State of Illinois
ENVIRONMENTAL PROTECTION AGENCY

Mary A. Gade, Director

2200 Churchill Road, Springfield, IL 62794-9276

April 26, 1995

US EPA RECORDS CENTER REGION 5
1000870

Mr. Paul A. Ahearn
Manager, Regulatory Compliance
Clean Harbors Environmental Services, Inc.
1200 Crown Colony Drive
P.O. Box 9137
Quincy, MA 02269-9137

0316000051 -- Cook County
Clean Harbors, Inc.
Log No. B-16-M-2
RCRA Permit File

Dear Mr. Ahearn:

During the April 21, 1995 visit of the Clean Harbors facility, you expressed concern about the time required by our consultant, C. March & Associates, to review the Fire Suppression System. To address this concern, the Agency spoke with Chuck March regarding his review.

If Gage-Babcock & Associates submits a response to his comments by April 28, 1995, he will complete his review by May 5, 1995. However, if the response to comments is submitted after April 28, 1995, the completion date for this review may change. The Agency will fax the comments to CHCI once we receive them.

If you have any questions regarding this letter, please feel free to call Rob Watson, P.E. at 217-524-3265.

Sincerely,

Harry A. Chappel, P.E.
Hazardous Waste Branch Manager
Permit Section, Bureau of Land

HAC:WRW

cc: Matt Dunn, IAG
George Hamper, USEPA, Region V
Tony Martig, USEPA, Region V (SP-14J)
Chuck March

RECEIVED
MAY 02 1995
PCB CONTROL SECTION
US EPA, REGION V

State of Illinois
ENVIRONMENTAL PROTECTION AGENCY

Mary A. Gade, Director

2200 Churchill Road, Springfield, IL 62794-9276

USEPA

January 24, 1995

RECEIVED
FEB 01 1995
PCB CONTROL SECTION
US EPA, REGION V

Mr. Chuck March
CMA
413 S. Catherine Ave.
La Grange, IL 60525

RE: 0316000051 -- Cook County
Clean Harbors, Inc.
Log No. B-16-M-2
RCRA Permit File

Dear Mr. March:

On December 23, 1994 Clean Harbors submitted a response to your comments on the revised Phase II Fire Protection System for the CWM facility. A copy of this submittal (including the blueprints) is attached to this letter.

The Agency would like to request that your firm provide a letter of proposal for the review of this document as soon as possible. Once your proposal is approved, the Agency would like CMA to provide comments and draft conditions which may be needed to address outstanding issues with Clean Harbors proposal.

If you have any questions regarding this letter, please feel free to call Rob Watson, P.E. at 217-524-3265.

Sincerely,

Harry A. Chappel, P.E.
Hazardous Waste Branch Manager
Permit Section, Bureau of Land

HAC:WRW

ATTACHMENTS

cc: Bureau File
George Hamper, USEPA Region V (w/o attachments)
Tony Martig, USEPA Region V (with attachments)
Matt Dunn, IAG (w/o attachments)

Printed on Recycled Paper

OLYMPIC ENGINEERING

A PROFESSIONAL CORPORATION

December 21, 1994

RECEIVED
DEC 23 1994
IEPA-DLPC

RECEIVED
DEC 24 1994
IEPA-DLPC

Clean Harbors Environmental Services
325 Wood Rd.
Braintree, MA 02184

Subject: Chemical Waste Management
Clean Harbors
11700 S. Stony Island Ave.
Chicago, IL

To whom it may concern:

The below listed Grinnell Fire Protection drawings, were prepared under my direct supervision. These drawings and the system design meet all applicable NFPA and City of Chicago code requirements.

