Chemical Delivery

Corrosive Liquid Overview

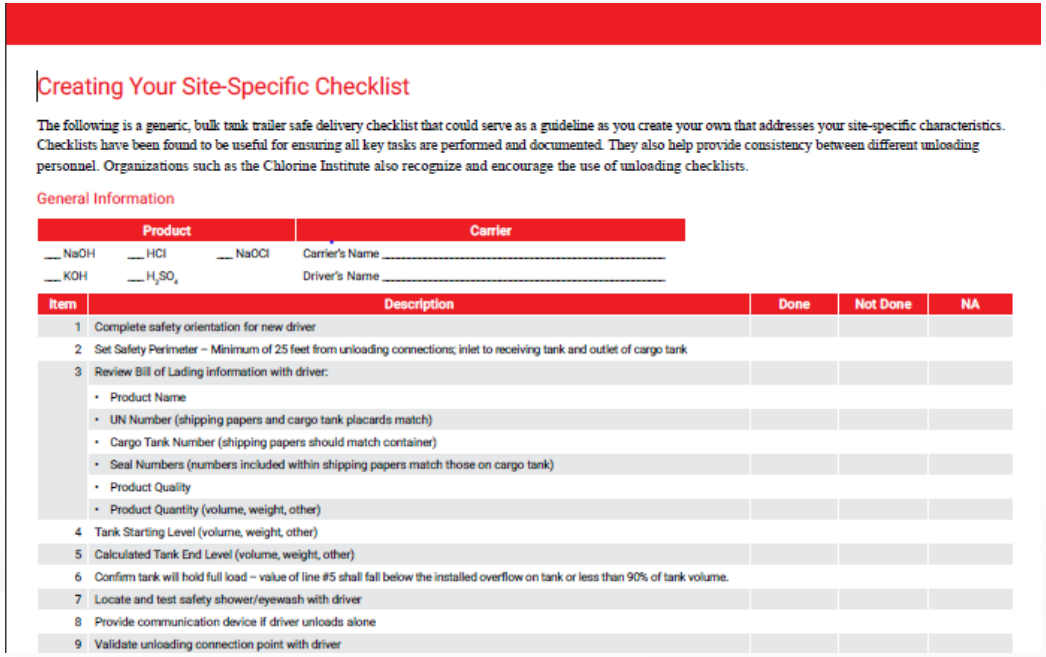
Chemical Delivery

Pre-delivery

- Meet driver and direct to delivery spot.
  - Conduct safety orientation
    - Understand roles in the delivery process
  - Set safety perimeter/secure vehicle.
  - Show safety shower/eyewash to driver and **test** to ensure operation.
  - **Review protocol for emergencies.**
    - Walkie talkie, air horn.....
- Check driver's paperwork.
  - Verify correct chemical by reviewing bill of lading and placards.
  - Verify correct quantity.
- Unlock the CORRECT delivery connection and show it to driver.
  - Verify driver confirms proper point of connection.
- Indicate that the driver may proceed with delivery
  - **Customers must OWN their systems and the safety of their facilities.**

Delivery Checklist

Checklist helps to facilitate communication - provides checks & balances.



Creating Your Site-Specific Checklist

The following is a generic, bulk tank trailer safe delivery checklist that could serve as a guideline as you create your own that addresses your site-specific characteristics. Checklists have been found to be useful for ensuring all key tasks are performed and documented. They also help provide consistency between different unloading personnel. Organizations such as the Chlorine Institute also recognize and encourage the use of unloading checklists.

General Information

Product			Carrier
___ NaOH	___ HCl	___ NaOCl	Carrier's Name _____
___ KOH	___ H_2SO_4		Driver's Name _____

Item	Description	Done	Not Done	NA
1	Complete safety orientation for new driver			
2	Set Safety Perimeter – Minimum of 25 feet from unloading connections; inlet to receiving tank and outlet of cargo tank			
3	Review Bill of Lading information with driver:			
	• Product Name			
	• UN Number (shipping papers and cargo tank placards match)			
	• Cargo Tank Number (shipping papers should match container)			
	• Seal Numbers (numbers included within shipping papers match those on cargo tank)			
	• Product Quality			
	• Product Quantity (volume, weight, other)			
4	Tank Starting Level (volume, weight, other)			
5	Calculated Tank End Level (volume, weight, other)			
6	Confirm tank will hold full load – value of line #5 shall fall below the installed overflow on tank or less than 90% of tank volume.			
7	Locate and test safety shower/eyewash with driver			
8	Provide communication device if driver unloads alone			
9	Validate unloading connection point with driver			

