

Initial Delivery Protocol

To ensure the safe delivery, storage and use of Hydrogen Peroxide, FMC performs an engineering assessment for each storage and handling system prior to the first delivery. FMC established the following guidelines to determine the level of evaluation required for each system.

For your convenience, we have included in this document two (2) equipment checklists and one (1) dilution deliveries requirements list. The first equipment checklist is for non-dilution deliveries and storage at concentrations less than 52%. The second supplements the first and outlines additional equipment requirements for storage of concentrations greater than 52% but less than 70%. The third list identifies requirements for dilution deliveries. Deliveries for concentrations greater than 70% or for other specialty grades having additional requirements shall be reviewed and approved by FMC Engineering Services.

Scenario	Requirement
Delivery and storage of 70% or greater Hydrogen Peroxide	FMC technical representative reviews system design and performs site inspection and safety training. FMC Driver Technician makes first delivery.
Delivery to new Hydrogen Peroxide user <ul style="list-style-type: none"> • all concentrations • includes customers upgrading from drum quantity to bulk systems 	FMC technical representative reviews system design and performs site inspection and safety training. FMC Driver Technician makes first delivery or FMC technical representative on hand for first delivery.
Delivery to new system at existing Peroxide User less than 70%	FMC technical representative or designee* reviews design package and performs site inspection. Safety training offered. FMC Driver Technician makes first delivery. Common carrier can be used for first delivery if FMC representative or designee* is present.
Delivery to new FMC account that is an existing peroxide user	Review elements of the FMC Mandatory System Requirements Checklist (completed by site personnel). Evaluate whether FMC Driver Technician needs to make initial delivery.
Delivery to FMC account where last delivery was over one year ago	Verbal review of system elements with site representative to ensure no changes were made since last delivery. Documentation of Mandatory System Requirements required if changes were made.

* Can be an approved FMC service company.

8/30/04

Please call FMC Engineering Services for assistance at (716) 879-0494 / (716) 879-0495 or visit the FMC website at www.fmcchemicals.com for more information

H₂O₂ Storage & Handling System Requirements*

Customer: _____ **Location:** _____
Customer Contact: _____ **Phone Number:** _____
Application: _____ **Approved Application (Y / N)** _____
H₂O₂ %/Grade: _____ **FMC Rep.** _____ **Approved for Delivery (Y / N)** _____
H₂O₂ Tank Size (Gals): _____ **Mat'l of Const. (S.S./Alum./PE):** _____

