Review of 2012 NFPA 407 Aircraft Fuel Servicing Standards for Fueling Agent Personnel

Federal Aviation Administration

Mike Mullen
Lead Airport Certification Inspector
Airports Division, Central Region
Federal Aviation Administration
January 2, 2018

PPT Updates

- New slides 29 & 30 were added to address the fueling standard for fuel trucks where the truck battery is not located in the engine compartment. This fueling standard was inadvertently left out.

PURPOSE

- **The purpose of this PowerPoint is to provided an overview of NFPA 407 and NFPA 30 related to fire safety in Airport fueling operations and is intended to provide supplemental on-the-job training in addition to the site specific training for fueling agent personnel who handle fuel.**

PURPOSE

139.321(b) *Each certificate holder shall establish and maintain standards authorized by the Administrator for protecting against fire and explosions in storing, dispensing, and otherwise handling fuel (other than articles and materials that are, or are intended to be, aircraft cargo) on the airport.*

Green text blocks in this ppt include the text from Part 139.321 related to fueling requirements.

NFPA 407, 5.2.1 *Fuel servicing equipment shall comply with the requirements of this standard and shall be maintained in safe operating condition. Leaking or malfunctioning equipment shall be removed from service.*

Purple text blocks in this ppt include the text from NFPA 407 or NFPA 30.

Part 139 Requirements Related to Fueling Operations

SECTION 139.321(a) – Cargo Handling Agent

There are very few airport certificate holders nationwide who act as a cargo handling agent that must comply with this paragraph.

139.321(a) *Each certificate holder who acts as a cargo handling agent shall establish and maintain procedures for the protection of persons and property on the airport during the handling and storing of any material regulated by the Hazardous Materials Regulations (49 CFR 171 through 180) that is, or is intended to be, transported by air.*

SECTION 139.321(b) – Fire Safety Standards

1. Aircraft Fuel Servicing Vehicles and Carts (NFPA 407)

4.1 General.

4.1.1 Fueling Hose Apparatus. Nozzle receptacles and hose storage shall be arranged to avoid kinks and maintain the hose bend radius with the requirements of API BULL 1529.

4.1.2 Electrostatic Hazards and Bonding

4.1.2.2 The maximum resistance between the bonding cable clip and the fueling system framework shall not exceed 25 ohms.

4.1.5 Emergency Fire Equipment Accessibility. Accessibility to aircraft by emergency fire equipment shall be considered in establishing aircraft fuel servicing positions.

4.1.7* Deadman Controls.

4.1.7.1 The valve that controls the flow of fuel to an aircraft shall have a deadman control. The deadman control device shall be arranged to accommodate the operational requirements of NFPA 407, Section 5.15. The fuel flow control valve shall be one of the following:

(1) The hydrant pit valve
(2) At the tank outlet on a tank vehicle
(3) A separate valve on the tank vehicle
(4) On the hose nozzle for overwing servicing

4.1.7.2 Deadman controls shall be designed to preclude defeating their intended

139.321(b) *Each certificate holder shall establish and maintain standards authorized by the Administrator for protecting against fire and explosions in storing, dispensing, and otherwise handling fuel (other than articles and materials that are, or are intended to be, aircraft cargo) on the airport.*

SECTION 139.321(b) – Fire Safety Standards

139.321(b) *Continued - These standards shall cover facilities, procedures, and personnel training and shall address at least the following:*

(1) Bonding.

(2) Public protection.

(3) Control of access to storage areas.

(4) Fire safety in fuel farm and storage areas.

(5) Fire safety in mobile fuelers, fueling pits, and fueling cabinets.

(6) Training of fueling personnel in fire safety in accordance with paragraph (e) of this section. Such training at Class III airports must be completed within 12 consecutive calendar months after June 9, 2004.

(7) The fire code of the public body having jurisdiction over the airport.

SECTION 139.321(b) – Fire Safety Standards

The NFPA 407 fire code for aircraft fueling is the most common fire code in effect at Part 139 airports. The International Fire Code is probably the second most common fire code in effect, however, the IFC defers to the NFPA 407 fire code for aviation fueling.

SECTION 139.321(c) – Compliance to Standards

139.321(c) *Each certificate holder shall, as a fueling agent, comply with, and require all other fueling agents operating on the airport to comply with, the standards established under paragraph (b) of this section and shall perform reasonable surveillance of all fueling activities on the airport with respect to those standards.*

SECTION 139.321(d) – Quarterly Fuel Inspections

FIRE SAFETY INSPECTION — ATTACHMENT 321-3

FUEL STORAGE AREAS LOADING /UNLOADING STATIONS

AIRPORT: The Eastern Iowa Airport (CID)
FUELING AGENT: Landmark
DATE: 1-3-07

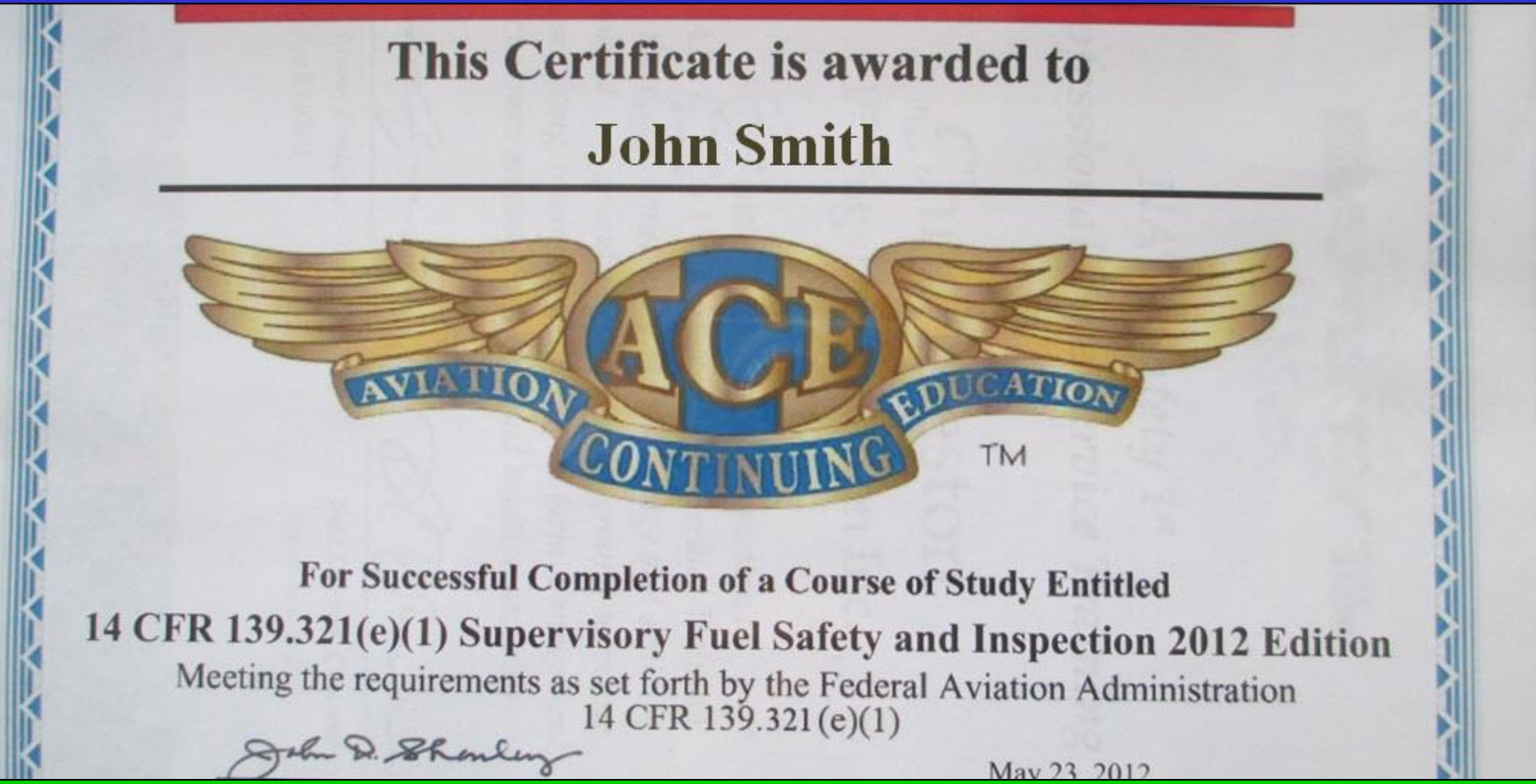
QTR 1: X QTR 2: QTR 3: QTR 4: FOLLOW UP:

	JET A SECTION			100LL SECTION			GASOLINE			DIESEL		
	S	U	R	S	U	R	S	U	R	S	U	R
Fencing/locks				✓			✓			✓		
No Smoking Signs/ No Evidence of Smoking				✓			✓			✓		
All tanks, machinery, piping is bonded or grounded				✓			✓			✓		
Emergency fuel shut off provided/Outside spill area				✓			✓			✓		
Emergency fuel shutoff placards, 7 ft abv grade				✓			✓			✓		
Fuel Equipment maintained, free from leaks				✓			✓			✓		
Emergency fuel shut offs clear/tested every 6 mos				✓			✓			✓		
Procedures for prevention and control of spills					✓			✓				✓
Bonding connections available				✓			✓			✓		
Deadman controls available				✓			✓			✓		
No evidence of bypassing deadman controls				✓			✓			✓		
A/C fuel hose in good condition				✓			✓			✓		
Portable fire extinguishers/ inspected				✓			✓			✓		
Explosion proof electrical equipment				✓			✓			✓		
Above gnd fuel piping protected by barrier guard				✓			✓			✓		
Fire extinguishers on ramps/aprons				✓			✓			✓		

S - SATISFACTORY U - UNSATISFACTORY R- REMARKS

139.321(d) *Each certificate holder shall inspect the physical facilities of each airport tenant fueling agent at least once every 3 consecutive months for compliance with paragraph (b) of this section and maintain a record of that inspection for at least 12 consecutive calendar months.*

SECTION 139.321(e) – Fueling Agent Training



139.321(e) *The training required in paragraph (b)(6) of this section shall include at least the following:*

(1) At least one supervisor with each fueling agent shall have completed an aviation fuel training course in fire safety that is authorized by the Administrator. Such an individual shall be trained prior to initial performance of duties, or enrolled in an authorized aviation fuel training course that will be completed within 90 days of initiating duties, and receive recurrent instruction at least every 24 consecutive calendar months.

SECTION 139.321(e) – Fueling Agent Training

ADDENDUM. LIST OF APPROVED FUEL SAFETY TRAINING COURSES

All courses listed in the addendum are acceptable to the Administrator.

Recurrent Training: Companies offering recurrent Fueling Safety Training are identified below.

Updating Training Information: This addendum is updated on a Quarterly basis. To update your organization's information, submit any changes to the FAA (see Paragraph 4c of AC 150/5230-4B for instructions) no later than September 25 for Quarter 1, December 25 for Quarter 2, March 25 for Quarter 3, and June 25 for Quarter 4.

Changes from the last addendum are marked with change marks in the margin.

ALABAMA

1. **Central Alabama Training Solutions Inc.**
   Contact: Keith Sharp
   Tel: 205-242-1996
   Email: ksharp@catscorp.org
   Website: www.catscorp.org

The latest list of Fueling Fire Safety Training courses that are acceptable to the FAA is currently in an Addendum to the fueling AC 150/5230-4B.

Federal Aviation Administration

FAA Home | Jobs | News | About FAA | A-Z Index | FAA for You...

Search | Search

Aircraft | Airports | Air Traffic | Data & Research | Licenses & Certificates | Regulations & Policies | Training & Testing

FAA Home ▸ Airports

- Airport Compliance
- Airport Cooperative Research Program
- Airport Improvement Program (AIP)
- Airport Safety
- Engineering, Design, & Construction
- Environmental Program
- Major Airport Development
- News & Information
- Passenger Facility Charge (PFC) Program
- Planning & Capacity
- Resources
- Runway Safety

Airport Programs & Guidance

Print | Share

The FAA ensures the national airport system is safe, efficient, and environmentally responsible and meets the needs of the traveling public.

News & Highlights

- **Airport Safety Information Video Series Launched**
  The new safety information video series provides the airport community with information that will help them continue to operate the nation's airports safely and efficiently. The first video, Winter Operations Update, launches a national pre-season winter safety campaign. Visitors can sign up to receive email alerts whenever we post a new video.
- **2013-2017 National Plan of Integrated Airport Systems (NPIAS)**
  The NPIAS report identifies 3,345 public-use airports that are important to national air transportation and therefore eligible to receive grants under the Federal Aviation Administration (FAA) Airport Improvement Program (AIP).
- **New AIP Handbook (Order 5100.38D)**
  The AIP Handbook provides FAA staff with guidance to manage the Airport Improvement Program (AIP). The Handbook update incorporates changes to the AIP that were part of the FAA Modernization and Reform Act of 2012, related Program Guidance Letters and other guidance, and comments from the public review process.
- Subscribe to FAA Web Pages

More »

Top Tasks

- View airport program statistics
- Search airport data
- Find an airport AC
- Read best practices for runway safety
- Learn about the Airport Improvement Program

Airport Safety Information Video Series

ACs, Forms, & Publications

- Advisory Circulars (AC) Library (Series 150)
  - Draft Airport ACs

Data & Statistics

- AIP Grant & Apportionment Data
- Airport Data & Contact Information
- Airport Operations & Ranking Reports from Air Traffic Activity

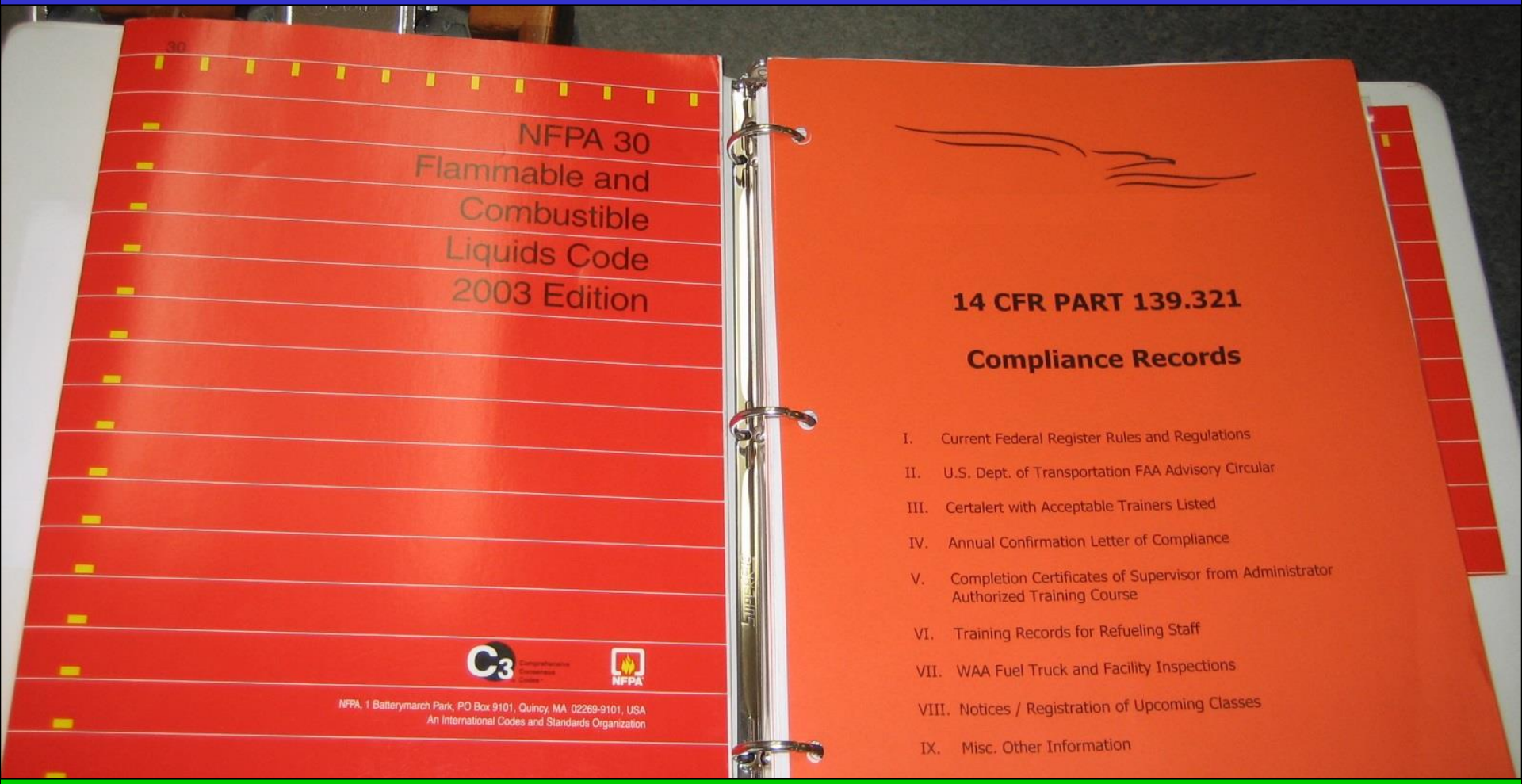
The Fueling AC Addendum can be found on the FAA Airports homepage at www.faa.gov/airports/. Click on the Advisory Circular link.

SECTION 139.321(e) – Fueling Agent Training

		Provides guidance on the development, installation, testing, approval, and maintenance of Automatic Dependent Surveillance – Broadcast (ADS-B) Out squitter units for airport ground vehicles. Change 1 updates the ADS-B Specification version number, Table 1 to show airports with existing or planned FAA surveillance systems, and Appendix A to list qualified products.	
150/5230-4B	AAS-300	Aircraft Fuel Storage, Handling, Training, and Dispensing on Airports Contains specifications and guidance for the storage, handling, and dispensing of aviation fuel on airports. Additionally, this AC provides standards and guidance for the training of personnel who conduct these activities. Please see the associated **Addendum** for a list of companies offering courses of instruction in line service training as well as supervisory training that are acceptable to the Administrator. We will update the Addendum on a quarterly basis. • 150/5230-4B - (PDF, 319 KB) • Addendum for AC 150/5230-4B (Updated 1/5/2015) - (PDF, 275 KB)	09-28-2012
150/5300-13A	AAS-100	Airport Design Contains the Federal Aviation Administration's (FAA) standards and recommendations for the geometric layout and engineering design of runways, taxiways, aprons, and other facilities at civil airports.This substantial revision fully incorporates all previous changes to AC 150/5300-13 as well as new standards and technical requirements. See also Interim Guidance on Land Uses Within a Runway Protection Zone (PDF).	09-28-2012

Go to AC 150/5230-4B and click on the Addendum link for the current list of supervisor training that is acceptable to the FAA for meeting training requirements for fueling agent supervisors in Part 139.321(e)(1).

SECTION 139.321(e) – Fueling Agent Training



139.321(e) *The training required in paragraph (b)(6) of this section shall include at least the following:*

(2) All other employees who fuel aircraft, accept fuel shipments, or otherwise handle fuel shall receive at least initial on-the-job training and recurrent instruction every 24 consecutive calendar months in fire safety from the supervisor trained in accordance with paragraph (e)(1) of this section.

SECTION 139.321(e) – Fueling Agent Training

139.321 – Hazardous Materials

(e) *The training required in paragraph (b)(6) of this section shall include at least the following:*

(2) All other employees who fuel aircraft, accept fuel shipments, or otherwise handle fuel shall receive at least initial on-the-job training and recurrent instruction every 24 consecutive calendar months in fire safety from the supervisor trained in accordance with paragraph (e)(1) of this section.

NATA Safety 1st Professional Line Service Training

Certificate of Training

Line Fuel Service

Name Blanked Out for Privacy Issues

*has successfully completed all classroom and practical application for the requirements of 14 CFR §139.321(b)(1) through (b)(6) and §139.321 (e)(2) excluding hands-on fire extinguisher training**

Thomas L. Hendricks, NATA President

7/14/2013

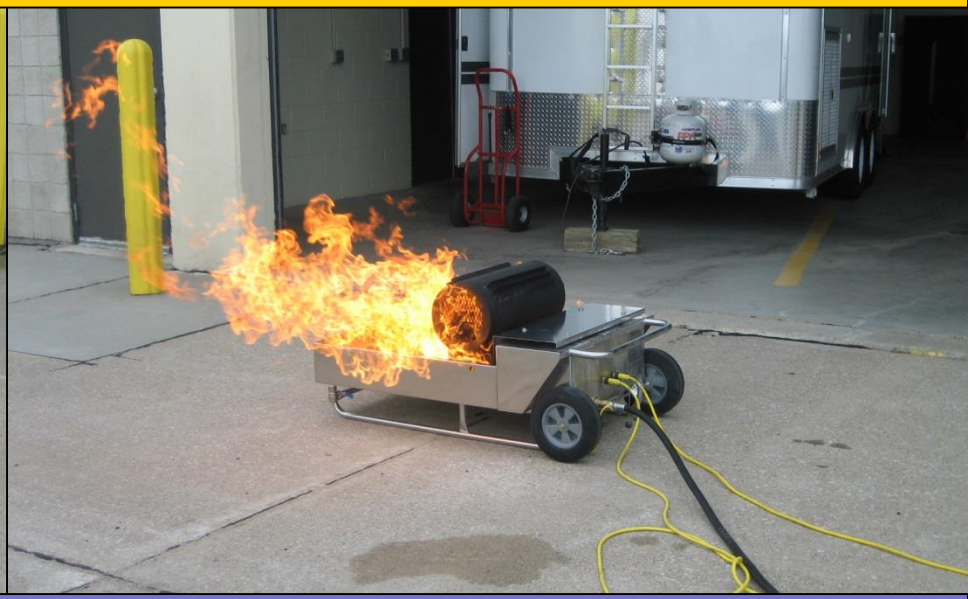
Completed this date

An FAA approved training course

On-the-job training for line service employees, required by 139.321(e)(2), does not have to be a training program approved by the FAA. It is at the discretion of the fueling agent if they want to pay for this option to meet the requirement in 139.321(e)(2).

Fueling Agent Training

Fire extinguisher training is required for fuel servicing personnel in NFPA 407, 5.13.6 and at many airports the training is provided by the airport fire department. The fire extinguisher training is required for the fueling agent supervisor, usually before a certificate is issued for the training required by Part 139.321(e)(1). Many fueling agents use a web based training program for line service personnel training that includes a requirement for local fire extinguisher training before a certificate is issued for the training required by Part 139.321(e)(2).



5.13.6* *Fuel servicing personnel shall be trained in the use of the available fire extinguishing equipment they could be expected to use.*

A.5.13.6 *Fuel servicing personnel should be given adequate training with extinguishers so that such equipment is used effectively in an emergency. Such training should be given on fires of the type that could be encountered on the job.*

SECTION 139.321(f) – Annual Training Certification

Federal Aviation Administration (Central Region Only)
Airports Division, Safety & Standards Branch, Room 364
901 Locust Street
Kansas City, MO 64106-2325

816-329-2618/2621/2624

E. TRAINING

1. A supervisor with Midwest Aviation will complete an aviation fuel training course in fire safety. The supervisor will receive recurrent training at least once every 24 months. If a new supervisor is hired, he/she will be enrolled in an authorized aviation fuel training course that will be completed within 90 days.

2. All other employees with Midwest Aviation, who fuel aircraft, accept fuel shipments, or handle fuel, receive at least initial on-the-job training in fire safety and recurrent training every 24 months from the supervisor mentioned in previous paragraph.

3. All fueling agents, engaged in handling and dispensing fuel at the airport, shall submit confirmation to airport management once every 12 months, that the above training standards have been accomplished. The training confirmation records shall be maintained in the Airport Manager office for 12 months.

4. Fueling agent personnel training records will be maintained for 24 months at the fueling agent's office.

The annual training certification is normally submitted in a letter to the Airport Authority.

139.321(f) *Each certificate holder shall obtain a written confirmation once every 12 consecutive calendar months from each airport tenant fueling agent that the training required by paragraph (e) of this section has been accomplished. This written confirmation shall be maintained for 12 consecutive calendar months.*

SECTION 139.321(g) – Immediate Corrective Action

139.321(g) *Unless otherwise authorized by the Administrator, each certificate holder shall require each tenant fueling agent to take immediate corrective action whenever the certificate holder becomes aware of noncompliance with a standard required by paragraph (b) of this section. The certificate holder shall notify the appropriate FAA Regional Airports Division Manager immediately when noncompliance is discovered and corrective action cannot be accomplished within a reasonable period of time.*

SECTION 139.321(h) – Advisory Circulars

U.S. Department
of Transportation
Federal Aviation
Administration

Advisory Circular

Subject: Aircraft Fuel Storage, Handling, Training, and Dispensing on Airports

Date: 9/28/2012 **AC No:** 150/5230-4B

Initiated by: AAS-300 **Change:**

1. Purpose. This advisory circular (AC) contains specifications and guidance for the storage, handling, and dispensing of aviation fuel on airports. Additionally, this AC provides standards and guidance for the training of personnel who conduct these activities.

2. Cancellation. This AC cancels AC 150/5230-4A, Aircraft Fuel Storage, Handling, and Dispensing on Airports, dated June 18, 2004.

3. Application. This AC provides an acceptable means of complying with Title 14 Code of Federal Regulations (CFR) part 139 (hereinafter referred to as Part 139) for all Part 139 airport operators. Although non-certificated airports are not required to develop fuel standards, the FAA recommends these airports use the guidance contained in this AC to develop such standards for the continued enhancement of aviation safety.

4. Addendum of Authorized Fuel Safety Training Courses. The Federal Aviation Administration (FAA) regards instructional programs that provide line service and supervisory training, as required by 14 CFR §139.321 (e) (1) and (2), as critical to safety on airports.

139.321(h) *FAA Advisory Circulars contain methods and procedures for the handling and storage of hazardous substances and materials that are acceptable to the Administrator.*

Fueling Agent

The FAA defines “fueling agent” as a person or company that sells fuel on the airport.

Self Fueling

This policy is intended to exclude the self fueling activities of an individual aircraft owner fueling their own aircraft from the Part 139.321 requirements.

Self Service Fueling Stations

However, self service fueling stations where people can purchase fuel by credit card and fuel their own aircraft, do come under the requirements of Part 139.321. NFPA 407 includes fueling standards specifically for self service fuel stations.

Self Fueling

This policy excludes the self fueling activities of an airline fueling their own aircraft from the Part 139.321 requirements.

Self Fueling

Self fueling activities by corporate aircraft owners are also excluded from Part 139 requirements, however, certificate holders should monitor these fueling activities for compliance to the local Fire Code in the interest of safety.