Drawing No. Cover , Rev. 2, dated 12/14/94
Drawing No. FP1 , Rev. 6, dated 12/14/94
Drawing No. FP2 , Rev. 5, dated 12/14/94
Drawing No. FP3 , Rev. 5, dated 12/14/94
Drawing No. FP4 , Rev. 3, dated 12/14/94
Drawing No. FP5 , Rev. 3, dated 12/14/94
Drawing No. FP6 , Rev. 3, dated 12/14/94
Drawing No. FP7 , Rev. 4, dated 12/14/94
Drawing No. FP8 , Rev. 4, dated 12/14/94
Drawing No. FP9 , Rev. 4, dated 12/14/94
Drawing No. FP10 , Rev. 3, dated 12/14/94
Drawing No. FP11 , Rev. 2, dated 12/14/94
Drawing No. FP12 , Rev. 3, dated 12/14/94
Drawing No. FP1-E , Rev. 2, dated 12/14/94
Drawing No. FP2-E , Rev. 2, dated 12/14/94
Drawing No. FP3-E , Rev. 2, dated 12/14/94
Drawing No. FP4-E , Rev. 3, dated 12/14/94
Drawing No. FP5-E , Rev. 2, dated 12/14/94
Drawing No. FP6-E , Rev. 2, dated 12/14/94
Drawing No. FP7-E , Rev. 2, dated 12/14/94
Drawing No. FP8-E , Rev. 2, dated 12/14/94
Drawing No. FP9-E , Rev. 2, dated 12/14/94
Drawing No. FP10-E, Rev. 2, dated 12/14/94
Specifications Pages 1 through 14, Rev. 5, dated 12/20/94

719 UTAH CIRCLE • ELK GROVE VILLAGE, ILLINOIS 60007 • OFFICE 708-529-3080 • FAX 708-529-3233

Drawing No. SK-1, Rev. B, dated 3/4/92
Hydraulic Calculations - Fuel Blending Operation, dated 12/19/94
Hydraulic Calculations - Container Handling Bldg., dated 12/18/94
Hydraulic Calculations - Container Management Bldg., dated 12/18/94
Hydraulic Calculations - Utilities Building, dated 12/19/94
Hydraulic Calculations - Rail Car Unloading Canopy, dated 12/19/94
Hydraulic Calculations - Tank Farm West, dated 12/19/94
Hydraulic Calculations - Tank Farm East, dated 12/19/94
Hydraulic Calculations - Ignitable Container Mgmt. Bldg., dated 12/19/94
Hydraulic Calculations - Personnel Building, dated 12/19/94
Hydraulic Calculations - Underground Foam Concentrate Ln, dated 12/20/94

Sincerely,

Jay Singh, P.E.

JASMIR SINGH
62-34210
REGISTERED PROFESSIONAL ENGINEER OF
ILLINOIS

719 UTAH CIRCLE • ELK GROVE VILLAGE, ILLINOIS 60007 • OFFICE 708-529-3080 • FAX 708-529-3233

Grinnell
FIRE PROTECTION SYSTEMS COMPANY

558 Lamont Road
Elmhurst, IL 60126
708-834-2300
312-242-1201

RECEIVED
DEC 23 1994
IEPA-DLPC

RECEIVED
DEC 24 1994
IEPA-DLPC

December 21, 1994

Mr. Paul Ahern
Clean Harbors Environmental Services, Inc.
1200 Crown Colony Drive
Quincy, MA 02269

Subject: Chemical Waste Management
Clean Harbors
11700 South Stony Island Avenue
Chicago, IL
Fire Suppression System

Gentlemen:

We are resubmitting our drawings and specifications which incorporates the comments of C. March & Associates, dated August 29, 1994. Response to the comments:

1)a. The NFPA standards have been revised per current editions.

1)b. The trouble condition for the high/low air supervisory switch has been deleted from the specification.

2) The elevated monitor M1A and new monitor M9 will cover the truck pad.

3) The 10" fire main is located under the fuel blending operation building. This is an existing condition and at the present time is not going to be relocated.

4) The 1,500 GPM at 125 PSI diesel fire pump in the east pump house will be installed. Drawing SK-1 by Techknow Consultants is included in our submittal.