H ₂ O ₂ System Requirement	Yes/No
1. In accordance with NFPA 430, any new or significantly modified hydrogen peroxide (H ₂ O ₂) storage facility has been reviewed by the authority having jurisdiction (e.g. Fire Marshal, Building Inspector, etc.).	
2. The facility has an appropriate emergency plan in place.	
3. The notification & reporting requirements of 40CFR370 for 27.5% to 52% H ₂ O ₂ have been/will be met.	
4. The facility has appropriate security measures in place, including, but not limited to, the peroxide storage tank(s) located in a secured area and not accessible to the general public.	
5. H ₂ O ₂ storage tank(s) equipped with floating relief manway covers. 1-in ² per 100-gals for <52% H ₂ O ₂ is required.	
6. H ₂ O ₂ storage tanks are constructed of 304Ls.s., 316Ls.s., 5254 aluminum, or polyethylene. Polyethylene is not acceptable above 52% concentrations.	
7. H ₂ O ₂ piping is constructed of 304Ls.s. or 316Ls.s. or 1060 aluminum. Plastic piping (e.g., PVC, polyethylene) is approved for short-term use only (i.e. <3 months), and can never be used for tank fill line piping.	
8. All "wetted" components of peroxide storage & handling system are compatible with hydrogen peroxide. Examples of some common materials that are not compatible with H ₂ O ₂ are black iron, carbon steel, hastelloy, copper, brass, bronze, graphite, Buna-N, neoprene rubber.	
9. All "wetted" stainless steel or aluminum components of peroxide system have been properly passivated with nitric acid solution in accordance with FMC's passivation procedures or an FMC approved equivalent.	
10. H ₂ O ₂ storage tank(s) equipped with some means of level indication (e.g. level transmitter w/local readout, sight glass, etc.), so driver can visually monitor tank levels during delivery.	
11. H ₂ O ₂ storage & handling system is free of any peroxide leaks.	
12. A water hose and a safety shower/eyewash station are available at the peroxide unloading area.	
13. Unloading and storage area is clear of combustible materials.	
14. There is safe truck access to within 20-ft of the peroxide fill line connection.	
15. Peroxide storage tank(s) clearly labeled "___% Hydrogen Peroxide." Fill line labeling is required if fill line connection is remote from tank.	
16. Pressure relief and/or venting is provided wherever H ₂ O ₂ may be trapped (e.g. ball valves, and sections of piping between 2 valves).	
17. All pressurized peroxide application points (incl. submerged discharges located at elevations above the top of the H ₂ O ₂ storage tank) are equipped with adequate backflow prevention (e.g. check valve). An atmospheric break tank between the H ₂ O ₂ storage tank & injection point is recommended for pressure injection applications.	
18. Peroxide application points located at an elevation below the top of the H ₂ O ₂ storage tank(s) (or feed tank) are equipped with adequate forward-siphon prevention (e.g. backpressure valve).	
19. H ₂ O ₂ storage tank is equipped with bottom outlet isolation valve.	
20. Some type of closure device is provided for the peroxide fill line, (i.e. valve, Q/C plug, blind flange, etc.). A locked valve is recommended.	
21. There are no return lines from downstream process to the peroxide storage tank. Only the following inlet lines are approved for peroxide storage tanks: H ₂ O ₂ fill line; approved dilution water or deluge water line; local peroxide recycle or inter-tank transfer piping; local pressure relief /vent piping. Peroxide day tank overflow line may also be approved if it is determined that there is no possibility of process contamination entering the day tank.	
22. There are no open nozzles on H ₂ O ₂ storage tank(s). Breather vents must be hooded ceramic filter stones or screened U-vents. FMC does not recommend overflow lines; however, if deemed necessary, some means (e.g. fine screen, hydraulic seal) must be provided to prevent entry of airborne contaminants	
23. Adequate secondary containment (e.g. dike, double-walled tank, trench system, gravel pit, etc.) has been provided. This is mandated for polyethylene tanks, and is strongly recommended for all peroxide storage tanks.	

Inspected by _____ Comments (note number of deficiency): _____ _____ _____ _____	Customer Representative (if applicable) _____	Date _____
---	---	----------------------

*** Note: This checklist applies only to straight deliveries of < 52% Standard or Tech Grade H₂O₂. Additional restrictions will apply to ≥52% H₂O₂, other grades of H₂O₂, or dilution deliveries.**

**FMC H₂O₂ Storage & Handling System
Mandatory Requirements
(Additional requirements for 52% to 70% Deliveries)**

52% to 70% Deliveries

The following requirements supplement requirements for <52% systems.

Mandatory Requirement	Yes/No
1. Floating relief manway covers are properly sized. Sizing based on 2-in ² per 100-gals for ≥ 52% H ₂ O ₂ .	
2. H ₂ O ₂ storage tanks are constructed 1060 or 5254 Aluminum, or 304Ls.s. or 316Ls.s.	
3. Vertical tanks are designed with 50% of the roof to shell seal as a “weak” seam for preferential failure.	
4. All H ₂ O ₂ piping is constructed of 1060 Aluminum or 304Ls.s. or 316Ls.s.	
5. Level monitoring is supplied and operable; alarm capability is recommended.	
6. Continuous temperature monitoring of tank is provided. Monitoring device should be RTD or thermocouple type installed in bottom of tank, with (2) adjustable high temperature contacts to trigger alarms. Initial emergency action alarm is set at 42° C (108° F). A second full emergency action alarm shall be set at 45° C (113° F or if rate of temperature rise exceeds 2° C (3.6° F)/hour.	
7. Storage tanks are designed with means to flood the tank with water (e.g. via “dry type” connection) and/or dump the tank in the event of an emergency.	