Airport Fuel Vehicles

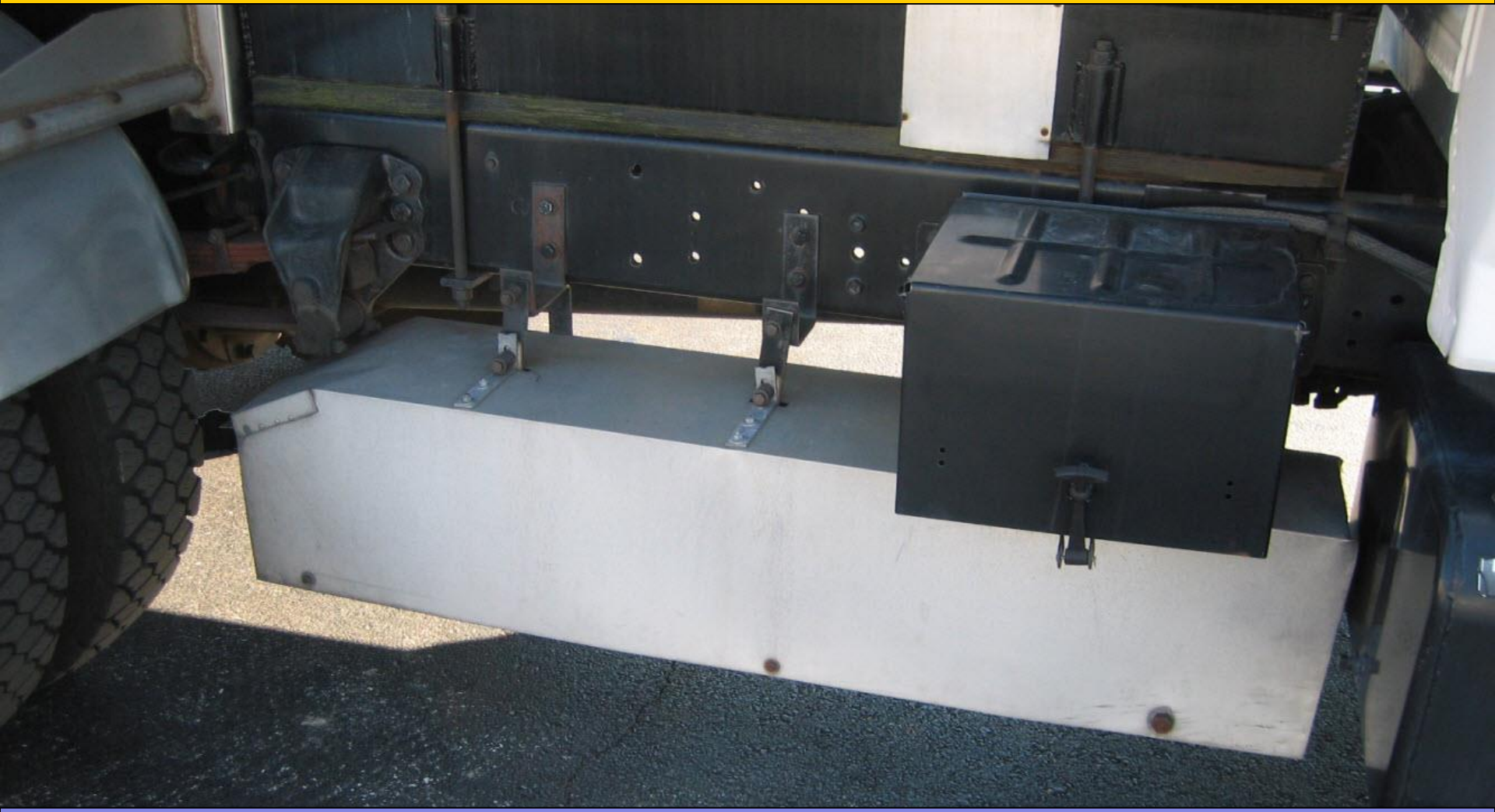
Aircraft Fuel Servicing Tank Vehicles

Tank full trailers are defined as an aircraft fuel servicing vehicle and must meet the same NFPA fueling fire safety standards as an aircraft fueling vehicle.

NFPA 407, 3.3.30 Tank Full Trailer. *A vehicle that is not self-propelled and that has a cargo tank for the transportation of aviation fuel mounted thereon or built as an integral part thereof. It is so constructed that its weight and load rest on its own wheels.*

3.3.35.2 Aircraft Fuel Servicing Tank Vehicle (Fueler). *A vehicle having a cargo tank (tank truck, tank full trailer, tank semitrailer) designed for or used in the transportation and transfer of fuel into or from an aircraft.*

Battery Compartments



NFPA 407, 4.3.7.1 Battery Compartments. *Batteries that are not in engine compartments shall be securely mounted in compartments to prevent accidental arcing. The compartment shall be separate from fueling equipment. Suitable shielding shall be provided to drain possible fuel spillage or leakage away from the compartment. The compartment shall be provided with a vent at the top of the compartment.*

Battery Compartments

Example of Noncompliance to Fueling Standards

The battery on this fuel truck is not securely mounted to prevent accidental arcing and is not shielded to drain possible fuel spillage or leakage away from the compartment.

NFPA 407, 4.3.7.1 Battery Compartments. *Batteries that are not in engine compartments shall be securely mounted in compartments to prevent accidental arcing. The compartment shall be separate from fueling equipment. Suitable shielding shall be provided to drain possible fuel spillage or leakage away from the compartment. The compartment shall be provided with a vent at the top of the compartment.*

Operator Name

NFPA 407, 5.1.3 *Aircraft fueling vehicles shall be marked with the name of the operator or the responsible organization.*

NFPA 407, 5.1.3.1 *The marking (operator name) shall be approved, legible signs on both sides of the exterior of the vehicle.*

Fuel Truck Parking

Aircraft fuel servicing tank vehicles should be parked with at least 10 feet of clear space around the vehicle and at least 50 feet from buildings and aircraft.

NFPA 407, 5.18 *Parking areas for unattended aircraft fuel servicing tank vehicles shall be arranged to provide the following:*

(1) Dispersal of the vehicles in the event of an emergency.

(2) A minimum of 10 feet of clear space between parked vehicles for accessibility for fire control purposes.

(3) Prevention of any leakage from draining to an adjacent building or storm drain that is not suitably designed to handle fuel.

(4) A minimum of 50 feet from any parked aircraft and buildings other than maintenance facilities and garages for fuel servicing tank vehicles.

Fuel Truck Parking

Example of Noncompliance to Fueling Standards

These fuel trucks are not parked at least 10’ apart. The 10 foot clearance also applies to other equipment such as these baggage carts.

Fuel Truck Parking

Example of Noncompliance to Fueling Standards

The fuel truck is parked within 50 feet of a building that could provide an ignition source in the event of a fuel leak.

Fuel Truck Parking

Example of Noncompliance to Fueling Standards

These fuel trucks are parked in a T-Hangar, contrary to NFPA 407, 5.18. Sparks from opening the doors could set off an explosion if fuel is leaking or vapors are escaping into the hangar.

Fuel Truck Parking

Example of Noncompliance to Fueling Standards

Parking standards also apply to tank trailers used for defueling. This defueling tank trailer is parked within 50 feet of a building.

Fuel Truck Parking

Marking the parking locations for fuel trucks to ensure compliance with parking standards is highly recommended. Note that engine oil stains indicate that fueling personnel are routinely complying with the parking standard.

Fuel Truck Parking

Example of Noncompliance to Fueling Standards

Other fueling agent vehicles and equipment cannot be parked within 10 feet of a fuel truck. The 10 foot clearance is to provide fire fighters access to a burning fuel truck and reduce the chance of a fire spreading to adjacent fuel trucks.

Fuel Truck Parking

The fire code standard for parking 10 feet apart and at least 50 feet from buildings does not apply to hydrant vehicles or carts since they do not have fuel tanks.

Fuel Truck Maintenance Facility

Some airports have garages or maintenance facilities for servicing fuel tank vehicles that are approved for maintenance or storage of fuel trucks.

NFPA 407, 5.18 *Parking areas for unattended aircraft fuel servicing tank vehicles shall be arranged to provide the following:*

(4) *A minimum of 50 feet from any parked aircraft and buildings <u>other than maintenance facilities and garages for fuel servicing tank vehicles</u>.*

Fuel Truck Maintenance Facility

These buildings must be constructed to eliminate ignition sources with explosion proof switches and electrical wiring enclosed in approved conduit, in accordance with NFPA 70, *National Electric Code*, Class I, Division 2, Group D.

Fuel Truck Maintenance Facility

If the local Fire Marshal, or the authority having jurisdiction (AHJ), approves a building for maintenance or parking of fuelers, this situation should be documented in the fueling section of the Airport Certification Manual.

If there is any question about the safety of a fueler maintenance facility, the local Fire Marshal, or the authority having jurisdiction, should be contacted to conduct an inspection to determine if the building is approved for maintenance of fuelers.

Fuel Leaks

Example of Noncompliance to Fueling Standards

Most fuel leaks will have evidence of the leak on the pavement under the truck

NFPA 407, 5.2.1 *Fuel servicing equipment shall comply with the requirements of this standard and shall be maintained in safe operating condition. Leaking or malfunctioning equipment shall be removed from service.*

Fuel Leaks

Example of Noncompliance to Fueling Standards

Fuel leaks are a common problem found during FAA inspections.

Fuel Leaks

NFPA 407, 5.17.2 *Leaking vehicles or carts shall be removed from service, defueled, and parked in a safe area until repaired.*

Normally, an out of service fuel truck is taken off the flight line and defueled.

Fuel Leaks

This is one method of documenting that a fuel truck is out of service.

Fuel Leaks

Example of Noncompliance to Fueling Standards

The rag indicates that fueling personnel were aware of the fuel leak and did not remove the fueler from service.

Procedures for Reporting Fuel Spills

NFPA 407, 5.2.6 *The airport fire crew shall be notified if a spill covers over 10 ft in any direction or is over 50 sq. ft in area, continues to flow, or is otherwise a hazard to persons or property. The spill shall be investigated to determine the cause, to determine whether emergency procedures were properly carried out, and to determine the necessary corrective measures.*

Engine Exhaust System

4.3.6.2 *Exhaust system components shall be secured and located clear of components carrying flammable liquids and separated from any combustible materials used in the construction of the vehicle.*

Engine Exhaust System

Most fuel trucks have the exhaust system at the front of the vehicle where it will be clear of fuel tanks and fuel piping in the event of a leak.

Engine Exhaust System

Any part of the engine exhaust system that extends out under the fuel tank or piping must be adequately shielded.

NFPA 407, 4.3.6.3 *Suitable shielding shall be provided to drain possible fuel spillage or leakage away from exhaust system components safely.*

Example of Noncompliance to Fueling Standards

This engine exhaust pipe located under the overflow drain pipe could be an ignition source. Shielding is missing.

Engine Exhaust System

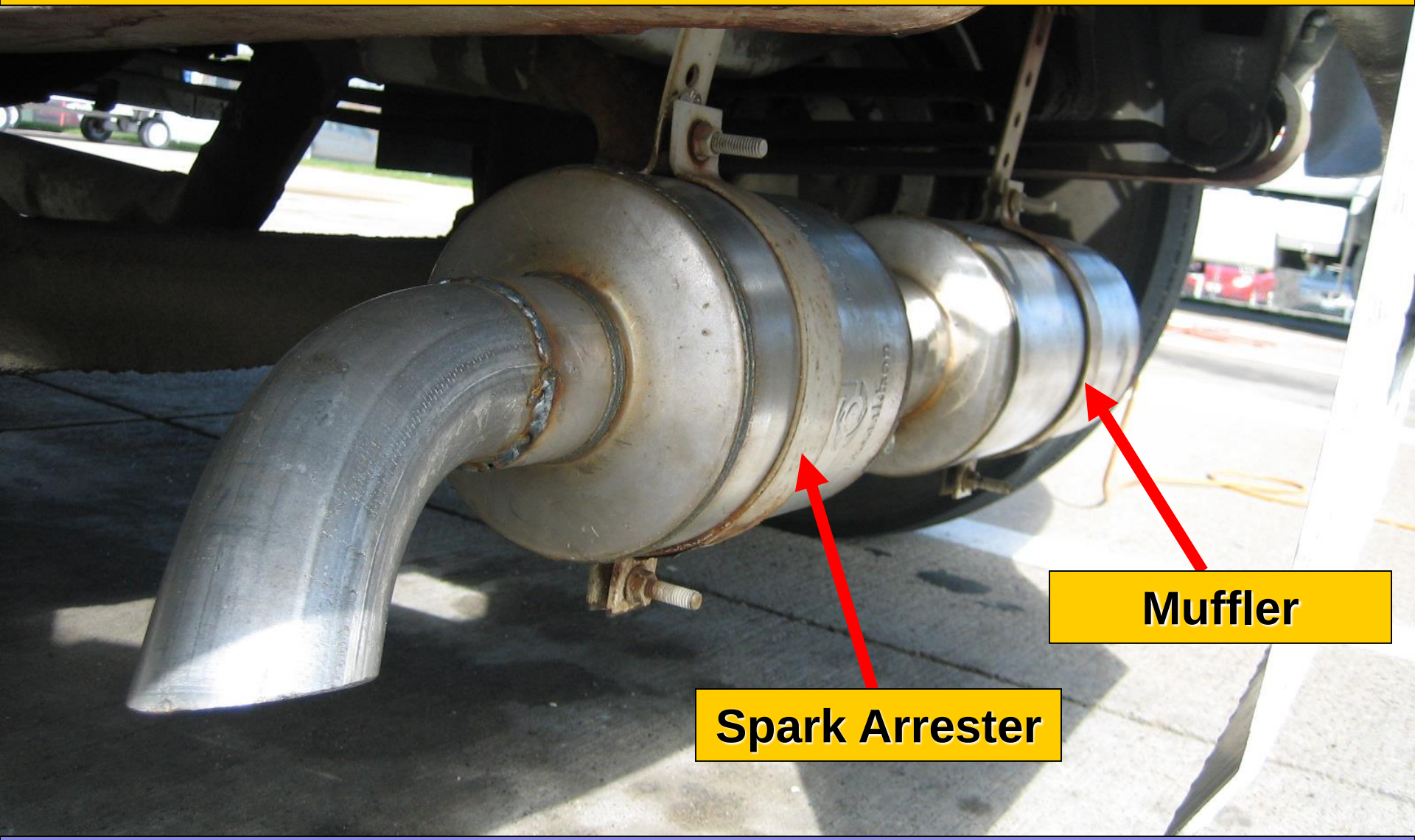
Example of Noncompliance to Fueling Standards

After this muffler was replaced with a longer muffler, the shielding is no longer adequate. Corrective action in this case is to shorten the exhaust pipe or extend the shield.

NFPA 407, 4.3.6.3 *Suitable shielding shall be provided to drain possible fuel spillage or leakage away from exhaust system components safely.*

Engine Exhaust System

Some Spark arresters look like small mufflers and are installed after the muffler.

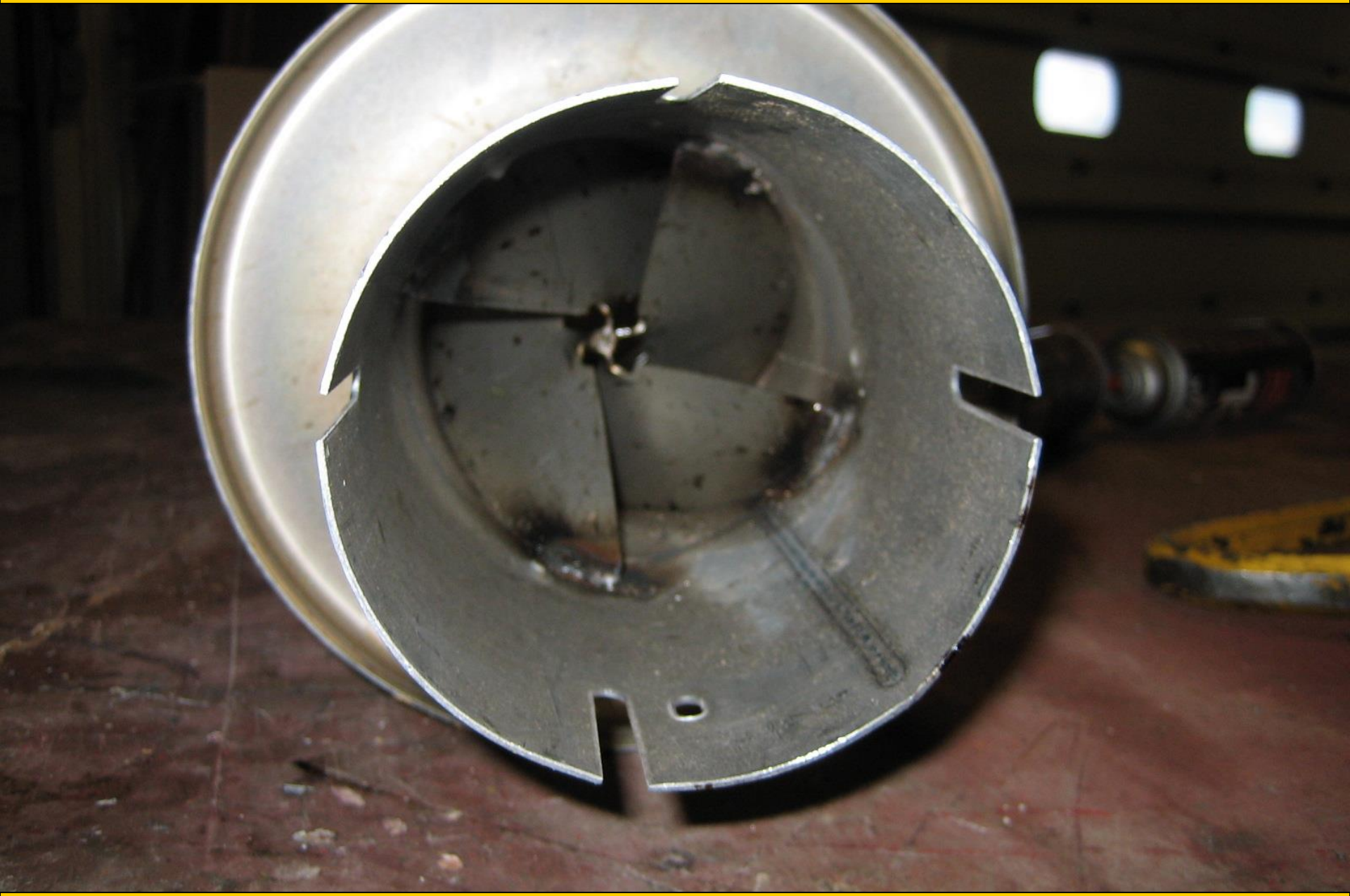


NFPA 407, 4.3.6.6 *Gasoline-powered engines on fuel servicing vehicles shall be provided with flame and spark arresting exhaust systems.*

Engine Exhaust System

This is an example of another type of spark arrester.

Engine Exhaust System



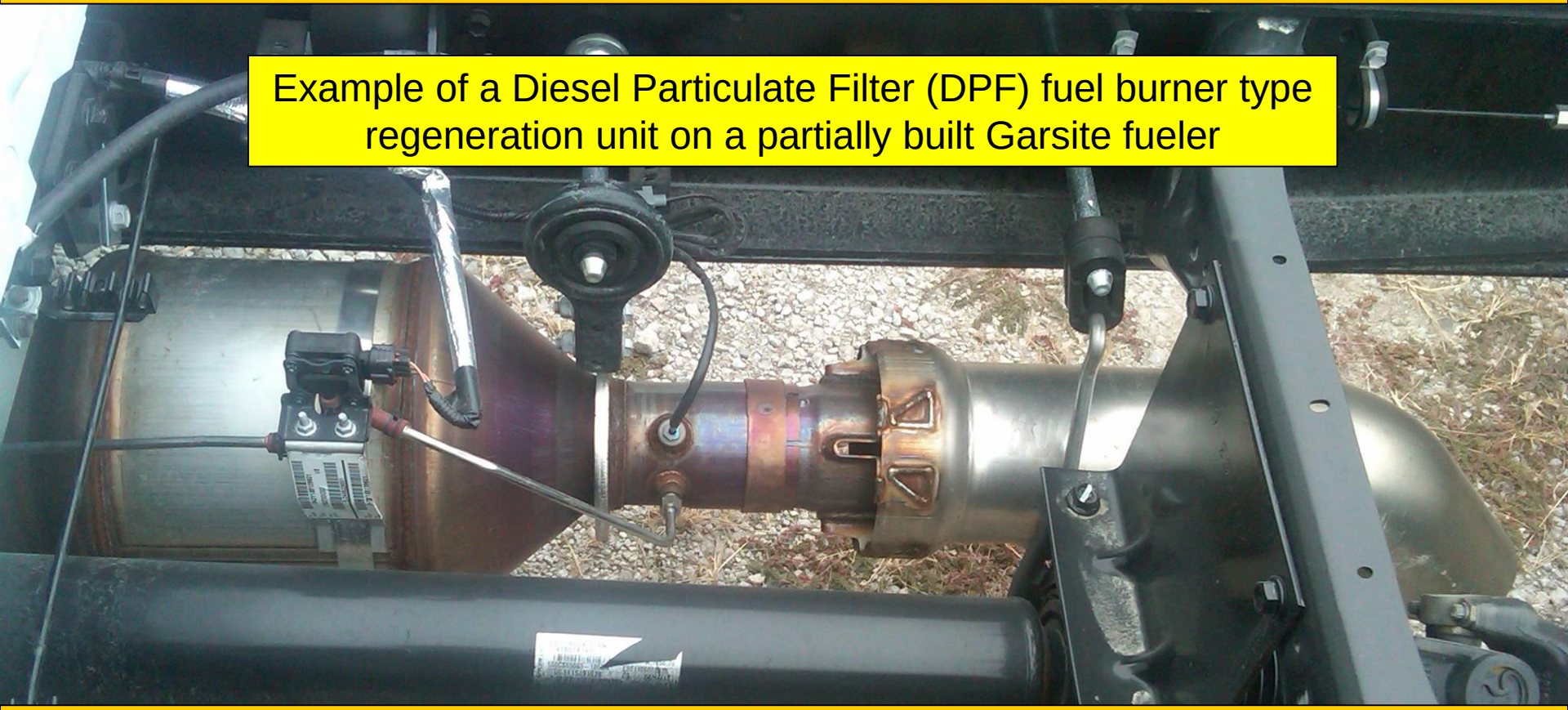
Spark arresters have baffles to dissipate sparks and flame.

Engine Exhaust System

Most diesel engines have turbo chargers and do not need a spark arrestor.

NFPA 407, 4.3.6.7 *Non-turbo charged diesel engines on fuel servicing vehicles shall be equipped with flame and spark arresting exhaust systems.*

Engine Exhaust System

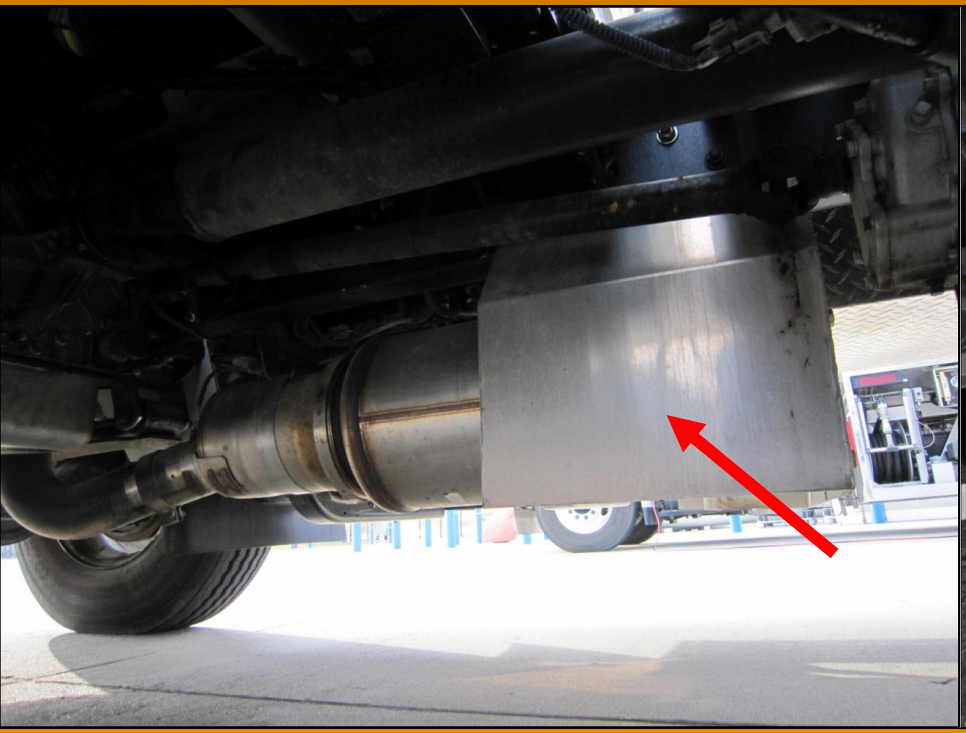


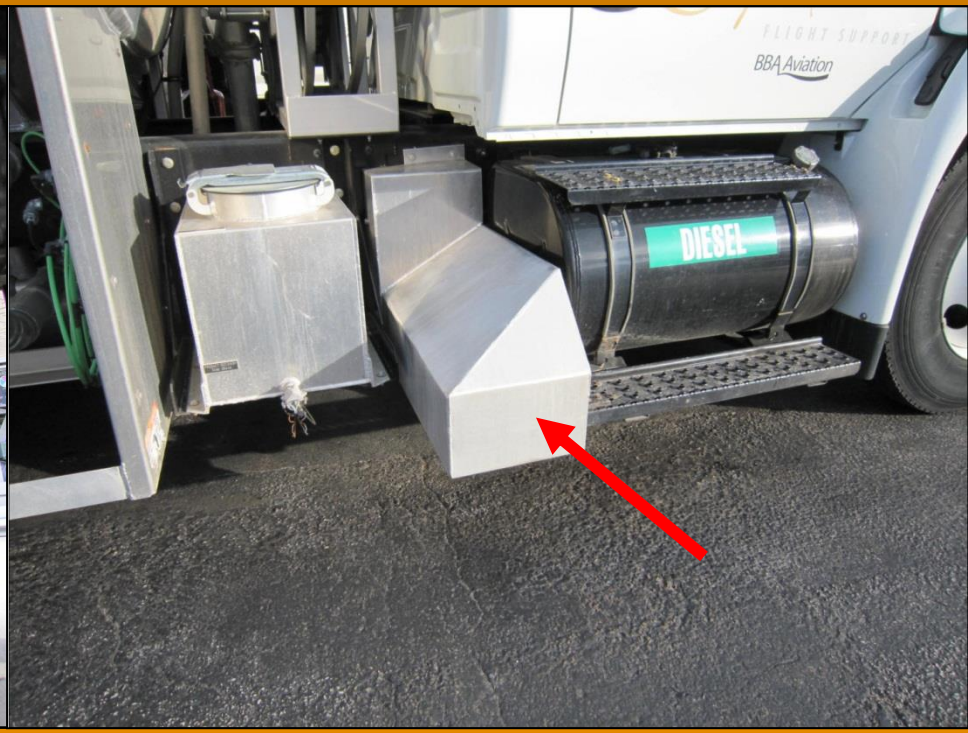
Example of a Diesel Particulate Filter (DPF) fuel burner type regeneration unit on a partially built Garsite fueler

Most diesel engine airport fuel trucks manufactured since 2007 are equipped with a DPF to remove diesel particulate matter, or soot, from the exhaust of diesel engines. Filter regeneration is necessary on diesel engines equipped with a DPF to burn off the soot when it builds up to a certain level and back pressure becomes too high. DPF regenerators are designed to burn off the accumulated particulate matter either passively through the use of a catalyst, or by active means such as a fuel burner. A fuel burner type DPF regenerator elevates exhaust temperature to a very high temperature to oxidize and burn off the accumulated ash.

Engine Exhaust System

Some diesel engine fuel trucks manufactured after 2007 are not equipped with a DPF system. This may be because fuel trucks are not normally operated on public roads.





Shielding is required due to the high heat generated during the DPF regeneration process.

3.6.3.1 *Diesel particulate filter (DPF) regeneration system piping shall be shielded from the engine discharge manifold to the outlet at the tailpipe.*

Engine Exhaust System

NFPA 407, 5.6.4 *All vehicles that have engines equipped with an exhaust after-treatment device, such as a DPF, that requires the filter to be cleaned at high temperature (regenerated) while installed on the vehicle shall meet the requirements of 5.6.4.1 through 5.6.4.7.*

Engine Exhaust System

5.6.4.1 *DPF regeneration shall be performed only in area(s) designated by the authority having jurisdiction (AHJ).*
5.6.4.2 DPF regeneration shall not be performed within 100 ft of any aircraft refueling operations.

NFPA 407, Annex A Explanatory Material.
A.5.6.4.3 *The size of the DPF regeneration area depends on the equipment being used (fleet size). The AHJ should designate the size and number of DPF regeneration pads and determine whether a centralized facility is advantageous.*

Engine Exhaust System

Concrete pavement is required at the DPF regeneration area due to the high heat generated during the DPF regeneration process.

NFPA 407, 5.6.4.3* Vehicle Regeneration Area.

5.6.4.3.1 *The immediate area surrounding the DPF exhaust outlet shall be concrete or other high temperature–resistant material and shall be clear of any grass, soil, or flammable materials.*

5.6.4.3.2 *The area shall be in a remote location that is a minimum of 100 ft from the nearest aircraft parking location, airport terminal, or flammable storage or a minimum of 50 ft from any other building.*

Engine Exhaust System

NFPA 407, 5.6.4.3* Vehicle Regeneration Area.