Chemical Delivery

During transfer

- Stay in the area/monitor the transfer.
- Have PPE staged and ready for use if needed - outside of hot zone.
- Verify that all personnel in hot zone are wearing full PPE at all times.
  - Persons not protected will be asked to leave immediate area during flow.
- Help driver, as second set of eyes,
  - look for any leaks and monitor tank level change.
- Direct driver to stop the transfer if you see any issues.
  - If leaving area, communicate with the driver on how to reach the operator in the event of the operator's absence from the area.

Chemical Delivery

After transfer

- Verify the level increased in storage.
- Ensure area is free and clear of debris/residue.
  - Properly dispose of any material collected in drip buckets.
- Secure the unloading connection.
  - Close valves (including drain).
  - Lock connection.
- Ensure PPE is clean and free of contaminants/residues after use.
- Sign delivery paperwork before releasing driver.

Chemical Delivery

Hypochlorite Systems design:

- Connection capped and locked.
- Two-inch non-metallic/Teflon™ lined male quick-connect fitting/standard.
- Should be well-supported and located ~ hip-height.
- 45° down angle preferred.
- Connector piping should clearly identify the product.
  - Example: “Sodium Hypochlorite, UN 1791”
- A drain valve near connector provides convenient sample collection port for inbound deliveries.
- Level display close for delivery driver to view during product transfer.

Chemical Delivery

Hydroxide Systems design

- Connection capped and locked.
- Two or three-inch male stainless steel quick-connect fitting/standard.
- Should be well-supported and located ~ hip-height.
- 45° down angle preferred.
- Connector piping should clearly identify the product.
  - Example: “Sodium Hydroxide-UN 1824 or Potassium Hydroxide-UN 1814”
- A drain valve near connector provides convenient sample collection port for inbound deliveries.
- Level display close for delivery driver to view level during product flow.

Chemical Delivery

Hydrochloric Acid Systems Design

- Two-inch 4 Bolt Flange – Acids.
- Should be well- supported and located ~ hip-height.
- 45° down angle preferred.
- Connector piping should clearly identify the product.
  - Example: "Hydrochloric Acid-UN 1789"
- A drain valve near connector provides convenient sample collection port for inbound deliveries.
  - Use of PPE should be donned for sampling collection and de-energizing line.
- Tank Level display close for delivery driver to view level during product flow.

Chemical Delivery

Hydrochloric Acid System Design

- Fume scrubbers control storage & unloading fumes.
  - Scrubbers must be properly designed to ensure efficiency (passive design is not effective) example; unregulated air flow into unit.
- Scrubber maintenance is critical to maximize performance.
  - Have a defined procedure in place to check prior to offloading Cargo Truck or Tank Car.
  - Continue monitoring while in use.

Avoiding Accidental Mixing

Corrosive Liquid Overview

Avoiding Accidental Mixing

WHY, WHAT and HOW?

WHY:

- Safety & Environment
- To avoid the 6:00 pm news on TV!

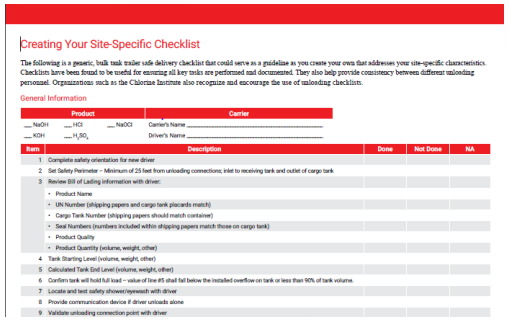
WHAT:

- Mixing incompatible materials will create an adverse reaction
  - Chemical Release
  - Explosion → Projectiles
- Do not mix or segregate
  - Acids and Alkalines
  - Reactive products: Ammonia, Organics, Peroxides

Avoiding Accidental Mixing

HOW:

