2/13/89

TA-50

Atch H ?
replacement

BATCH WASTE TREATMENT UNIT

OPERATIONS

INTRODUCTION

DESCRIPTION

HEALTH, SAFETY and ENVIRONMENTAL CONCERNS

PROCEDURES FOR SAFE OPERATIONS

- Cyanide Destruction
- Ammonia Destruction
- Chromate Reduction and Heavy Metal Removal
- General Safe Operating Procedures

RELATIONSHIPS BETWEEN OPERATIONS AND SUPPORT

TRAINING

EMERGENCY PROCEDURES

INTRODUCTION

The Batch Waste Treatment Unit (BWTU) is located at TA-50-1-24B (Figs 1 and 2). The process treats hazardous non-radioactive wastes and converts them to non-hazardous wastes. Two trained personnel are required to operate the BWTU.

DESCRIPTION

The waste is analyzed as received to determine the type of treatment required. The main component of the BWTU is a 500 gallon Kynar-lined, jacketed reactor. The reactor is water heated and water cooled. Liquids and slurried solids may be charged from a feed tank or drum either directly into the bottom of the reactor or through a recycle loop. A cartridge and bag filter is used for removing solids is a part of the reactor system.

Gases from the reactor pass through a a double-pipe heat exchanger to condense any vapors present. The vapor line goes to the top of building or to the hood in Room 24B which goes into exhaust system. The reactor is under a negative pressure when the vent line goes to the hood.

Four gas sensors monitor the BWTU area for the presence of H_2S, HCN, Cl_2 and NH_3 when appropriate.

HEALTH, SAFETY AND ENVIRONMENTAL CONCERNS

The Health, Safety and Environmental concerns are personnel exposure to hazardous chemicals and the potential release of toxic gases to the environment. The chemicals can be toxic, corrosive and/or reactive. No combustible chemicals are processed. Some of the primary treatment chemicals and their properties are listed here:

Calcium Hypochlorite: A powerful oxidant and a stable chlorine carrier.

Sodium Bisulfite: Irritating to skin and tissue. Reducing agent. TLV 5mg/M^3, IDLH 100 mg/M^3.

Sodium Hypochlorite: Strong oxidizing agent, strong irritant to tissue, disagreeable sweet odor. Toxic by ingestion.

Sodium Hydroxide: Corrosive to tissue. TLV 2 mg/M^3, IDLH 200 Mg/M^3 .

Sodium Bisulfide: Strong irritant to skin and tissue, liberates H_2S on contact with acids.

Nitric or Sulfuric Acid: Strong oxidizers. May react violently when in contact with organic chemicals. Very corrosive to skin and eyes.

PROCEDURES FOR SAFE OPERATION

Cyanide Destruction

Cyanide is destroyed by an oxidation process using calcium hypochlorite ($Ca(OCl)_2$), sodium hypochlorite (NaOCl) or similar oxidant. The cyanide contaminated material is charged to the reactor and the pH is adjusted as needed. As the oxidant is added the pH/Oxidation-Reduction Potential(ORP) is monitored. Cyanide is oxidized to cyanate. Periodic addition of caustic is required during the processing to keep the pH above 8. Further oxidation converts the cyanate to carbon dioxide and nitrogen.

Ammonia Destruction

Ammonia wastes are destroyed by oxidation with hypochlorite. Any solution which has been treated for cyanide will also have destroyed any ammonia present. Periodic addition of caustic is required during the processing to keep the pH above 8.

Chromate Reduction and Heavy Metal Removal

To remove chromate any Cr^{+6} present is first reduced to Cr^{+3} and the Cr^{+3} precipitated out of solution as chromic hydroxide [$Cr(OH)_3$].

If no other heavy metal ions are present the chromate is reduced with sodium bisulfite [$NaHSO_3$] and then precipitated with NaOH.

If chromate is to be removed with other heavy metals, sodium bisulfide [NaHS] is added to the solution to first precipitate out all the heavy metals except chrome as their sulfide. More NaHS then reduces the chrome to +3. The chrome is then precipitated with NaOH.

General Safe Operating Procedures

Any time the reactor temperature exceeds 120^{o}F, cooling water is turned on to the jacket until the temperature is less than 90^{o}F.

All instruments/guages are checked and/or calibrated per Module IV sections D and E from the RCRA Part B draft permit.

A safety shower, eye wash sink and a hose bib are located in the BWTU area.

All valves, lines and connections are checked before and during operations for leaks.

During operations the reactor is vented to the hood.

The mixer is always turned on whenever chemicals are being added.