5.6.4.3.3 *The area shall be clearly marked with a minimum 2 ft by 1 ft sign reading "Vehicle DPF Regeneration Area," which shall have letters at least 3 in. high and shall be of a color contrasting sharply with the sign background for visibility.*

Engine Exhaust System

Example of Noncompliance to Fueling Standards

As instructions are passed down to the person actually making the sign, they can easily change.

NFPA 407, 5.6.4.3* Vehicle Regeneration Area.

5.6.4.3.3 *The area shall be clearly marked with a minimum 2 ft by 1 ft sign reading "Vehicle DPF Regeneration Area," which shall have letters at least 3 in. high and shall be of a color contrasting sharply with the sign background for visibility.*

Engine Exhaust System

5.6.4.4 *The regeneration cycle shall be performed only by trained personnel, who shall remain with the vehicle until the regeneration cycle is complete.*

5.6.4.5 *The vehicle shall be visually inspected for any signs of fluid leaks under or around the vehicle before regeneration is initiated. DPF regeneration shall not be initiated if there are any signs of any fluid leaks on or beneath the vehicle.*

5.6.4.6 *Once a regeneration cycle is started, it shall be completed without interruption.*

5.6.4.7 *After the regeneration process is successfully completed, the vehicle shall be permitted to return to normal service. Problems occurring during the regeneration cycle shall be corrected prior to the vehicle returning to normal service.*

5.6.4.8 *Aircraft refueling operations shall not be initiated if the regenerative system indicates regeneration is required.*

Smoking Restrictions

NFPA 407, 4.3.11.1 *A "no smoking" sign shall be posted prominently in the cab of every aircraft fuel service vehicle.*

Smoking Restrictions

This NO SMOKING sign is rather small, however, NFPA 407, 4.3.11.1 does not specify a minimum size for the NO SMOKING sign in the cab.

NFPA 407, 4.3.11.1 *A "no smoking" sign shall be posted prominently in the cab of every aircraft fuel service vehicle.*

Smoking Restrictions

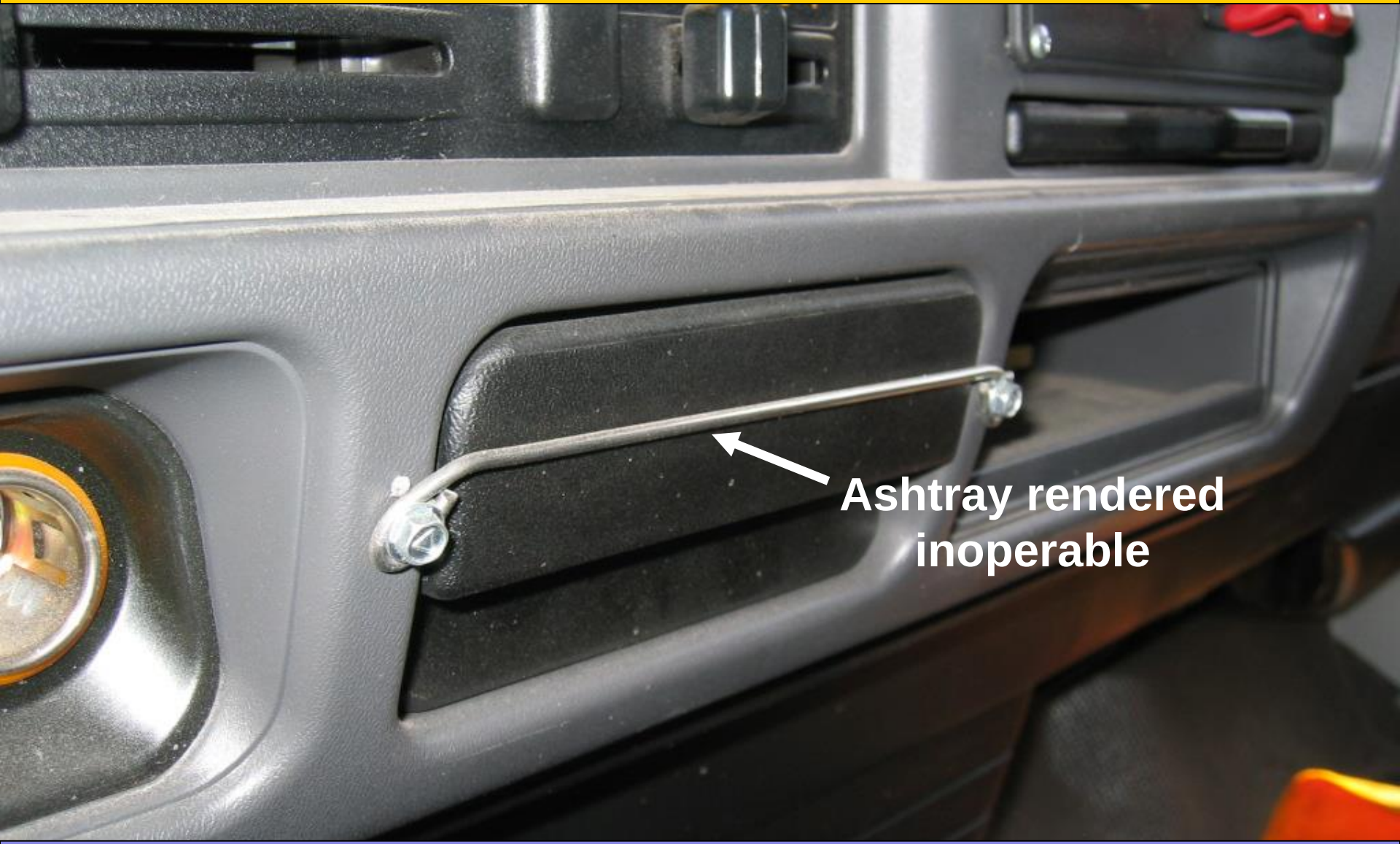
There is no specific requirement on where the “NO SMOKING” must be posted. It may be on the back window in some trucks.

NFPA 407, 4.3.11.1 *A “no smoking” sign shall be posted prominently in the cab of every aircraft fuel service vehicle.*

Smoking Restrictions

NFPA 407 does not require “no smoking” signs on the outside of fuel trucks. However, almost all fuel trucks have “no smoking” signs on all four sides to meet DOT requirements.

Smoking Restrictions



NFPA 407, 4.3.11.2 *Smoking equipment such as cigarette lighters and ash trays shall not be provided. If a vehicle includes such equipment when initially procured, it shall be removed or rendered inoperable.*

Example of Noncompliance to Fueling Standards

This truck has an ashtray and there is also evidence of smoking by fueling personnel.

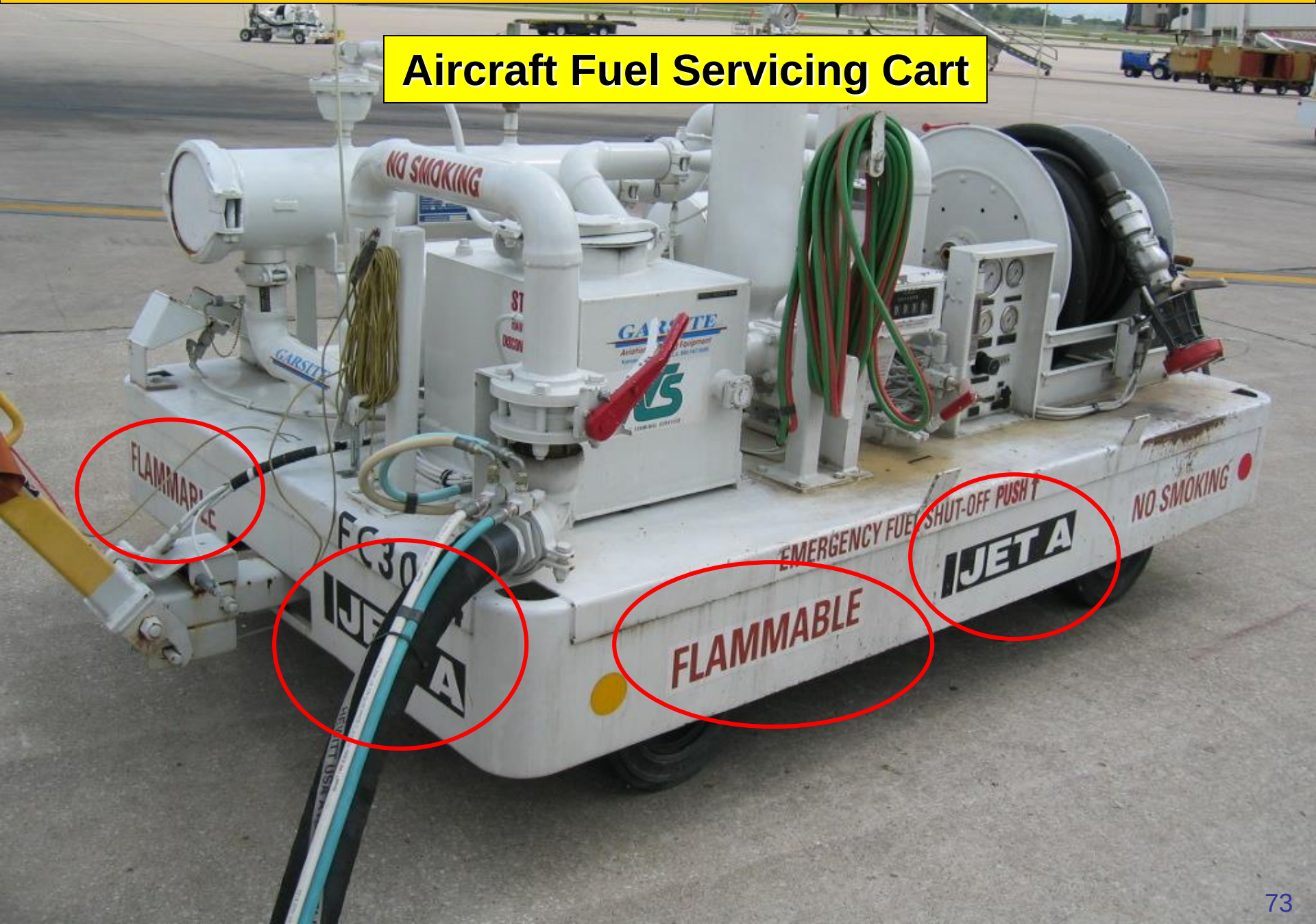
NFPA 407, 4.3.11.2 *Smoking equipment such as cigarette lighters and ash trays shall not be provided. If a vehicle includes such equipment when initially procured, it shall be removed or rendered inoperable.*

Flammable/Product Placards

Aircraft Fuel Servicing Tank Vehicle

NFPA 407, 4.3.18 *Each aircraft fuel servicing vehicle or cart shall have a sign on each side and the rear to identify the product. The sign shall have letters at least 3 inches high and shall be of a color contrasting sharply with the sign background for visibility. The word FLAMMABLE and the name of the product carried, such as JET A, JET B, GASOLINE, or AVGAS shall appear on the sign.*

Flammable/Product Placards



Flammable/Product Placards

Example of Noncompliance to Fueling Standards

NFPA 407, 4.3.18 *Each aircraft fuel servicing vehicle or cart shall have a sign on each side and the rear to identify the product. The sign shall have letters at least 3 inches high and shall be of a color contrasting sharply with the sign background for visibility. The word FLAMMABLE and the name of the product carried, such as JET A, JET B, GASOLINE, or AVGAS shall appear on the sign.*

Flammable/Product Placards

Example of Noncompliance to Fueling Standards

This FLAMMABLE sign is faded and not clearly visible.

NFPA 407, 4.3.18 *Each aircraft fuel servicing vehicle or cart shall have a sign on each side and the rear to identify the product. The sign shall have letters at least 3 inches high and shall be of a color contrasting sharply with the sign background for visibility. The word FLAMMABLE and the name of the product carried, such as JET A, JET B, GASOLINE, or AVGAS shall appear on the sign.*

Haz Mat Placards

The FLAMMABLE placard for Avgas is “1203”.

The requirements and standards for Hazardous Materials placards are contained in Code of Federal Regulations, Title 49, Part 172, Subpart F, *Placarding*.

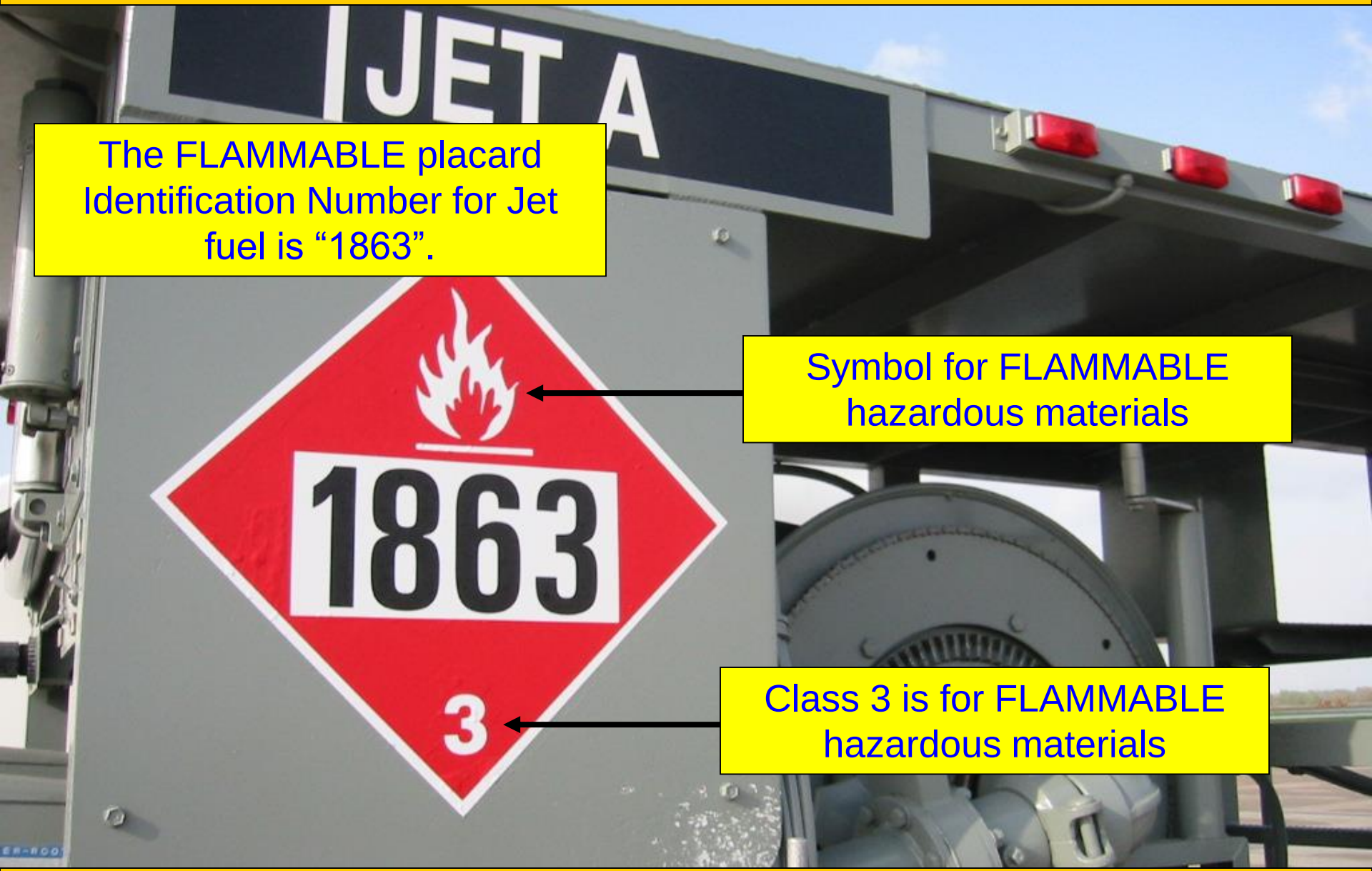
Haz Mat Placards

CFR Title 49, Part 172, Subpart F

Sec. 172.504 General placarding requirements.

(a) General. Except as otherwise provided in this subchapter, each bulk packaging, freight container, unit load device, transport vehicle or rail car containing any quantity of a hazardous material must be placarded on each side and each end with the type of placards specified in tables 1 and 2 of this section and in accordance with other placarding requirements of this subpart, including the specifications for the placards named in the tables and described in detail in Sec. 172.519 through 172.560.

Haz Mat Placards



The FLAMMABLE placard Identification Number for Jet fuel is “1863”.

Symbol for FLAMMABLE hazardous materials

Class 3 is for FLAMMABLE hazardous materials

FLAMMABLE placards must have a red background with white symbol, class and inner border.

Haz Mat Placards

Sec. 172.516 Visibility and display of placards.

(a) Each **placard** on a motor vehicle and each **placard** on a rail car must be clearly visible from the direction it faces, except from the direction of another transport vehicle or rail car to which the motor vehicle or rail car is coupled.

Haz Mat Placards

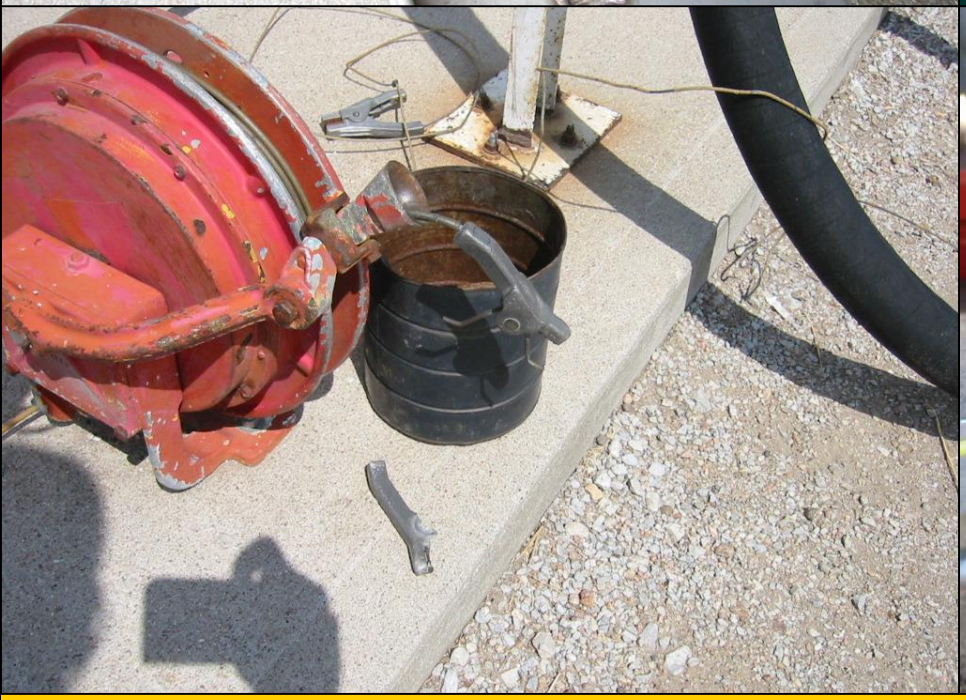
Sec. 172.516 Visibility and display of placards.

(b) The required placarding of the front of a motor vehicle may be on the front of a truck-tractor instead of or in addition to the placarding on the front of the cargo body to which a truck-tractor is attached.

Bonding

NFPA 407, 4.3.3.3 *Cables shall be provided on the vehicle or cart to allow the bonding operations specified in Section 5.4.*

Example of Noncompliance to Fueling Standards



Broken bonding clips are a common problem found during FAA inspections.

Fire Extinguishers

NFPA 407, 4.3.9.1 *Each aircraft fuel servicing tank vehicle shall have two listed fire extinguishers, each having a rating of at least 20-B:C with one extinguisher mounted on each side of the vehicle.*

Fire Extinguishers

Fire extinguishers mounted on the rear or front of a fuel truck are considered accessible from the sides.

Fire Extinguishers

NFPA 407, 4.3.9.2 *There shall be one listed extinguisher having a rating of at least 20-B:C installed on each hydrant fuel servicing vehicle or cart.*

Fire Extinguishers

Example of Noncompliance to Fueling Standards

The area immediately behind the extinguisher is painted the same color as the fire extinguisher. Just about all fire extinguishers for fuelers are red so this is not normally a problem unless the fuel truck is painted red.

NFPA 407, 4.3.9.3 *Extinguishers shall be readily accessible from the ground. The area of the paneling or tank adjacent to or immediately behind the extinguisher(s) on fueling vehicles or carts shall be painted with a contrasting color.*

Fire Extinguishers

NFPA 407, 4.3.9.4 *Extinguishers shall be kept clear of elements such as ice and snow.*

NFPA 407, Annex A Explanatory Material - A.5.13.5, *During inclement weather, extinguishers not in enclosed compartments may be permitted to be protected by canvas or plastic covers. If icing occurs, the extinguisher should be sprayed with deicing fluid.*

Fire Extinguishers

Example of Noncompliance to Fueling Standards

The fuel storage area is not in compliance with the Airport fueling fire safety standards in Section 321 of the ACM. The fire extinguisher on the loading rack is not adequately protected from snow and ice, due to a worn cover.

Fire Extinguishers

In place of using fire extinguisher covers, it would be acceptable for the fueling agent to have a procedure to spray the extinguishers with deicing fluid to clear ice and snow from the extinguishers before using the fuel truck. However, this option should receive closer monitoring by the airport operator during snow & ice conditions.

NFPA 407, Annex A Explanatory Material - A.5.13.5, *During inclement weather, extinguishers not in enclosed compartments may be permitted to be protected by canvas or plastic covers. If icing occurs, the extinguisher should be sprayed with deicing fluid.*

Fire Extinguishers

Installing fire extinguishers on the side of a fuel truck under the tank may provide the added benefit of protecting the fire extinguisher from snow and ice without installing covers. However, the extinguishers would need to be deiced if snow & ice did accumulate on the extinguishers.

Fire Extinguishers

Covers should be removed from fire extinguishers in the spring so they are more accessible and easier to inspect.

Fire Extinguishers

Example of Noncompliance to Fueling Standards

ABC rated multipurpose dry chemical extinguishers are not to be used on fuel trucks, on aprons and at fuel farms.

NFPA 407, 4.1.6.3* *ABC multipurpose dry chemical fire extinguishers (ammonium phosphate) shall not be placed on aircraft fueling vehicles, airport fuel servicing ramps, or aprons, or at airport fuel facilities.*

NFPA 407, A.4.1.6.3 *Multipurpose dry chemical (ammonium phosphate) fire extinguishing agent is known to cause corrosion to aluminum aircraft components. Although the agent is capable of extinguishing fires on or near aircraft, it is likely that the agent will spread to other, uninvolved aircraft, causing damage from corrosion.*

Fire Extinguishers

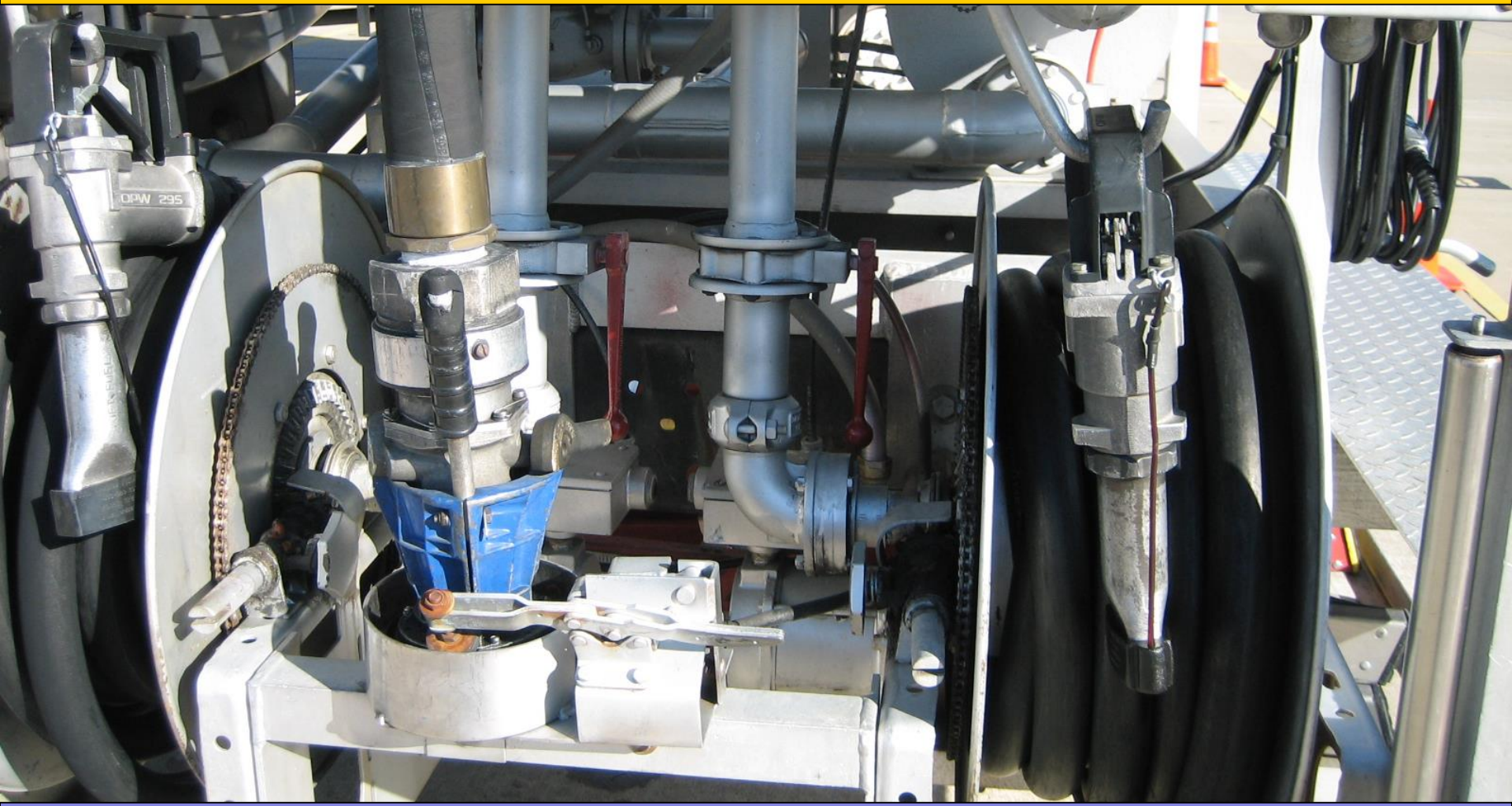
ABC rated clean agent extinguishers, such Halotron extinguishers, are acceptable.

Fire Extinguishers

Check fire extinguishers for proper charge, pin sealed and current inspection tags. Extinguishers should be inspected at least annually by a fire extinguisher servicing company.

Deadman Controls

This is an example of overwing and single point nozzles. The deadman control on overwing nozzles is located on the nozzle.



4.1.7.1 *The valve that controls the flow of fuel to an aircraft shall have a deadman control. The deadman control device shall be arranged to accommodate the operational requirements of Section 5.15.*

Deadman Controls

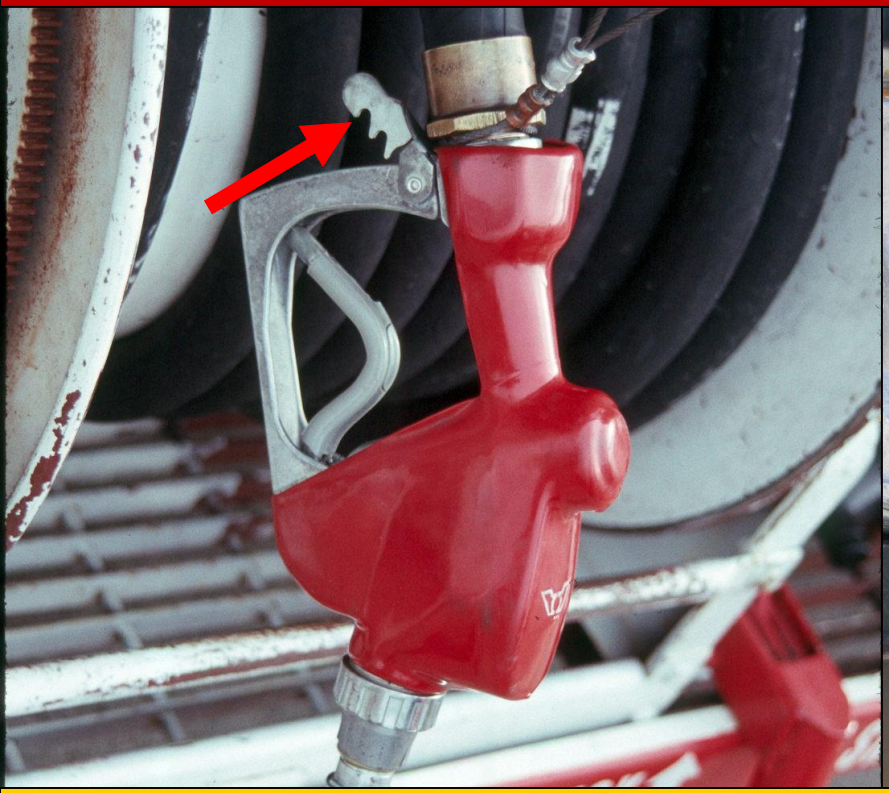
Deadman controls for single point fueling nozzles for Jet fuel normally require squeezing a level or button that maintains the flow control valve in the open position.