5) The foam concentrate supply piping has been sized. Calculations are included.

6) Additional foam/water test valves have been added.

7) The sprinkler spacing for the Fuel Blending Operations Building has been revised to a maximum of 80 square feet. We have been informed that this site will not handle Class 1A Liquids, but will handle Class IB & 1C Liquids.

8) The sprinkler spacing for the Container Management Building has been revised not to exceed 120 square feet.

9) The sprinkler spacing for the Container Handling Dock has been revised not to exceed 80 square feet.

10) Additional foam/water test valves have been added.

11) The design area for the Container Management Building has been reduced from 5,000 square feet to 3,000 square feet. Class III liquids will not be stored more than three drums high.

12) The central foam pumping system has been verified. Calculations are included. The size of the storage tank will remain at 4,000 gallons based on 4 monitor nozzles flowing 500 GPM each. 4 x 500 GPM = 2,000 GPM x 3% foam = 60 GPM. Duration is 65 minutes x 60 GPM = 3,900 gallons of foam concentrate required.

13) The foam concentrate piping has been revised and will not run outside above ground.

14) A check valve in the riser has been added.

15) The sprinkler spacing for the Rail Car Canopy has been revised not to exceed 80 square feet.

16) The Tank Farm Dike areas have been redesigned using foam makers.

17) The sprinkler spacing for the Ignitable Container Management Building has been revised not to exceed 80 square feet.

18) Additional foam/water test valves have been added.

19) A check valve in the riser has been added.

20) The above grade existing conduit has been noted on drawing FP1-E. All new conduit will run underground. All the conduit that is installed in this facility is galvanized rigid conduit and is installed in an explosion proof and sealed manner. All conductors are high temperature THHN and the conduit is installed as protected as possible.

21) Drawing FP2-E will be revised to show the battery drain calculations once the actual number of devices are known (Shop drawings).

22) The protectowire system is an intrinsically safe system and is equipped with a barrier circuit which protects the system and the wire from any spikes, over-current situations or damage. The wire is also applicable in a Class I, Division 2 location for both electrical and atmospheric reasons.

23) The note for explosion proof wiring has been added to the drawings that apply.

24) The temperature rating of the heat detectors has been shown on the drawings.

25) Hydraulic calculations are being submitted with this submittal.

Trusting this submittal meets with your approval, we are,

Very truly yours,

GRINNELL FIRE PROTECTION
SYSTEMS COMPANY

Thomas Wall

Thomas Wall
Sales Representative

TW/ar

Enclosures

1220-94

RECEIVED
DEC 23 1994
IEPA-DLPC

RECEIVED
DEC 24 1994
IEPA-DLPC

SPECIFICATION

PHASE II FIRE PROTECTION SYSTEM

for

CHEMICAL WASTE MANAGEMENT
CLEAN HARBORS
1700 S. STONY ISLAND AVE.
CHICAGO, IL 60617

DECEMBER 20, 1994
REVISION NO. 5

GRINNELL FIRE PROTECTION
558 LAMONT ROAD
ELMHURST, IL 60126

APPLICABLE NFPA STANDARDS & RECOMMENDED PRACTICES

All work shall conform to the requirements of the current edition of the following NFPA Standards and Recommended Practices as appropriate for the type of service except as specifically noted in each Design Analysis Section:

a. "Standard for Low Expansion Foam and Combined Agent Systems," No. 11.

b. "Standard for the Installation of Sprinkler Systems," No. 13-1973 (Chicago Fire Prevention Code).

c. "Standard for the Installation of Deluge Foam-Water Sprinkler Systems and Foam-Water Spray Systems," No. 16.

d. "Recommended Practice for the Installation of Closed-Head Foam-Water Sprinkler Systems," No. 16A.

e. "Standard for Dry Chemical Extinguishing Systems," No. 17.

f. "Standard for the Installation of Centrifugal Fire Pumps," No. 20.

g. "Standard for the Installation of Private Fire Mains and Their Appurtenances," No. 24.

h. "Standard for Water Tanks and Private Fire Protection," No. 22.

i. "Recommended Practice for the Supervision of Valves Controlling Water Supplies," No. 26.

j. "The Flammable and Combustible Liquids Code," No. 30.

k. "National Electrical Code," No. 70.

l. National Fire Alarm Code," No. 72.

m. City of Chicago Codes.

n. "Inspection, Testing and Maintenance of Water Based Fire Protection Systems No. 25."