- Layers of Protection – More is better (Swiss cheese Model)
- Pre-delivery inspection (as seen in slides 2 & 3)
  - Unloading procedure/checklist
  - Driver's paperwork: Verify correct chemical by reviewing bill of lading and placards
  - Verify driver's connection point prior to approving/starting flow
  - #1 Goal: Avoid Wrong Chemical/Wrong Tank



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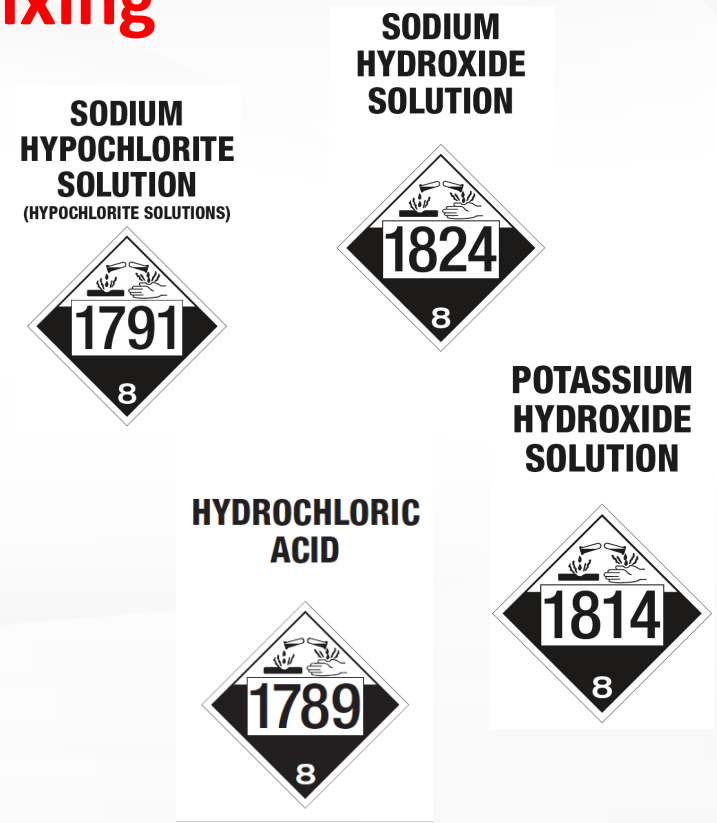
Avoiding Accidental Mixing

HOW:

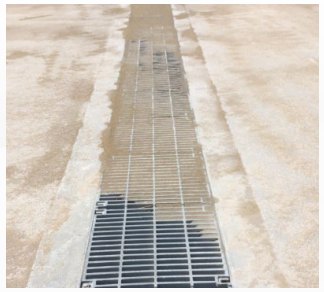
- Unloading connection
  - Avoid close proximity when possible
  - Different connection type for acids (flange) and alkalines (camlock)
    - Bleach + Acids → Cl2 gas
  - MUST be clearly labeled
  - Apply locks: owner to use designated key or combination to unlock point of connection



Avoiding Accidental Mixing

HOW:

- Accidental Mixing could happen not only in tanks…
- Separate containment system and drains or keep them clean.
- Common unloading station for multiple chemicals
    - Housekeeping and management inspections done frequently to ensure area free of residues before next offload
- Drip buckets management
    - Label and ensure they are clean, clean, and very clean before and after use.



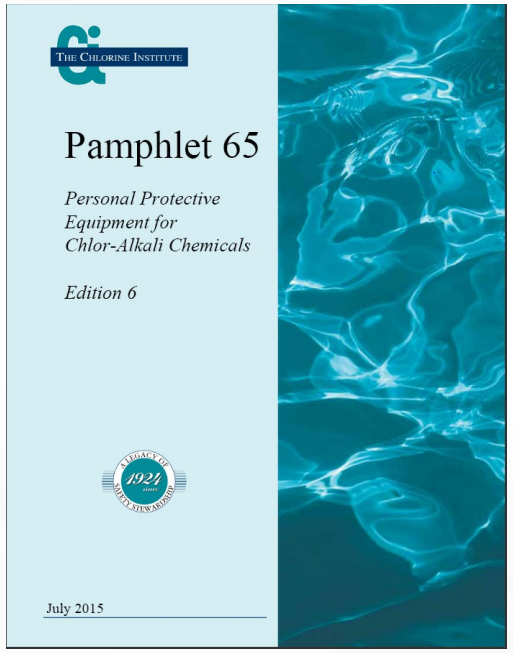
Personal Protective Equipment (PPE)