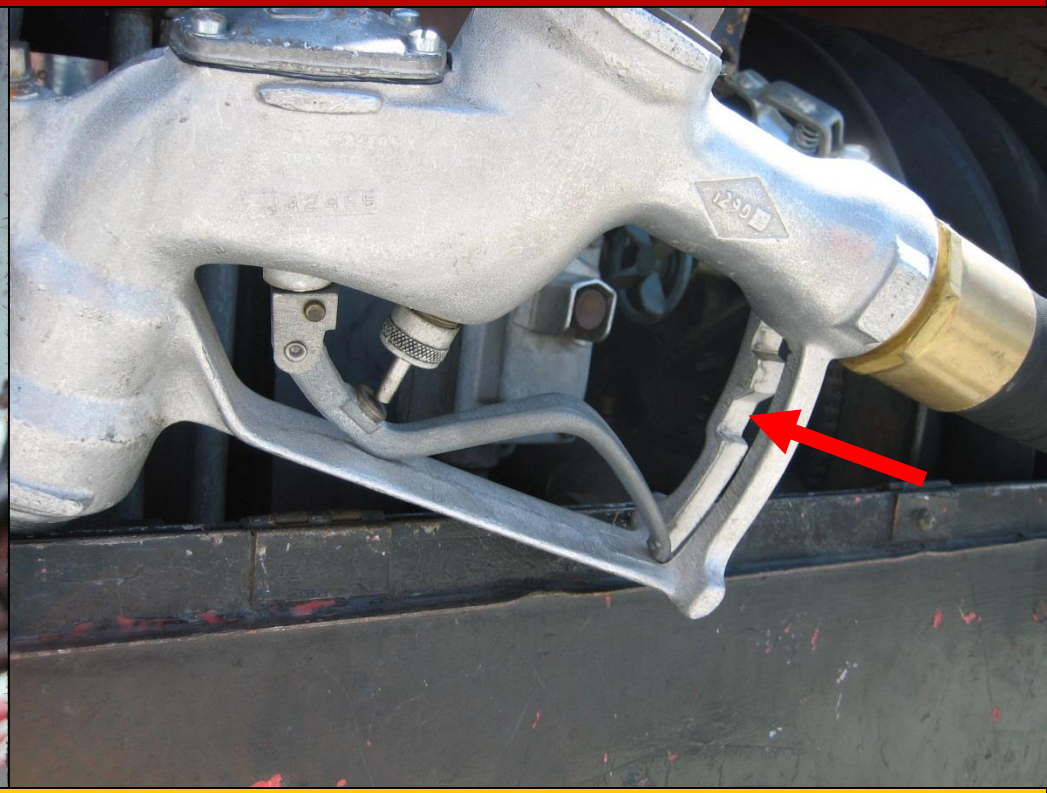
This deadman control has a button that must be depressed to maintain the flow valve open for an underwing or single point nozzle.

NFPA 407, 3.3.13 Deadman Control. *A device that requires a positive continuing action of a person to allow flow of fuel.*

Deadman Controls

Example of Noncompliance to Fueling Standards



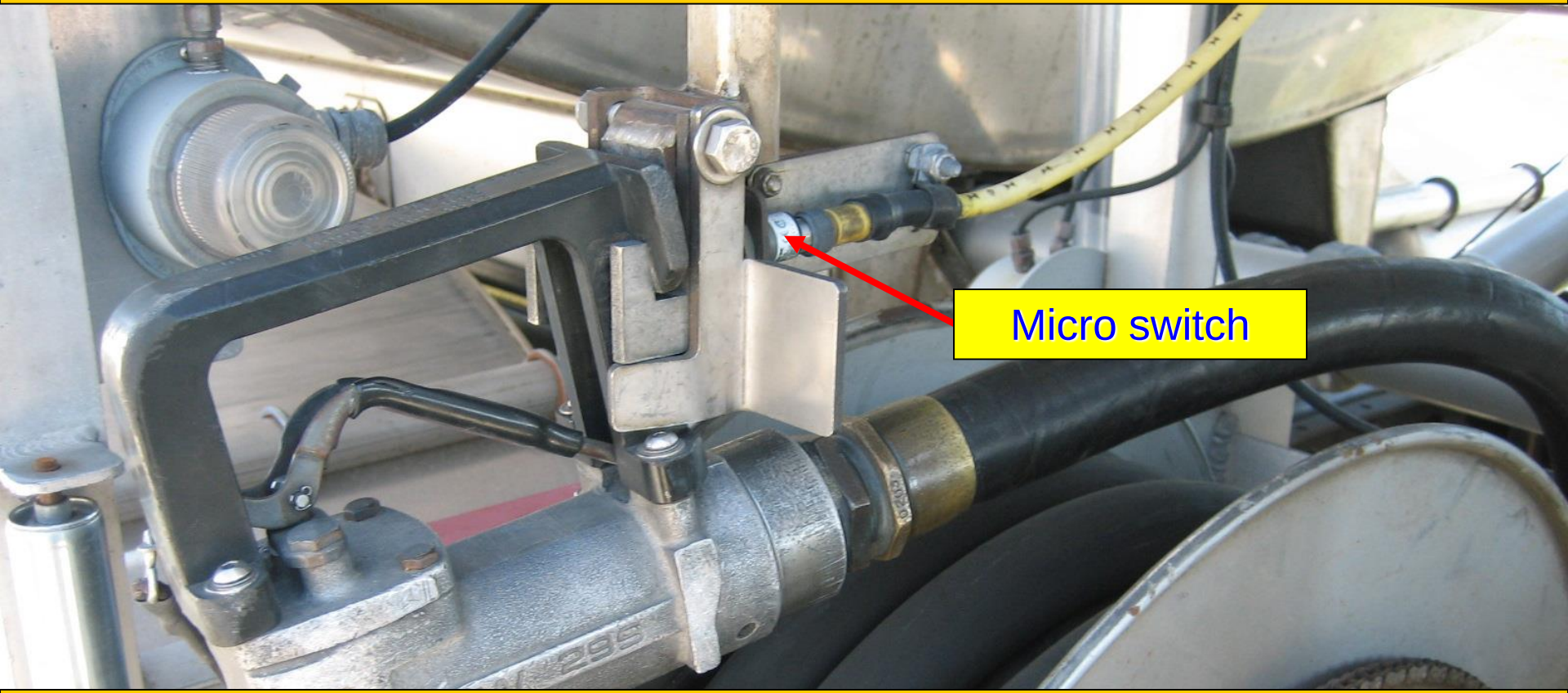


These nozzles have notches that allow bypassing the deadman control and are not in compliance with NFPA 407, 4.3.16.2.

4.1.7.2 *Deadman controls shall be designed to preclude defeating their intended purpose.*

NFPA 407, 4.3.16.2 *The deadman flow control in the nozzle shall be permitted for overwing fueling. Notches or latches in the nozzle handle that could allow the valve to be locked open shall be prohibited.*

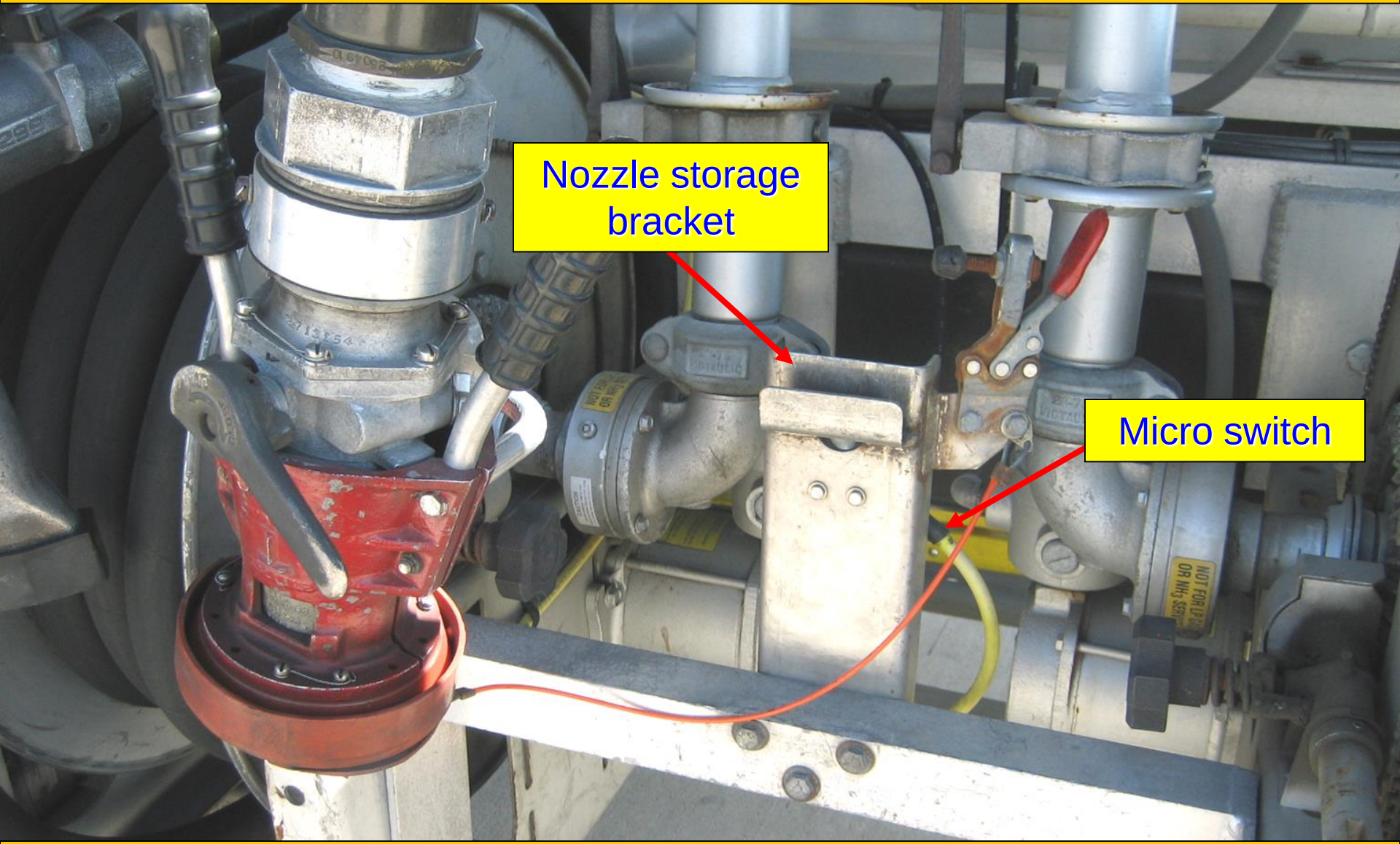
Brake Interlock System for Nozzles



This is an example of a system that prevents this fueler from being moved unless the overwing nozzle is properly stowed. A micro switch is installed in the bracket for the overwing nozzle. The nozzle must be in the stowed position to depress the micro switch to allow the brake system to be released.

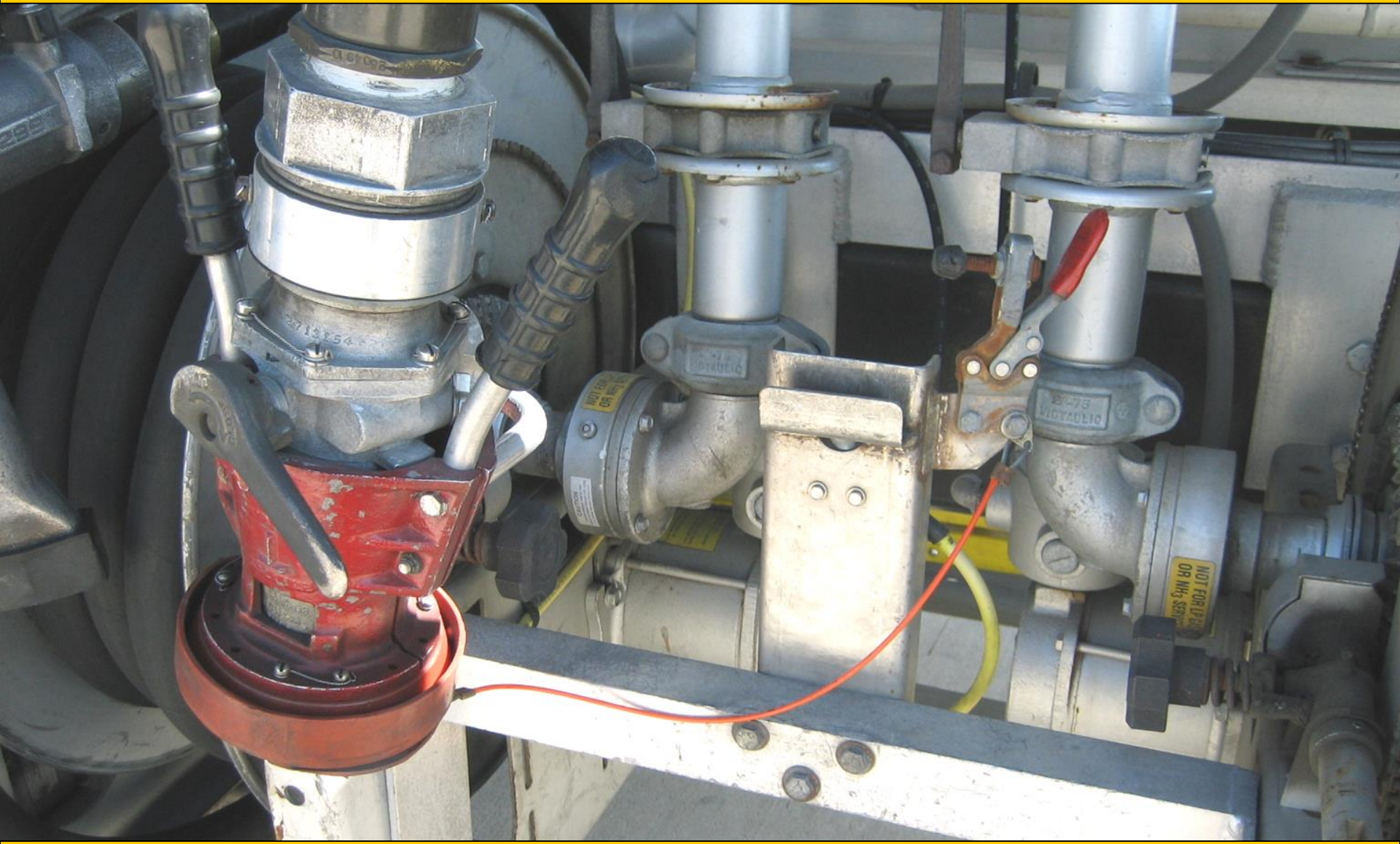
4.3.16.7 *Aircraft fuel servicing vehicles and carts shall have an integral system or device that prevents the vehicle or cart from being moved unless all fueling nozzles and hydrant couplers are properly stowed and mechanical lifts are lowered to their stowed position.*

Brake Interlock System for Nozzles



This is an example a brake interlock system for a single point nozzle. The single point nozzle must be in the stowed position to depress the micro switch to allow the brake system to be released.

Brake Interlock System for Nozzles

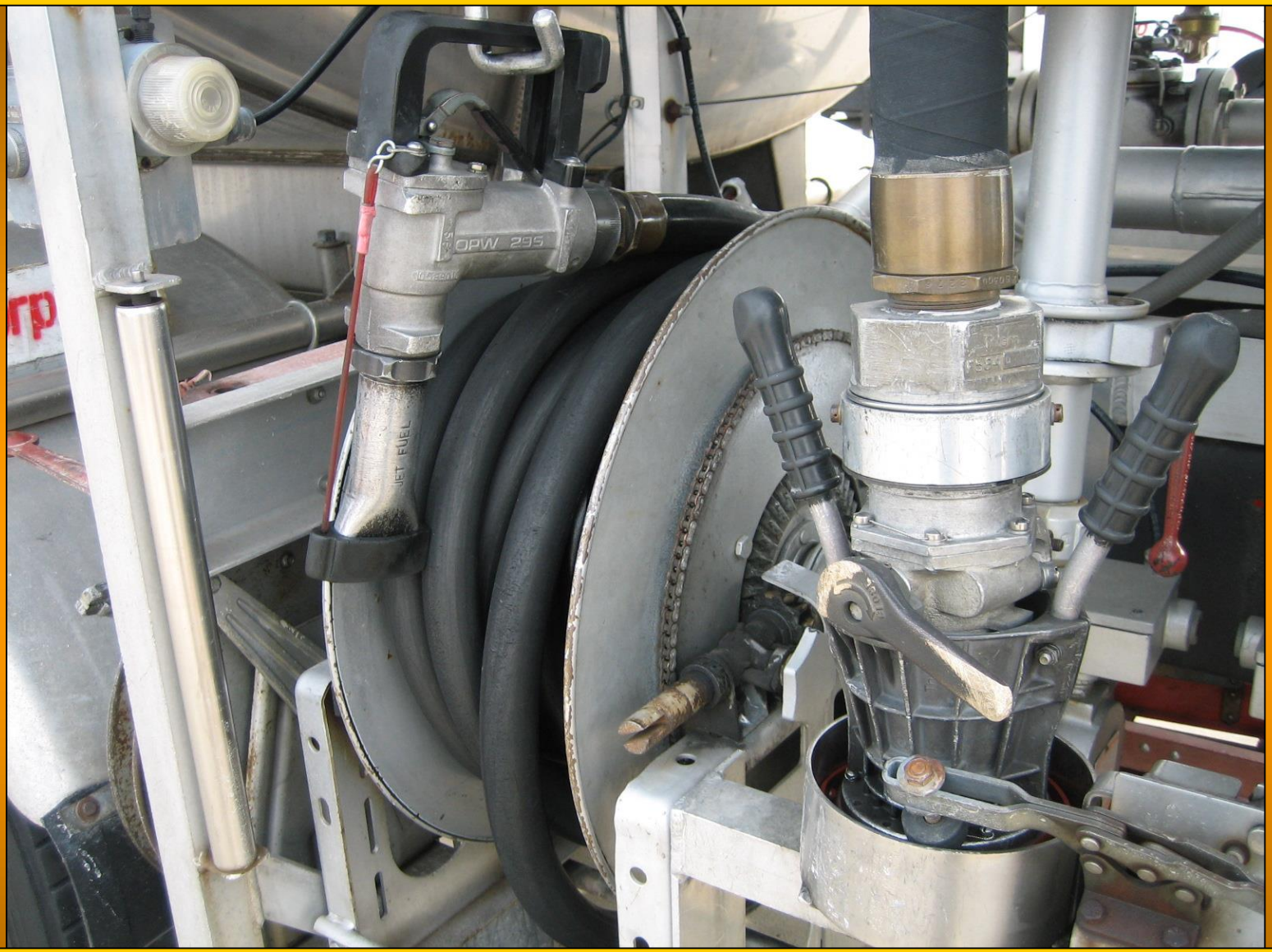


The interlock brake system can be tested by removing a nozzle from it's stowed position and having fueling personnel attempt to move the fueler. The fueler should not be able to be driven off with the brakes locked on.

Brake Interlock System for Nozzles

Older fuel trucks manufactured prior to about 1996 will probably not have the overwing nozzles connected to an integral system or device to prevent the vehicle from being moved when the overwing nozzles are not stowed. These fuelers are grandfathered from this requirement as it was not in effect at the time the fueler was manufactured.

Brake Interlock System for Nozzles



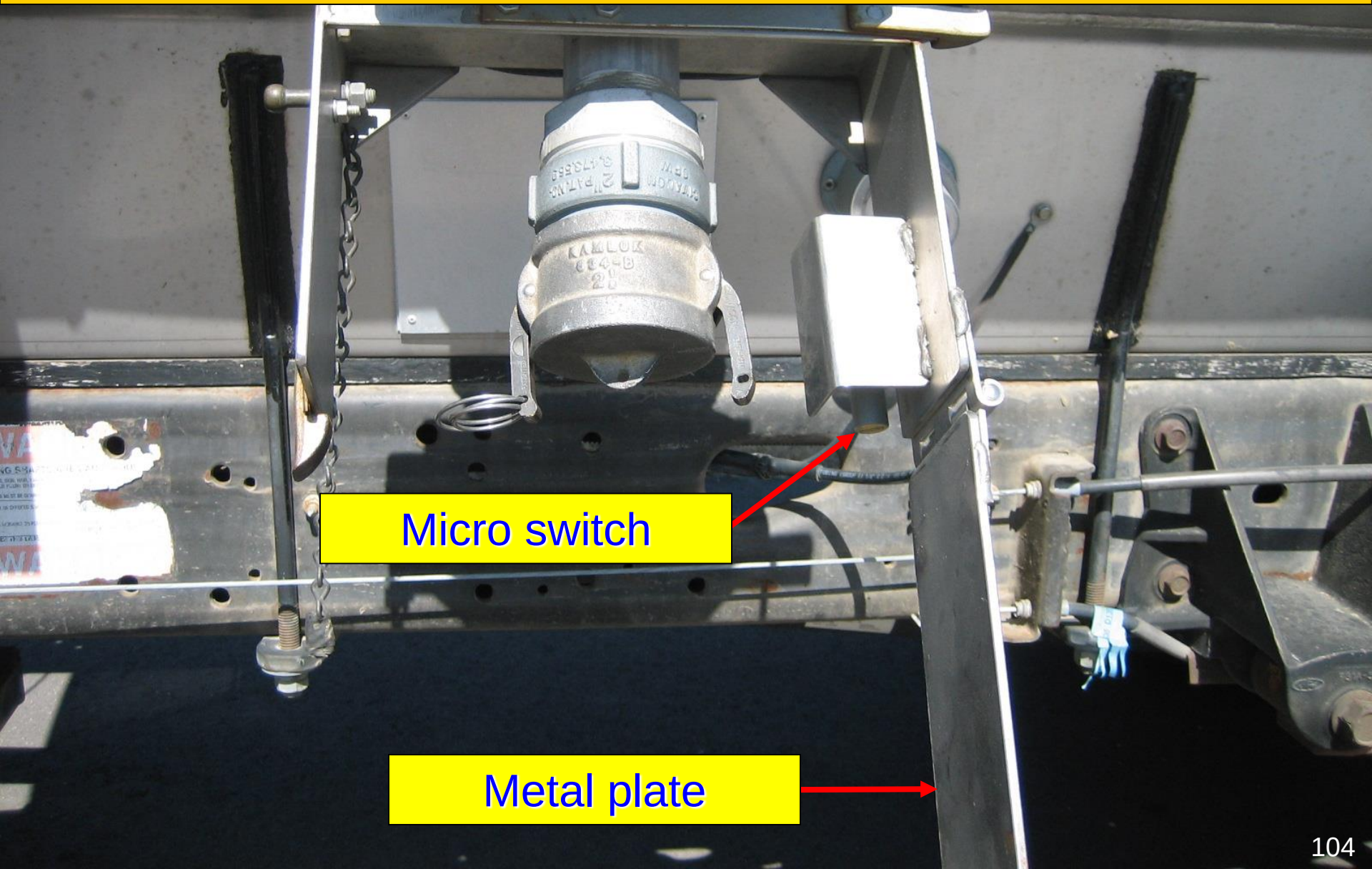
Typically, on older fuel trucks the overwing nozzles are hanging from a hook. However, older fuel trucks will normally have a brake interlock system on the single point nozzle and bottom loader coupler.

Brake Interlock System for Bottom Loading Coupler

NFPA 407, 4.3.21.5 *Aircraft fuel servicing vehicles shall incorporate an integral brake interlock system that prevents the vehicle from being moved until the bottom loading coupler has been disconnected from the vehicle.*

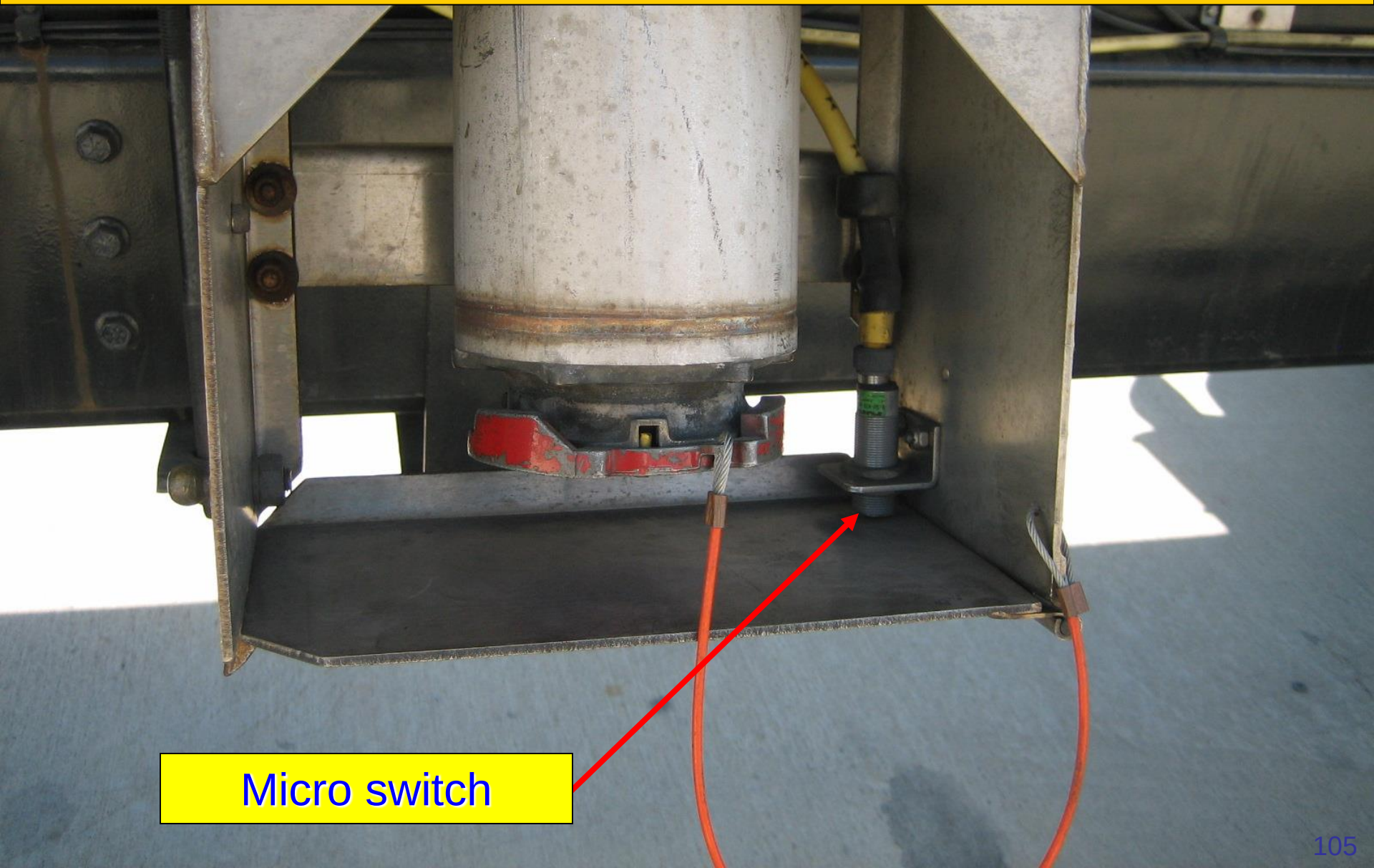
Brake Interlock System for Bottom Loading Coupler

The metal plate on this bottom fill coupling must be closed to depress the micro switch to release the brakes. The metal plate cannot be closed until the hose is disconnected.