Chemical charging lines are rinsed with water after each new chemical is added.

The reactor and associated piping are rinsed with water after each batch.

Two trained operators, at a minimum, are present during treatment.

All personnel wear protective clothing and equipment whenever they are performing a chemical transfer. The gear consists of:

- A chemical resistant suit,

- Close-fitting safety goggles and face shield (with a optional hard hat),
- Chemical resistant gloves,
- Chemical resistant boots or chemical resistant coverings over shoes.

Detailed operating instructions(OI's) are used for each specific operation.

If another waste chemical not mentioned in this SOP is to be processed in the BWTU, a Special Work Permit (SWP) is prepared and approved for that chemical before processing.

RELATIONSHIPS BETWEEN OPERATIONS AND SUPPORT

The BWTU is supported by the following groups: HSE-2 Occupational Medicine, HSE-3 Safety, HSE-5 Industrial Hygiene, HSE-7 Waste Management, HSE-8 Environmental Surveillance, and HSE-9 Analytical Chemistry.

More detailed information of individual group responsibi- lities are located in Permit Attachments; A, B, C, D, E, F, and J.

TRAINING

All HSE-7 personnel involved with the BWTU will receive training consistent with those described in Permit Attachment C. Annual reviews of OI's, SOP's and procedures will be conducted.

EMERGENCY PROCEDURES

Emergency procedures for the BWTU are covered under the RCRA Part B Permit Attachment D. In addition to this, site specific training will be given as specified in Attachment C of the RCRA Part B Permit.

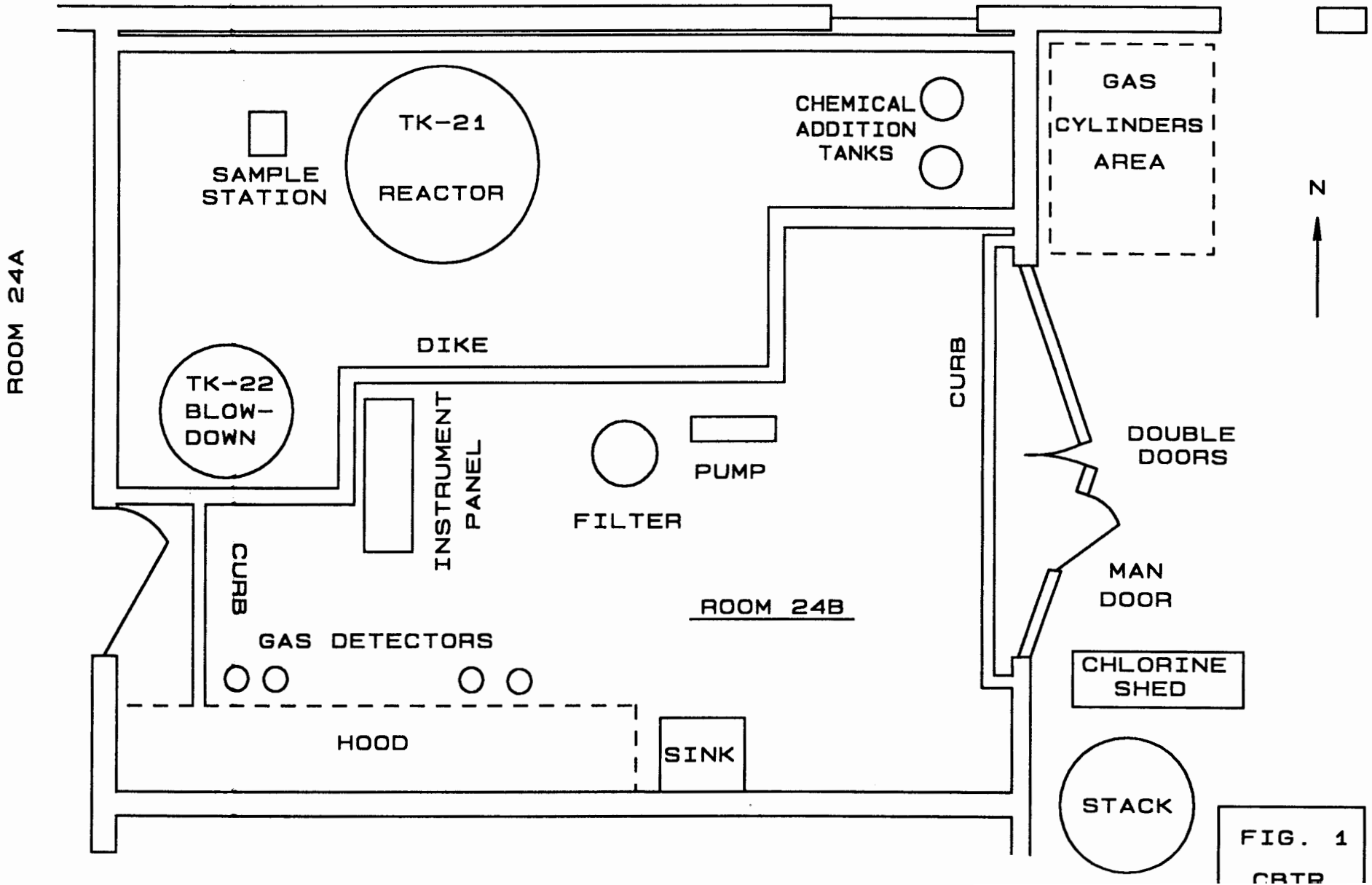
ROOM 24A
SAMPLE STATION
TK-21
REACTOR
CHEMICAL ADDITION TANKS
GAS CYLINDERS AREA
N
DIKE
TK-22 BLOW-DOWN
INSTRUMENT PANEL
FILTER
PUMP
CURB
DOUBLE DOORS
MAN DOOR
CURB
ROOM 24B
GAS DETECTORS
CHLORINE SHED
HOOD
SINK
STACK