Corrosive Liquid Overview

PPE Overview

Determine the PPE required to assure adequate protection to personnel

- Hazard assessment of the task to be executed.
  - The design and function of the system must be included in the assessment.
- Example of task to be assessed:
  - Monitoring process operation.
  - Process sampling.
  - Product unloading.
  - Clean-up operation in containment areas.
  - Line breaking, product unloading, maintenance.
  - Emergency response operation.



PPE Overview

Protection should be provided for

- Head (hard hat)
- Face (face shield)
- **Eyes (goggles)**
- Hands (chemical gloves)
  - No leather
- Body (chemical suit)
- Feet (chemical boots)
  - No leather
- Respiratory tract (respirator)
  - If misting/vapors present.

Safety Shower & Eyewash Units

Corrosive Liquid Overview

Safety Shower and Eyewash Units

Locations:

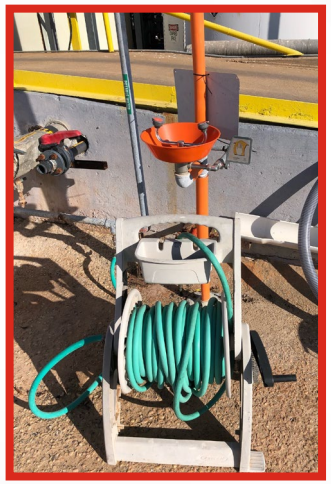
- Near delivery connection, **however** positioned away from hazards that may affect safe use.
  - Dilution is not the solution
- Available in other areas where corrosive liquids are stored/handled.
- In clear view from the work site.
- Should stand out clearly from the background.
- Within 10 seconds (for average person, this means within approximately 55 ft.).
- **Outside the "hot zone" (splash zone of hazard).**
  - Consider operation alarms as Best Practice.

- Reference ANSI Z358.1 Standard

Safety Shower and Eyewash Units

No intervening obstacles

- Doors and containment walls are obstructions.
- On same level as the hazard – no stairs.
- No tripping hazards – temporary or permanent.



- Reference ANSI Z358.1 Standard

Safety Shower and Eyewash Guidelines

Flushing medium

- Supplied with **potable** water.
- Temperature between 60° F (15° C) and 100° F (38° C).
- Freeze protected/pressure regulated.

Inspection and maintenance

- Documented inspection schedule.
- Immediate repairs performed.
- Clearly communicate when equipment not working.
  - Have temporary system available.
  - Garden hose w/nozzle under full pressure not acceptable
- Caps installed.

Emergency Preparedness

Corrosive Liquid Overview

Emergency Preparedness

Guidelines for leaks and spills

- Evacuate all personnel from the area.
  - Restrict access.
  - Keep people upwind from the spill area; Misting.
- Don/Wear appropriate PPE per SDS.
  - Isolate the source of the leak or spill.
  - Contain the spill with compatible absorbent materials.
    - Sand, clay, or commercial absorbents.

Emergency Preparedness

Guidelines for leaks and spills – Trained and Equiped Responders

- Neutralize spilled materials when possible.
  - Always know what chemical reactions will occur during neutralization .
    - Never add acid to hypochlorite solutions without first neutralizing the Hypochlorite ion.
    - Avoid adding strong acids to bases (such as hydroxide solutions) without significant dilution.
  - Take adequate precautions.
- Remove spilled material.
  - Use vacuum or pump system.
  - Treat before disposing according to state and federal regulations.
- Report all spills in compliance with local, province, state, and federal regulations.
  - Note: The above should only be exercised by trained and equiped response personel.

Emergency Preparedness

General good practices

- **Know your Preparedness Plan – drill to handle a variety of different situations;**
  - **Chemical spills, how do I handle, who do I call**
  - **Leaking/FAILED STORAGE tanks**
  - **Wrong tank wrong chemical**
  - **Standing liquids, shared collectors**