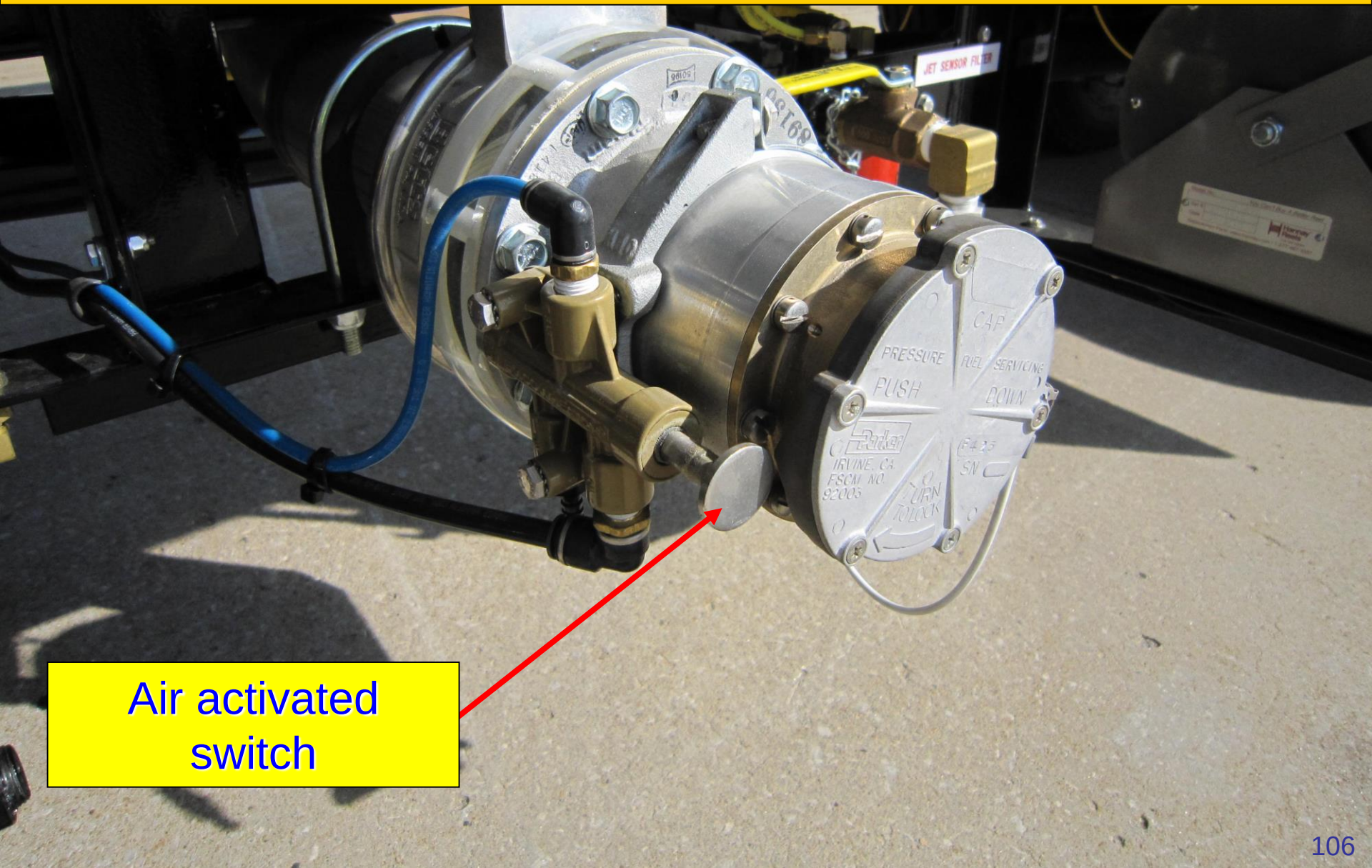
Brake Interlock System for Bottom Loading Coupler

This photo shows the metal plate on the bottom fill coupler in the closed position, which depresses the micro switch so the brakes can be released.

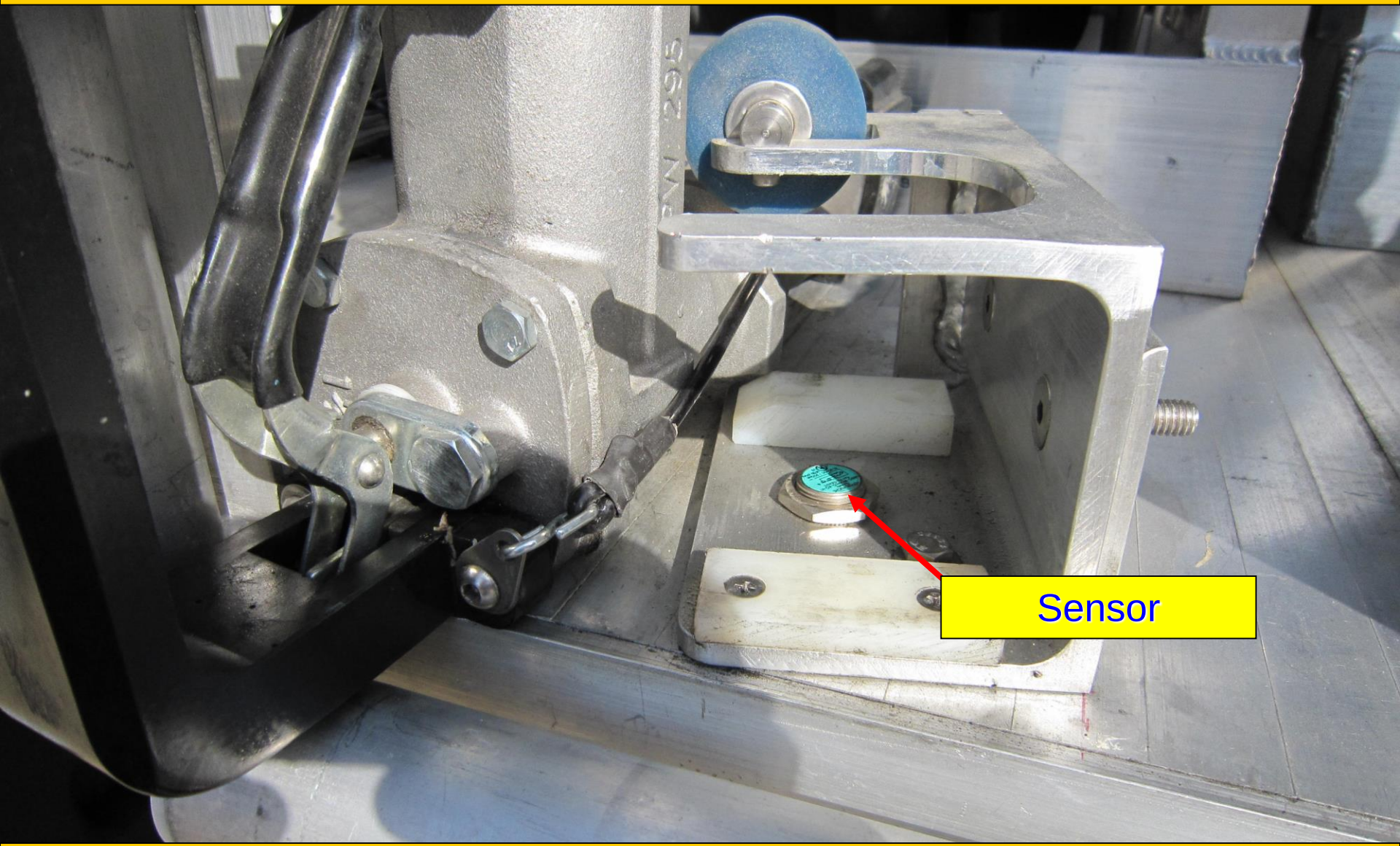


Brake Interlock System for Bottom Loading Coupler

This photo shows an example of an air activated type switch for the interlock brake system.

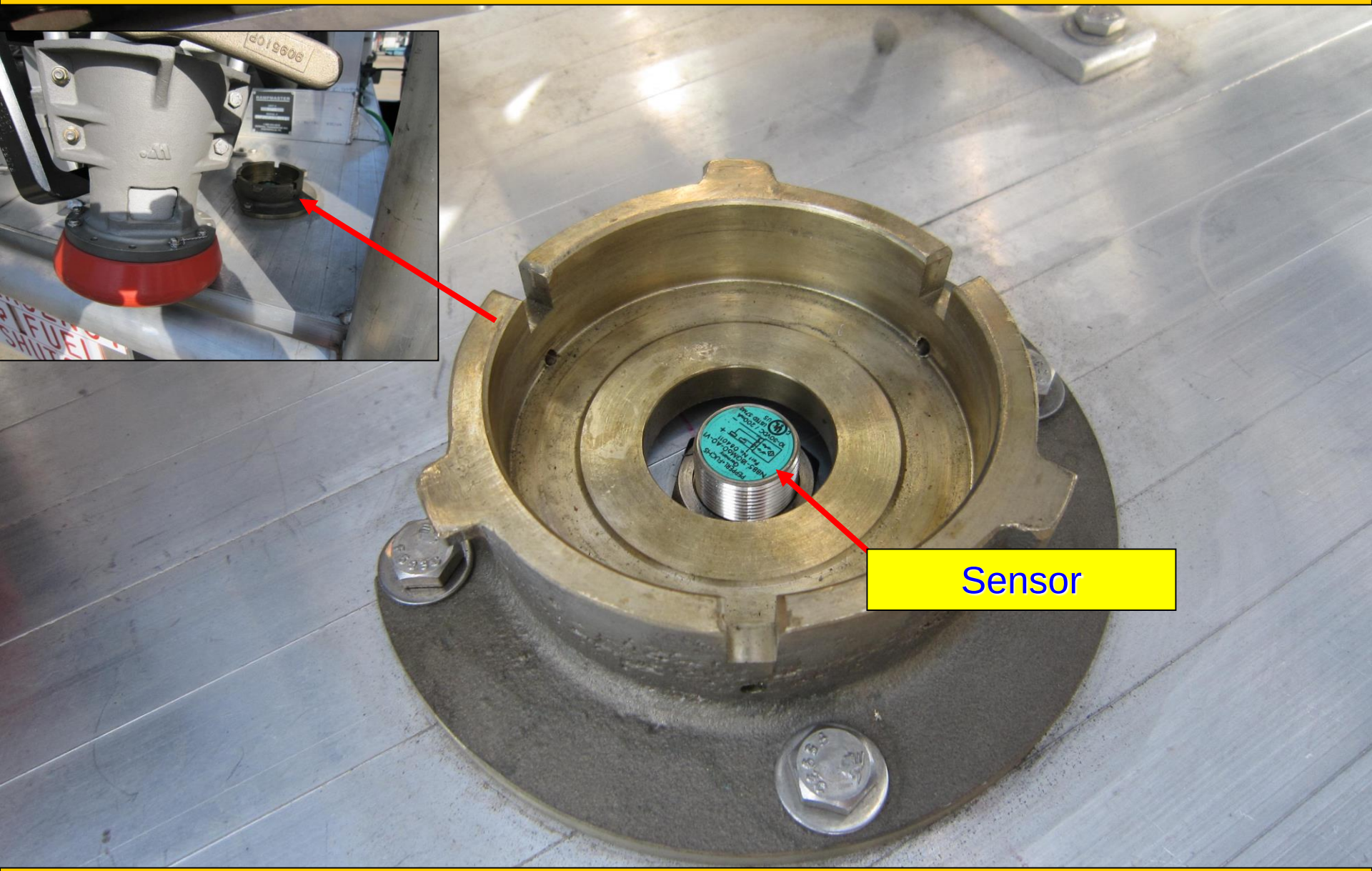


Brake Interlock System



This is an example of a brake interlock system using a sensor, in place of a micro switch, that detects the presence of a properly stowed overwing nozzle, allowing the brake system to be released.

Brake Interlock System



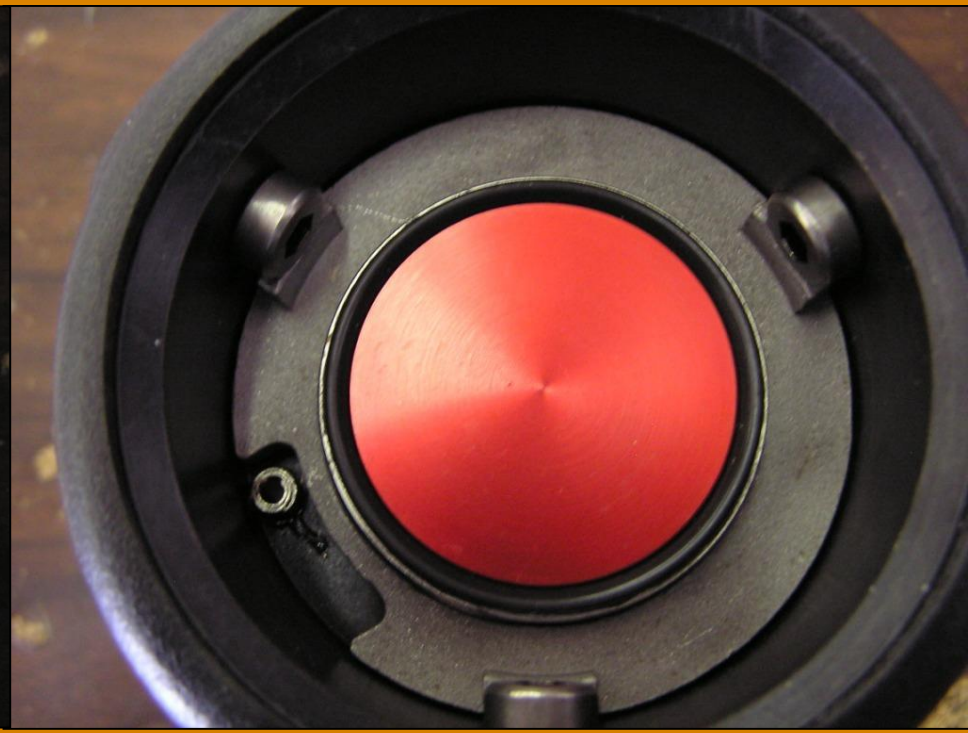
These sensor type brake interlock systems are showing up on new fuelers and are less prone to mechanical failure.

Dry-Break Coupler for Bottom Loading (2007 Change)

A 2007 change to NFPA 407 requires dry-break couplers on truck full hoses.

Dry-Break Adapter

Dry-Break Coupler



4.3.21.3 *The connection between the tank truck and the arm or hose shall be a dry-break coupler that cannot be opened until it is engaged to the vehicle tank adapter. It shall not be possible to disconnect the hose coupler from the tank vehicle until the coupler valve is fully closed.*

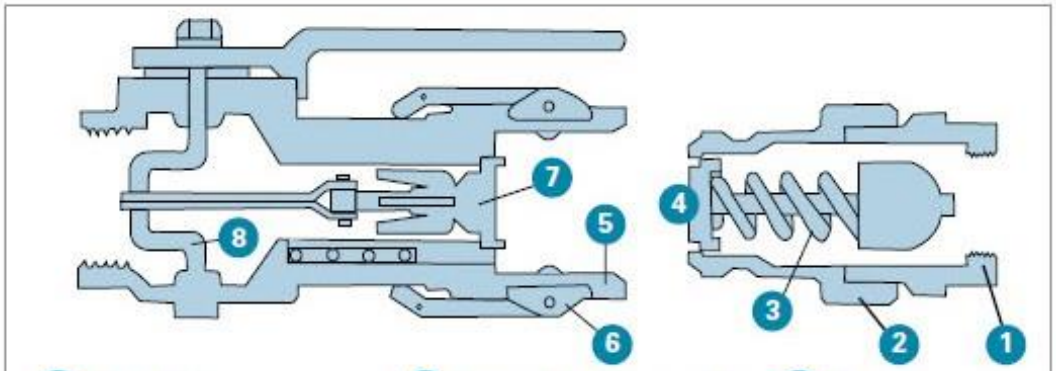
Dry-Break Coupler for Bottom Loading (2007 Change)

Loading Station
100LL Dry Break Coupler

Loading Station
Jet A Dry Break Coupler

4.3.21.3 *The connection between the tank truck and the arm or hose shall be a dry-break coupler that cannot be opened until it is engaged to the vehicle tank adapter. It shall not be possible to disconnect the hose coupler from the tank vehicle until the coupler valve is fully closed.*

Dry-Break Coupler for Bottom Loading

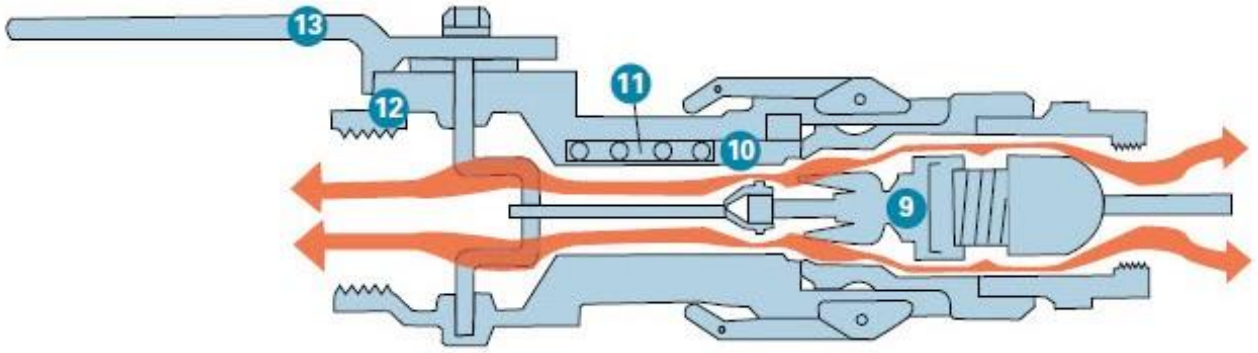


1 Pipe End
2 Adaptor
3 Spring
4 Poppet Sub-Assembly
5 Body
6 Cam Arm
7 Poppet
8 Stem Sub-Assembly

Kamvalok® Coupler With Valve Closed

This drawing demonstrates how, when the Kamvalok® adaptor is separated from the coupler its own spring-loaded poppet assembly holds the disc firmly in the closed position.

The drawing below shows the coupler and adaptor coupled and the lever opened. The coupler poppet mates with the adaptor poppet, pushing it open when the lever is actuated, allowing for the full flow of product.



9 Center Guided Poppet
10 Seal Cylinder
11 Spring
12 Body
13 Lever

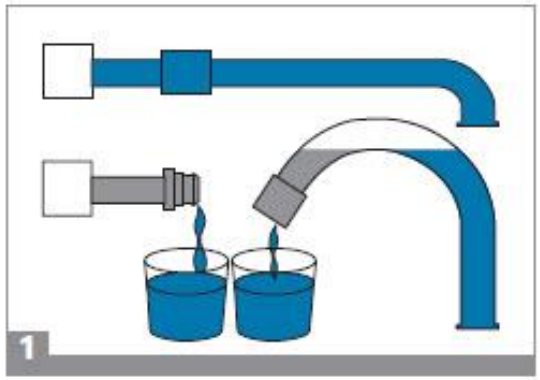
Kamvalok® Coupler With Valve Open

Dry-Break systems only permit fuel flow when the coupler is connected to the adapter.

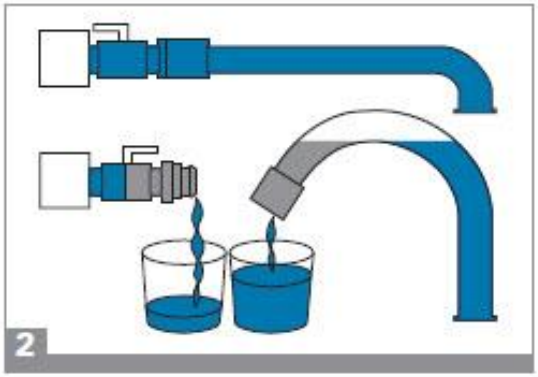
Dry-Break Coupler for Bottom Loading

WHY USE KAMVALOKS®

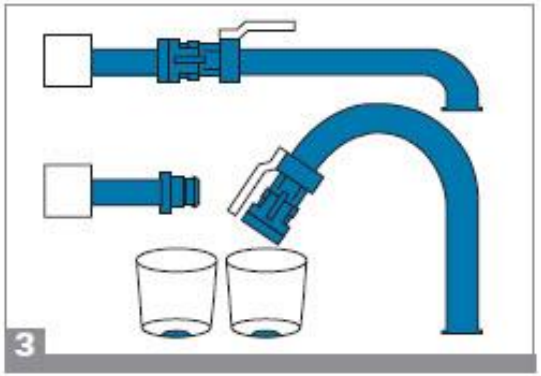
- If your product is corrosive, toxic, caustic or otherwise harmful Kamvaloks® will reduce the hazard associated with the transfer of these products.
- If your product is a VOC (Volatile Organic Compound) that has a high vapor pressure and tends to evaporate quickly, Kamvaloks® will keep the product in-line and out of the air.
- Kamvaloks® will contain fugitive emissions, transfer VOC's without vapor loss, help keep employees out of harm's way and help promote responsible environmental management.



Ordinary Quick Disconnect Couplings
Excessive amount of liquid spills out when coupling is disconnected.



Ordinary Quick Disconnect Couplings Plus Ball Valve
Excessive amount of liquid spills out when coupling and ball valve are disconnected.

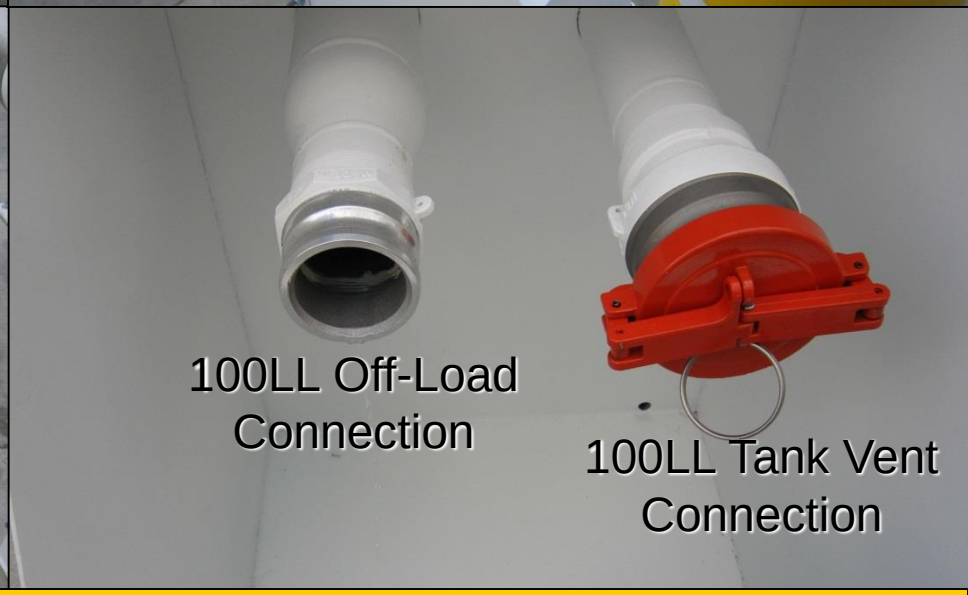


OPW Dry Disconnect Couplings
Virtually eliminates spillage of any residual liquid contained within the line after disconnection.

Dry-Break systems result in no fuel leakage when the coupler is disconnected from the adapter.

Fuel Farm Off-Load Connections

Jet A Off-Load Connection



100LL Off-Load Connection

100LL Tank Vent Connection

Dry-Break type adaptors are not required on the off-load facilities where tanker trucks deliver fuel to the airport fuel farm.

Emergency Fuel Shutoffs

4.3.15.2 … .*The vehicle shall have at least two emergency shutoff controls, one mounted on each side of the vehicle. These controls shall be quick-acting to close the tank outlet valve in case of emergency. They also shall be remote from the fill openings and discharge outlets and shall be operable from a ground-level standing position. In addition, all vehicles or carts equipped with a top deck platform shall have an emergency shutoff control operable from the deck.*

Emergency Fuel Shutoffs

4.3.15.2 *There shall be at least two emergency shutoff controls, one mounted on each side of the vehicle. These controls shall be quick-acting to close the tank outlet valve in case of emergency. They also shall be remote from the fill openings and discharge outlets and shall be operable from a ground-level standing position. In addition, all vehicles or carts equipped with a top deck platform shall have an emergency shutoff control operable from the deck.*

Emergency Fuel Shutoffs

Example of Noncompliance to Fueling Standards

This fuel truck is lacking an emergency fuel shutoff on the right side as required by NFPA 407, 4.3.15.2.

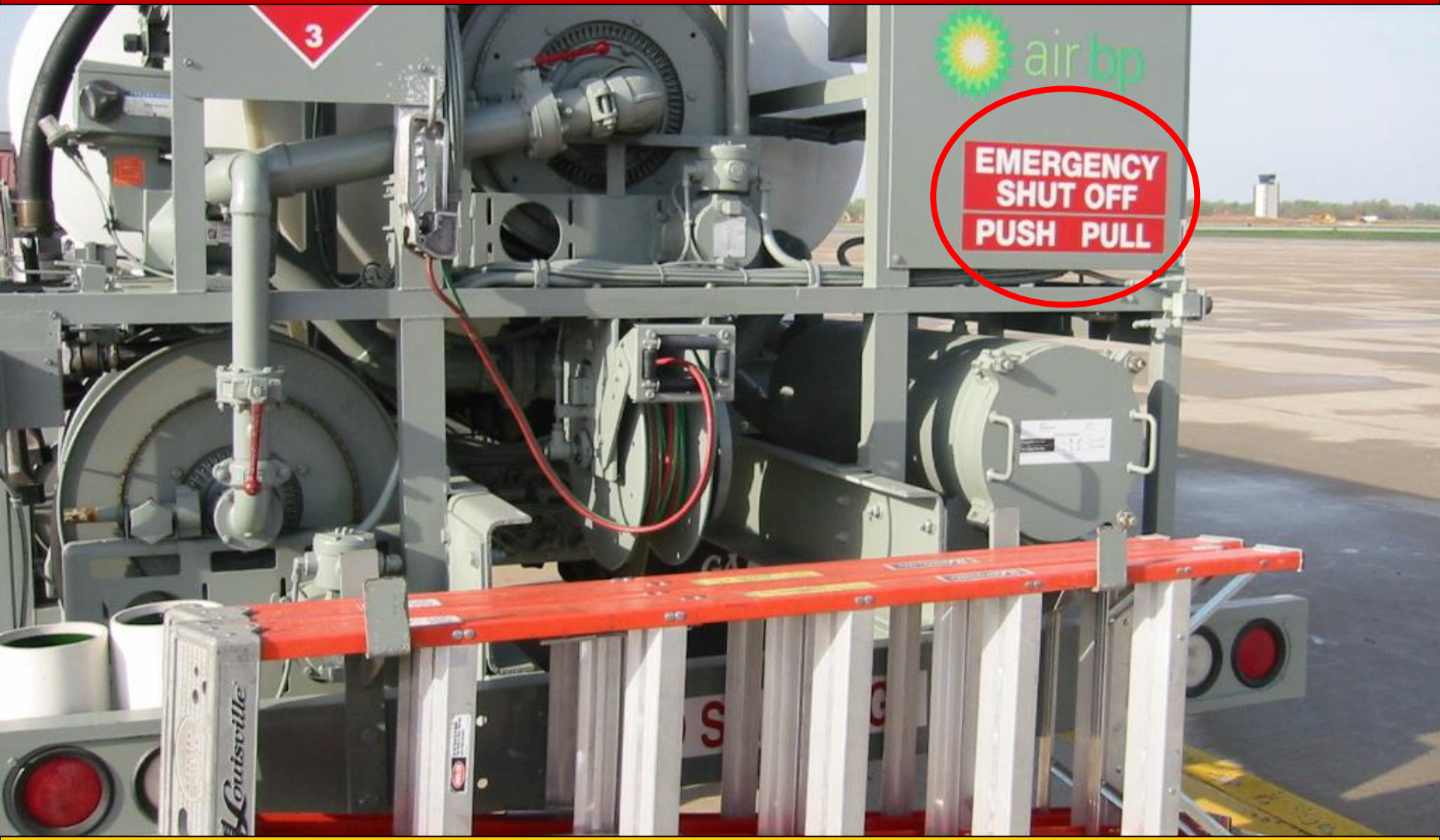
Emergency Fuel Shutoffs

An arrow or the word PUSH or PULL, as appropriate, is required.