FIG. 1

CRIR

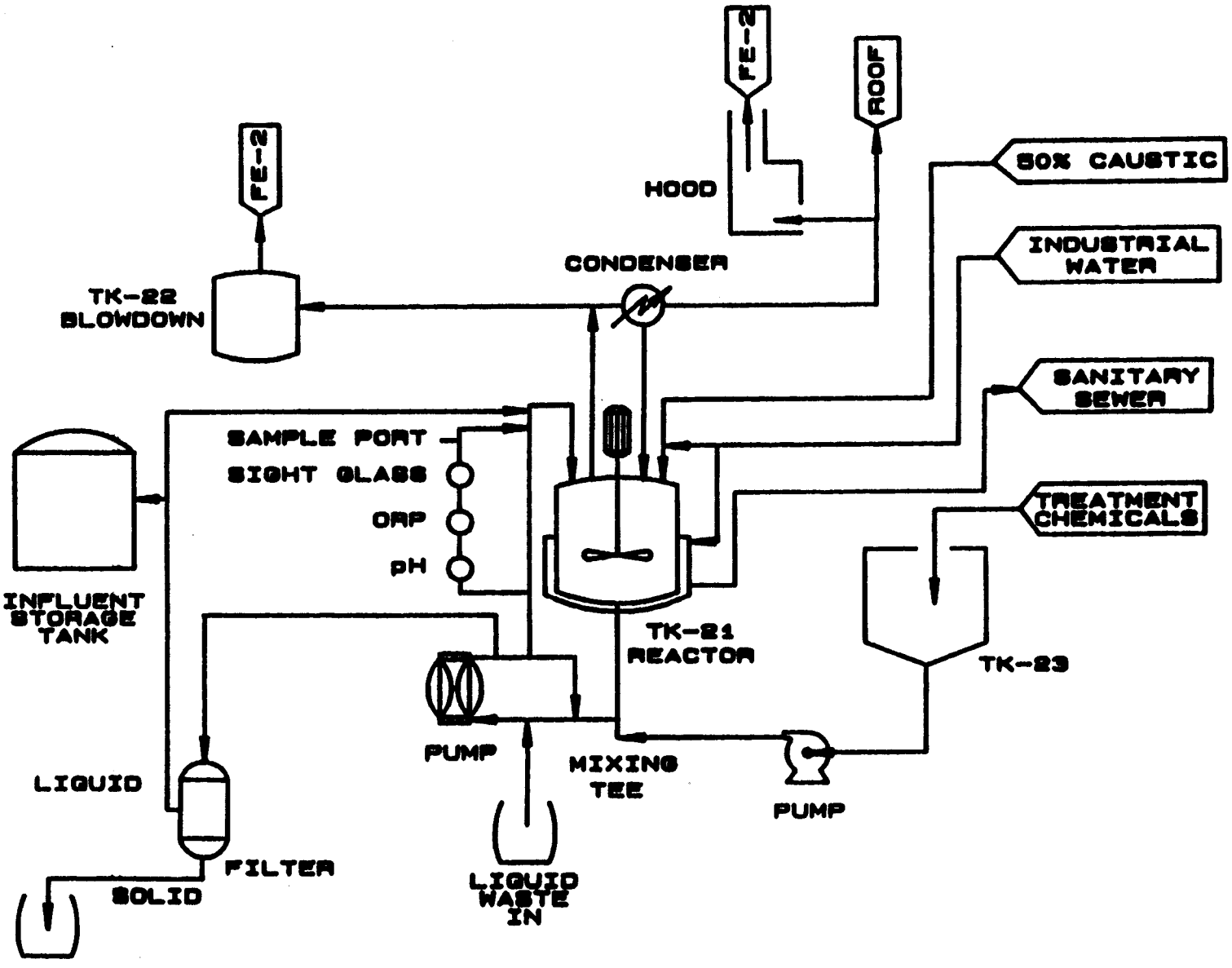

FIG. 2 CBIP - PROCESS FLOW SHEET

BATCH WASTE TREATMENT UNIT OPERATION

PERMIT ATTACHMENT H

NM0890010515-1

STANDARD OPERATING PROCEDURE
FOR
THE CHEMICAL BATCH TREATMENT PLANT

/Approved

1.0 INTRODUCTION

The Chemical Batch Treatment Plant(CBTP) is located at TA-50-1-24B (Figs 1 and 2). The process treats hazardous non-radioactive wastes and converts them to non-hazardous wastes. Two trained personnel are required to operate the CBTP.

2.0 DESCRIPTION

The waste is analyzed as received for pH, Cl^-, NH_3, CN^- metals content and density to determine the type of treatment required. It is also counted to insure the absence of any radionuclides. The main component of the CBTP is a 500 gallon Kynar-lined, jacketed reactor. The reactor is water heated and water cooled. Liquids and slurried solids may be charged from a feed tank or drum either directly into the bottom of the reactor or through a recycle loop. A four sq. ft cartridge and bag filter for removing solids is a part of the reactor system. Gases from the reactor pass through a a double-pipe heat exchanger to condense any vapors present. The vapor line goes to the top of building WM-1 or to the hood in Room 24B which goes into exhaust system FE-2. The reactor is under a negative pressure when the vent line goes to the hood.

Four gas sensors continually monitor the CBTP area for the presence of H_2S, HCN, Cl_2 and NH_3.

3.0 HEALTH, SAFETY AND ENVIRONMENTAL CONCERNS

3.1 The Health, Safety and Environmental concerns are personnel contact with the hazardous chemicals which are being handled during the operation of the CBTP. The chemicals can be toxic and/or corrosive and reactive. No combustible chemicals are processed or handled.

The chemicals and some of their properties are listed here. For a more complete description see the Manufacturers Safety Data Sheets (MSDSs) attached to this SOP:

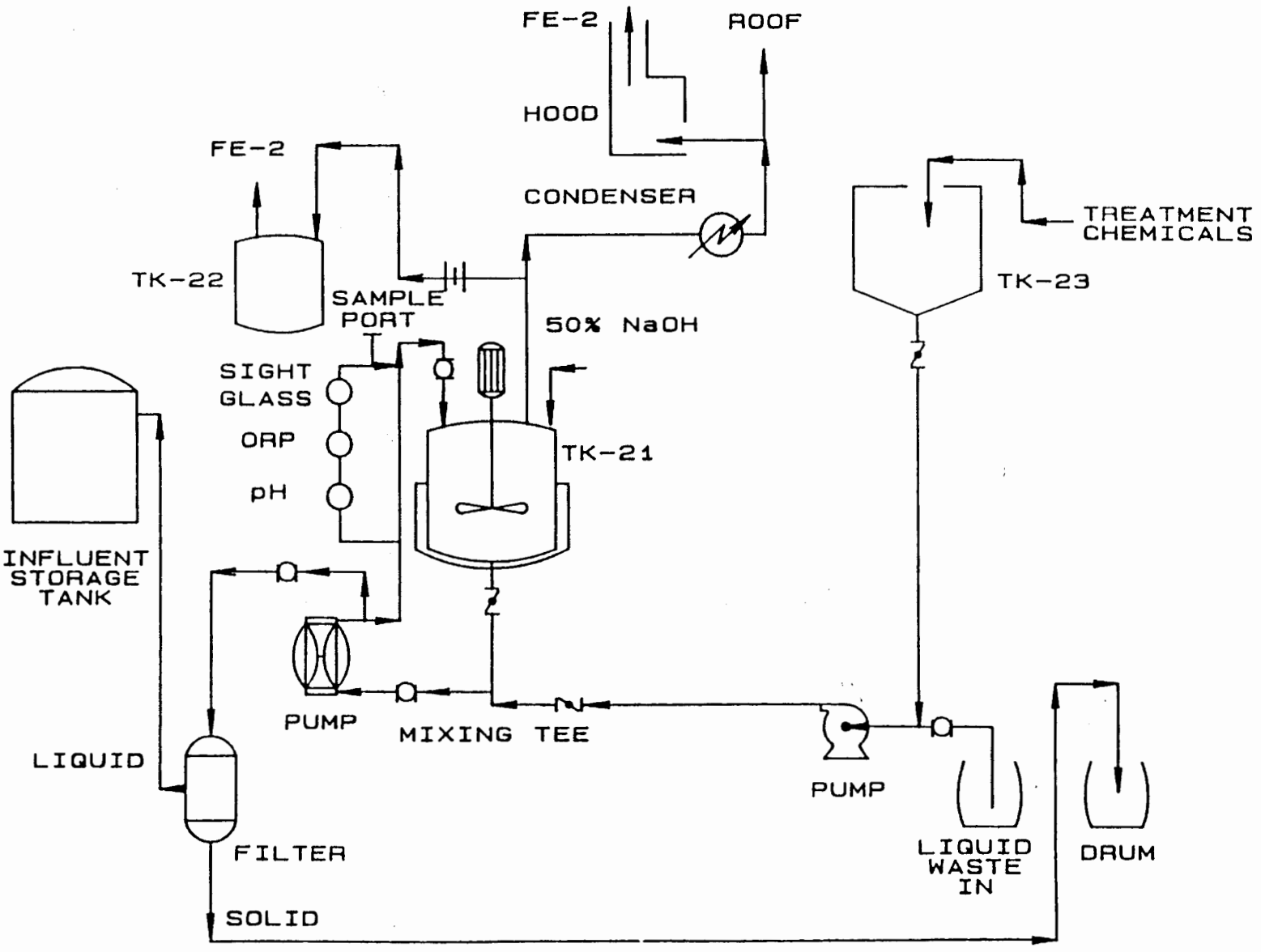

FIG. 2 CBTP - PROCESS FLOW SHEET

3.1.1 Calcium Hypochlorite: A powerful oxidant and a stable chlorine carrier.

3.1.2 Hydrogen Cyanide: An extremely toxic gas. TLV 10 ppm, IDLH 50 ppm.

3.1.3 Hydrogen Peroxide:Strong oxidizing agent. Concentrated solutions are toxic and strongly irritating. TLV 1 ppm, IDLH 75 ppm.

3.1.4 Potassium Permangate:Strong oxidizing agent.

3.1.5 Sodium Bisulfite: Irritating to skin and tissue. TLV 5mg/M^3, IDLH 100 mg/M^3.

3.1.6 Sodium Hypochlorite: Strong oxidizing agent, strong irritant to tissue, disagreeable sweet odor. Toxic by ingestion.

3.1.7 Sodium Hydroxide: Corrosive to tissue. TLV 2 mg/M^3, IDLH 200 Mg/M^3 .

3.1.8 Sodium Sulfide: Strong irritant to skin and tissue, liberates toxic H_2S on contact with acids.

3.1.9 Nitric or Sulfuric Acid: Strong oxidizers. May react violently when in contact with organic chemicals. Very corrosive to skin and eyes.

4.0 PROCEDURES FOR SAFE OPERATION

4.1 Cyanide Destruction

Cyanide is destroyed by an oxidation process using calcium hypochlorite $Ca(OCl)_2$ or sodium hypochlorite (NaOCl) as the oxidant. The cyanide contaminated material is charged to the reactor and the pH is adjusted to between 9.5 and 12 by adding sodium hydroxide or sulfuric acid as needed. As the oxidant is added the pH/ORP is monitored (Fig.3). Cyanide is oxidized to cyanate. Periodic addition of caustic is required during the processing to keep the pH up. When the ORP is between +350 and +400