APPLICABLE FM ENGINEERING DATA SHEETS

All work shall conform to the requirements of the current edition of the following Factory Mutual Engineering Data sheets except as specifically noted in each design analysis section.

a. "Installation of Sprinkler Systems," 2-8N - 1989.

b. "Water Tanks for Fire Protection," 3-2.

c. "Centrifugal Fire Pumps," 3-7N/13-4N.

d. "Installation/Maintenance of Fire Service Mains," 3-10.

e. "Water Demand for Private Fire Protection," 3-26.

f. "Foam Extinguishing Systems," 4-7N.

g. "Local Protective Signalling Systems," 5-5.

h. "Fire and Explosion Protection for Flammable Liquid, Flammable Gas, and Liquified Flammable Gas Processing Equipment and Supporting Structures," 7-14.

i. "Flammable Liquids in Drums and Small Containers," 7-29.

j. "Storage Tanks for Flammable and Combustible Liquids," 7-88.

DESIGN BASIS

The system design will be based on the operation of both 1,500 GPM fire pumps with the underground fire loop intact.

The foam concentrate to be used should be Ansulite 3X3 Low Vicosity Alcohol Resistant Concentrate or approved equal for use as a 3% concentrate on both polar solvent and hydrocarbon fuels.

SCOPE OF WORK

Personnel & Training Center: Building No. 7 (Dwg. No. FP-10 and FP 10-E)
Provide a new wet pipe sprinkler system for the Personnel Building. Provide a new cut-in to the 10" fire main loop.

The system to be designed for a Light Hazard Occupancy, .15 GPM per square foot over the most remote 2,000 square foot of floor area. Provide a local sprinkler alarm consisting of a 6" inside alarm bell at the riser and a 10" alarm bell outside of the building. Connect the sprinkler flow switch to the new plant fire alarm panel.

Laboratory Building: Building No. 8 (Dwg. No. FP-5)
This building is equipped with a wet pipe sprinkler system and selected area Halon protection. Both systems are currently monitored by the existing plant alarm system. Connect these systems to the new plant fire alarm system. Revise the existing wet pipe sprinkler system, if necessary, to meet NFPA 13 design criteria for Ordinary Hazard Group 2 occupancies: .24 GPM per square foot over the most remote 1,500 square feet. Provide hydraulic calculations to verify the design criteria.

Verify that the existing Halon system is in working order and the system has sufficient gas for each room. Also, verify that the Halon control panel shuts down power to the rooms and the HVAC systems.

Inspect the integrity of each room. Notify Owner of any openings that need to be sealed. Also verify that the ceiling tiles are clipped down or held in place in an approved manner.

Perform a door fan test in each room to verify the integrity of the room.

Control Building: Building No. 9 (Dwg. No. FP 4-E)
Provide a smoke detection system in the Electrical Switchgear Room. Connect this system to the new plant fire alarm panel in the Control Room. All devices shall be installed in conformance with NFPA 72.

Provide additional CO_2 fire extinguishers in the Control Room and near the door of the Switchgear Room.

Tank Truck Unloading Area: Area No. 15 (Dwg. No. FP-8 and FP 8-E)
The Tank Truck Unloading area is currently protected by a deluge foam-water system with dry pilot actuation. The system is designed to provide a density of .16 GPM per square foot over the entire area for a minimum of ten minutes. Verify that the system will provide a density of .17 GPM per square foot over the entire area.

