U. S. Army Corps of Engineers Chemical Feed & Storage System Checklist

Installation Name	_____
Site Name / I.D.	_____
Evaluation Team	_____
Site Visit Date	_____

This checklist is designed to facilitate the performance evaluation of chemical feed and storage systems. It is divided into the following sections:

1) Evaluation team composition
2) Typical treatment objectives
3) References
4) Data collection requirements
5) Performance analyses calculations
6) Operations and maintenance
7) Typical performance problem
8) Alternatives for possible cost savings.
9) Supplemental notes and data.

The checklist provides suggestions for information gathering, and space has been provided to record data and notes from the site visit. Supplementary notes, if required, should be numbered to correspond to the appropriate checklist sections.

1) Evaluation Team Composition

The following disciplines should be included in the evaluation team for the chemical feed and storage systems.

- Process Engineer (site visit, treatment system evaluation)
- Chemist (chemical compatibility)
- Cost Engineer (cost of alternatives)

2) Typical Treatment Objectives

Chemical storage and feed systems are typically associated with pH control, filtration, precipitation, chemical treatment, biological nutrient addition, and air stripping. They may be included as part of other remediation technology systems.

Verify that the treatment objectives established when the chemical feed and storage system was designed and installed are clear and still valid.

3) References

Coordinate this checklist with the Liquid Process Piping checklist, the Process Instrumentation and Control checklist, and the applicable sections of any remediation system checklist. See also the Material Safety Data Sheets (MSDS) for the chemicals handled. The following reference may also be helpful:

CEGS 11242 [1]: Chemical Feed Systems

ANSI Z 4001 (1993) Hazardous Industrial Chemicals-Material Safety Data Sheets-Preparation

4) Data Collection Requirements

Use the following sections as guidelines for evaluating chemical feed and storage systems. Multiple tanks and pumps associated with a single chemical feed and storage system can be recorded in the spaces provided, but a separate set of checklist forms should be used for each chemical feed and storage system reviewed. Record the appropriate units with each value.

a) With which treatment process is this chemical feed and storage system associated?

_____

b) Sketch a process flow diagram (PFD), including valves and instrument locations, on the back of this sheet or on a separate sheet.

4.1) Tankage

a) Tank I.D.			
b) Tank capacity			
c) Material of construction			
d) Chemical stored			
e) Chemical concentration or dilution (e.g., mg/L, wt %)			
f) Is the chemical dilution optimal for delivery or climatic conditions? (e.g., std. Concentration from vendor)			
g) Is the tank located indoors or out?			
h) Is there mechanical damage or leaks?			
i) Is the location of each connection and fitting appropriate for safe and convenient operation?			
j) Check for leakage and the integrity of connections, pipe, or valves.			
Containment:			
k) Do provisions for the overfill protection and secondary containment conform to all criteria and requirements?			
l) Cover vent control type			
m) Cover vent maintenance frequency			
Chemical Delivery:			
n) Mode of chemical delivery (e.g., containers, partial truckload, full truckload)			
o) Delivery schedule			

p) Is each fill connection in a safe and convenient location?			
q) Does the tank provide an adequate operating margin beyond the delivered quantity?			
r) Is each tank adjacent to truck access?			

4.2) Pumps and Mechanical Equipment

a) Record the nameplate information from each pumps or other mechanical equipment for future reference. Use additional sheets as necessary.

_____

_____

_____

b) Pump I.D.			
c) Chemical fed			
d) Chemical concentration or dilution (e.g., std. Concentration from vendor)			
e) Are chemical solutions diluted to accommodate pump over sizing?			
f) How are pumps controlled? (e.g., on-off, flow proportional, feed forward/feedback)			
g) How often is pump feed rate calibrated?			
h) Date feed rate was last calibrated	___/___/___	___/___/___	___/___/___
i) Problems with pump priming or pump suction			
j) Date pump was last repaired/rebuilt	___/___/___	___/___/___	___/___/___

k) Are mechanical accessories (e.g., mixers) functioning properly?

_____

_____

4.3) Piping and Fittings

a) Where is the chemical added/injected into the treatment process (i.e., point of application)?

_____

_____

b) Is all required information printed on valve tags, pressure relief valves, check valves, sight glasses, strainers, and pipe/tubing?

_____

c) Are there any problems with the integrity, degradation, leakage, mechanical damage, or plugging of connections, piping, or valves?

_____

_____

d) Have operational problems been reported? *(e.g., reaction heat, incomplete mixing, or off-gassing)*

_____

_____

4.4) Process Monitoring (See Process Instrumentation and Control)

Level Controls:			
a) Device I.D.			
b) Application			
c) Type of device			
d) Date last calibrated	___/___/___	___/___/___	___/___/___
Flow Metering:			
e) Device I.D.			
f) Application			
g) Type of device			
h) Frequency of calibration			
j) Date last calibrated	___/___/___	___/___/___	___/___/___
Pressure Regulators:			
k) Device I.D.			
m) Application			
n) Type of device			
o) Frequency of calibration			
p) Date last calibrated	___/___/___	___/___/___	___/___/___

5) Performance Analysis Calculations

a) Perform calculations to compare with the manufacturers design information to see if the pumps are appropriately sized. Consider the following for each pump:

- Are the chemical addition rates the same as those in the original design specifications?
- Would pump head replacement result in more efficient operation?
- Can any pump motor be reduced in size and still meet the desired treatment requirements?

_____

_____

_____

6) Operations and Maintenance

a) Verify that the tankage is properly maintained. Are there visible signs of corrosion damage? Are the tanks constructed of a material that will withstand chemical attack, or has a protective interior coating been applied to achieve the same result?

_____

b) Verify that the pumps are maintained per manufacturers recommendations. Is the spare parts inventory adequate? Is the documentation complete (e.g., operating instructions, maintenance procedures)?

c) Verify that the piping, valves, and fittings are maintained per manufacturers recommendations.

d) Verify that controls and alarms are working. Are there provisions to notify an operator of a malfunction when the unit is unattended?

7) Typical Performance Problems

a) If the storage or feed system is located outside, are there provisions to drain the water lines and the sump(s) when the unit is shut down? Inspect the tankage and piping system to verify there is adequate insulation to prevent rupture of lines due to freezing.

b) Are the material safety data sheets (MSDS) for each chemical on hand?

c) Is the tank labeling and signage consistent with the MSDS for each chemical?

d) Are the chemicals in tankage used rapidly enough to prevent loss of efficacy? (e.g., polymers begin to deteriorate after mixing and have a limited "shelf-life")

8) Alternatives for Possible Cost Savings.

The contaminants in the water stream and/or the contaminant concentrations may have changed to the extent that other alternatives are more cost effective. Consider the following:

Verify that the dosage of each chemical is appropriate and that there are no alternatives that are more cost effective. Can the unit be easily bypassed if this treatment is no longer needed?

9) Supplemental Notes and Data

There are _____ pages of supplemental notes and data attached to this checklist.

[1] CEGS: USACE Guide Specifications for Construction, available at www.usace.army.mil/inet/usace-docs/