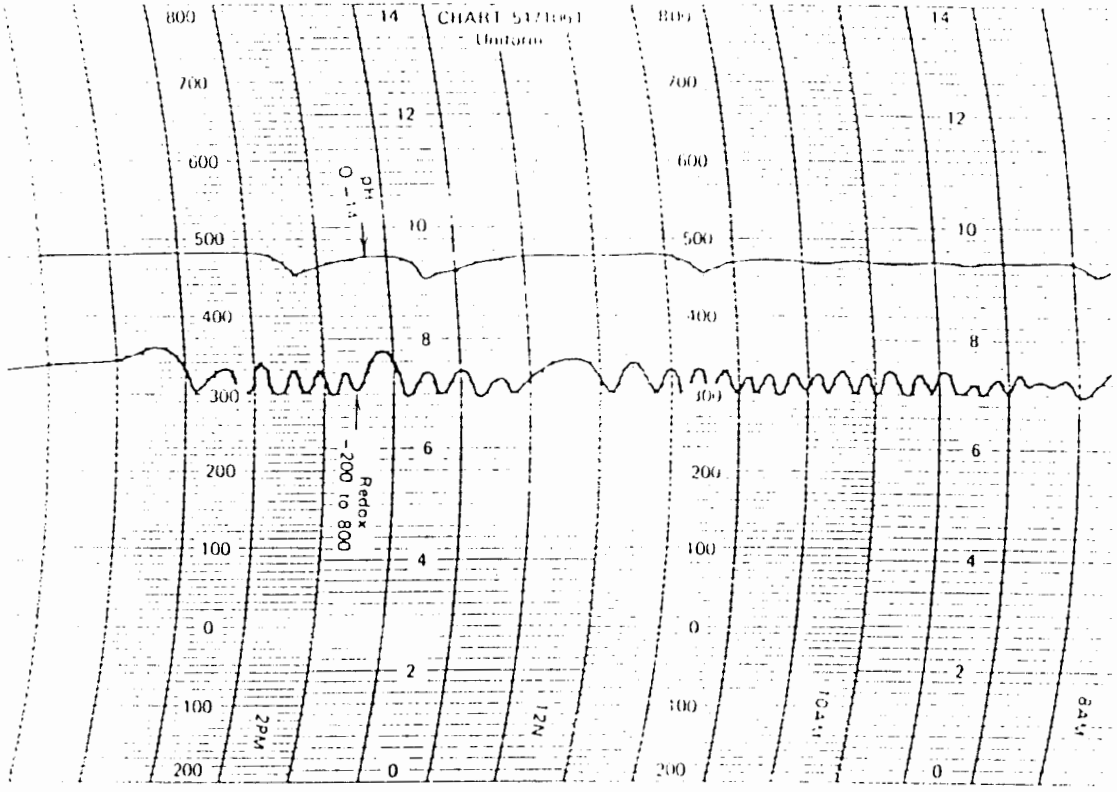

FIG. 3 PH/ORP VS TIME

4.4.6 The mixer is always turned on whenever chemicals are being added.

4.4.7 Chemical charging lines are rinsed after each new chemical is added.

4.4.8 The reactor and associated piping are rinsed with water after each batch.

4.4.9 Two trained operators are present during treatment.

4.4.10 All personnel wear protective clothing and equipment whenever they are performing an acid or caustic transfer. The gear consists of:

- A Saranex suit,
- Close-fitting safety goggles , face shield and a hard hat,
- Rubber gloves,
- Rubber boots or rubber coverings over shoes.

4.4.11 Detailed operating instructions(OI's) are written for each specific operation. The following OI's must be followed for the appropriate operation:

- Transfer of sodium hydroxide solutions.
- Operation of the Chemical Batch Waste Treatment Plant.
- Transfer of Batch Waste to the 75,000 gal(285,000 L) Influent Tank.

4.4.12 If another chemical not mentioned in this SOP is to be processed in the CBTP, a Special Work Permit (SWP) is prepared and approved for that chemical before processing.

mV, the total cyanide level is less than 0.2 mg/L. Further oxidation then converts the cyanate to carbon dioxide and nitrogen. When the cyanate level is determined to be below 0.5 mg/L by lab analysis, the destruction is considered complete.

4.2 Ammonia Destruction

Ammonia wastes are also destroyed by oxidation with hypochlorite, peroxide, or permangate. Any solution which has been treated for cyanide will also have destroyed any ammonia present. Periodic addition of caustic is required during the processing to keep the pH up. Hypochlorite is continued until a reading of +600 mV is obtained on the ORP meter. If a batch sample is less than 10 mg/L NH_3, the destruction is considered complete.

4.3 Chromate Reduction and Heavy Metal Removal

Hexavalent chrome is reduced to the +3 state by the addition of sodium bisulfite to the batch tank containing the cr^{+6}. Sodium hydroxide is then added slowly to the waste solution to precipitate out the chrome and any other heavy metals present as the hydroxide.

4.4 General Safe Operating Regulations

4.4.1 Any time the reactor temperature exceeds 120°F, cooling water is turned on to the jacket until the temperature is less than 90°F.