NFPA 407, 4.3.15.3 *Emergency fuel shutoff controls shall be placarded EMERGENCY FUEL SHUTOFF in letters at least 2 in. high and shall be of a color that contrasts with the placard background for visibility. The method of operation shall be indicated by an arrow or by the word PUSH or PULL, as appropriate.*

Emergency Fuel Shutoffs

Example of Noncompliance to Fueling Standards



Both PUSH and PULL should not be on the placard. In addition, the placard is missing the “FUEL” portion of the EMERGENCY FUEL SHUTOFF placard..

Emergency Fuel Shutoffs

Example of Noncompliance to Fueling Standards

The shut off lever is labeled with both PUSH and PULL.

Emergency Fuel Shutoffs

Example of Noncompliance to Fueling Standards

The word, “FUEL” is missing from this placard. This is a common problem found during FAA inspections.

Emergency Fuel Shutoffs

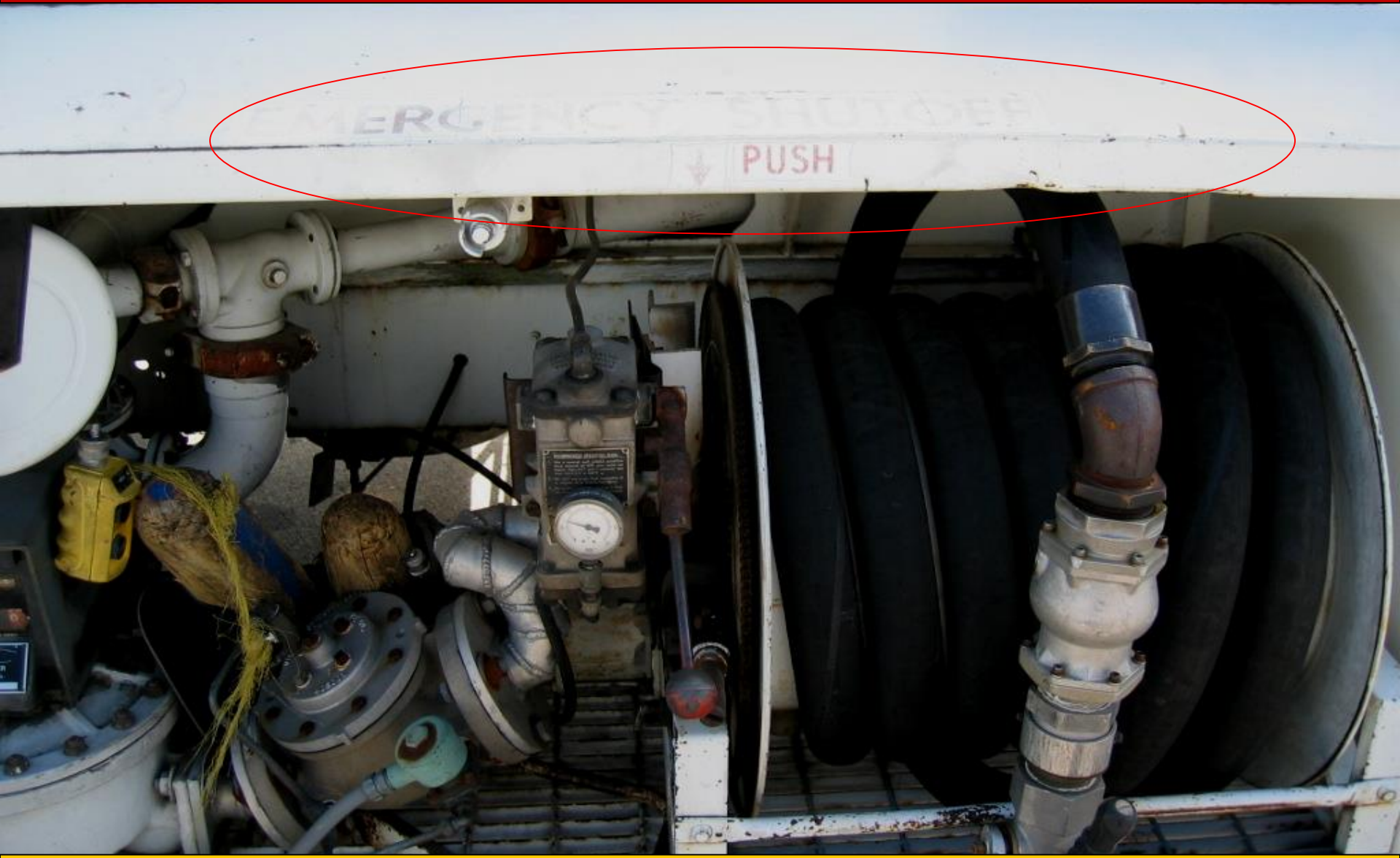
Example of Noncompliance to Fueling Standards

The EMERGENCY FUEL SHUTOFF placard letters are 1 inch rather than the required 2 inch size.

NFPA 407, 4.3.15.3 *Emergency fuel shutoff controls shall be placarded EMERGENCY FUEL SHUTOFF in letters at least 2 in. high and shall be of a color that contrasts with the placard background for visibility. The method of operation shall be indicated by an arrow or by the word PUSH or PULL, as appropriate.*

Emergency Fuel Shutoffs

Example of Noncompliance to Fueling Standards



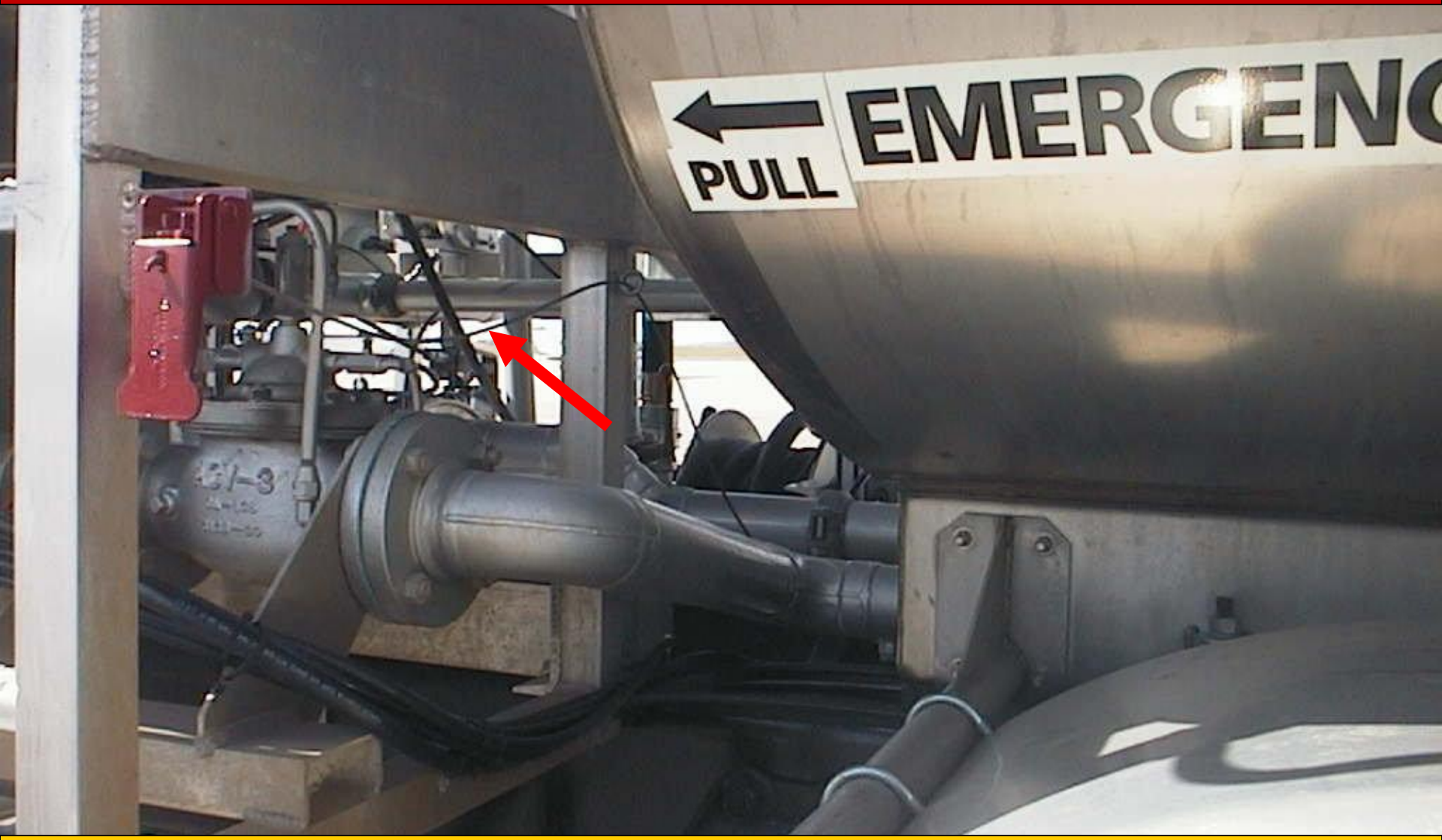
This emergency fuel shutoff placard is faded and not readily visible.

Emergency Fuel Shutoffs

Physically activating the cable operated emergency fuel shutoff systems when inspecting fuelers is recommended. Cable operated emergency fuel shutoffs have problems with cables not being properly adjusted or being inoperable due to freezing or rust problems inside the cable sheaths.

Emergency Fuel Shutoffs

Example of Noncompliance to Fueling Standards



This emergency fuel shutoff is not operable because of too much slack in the cable. Inoperable cable activated emergency fuel shutoffs are a fairly common problem.

Emergency Fuel Shutoffs

For pneumatic operated emergency fuel shutoffs, fuelers must be started up and placed in pump mode in order to check the emergency fuel shutoff system.

Emergency Fuel Shutoffs

NFPA 407, 5.3.4 *Emergency fuel shutoff systems shall be operationally checked at intervals not exceeding 6 months. Each individual device shall be checked at least once during every 12 month period.*

Many fueling agents include a check of the emergency shutoff systems in their weekly or monthly checklists.

Aircraft Fueling Hose

NFPA 407, Annex A Explanatory Material

A.5.16 *Failure of aircraft fueling hose in service is a potential source of fuel spillage and a potential fire hazard. The principal reasons for failure of aircraft fueling hoses include the following:*

(1) Using damaged hoses

(2) Using aged hoses

(3) Exceeding pressure limits

(4) Improper installation

Aircraft Fueling Hose

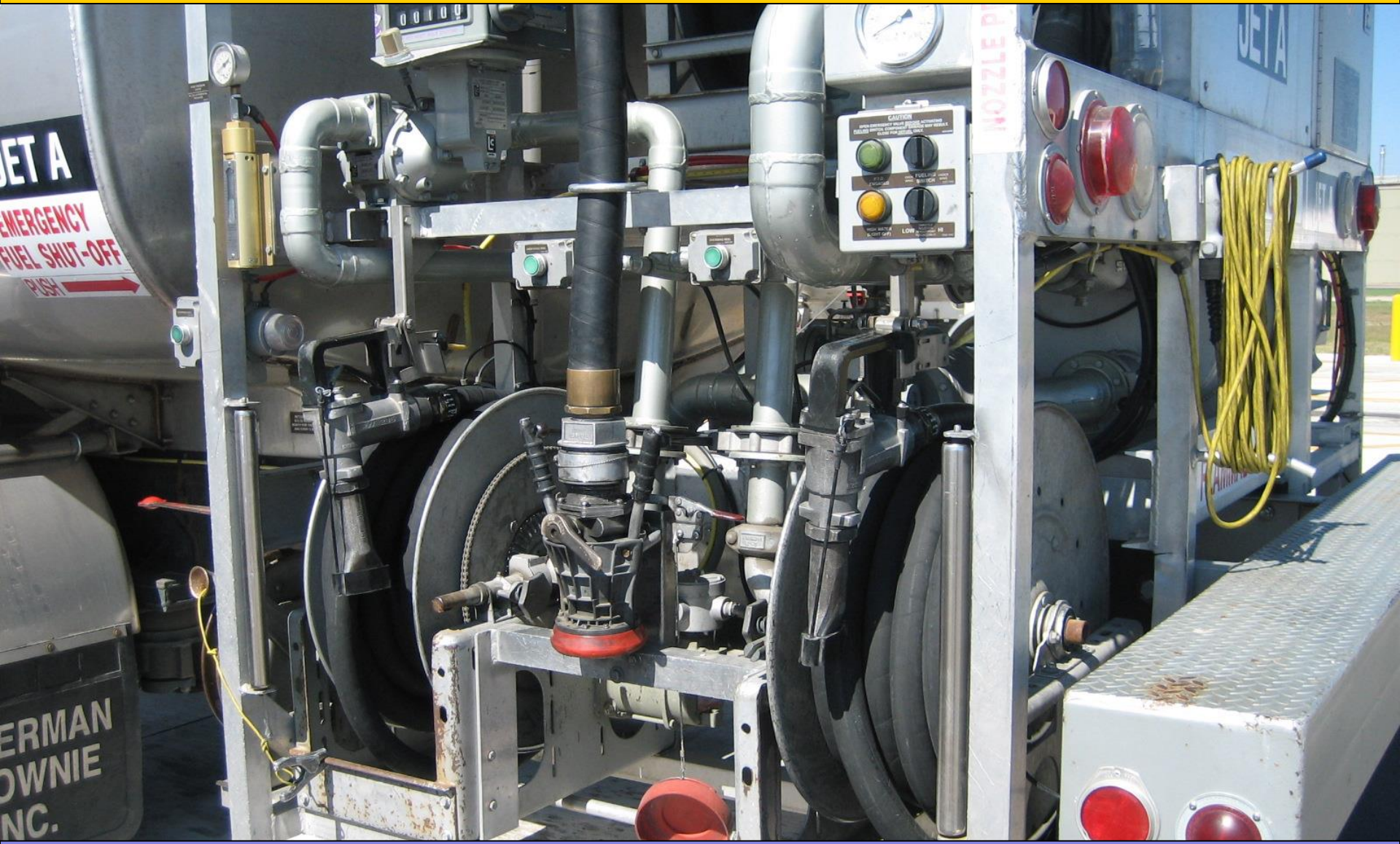
NFPA 407, 5.16 Aircraft Fueling Hose.

5.16.1 *Aircraft fueling hose shall be inspected before use each day. The hose shall be extended as it normally would be for fueling and checked for evidence of blistering, carcass saturation or separation, cuts, nicks, or abrasions that expose reinforcement material, and for slippage, misalignment, or leaks at couplings. If coupling slippage or leaks are found, the cause of the problem shall be determined. Defective hose shall be removed from service.*

Aircraft Fueling Hose

NFPA 407, 5.16.2 *At least once each month the hose shall be completely extended and inspected as required in 5.16.1. The hose couplings and the hose shall be examined for a length approximately 305 mm (12 in.) adjacent to the couplings. Structural weakness shall be checked by pressing the hose in this area around its entire circumference for soft spots. Hoses that show evidence of soft spots shall be removed from service. The nozzle screens shall be examined for rubber particles. The presence of such particles indicates possible deterioration of the interior, and the hose shall be removed from service. With the hose still completely extended, it shall be checked at the working pressure of the fueling equipment to which it is attached. Any abnormal twisting or ballooning during this test indicates a weakening of the hose carcass, and the hose shall be removed from service.*

Aircraft Fueling Hose



NFPA 407, 4.1.1 *Fueling Hose Apparatus. Nozzle receptacles and hose storage shall be arranged to avoid kinks and maintain the hose bend radius within the requirements of API BULL 1529.*

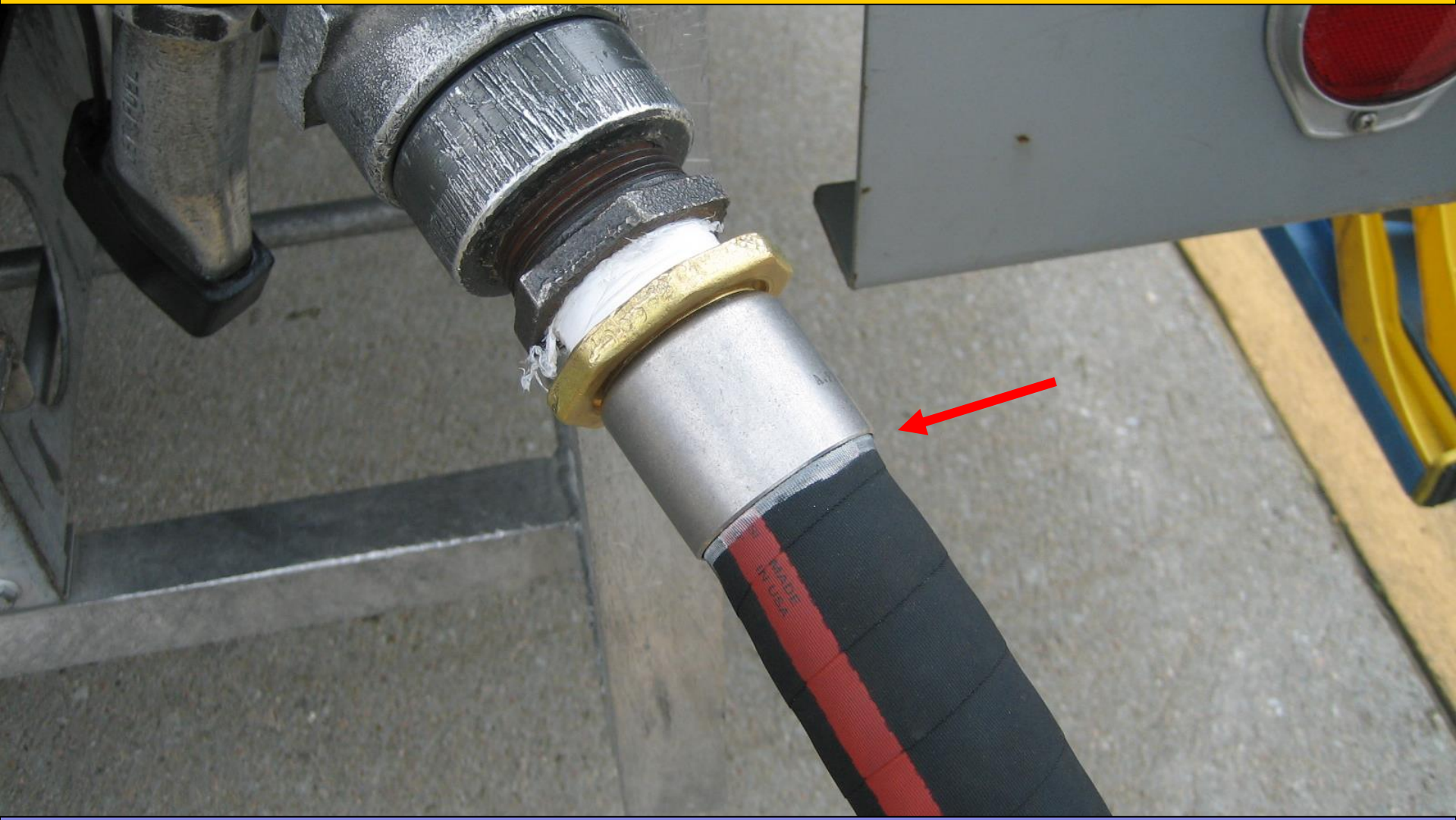
Aircraft Fueling Hose

NFPA 407, 5.4.6 *Conductive hose shall be used to prevent electrostatic discharge but shall not be used to accomplish required bonding.*

NFPA 407, 4.1.2.4 *API BULL 1529, Aviation Fueling Hose, Type C hose (semiconductive) shall be used to prevent electrostatic discharges but shall not be used to accomplish required bonding. API BULL 1529, Type A hose that does not have a semiconductive cover shall not be used. Type F hose (hard wall) and Type CT hose (cold temperature) shall be permitted because they have semiconductive covers.*

Aircraft Fueling Hose

Check the coupling area of the hose for signs of hose slippage.



NFPA 407, 4.2.2.5 *The hose at the end of each coupling ferrule shall be permanently marked prior to hydrostatic testing to serve as a reference to determine whether a coupling has slipped during testing or while in service.*

Lighting and Electrical Equipment

NFPA 407, 4.3.7.6 *Lamps, switching devices, and electronic controls, other than those covered in 4.3.7.4 and 4.3.7.5, shall be of the enclosed, gasketed, weatherproof type. Other electrical components shall be of a type listed for use in accordance with NFPA 70 Class I, Division 2, Group D locations.*

Tail light lenses sometimes are damaged by ladders or from backing into things, resulting in a potential ignition source.

Example of Noncompliance to Fueling Standards

This missing tail light lens provides a potential ignition source, contrary to NFPA 407, 4.3.7.6.

NFPA 407, 4.3.7.6 *Lamps, switching devices, and electronic controls, other than those covered in 4.3.7.4 and 4.3.7.5, shall be of the enclosed, gasketed, weatherproof type. Other electrical components shall be of a type listed for use in accordance with NFPA 70 Class I, Division 2, Group D locations.*

Example of Noncompliance to Fueling Standards

This missing dome light cover provides a potential ignition source, contrary to NFPA 407, 4.3.7.6.

NFPA 407, 4.3.7.6 *Lamps, switching devices, and electronic controls, other than those covered in 4.3.7.4 and 4.3.7.5, shall be of the enclosed, gasketed, weatherproof type. Other electrical components shall be of a type listed for use in accordance with NFPA 70 Class I, Division 2, Group D locations.*

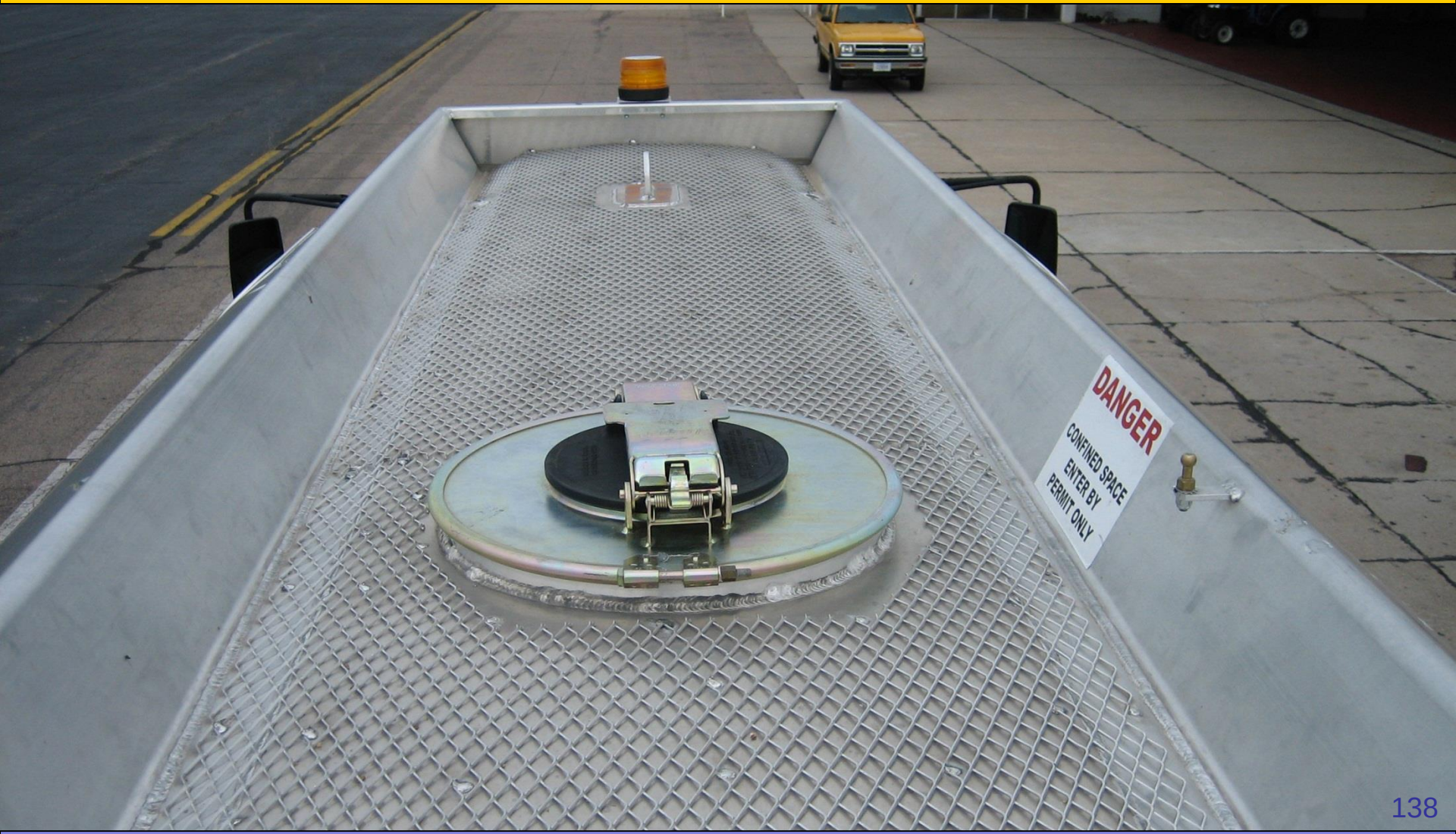
Lighting and Electrical Equipment

The recessed type lenses are less likely to be damaged.

Dome Covers

Dome covers should be physically inspected for leaking problems, especially on older trucks.

Dome Covers



NFPA 407, 4.3.13.1 *Dome covers shall be provided with a forward-mounted hinge and self-latching catches and shall be fitted with watertight fuel-resistant seals or gaskets (designed to prevent spillage or leakage from overturn and to prevent water entry). Dome covers shall automatically close and latch with the forward motion of the vehicle.*

Dome Covers

Example of Noncompliance to Fueling Standards

The fuel stains on the side of the tank indicate that the dome cover seal is not properly fitted with a watertight fuel resistant gasket, contrary to NFPA 407, section 4.3.13.1.

NFPA 407, 4.3.13.1 *Dome covers shall be provided with a forward-mounted hinge and self-latching catches and shall be fitted with watertight fuel-resistant seals or gaskets (designed to prevent spillage or leakage from overturn and to prevent water entry). Dome covers shall automatically close and latch with the forward motion of the vehicle.*

Airport Fueling Systems

Grounding/Bonding

Underground fuel tanks and piping are grounded by the nature of the installation.

NFPA 30, 6.5.4 *All equipment such as tanks, machinery, and piping shall be designed and operated to prevent electrostatic ignitions. All metallic equipment where the potential exists for an ignitable mixture could be present shall be bonded or grounded. The bond and ground shall be physically applied or shall be inherently present by the nature of the installation. Any electrically isolated section of metallic piping or equipment shall be bonded and grounded to prevent hazardous accumulation of static electricity.*

Grounding/Bonding

Above ground fuel tanks need to be grounded or bonded together and connected to a grounding rod.

Grounding/Bonding

Check above ground fuel tanks for proper grounding.

Smoking Restrictions

NFPA 407, 4.1.3 *No Smoking Signs. Entrances to fueling areas shall be posted with "no smoking" signs.*

Smoking Restrictions

Example of Noncompliance to Fueling Standards

The No Smoking sign is faded.

Fuel Storage Area Ground

NFPA 30, 21.6.6.3 *Ground areas around tank storage facilities shall be kept free of weeds, trash, or other unnecessary combustible materials.*

Fuel Storage Area Ground

Example of Noncompliance to Fueling Standards

The ground area around this tank storage facility is not free of weeds, which can contribute to the spread of fire.

