evacuate on the basis of possible violent rupture, including fragments from the car, or toxic vapor cloud
- have an expert select and place charges
- provide air monitoring to determine if the evacuation area needs expanding
- allow only those personnel required to set charges to be on site when the charges are set
- have the FAA impose air traffic restrictions over the site
- have fire fighting capability on standby at edge of the evacuation zone; in forested or grassland areas, this may include aerial fire fighting forces
- ensure close coordination and liaison among all parties.

Figure 7-2.14: Diagram of firing first charge in vent and burn operation.

Figure 7-2.15: Diagram of firing second charge in vent and burn operation.
Hot and Cold Tapping

Overview

The hot tap is a technique for providing access to the contents of a tank car when damage to the valves and fittings precludes access. After the hot tap, transfer, flaring, or venting can occur.

Hot tapping involves welding a threaded nozzle into an undamaged section of the tank that is in contact with the liquid. The operator attaches a liquid valve to the nozzle, then drills a hole through the tank with a special drilling machine. Seals on the hot tapping (drilling) machine prevent loss of product during the drilling. Liquid hoses or pipe can attach to the valve outlet.

The cold tap is similar to hot tapping except that the threaded nozzle attaches to the tank without welding, by strapping the nozzle plate onto the tank.

Potential Risks

These risks accompany hot tapping:

- a failure of the tank, installed valve, or nozzle could expose people, property, and the environment to the contents of the damaged tank car
- the heat applied to the tank during welding could cause a chemical reaction inside the tank, leading to a tank rupture or explosion
- if the hot tap is performed mistakenly in the vapor space of the tank, the tank steel may overheat, weakening it and resulting in catastrophic failure
- the hot tap produces thermal stress in the tank steel; the magnitude of this stress depends on the welding technique
- performing a hot tap takes about 2 hours; after the hot tap is done, the response crew still must implement the selected unloading method (transfer, flaring, or venting); this increases the time during which responders are near the tank
- metal shavings from the hot tap could lodge in the control valve attached to the nozzle; the shavings could prevent the valve from closing completely, causing loss of product when the hot tap machine is removed.
**Preferred Conditions**

These optimal conditions should exist or be met (though they may not be practical in all cases) before performing a hot tap:

- suitable systems are in place for protecting persons and property in the event of an accidental release during the transfer
- the lading is not one of these products:
  - cryogenic liquids
  - ethylene
  - ethylene oxide
  - propylene oxide
  - elemental sulphur
  - chlorine
  - bromine
  - hydrocarbons in stainless steel tanks
  - sulfuric acid
  - hydrochloric acid
  - nitric acid
- the lading in the car can withstand the heat from the welding without undergoing chemical reactions
- the required equipment, including for removing the tank jacket and insulation (if present), is available
- the tank has an appropriate, undamaged section in contact with the liquid for welding the nozzle
- an ASME certified welder is available (6G position)
- the tank is not exposed to fire
- the area is free of flammable vapors.

**Safety Precautions**

Take these safety precautions for hot tap operations:

- ensure that nonessential personnel are away from the area during welding and hot tap operations
- allow only qualified personnel to perform hot tap
- perform a pressure test with nitrogen before starting the drilling process, to check for leaks
- control ignition sources
- practice welds.

**General Procedures**

1. Plan the hot tap operation.
   a. Identify the required equipment.
   b. Prepare a plan for locating, setting up, implementing, and shutting down the hot tap.
   c. Arrange for appropriate fire protection.

2. Set up the hot tap operation.
   a. Obtain the required equipment.
   b. Hold a safety briefing.
   c. Make practice welds.

3. Implement the hot tap operation.
   a. Weld the nozzle to tank.
   b. Attach the liquid valve to the nozzle.
   c. Attach the hot tap machine to the liquid valve.
   d. Check for leaks.
   e. Drill the tank.
   f. Withdraw the hot tap machine.
   g. Proceed with transfer, flaring, or venting.