4.4.2 The pH/ORP meter is calibrated before each batch.

4.4.3 A safety shower, eye wash sink and a hose bib are kept in the CBTP area.

4.4.4 All valves, lines and connections are checked before and during operations for leaks.

4.4.5 While chemicals are being added or during sampling the reactor is vented to the hood.

5.0 RELATIONSHIPS BETWEEN OPERATIONS AND SUPPORT

5.1 HSE-2 Occupational Medicine:

Provide emergency or first aid care in the event of any corrosive or toxic chemical contact on personnel.

5.2 HSE-3 Safety:

Provide support for operations by review of this SOP and by inspection of the process for any industrial safety considerations.

5.3 HSE-5 Industrial Hygiene:

Provide support for operations by review of this SOP, by recommendations for personal protective equipment, and by inspection of the process for any industrial hygiene considerations.

5.4 HSE-7 Waste Management:

Responsible for all operations involving the Chemical Batch Treatment Plant not specifically assigned to another Group.

5.5 HSE-9 Analytical Chemistry:

Perform analytical chemical analysis as required, on the waste before, during and after processing.

6.0 TRAINING

All HSE-7 personnel involved will initial the Section Leaders Training forms to indicate:

6.1 They have read and understood the requirements of this SOP.

6.2 They have read and understood the operating instructions referenced in section 4.4.9.

6.3 They have discussed with their supervisor the hazards involved in the handling of corrosive, reactive and toxic chemicals.

6.4 They have received on-the-job training by a qualified operator.

6.5 They have a HSE-5 Respirator card showing they have had the following training:

- Full Face Mask
- SCBA

6.6 They have personal copies of the HSE-7 Safety Policy and the HSE-7 Site Emergency Plan.

6.7 They have had Fork Lift Vehicle Operation training.(optional)

6.8 They have received Hazard Communications training.

7.0 EMERGENCY PROCEDURES

7.1 If any **CORROSIVE** chemical contacts the skin or eyes:

7.1.1 The affected areas must be flushed immediately with large volumes of low pressure water from an emergency shower or a hand-held eye wash.

7.1.2 Contaminated clothing or shoes must be removed and disposed of.

7.1.3 If contact appears to be minor, personnel receiving *any* burns should still report to HSE-2 for an examination.

7.1.4 If burns are extensive or if any **TOXIC** chemicals are inhaled, ingested or are contacted with the skin or eyes remove the contaminated person from the area and:

- *Call an ambulance at 9-911.*
- *Notify the HSE-2 Group Leader at 7-0660.*
- *Meet the ambulance outside at the site and direct the medical personnel to the patient.*
- *Direct the ambulance to take the victim to the HSE-2 emergency entrance at TA-3-409.*
- *Notify the HSE-7 Group Leader or Deputy as soon as possible.*

7.2 If there is an **ACCIDENT** or **SPILL** of chemicals that could be hazardous to personnel in the building operators are to:

7.2.1 Pull the nearest fire alarm lever, or use the building paging system to notify occupants to evacuate.

7.2.2 Close any chemical feed valves.

7.2.3 Leave the area by the shortest and safest route.

7.2.4 Evacuate to the muster area.

7.2.7 Re-enter the area with caution and only with the approval of the Group Leader.

7.2.6 Consult HSE-5 for recommendations if personal protective equipment might be needed to re-enter the CBTP .

7.3 If there is a **POWER LOSS** while treating a batch:

7.3.1 Stay calm,

7.3.2 Close feed lines,

7.3.3 Adjust the operation to a safe "standby" **IF IT WILL ONLY TAKE A FEW SECONDS,**

7.3.4 Leave the building through the nearest exit door,

7.3.5 Go to the muster area,

7.3.6 Do not re-enter the building or CBTP without the approval of the Group Leader.

7.4 If one of the **HAZARDOUS GAS ALARMS** goes off:

7.4.1 Leave the area immediately.

7.4.2 Each operator put on a Saranex suit and a SCBA.

7.4.3 One operator go back into the area and check the alarm while the other stays outside in standby.

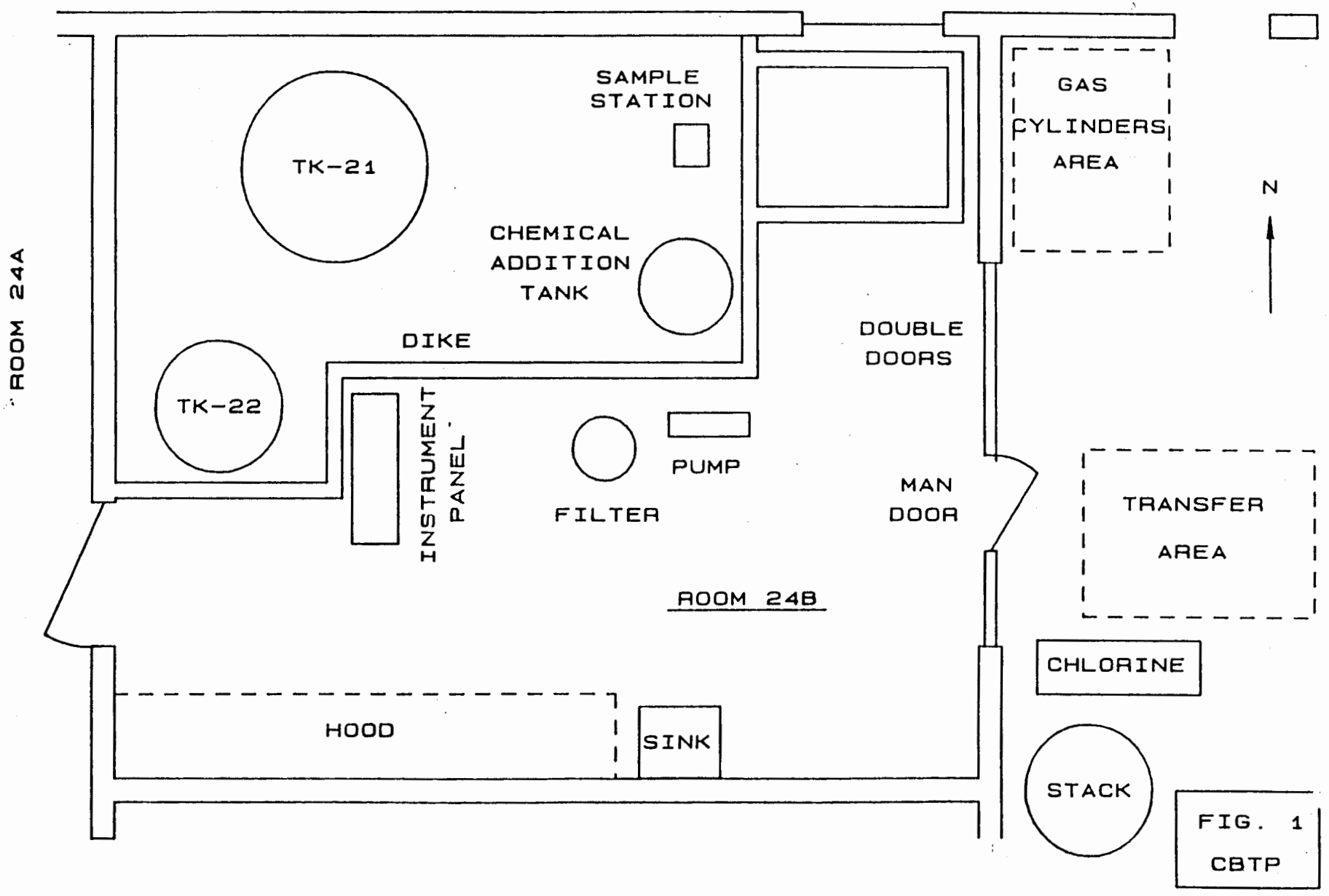
ROOM 24A
SAMPLE STATION
TK-21
GAS CYLINDERS AREA
N
CHEMICAL ADDITION TANK
DIKE
DOUBLE DOORS
TK-22
INSTRUMENT PANEL
FILTER
PUMP
MAN DOOR
TRANSFER AREA
ROOM 24B
CHLORINE
HOOD
SINK
STACK

FIG. 1
CBTP

7.4.4 If the alarm is verified as true:

- Leave the area.
- Announce over the pager for all personnel to evacuate the building or pull the nearest fire alarm.
- Go to the muster area.
- Do not re-enter the building or the CBTP area without the approval of the Group Leader.

8.0 RESPONSIBILITIES

The Liquid Waste Operations Section of Group HSE-7 has the responsibility for the Chemical Batch Treatment Plant and for enforcing this SOP. The line management is as follows:

Brian Myers	Staff Member	MS E518	7-4301
Mort Sanders	Staff Asst	MS E518	7-4301
Jerry Buchholz	Section Leader	MS E518	7-4301
(New One)	Dep. Gp. Leader	MS E518	7-4301
Ralph Koenig	Group Leader	MS E518	7-4301