NFPA 30, 21.6.6.3 *Ground areas around tank storage facilities shall be kept free of weeds, trash, or other unnecessary combustible materials.*

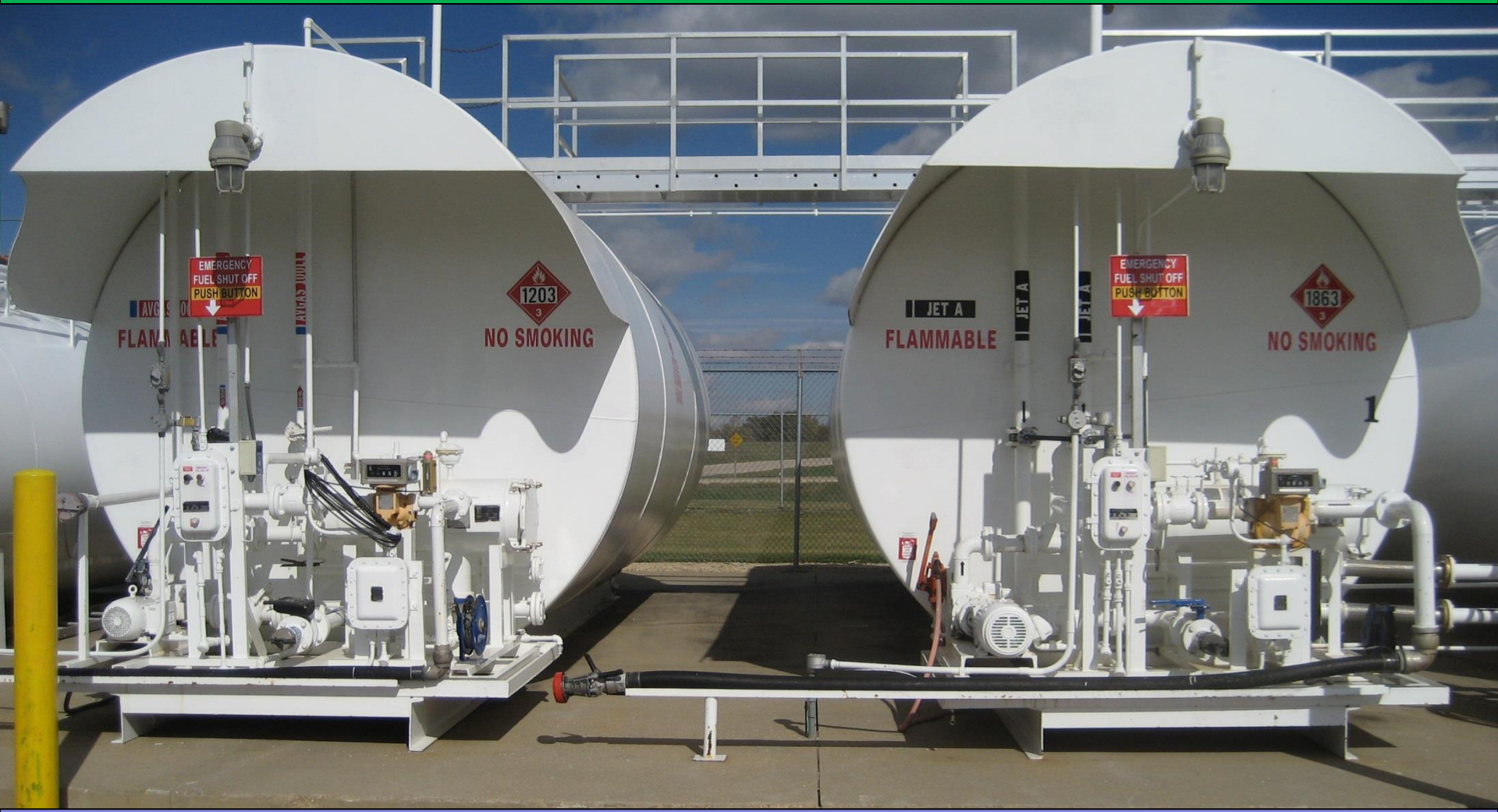
Emergency Fuel Shutoffs

The Emergency Fuel Shutoffs for loading stations are located at the loading stations while the Emergency Fuel Shutoff for the fuel facility is located outside the probable spill areas and near the route that normally is used to leave the spill area or to reach fire extinguishers. The emergency fuel shutoffs for loading stations and fuel facility are separate requirements. Emergency fuel shutoffs for loading stations are in the probable spill area and therefore, would not meet the requirement for an emergency fuel shutoff for the fuel facility, which must be located outside the probable spill area.

Emergency Fuel Shutoff for Loading Station

Emergency Fuel Shutoff for Airport Fuel Facility

Emergency Fuel Shutoffs – Loading Stations



NFPA 407, 4.3.22.1 *Each tank vehicle loading station shall be provided with an emergency fuel shutoff system. This requirement is in addition to the deadman control required by 4.3.20.5 for top loading and by 4.3.21.7 for bottom loading. It shall be the purpose of this system to shut down the flow of fuel in the entire system or in sections of the system if an emergency occurs. This system shall be of a fail-safe design.*

Loading Station Emergency Fuel Shutoff - Placard

NFPA 407, 4.3.22.2 *Each emergency fuel shutoff station location shall be placarded EMERGENCY FUEL SHUTOFF in letters at least 2 in. high. The method of operation shall be indicated by an arrow or by the word PUSH or PULL, as appropriate. Any action necessary to gain access to the shutoff device (e.g., BREAK GLASS) shall be shown clearly. Lettering shall be of a color contrasting sharply with the placard background for visibility. Placards shall be weather resistant, shall be located at least 7 ft above grade, and shall be positioned so that they can be seen readily from a distance of at least 25 ft.*

Emergency Fuel Shutoffs – Airport Fuel Systems

NFPA 407, 5.3.1 *Access to emergency fuel shutoff control stations shall be kept clear at all times.*

NFPA 407, 4.4.5.1 *Each fuel system, as required by 4.4.3.3, shall have means for quickly and completely shutting off the flow of fuel in an emergency. This requirement shall be in addition to the requirement in 4.1.7 for deadman control of fuel flow.*

Airport Fuel System Emergency Fuel Shutoff - Placard

Example of Noncompliance to Fueling Standards

The labelled Emergency Fuel Shutoff switch is actually the tank overfill alarm reset.

Emergency Fuel Shutoffs – Airport Fuel Systems

NFPA 407, 4.4.5.3 *The emergency fuel shutoff system shall include shutoff stations located outside of probable spill areas and near the route that normally is used to leave the spill area or to reach the fire extinguishers provided for the protection of the area.*

Airport Fuel System Emergency Fuel Shutoff - Placard

NFPA 407, 4.4.5.7 *Each emergency fuel shutoff station shall be placarded EMERGENCY FUEL SHUTOFF in letters at least 2 in. high. The method of operation shall be indicated by an arrow or by the word PUSH or PULL, as appropriate.*

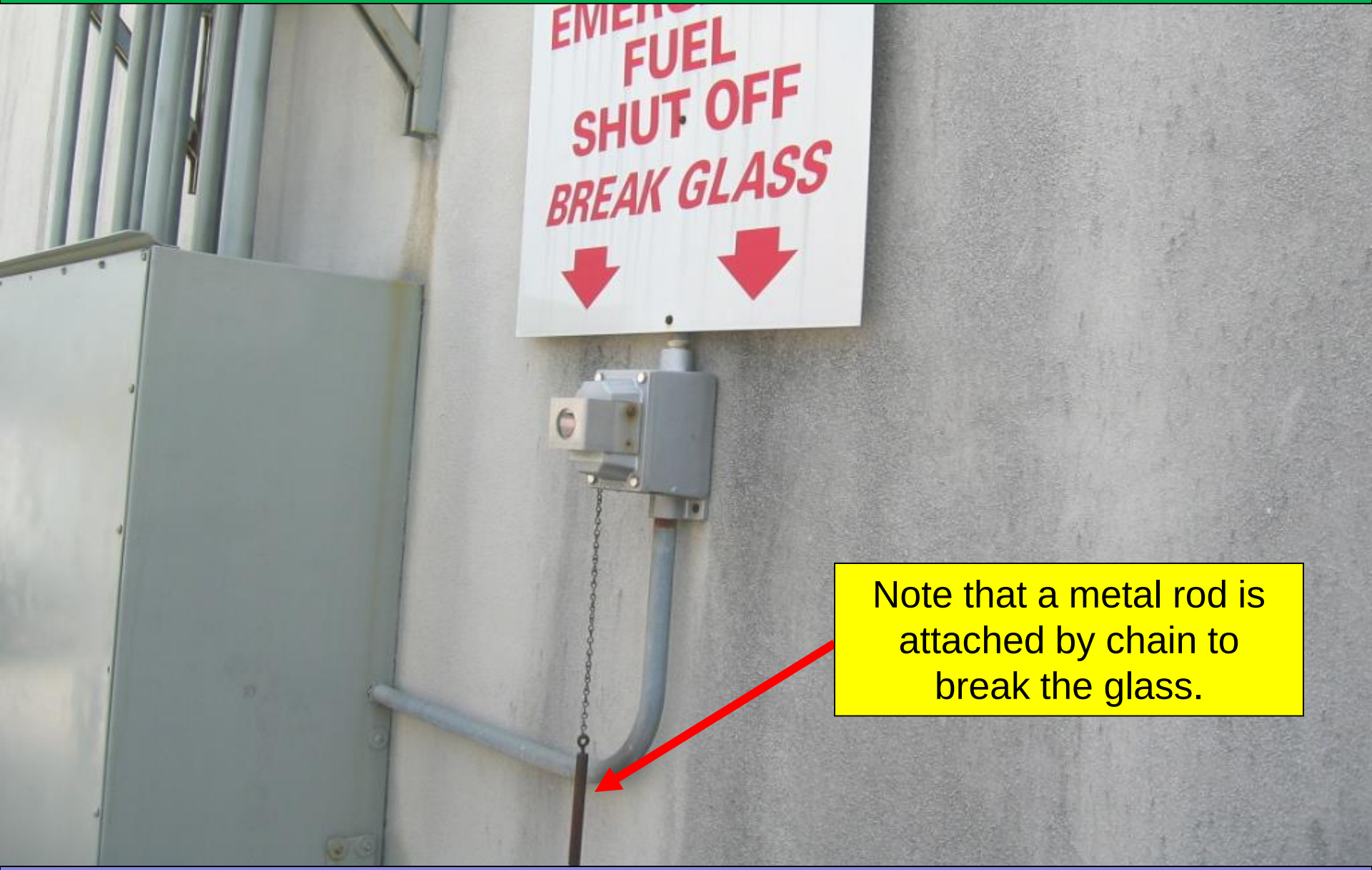
Airport Fuel System Emergency Fuel Shutoff - Placard

Example of Noncompliance to Fueling Standards

The Emergency Fuel Shutoff placard is missing the word “fuel”.

NFPA 407, 4.4.5.7 *Each emergency fuel shutoff station shall be placarded EMERGENCY FUEL SHUTOFF in letters at least 2 in. high. The method of operation shall be indicated by an arrow or by the word PUSH or PULL, as appropriate.*

Airport Fuel System Emergency Fuel Shutoff - Placard



NFPA 407, 4.4.5.7 *(continued) Any action necessary to gain access to the shutoff device (e.g., BREAK GLASS) shall be shown clearly.*

Airport Fuel System Emergency Fuel Shutoff - Placard

NFPA 407, 4.4.5.7 *(continued) Lettering shall be of a color contrasting sharply with the placard background for visibility. Placards shall be weather resistant, shall be located at least 7 ft above grade, and shall be positioned so that they can be seen readily from a distance of at least 25 ft. Valves used to shut off a hydrant for maintenance purposes shall not have placards that could create confusion in an emergency.*

Airport Fuel System Emergency Fuel Shutoff - Placard

Example of Noncompliance to Fueling Standards

The Emergency Fuel Shutoff placard is not 7 feet above grade and does not include the word, “FUEL”.

NFPA 407, 4.4.5.7 *(continued) Lettering shall be of a color contrasting sharply with the placard background for visibility. Placards shall be weather resistant, shall be located at least 7 ft above grade, and shall be positioned so that they can be seen readily from a distance of at least 25 ft. Valves used to shut off a hydrant for maintenance purposes shall not have placards that could create confusion in an emergency.*

Emergency Fuel Shutoffs

The 7 foot distance above grade for the Emergency Fuel Shutoff placard is measured to the bottom of the placard. This placard was located by measuring to the top of the placard, which does not meet the requirement in 4.4.5.7.

NFPA 407, 4.4.5.7 *(continued) Placards shall be weather resistant, shall be located at least 7 ft above grade, and shall be positioned so that they can be seen readily from a distance of at least 25 ft. Valves used to shut off a hydrant for maintenance purposes shall not have placards that could create confusion in an emergency.*

Emergency Fuel Shutoffs

The intent of the 7 foot above grade requirement in 4.4.5.7 is to locate the placard above a parked vehicle.

An alarm connected to the emergency shutoff is recommended. Some airports have an emergency phone station near the fuel storage area.

NFPA 407, Annex A Explanatory Material

A.4.4.5.4 *Alarms for Emergency Shutoff System. The operation of the emergency shutoff control should sound an alarm at the airport fire crew station and at the fuel storage facility.*

Piping

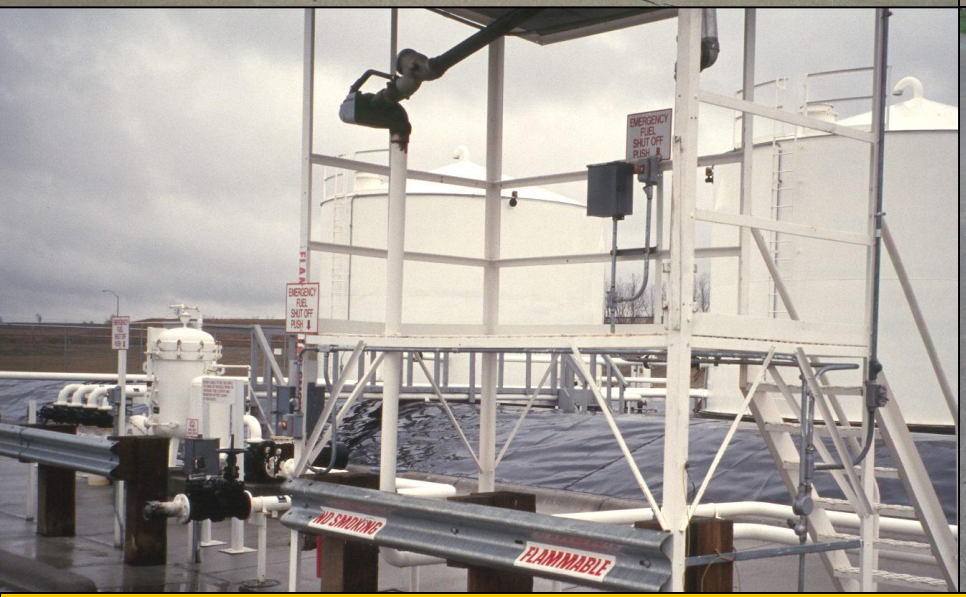
NFPA 407, 4.4.6.1 *Underground piping shall be used in the vicinity of aircraft movement areas unless the piping is protected by a substantial barrier guard.*

NFPA 30, 27.3.2 *Piping systems shall be maintained liquid tight. A piping system that has leaks that constitute a hazard shall be emptied of liquid or repaired in a manner acceptable to the authority having jurisdiction.*

Pipe Bollards

This loading station is protected against physical damage by ground vehicles.

Pipe Bollards



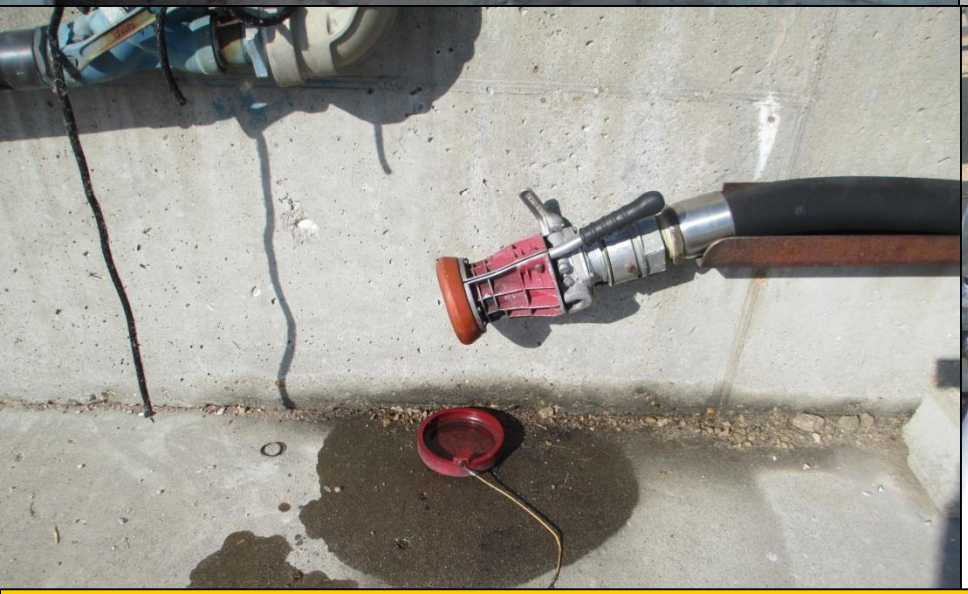
Typical pipe bollards and guard rails used to protect fueling facilities against physical damage from vehicles.

Maintenance of Equipment

NFPA 407, 5.2.1 *Fuel servicing equipment shall comply with the requirements of this standard and shall be maintained in safe operating condition. Leaking or malfunctioning equipment shall be removed from service.*

Maintenance of Equipment

Example of Noncompliance to Fueling Standards



Fuel leaks are a common problem found during inspections of fuel storage and loading areas.

Aircraft Fueling Hose

NFPA 407, 4.1.1 *Fueling Hose Apparatus. Nozzle receptacles and hose storage shall be arranged to avoid kinks and maintain the hose bend radius within the requirements of API BULL 1529.*

Aircraft Fueling Hose

Example of Noncompliance to Fueling Standards

NFPA 407, 5.16 Aircraft Fueling Hose.

5.16.6 *Kinks or short loops in fueling hose shall be avoided.*

NFPA 407, 4.1.1 Fueling Hose Apparatus. *Nozzle receptacles and hose storage shall be arranged to avoid kinks and maintain the hose bend radius within the requirements of API BULL 1529.*

Aircraft Fueling Hose

NFPA 407, Annex A Explanatory Material

A.5.16 *Failure of an aircraft fueling hose in service is a potential source of fuel spillage and a potential fire hazard. The principal reasons for failure of aircraft fueling hoses include the following:*

(1) Using damaged hoses

(2) Using aged hoses

(3) Exceeding pressure limits

(4) Improper installation

Fueling Cabinets

NFPA 407, 4.4.10 – Fuel Servicing Hydrants, Pits and Cabinets.

4.4.10.3 *Fueling hydrants, cabinets, and pits shall be located at least 50 ft from any terminal building, hangar, service building, or enclosed passenger concourse (other than loading bridges).*

Fire Extinguishers

NFPA 30

24.6.1.1* *Listed portable fire extinguishers shall be provided for facilities in such quantities, sizes, and types as could be needed for the special hazards of operation and storage.*

NFPA 30 is not specific concerning fire extinguishers at fuel storage areas and loading stations. NFPA 30, 17.15.3 states that the extent of fire prevention and control is determined by an engineering evaluation of the operation.

Fire Extinguishers

Even though there is no specific requirement in NFPA 407 or NFPA 30 for portable fire extinguishers at fuel storage areas and loading stations, the FAA has been inspecting for 2 fire extinguishers at these locations. This inspection criteria was based on the old fueling AC, 150/5230-4. The fire safety standards in ACMs, primarily based on the old fueling AC, typically require two fire extinguishers at fuel storage areas and loading stations.

Fire Extinguishers - Aprons

NFPA 407, 5.13* – Portable Fire Extinguishers.

5.13.1 *During fueling operations, fire extinguishers shall be available on aircraft servicing ramps or aprons.*

Fire Extinguishers - Aprons

For normal, single parking configurations, extinguishers specified for protection of fuel servicing operations should be located along the fence, at terminal building egress points, or at emergency remote control stations of airport fixed-fuel systems with a maximum distance of 300’ apart. *(NFPA 407, Annex A Explanatory Material, A.5.13)*

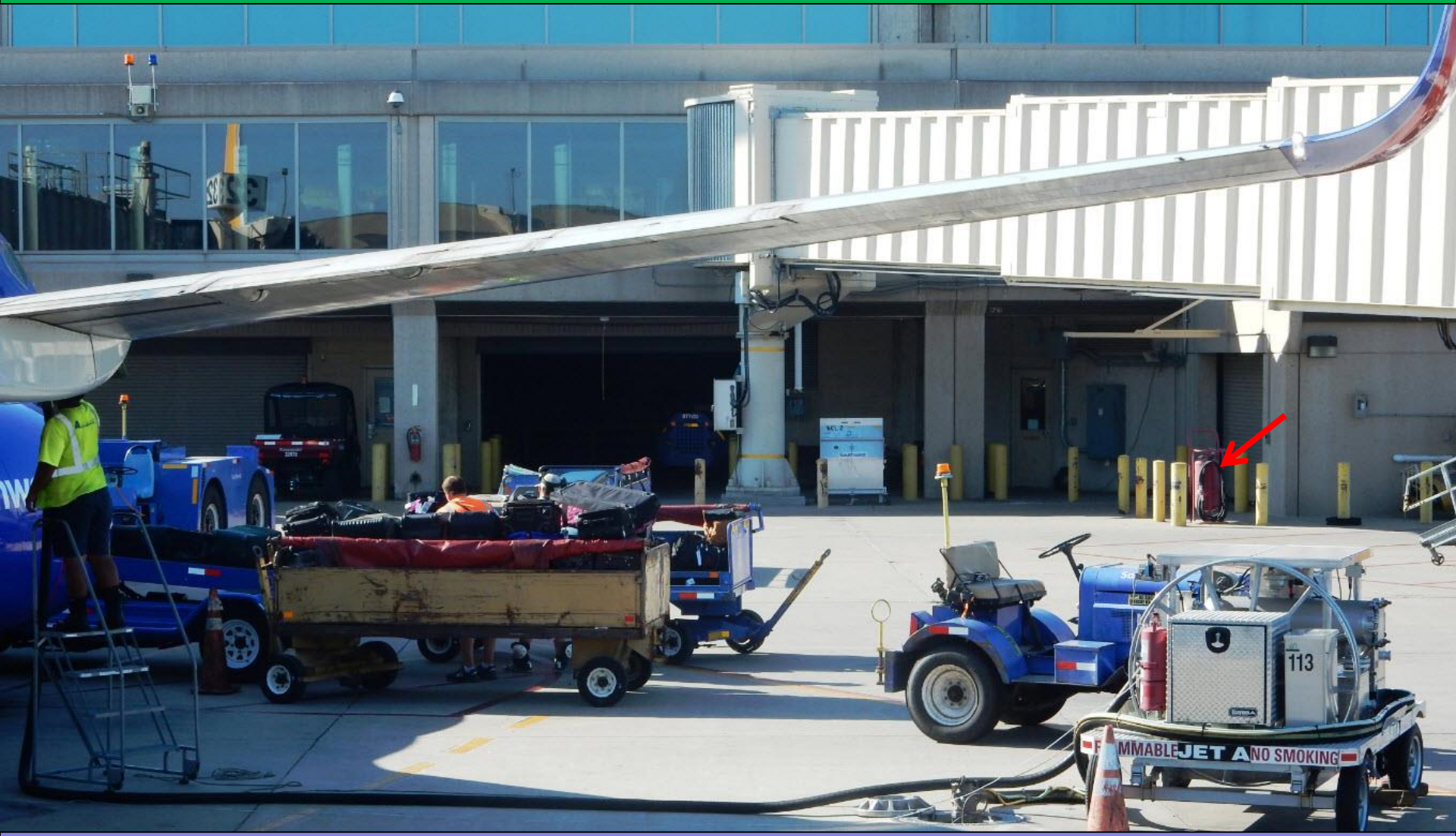
Fire Extinguishers - Aprons

Example of Noncompliance to Fueling Standards

This ABC multipurpose dry chemical wheeled extinguisher is not in compliance with NFPA 407, 4.1.6.3. Since it belongs to an airline, there would be some question as to whether it a Part 139 problem because the airline is not a fueling agent. However, it is not in accordance with NFPA requirements and needs to be replaced.

NFPA 407, 4.1.6.3* *ABC multipurpose dry chemical fire extinguishers (ammonium phosphate) shall not be placed on aircraft fueling vehicles, airport fuel servicing ramps, or aprons, or at airport fuel facilities.*

Fire Extinguishers - Aprons



NFPA 407 5.13.4 *Where the open hose discharge capacity of the aircraft fueling system or equipment is more than 200 gpm, at least one listed wheeled extinguisher having a rating of not less than 80-B:C and a minimum capacity of 125 lb of agent shall be provided.*

Fire Extinguishers - Aprons

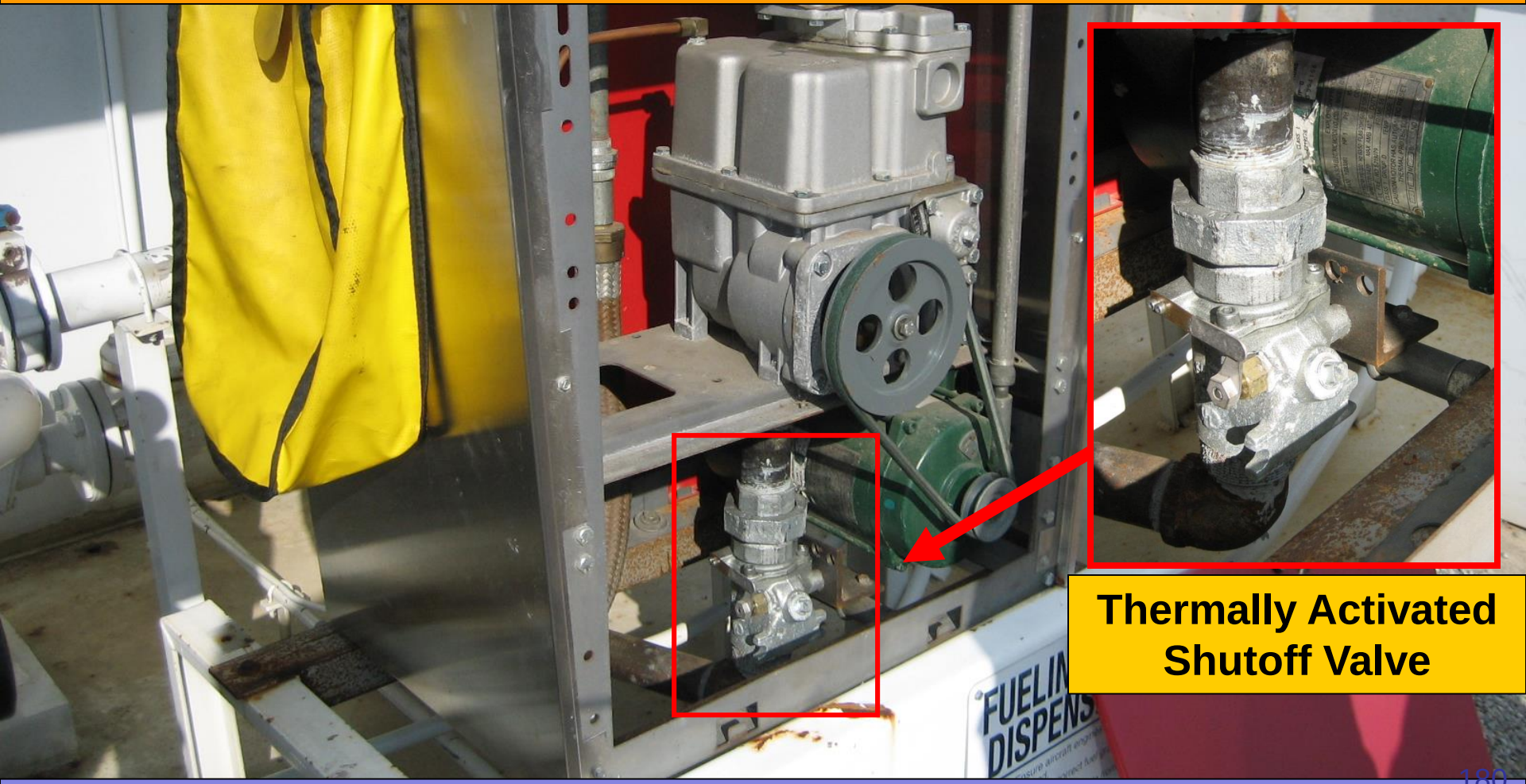
Extinguishers should not be blocked by equipment that would hide the extinguisher or hamper access in the event of a fire.