Inspected by

Date

Comments (note number of deficiency)

Note: This checklist is intended to supplement the standard delivery checklist to address additional requirements for deliveries of concentrations from 52% to 70%. For all other concentrations or product grades, consult with FMC Engineering Services.

6/14/04

Hydrogen Peroxide Dilution Deliveries

FMC offers dilution deliveries of several grades of Hydrogen Peroxide in order to reduce shipping costs. This allows the customer to purchase higher concentrations (70% or 50%) of Hydrogen Peroxide and dilute down to specific concentrations. FMC supports in-tank dilutions or can provide portable dilution units.

The following criteria must be met for FMC to make dilution deliveries. These additional requirements supplement the standard delivery requirements.

Water Quality

Water quality is critical for dilution deliveries and the dilution water source must be approved prior to delivery. Even trace amounts of metals, chlorine or other minerals can lead to product decomposition resulting in safety or quality problems.

FMC requires 3 water samples be drawn at least a week apart for analysis 30 days prior to the expected initial delivery. To protect against changes to the water source, the dilution water quality should be verified annually or following any changes to the water system.

Water Quality Specifications for Dilution Deliveries

Specification Element	Acceptance Criteria - Standard Grade	Acceptance Criteria - all Other Grades (see notes below)
Conductivity	35% - 350 µMho/cm 50% - 600 µMho/cm	2 µMho/cm
Chloride	35% - 20 ppm 50% - 50 ppm	0.6 ppm
pH	5 to 10	5 to 7
Total Dissolved Solids	Clear and free of Visible Solids	4.0 ppm
35% Dilution Test	Must pass 85% minimum stability (24 hrs / 100 deg C)	Must pass 96% minimum stability (24 hrs / 100 deg C)

Notes

1. Technical Grade, Food Grade, Semiconductor Grade and Super D[®] Grades must be diluted using de-mineralized water meeting the above quality. These grades have shipping specifications that are more stringent than Standard Grade Hydrogen Peroxide.
2. De-mineralization systems are required for customers where water quality is unknown or where the water quality does not meet the above requirements. In all cases, water generated from de-mineralizers must be tested and verified to meet above standards.
3. Water quality verification requires “passing” samples taken in three (3) consecutive weeks within a 30-day period prior to the initial delivery.
4. Annual water quality verification is required to ensure ongoing suitability of dilution water.

Please call FMC Engineering Services for assistance at (716) 879-0494 / (716) 879-0495 or visit the FMC website at www.fmcchemicals.com for more information

Equipment Requirements

Dilution Equipment Requirements

The tank system must be equipped with one of the following means to facilitate dilution deliveries:

- For in-tank dilutions, a means to meter and filter the water is required. Also, a means to mix the tank is required (i.e. jet mixer, recirculation pump, etc.).
- For on-board blender dilutions, water pressure must be steady at 40 gpm and 60 psi.

Tank Capacity Requirements

The following outlines the recommended minimum tank capacity requirements for common dilution scenarios. Dilutions to other concentrations or into other tank capacities are evaluated on a case-by-case basis.

Dilution Concentration	Recommended Tank Capacity (US Gallons)
70% to 50% - United States	7,000 gallons
70% to 35% - United States	10,000 gallons
50% to 35% - United States	7,000 gallons
70% to 50% - Canada	10,000 gallons
70% to 35% - Canada	13,000 gallons
50% to 35% - Canada	10,000 gallons

Consequences of Deviation

Failure to follow the above standards can result in accelerated Hydrogen Peroxide decomposition that could lead to personnel injury, equipment damage or possibly death.

6/14/04

Please call FMC Engineering Services for assistance at (716) 879-0494 / (716) 879-0495 or visit the FMC website at www.fmcchemicals.com for more information