Self Service Fueling Facilities

Self-Service Aircraft Fueling

Self service fueling stations generally must comply with the same standards for fuel storage and loading stations. The remaining self service fueling slides address standards specific to self service stations.

Self-Service Aircraft Fueling



NFPA 407, 4.6.3.3 *Dispensing devices shall have a listed or approved emergency shutoff valve, incorporating a fusible link or other thermally actuated device designed to close automatically in case of fire. This valve shall also incorporate a shear section that automatically shuts off the flow of fuel due to severe impact. This valve shall be rigidly mounted at the base of the dispenser in accordance with the manufacturer's instructions.*

Self-Service Aircraft Fueling

The thermally activated shutoff valve on self service fuel dispensing units is usually located below the pump inside a cabinet.

Self-Service Aircraft Fueling

NFPA 407 4.6.3.4 *Dispensing devices shall be located on an island to protect against collision damage or shall be suitably protected with pipe bollards or other suitable*

Self-Service Aircraft Fueling

Example of Noncompliance to Fueling Standards

This self-service fueling station is not installed on an island or protected by pipe bollards.

Self-Service Aircraft Fueling

NFPA 407 4.6.6.3 *The emergency fuel shutoff controls shall be installed in a location acceptable to the authority having jurisdiction and shall be more than 20 ft but less than 100 ft from the dispensers.*

Self-Service Aircraft Fueling

NFPA 407, 4.6.7 *A clearly identified means to notify the fire department shall be provided and shall be located in the immediate vicinity of each emergency fuel shutoff control.*

Self-Service Aircraft Fueling

Example of Noncompliance to Fueling Standards

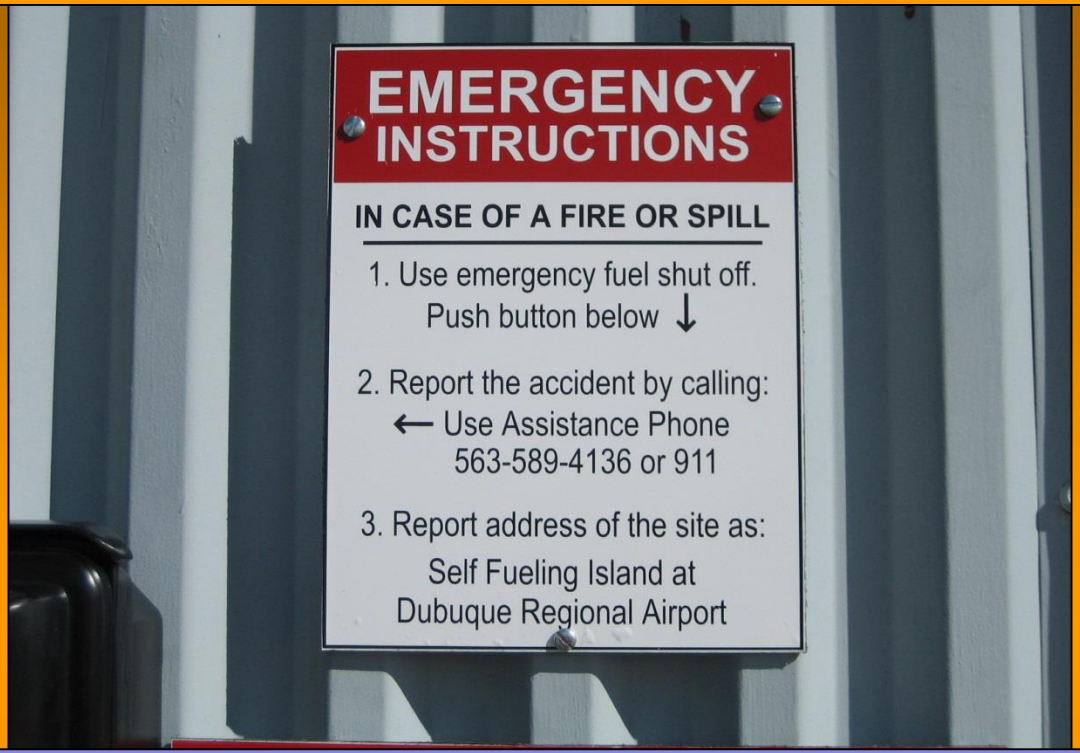
A telephone is expected to be installed in a telephone box.

NFPA 407 4.6.7 *A clearly identified means to notify the fire department shall be provided and shall be located in the immediate vicinity of each emergency fuel shutoff control.*

Self-Service Aircraft Fueling

NFPA 407, 4.6.8 *Each facility shall have a minimum of one fire extinguisher with a rating of at least 20-B:C located at the dispenser and one fire extinguisher with a rating of at least 20-B:C at each emergency fuel shutoff control.*

Self-Service Aircraft Fueling



NFPA 407, 4.6.9 *In addition to the warning signs specified in 4.4.5.7 and 5.8.1, emergency instructions shall be conspicuously posted in the dispensing area and at the emergency fuel shutoff control and shall provide the address of the site and shall incorporate the following or equivalent wording:*

EMERGENCY INSTRUCTIONS:

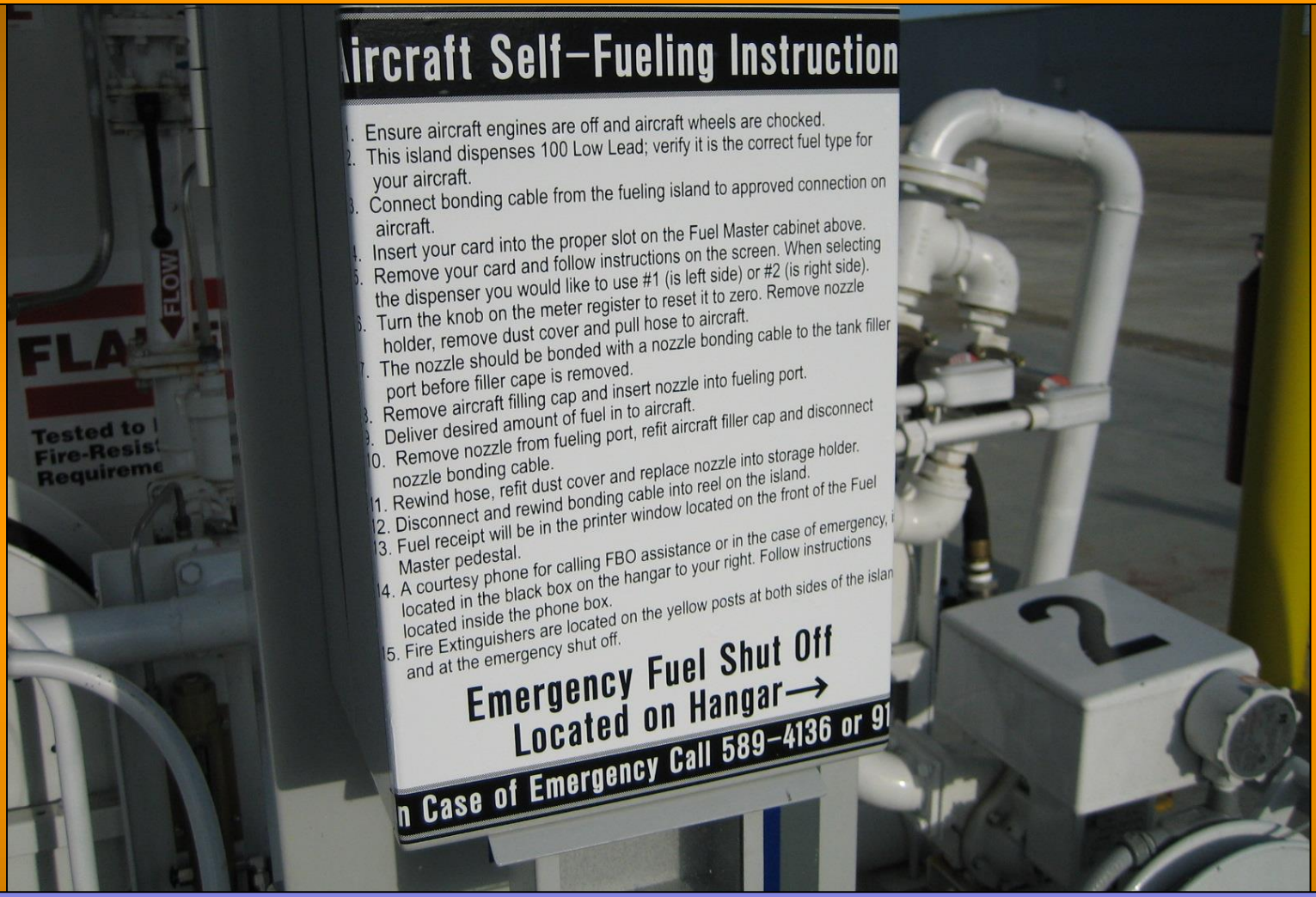
In case of fire or spill:

(1) Use emergency fuel shutoff.

(2) Report accident by calling (specify local fire emergency reporting number) on phone.

(3) Report address of site (list address of site here).

Self-Service Aircraft Fueling



NFPA 407 4.6.10 Operating Instructions. *Operating instructions shall be posted. The instructions shall include the proper operation and use of all equipment, correct bonding procedures, the procedures that are to be employed to dispense fuel safely, the location and use of the emergency fuel shutoff controls, the use of the available fire extinguishers, and the procedures to be used in the event of an emergency.*

Self-Service Aircraft Fueling

NFPA 407, 2.22 Self-Service Fueling. *Occupancy of the aircraft during self-service fueling shall be prohibited.*

Fueling Operations

Loading of Aircraft Fuel Servicing Tank Vehicles

NFPA 407, 5.20.2 Top Loading.

5.20.2.1 *Where loading tank trucks through open domes, a bond shall be established between the loading piping and the cargo tank to equalize potentials. The bond connection shall be made before the dome is opened and shall be removed only after the dome is closed.*

NFPA 407, 5.20.3 Bottom Loading.

5.20.3.1 *A bonding connection shall be made between the cargo tank and the loading rack before any fuel connections are made and shall remain in place throughout the loading operation.*

Loading of Aircraft Fuel Servicing Tank Vehicles

NFPA 407, 4.3.20 – Top Loading.

4.3.20.5 *A deadman control shall be provided and located so that the operator can observe the liquid level in the tank as it fills.*

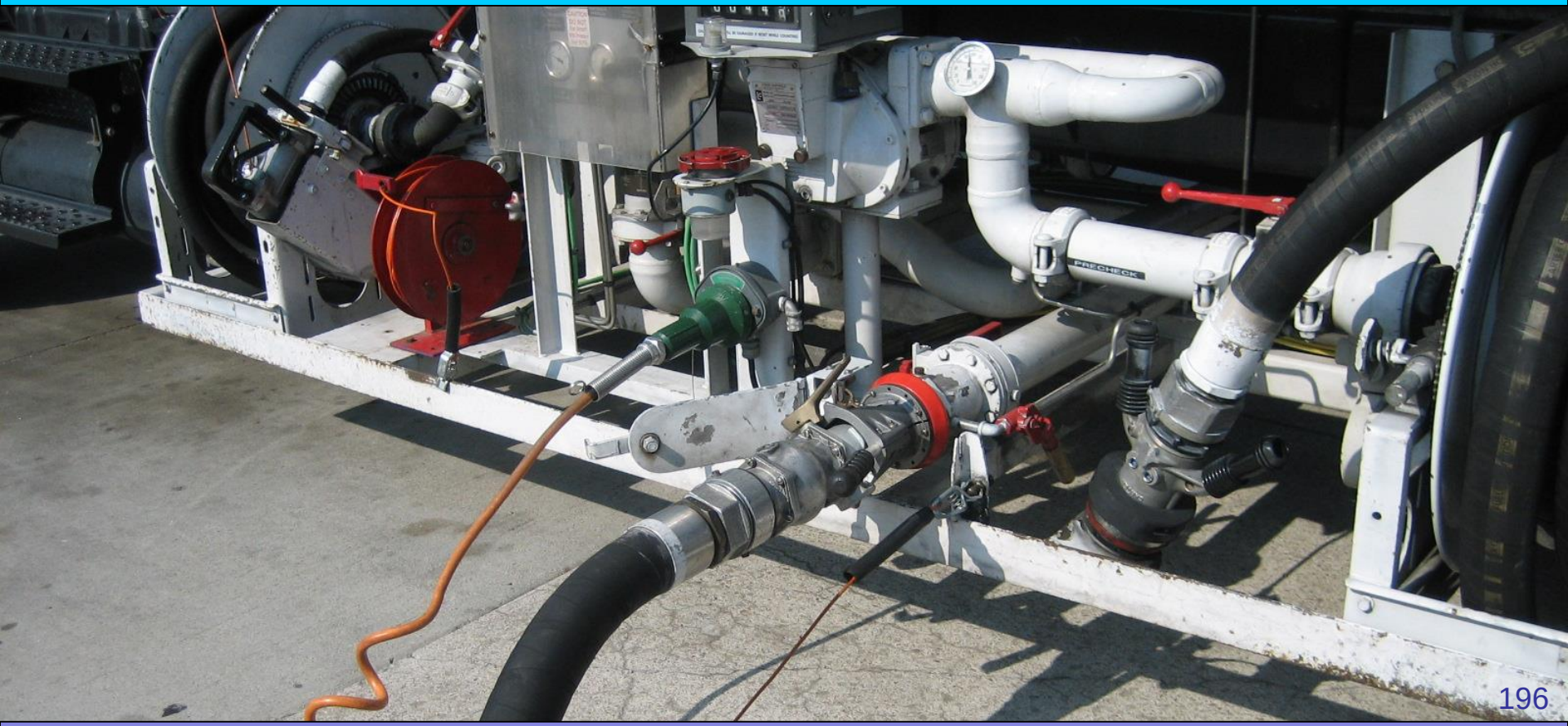
Loading of Aircraft Fuel Servicing Tank Vehicles

NFPA 407, 5.20.3 Bottom Loading.

5.20.3.2 *The operator shall initiate fuel flow by means of a deadman control device.*

Some fuel loading facilities are equipped with a Scully system, which incorporates both the deadman and bonding features into the system.

Fueling Operations



NFPA 407, 5.20 Loading of Aircraft Fuel Servicing Tank Vehicles.

5.20.1.2 *Filling of the vehicle cargo tank shall be under the observation and control of a qualified and authorized operator at all times.*

5.20.1.3 *The required deadman and automatic overfill controls shall be in normal operating condition during the filling operation. They shall not be blocked open or otherwise bypassed.*

5.20.1.4 *The engine of the tank vehicle shall be shut off before starting to fill the tank.*

Fueling Operations

Photo courtesy of Spirt of St. Louis Airport

NFPA 407, 5.10.2* *Aircraft being fueled shall be positioned so that aircraft fuel system vents or fuel tank openings are not closer than 25 ft to any terminal building, hangar, service building, or enclosed passenger concourse other than a loading walkway. Aircraft being fueled shall not be positioned so that the vent or tank openings are within 50 ft of any combustion and ventilation air-intake to any boiler, heater, or incinerator room.*

Fueling Operations

NFPA 407, 5.12.1 *Aircraft fuel servicing vehicles and carts shall be positioned so that a clear path of egress from the aircraft for fuel servicing vehicles shall be maintained.*

Fueling Operations

NFPA 407, 5.12.2 *The propulsion or pumping engine of aircraft fuel servicing vehicles or carts shall not be positioned under the wing of the aircraft during overwing fueling or where aircraft fuel system vents are located on the upper wing surface. Aircraft fuel servicing vehicles or carts shall not be positioned within a 10-ft radius of aircraft fuel system vent openings.*

Fueling Operations

Example of Noncompliance to Fueling Standards

NFPA 407, 5.12.2 *The propulsion or pumping engine of aircraft fuel servicing vehicles or carts shall not be positioned under the wing of the aircraft during overwing fueling or where aircraft fuel system vents are located on the upper wing surface. Aircraft fuel servicing vehicles or carts shall not be positioned within a 10-ft radius of aircraft fuel system vent openings.*

Fueling Operations

Example of Noncompliance to Fueling Standards

Fueling personnel are fueling inside a hangar, contrary to fire safety standards.

NFPA 407, 5.10.1 *Aircraft fuel servicing shall be performed outdoors.*

Fueling Operations

NFPA 407, 5.8.5 *Personnel shall not carry lighters or matches on their person while engaged in fuel servicing operations.*

Fueling Operations

Example of Noncompliance to Fueling Standards

NFPA 407, 5.8.6 *Lighters or matches shall not be permitted on or in fueling equipment.*

Fueling Operations

Example of Noncompliance to Fueling Standards

204

This fuel truck has evidence of fueling personnel smoking. Technically, NFPA 407, 5.8.6 only prohibits lighters or matches in a fuel truck. However, if someone has cigarettes in a fuel truck, they likely have a lighter somewhere in the cab or on their person.

NFPA 407, 5.8.5 *Personnel shall not carry lighters or matches on their person while engaged in fuel servicing operations.*

NFPA 407, 5.8.6 *Lighters or matches shall not be permitted on or in fueling equipment.*

Fueling Operations

Example of Noncompliance to Fueling Standards

Cigarette butts at the fuel storage area indicate that personnel are smoking.

NFPA 30, 5.9.2 Smoking. (NFPA 30 provides standards for fuel farms)

Smoking shall be permitted only in designated and properly identified areas.

Fueling Operations

NFPA 407

5.8.2 *Open flames on aircraft fuel servicing ramps or aprons within 15 m (50 ft) of any aircraft fuel servicing operation or fueling equipment shall be prohibited.*

5.8.3 *The category of open flames and lighted open-flame devices shall include, but shall not be limited to, the following:*

(1) Lighted cigarettes, cigars, pipes

(2) Exposed flame heaters, liquid, solid, or gaseous devices, including portable and wheeled gasoline or kerosene heaters

(3) Heat-producing, welding, or cutting devices and blowtorches

(4) Flare pots or other open-flame lights

Fueling Operations

NFPA 407, Operations, 5.15.1 *The fueling operator shall monitor the panel of the fueling equipment and the aircraft control panel during pressure fueling or shall monitor the fill port during overwing fueling.*

Fueling Operations

Example of Noncompliance to Fueling Standards

NFPA 407, Operations, 5.15.1 *The fueling operator shall monitor the panel of the fueling equipment and the aircraft control panel during pressure fueling or shall monitor the fill port during overwing fueling.*

Fueling Operations

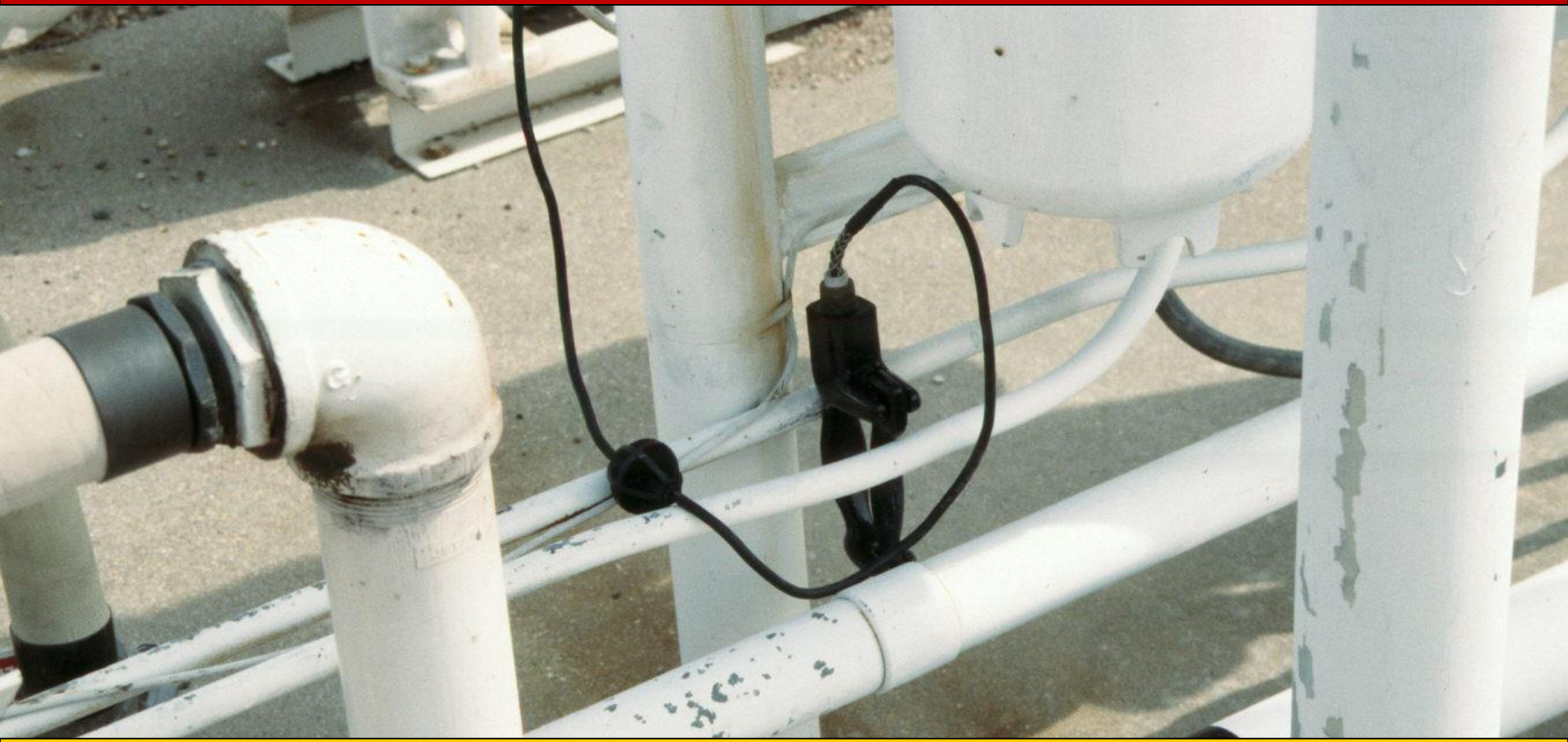
Example of Noncompliance to Fueling Standards

Fueling personnel are bypassing the deadman control by wedging the switch against this fire extinguisher hose. The scratches indicate that this is a regular practice with fueling personnel.

NFPA 407, Operations, 5.15.2 *Fuel flow shall be controlled by the use of a deadman control device. The use of any means that defeats the deadman control shall be prohibited.*

Fueling Operations

Example of Noncompliance to Fueling Standards



Fueling personnel are bypassing the deadman control.

NFPA 407, 5.20 Loading of Aircraft Fuel Servicing Tank Vehicles.

5.20.1.2 *The required deadman and automatic overfill controls shall be in normal operating condition during the filling operation. They shall not be blocked open or otherwise bypassed.*

Fueling Operations

NFPA 407, 5.7.6* Communications equipment located outside of the cab of the vehicle and used during aircraft fuel servicing operations within 3 m (10 ft) of the fill or vent points of aircraft fuel systems shall be listed as intrinsically safe for Class I, Division 1, Group D hazardous (classified) locations in accordance with ANSI/UL.913.

If fueling personnel do not know if their communications equipment is safe to use around fuel vapors, they should not use it.

Fueling Operations

NFPA 407, 5.9* – Lightning Precautions.

5.9.1 *Fuel servicing operations shall be suspended where there are lightning flashes in the immediate vicinity of the airport.*

5.9.2 *A written procedure shall be established to set the criteria for where fueling operations are to be suspended at each airport as approved by the fueling agent and the airport authority.*

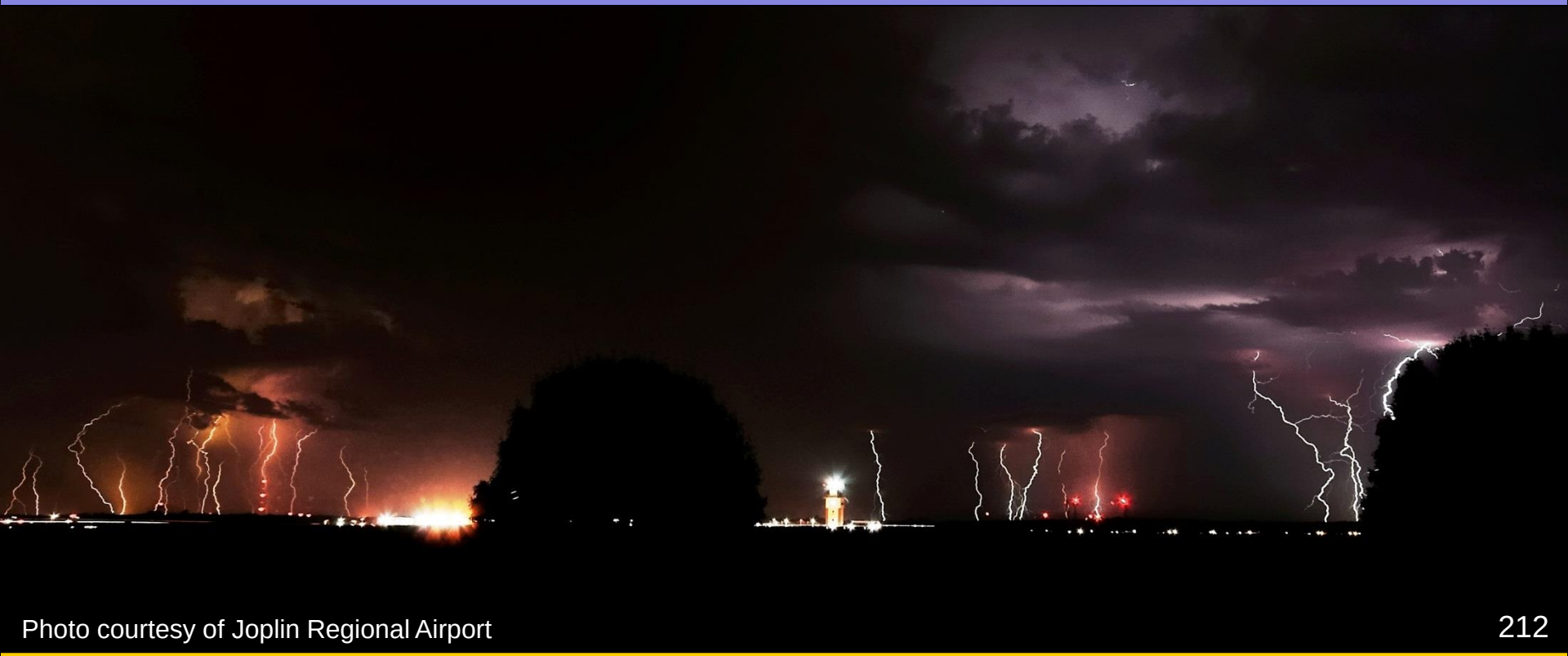


Photo courtesy of Joplin Regional Airport

If a thunder storm is in the vicinity, fuel servicing operations must be suspended when there are lightning flashes in the immediate vicinity of the airport.

If this video clip works on your computer (move the cursor onto the photo and click on the start button lower left), watch for the slit second lightning strike on the tail of the aircraft. At the same time the lighting strikes the tail, it exits the nose gear into the metal plate in the concrete and blows a manhole cover out towards the baggage tug. You may need to watch several times to see this. Imagine what the results would be if fueling was being conducted.

THE END

British Airways B-777 Fueling Fire, Denver, CO, September 5, 2001