The foam concentrate for this system is currently supplied by an insulated bladder tank. This bladder tank is to be removed, and the system modified for the central foam pumping system.

Electric trim to be added to the deluge system so three electric manual pull stations can be added to manually activate the deluge system. Manual pull stations to be located as shown on the drawings.

The local alarm/release panel shall be an "FCI-FC72-DL-3" mounted in a NEMA 12 enclosure. The control panel zones shall be arranged with Zone 1 as a Class A/Style D circuit with alarm output and release activation for the manual pull stations. Zone 2 shall be a Class B/Style B circuit for annunciation of a waterflow condition with an alarm output. Zone 3 shall supervise the high/low air switch.

The control panel shall be mounted near the deluge valve with a ten inch outside alarm bell. The control unit shall have a "C" set of contacts for remote alarm signal transmission and a set of "C" contacts for remote trouble supervision signals. These signals to be connected to the new plant fire alarm panel.

The entire detection and activation system shall be in strict conformance with NFPA #13, 72, Factory Mutual Data Sheet 2-8N, and the Chicago Fire Prevention Code.

Proposed Rail Car Unloading Area: Area No. 13 (Dwg. No. FP-8 and FP 8-E)

Provide an automatically actuated deluge foam-water system for the proposed railcar unloading area canopy. The system to be designed to provide a density of .17 GPM per square foot over the entire canopy area. The deluge valve for this system to be located in a new valve house for the Tank Farm Areas.

The deluge detection system shall consist of "Fenwal" detect-a-fire Model 27-121-0 rate compensated heat detectors mounted in an explosion-proof manner. These detectors shall be no more than twelve feet from any partition or outside wall and not more than twenty-four feet between any detector. Provide two electric manual pull stations to manually activate the deluge system as shown on the drawings. The detectors and manual pull stations shall be wired in a Class A/Style D circuit so that a single open or ground will not stop an alarm signal.

The local alarm/release panel shall be an "FCI-FC72-DL-2" mounted in a NEMA 12 enclosure. The control panel zones shall be arranged with Zone 1 as a Class A/Style D circuit with alarm output and release activation. Zone 2 shall be a Class B/Style B circuit for annunciation of a waterflow condition with an alarm output.

The control panel shall be mounted near the deluge valve with a common ten inch outside alarm bell. The control unit shall have a "C" set of contacts for remote alarm signal transmission and a set of "C" contacts for remote trouble supervision signals. These signals to be connected to the new plant fire alarm panel.

The entire detection and activation system shall be in strict conformance with NFPA #13, 72, Factory Mutual Data Sheet 2-8N, and the Chicago Fire Prevention Code.

Tank Farm East: Area No. 16 (Dwg. FP-8 and FP 8-E)

This area is protected with an existing automatic detection system consisting of line type heat detection (protectowire) on the diked wall and additional rate compensated heat detectors over the pumps and sump area.

Provide an automatically actuated deluge foam-water system for the dike area. System to be designed to provide a density of .17 GPM per square foot over the entire dike area. Dike foam makers to be used. Modify the existing detection system to actuate the deluge foam-water system. The deluge valve for this system to be located in the new valve house.

Provide four electric manual pull stations to manually activate the deluge system located as shown on the drawings.

The protectowire and manual pull stations shall be wired in a Class A/Style D circuit so that a single open or ground will not stop an alarm signal. The local alarm/release panel shall be an "FCI-FC72-DL-2" mounted in a NEMA 12 enclosure. The control panel zones shall be arranged with Zone 1 as a Class A/Style D circuit with alarm output and release activation. Zone 2 shall be a Class B/Style B circuit for annunciation of a waterflow condition with an alarm output.

The control panel shall be mounted near the deluge valve with a common ten inch outside alarm bell. The control unit shall have a "C" set of contacts for remote alarm signal transmission and a set of "C" contacts for remote trouble supervision signals. These signals to be connected to the new plant fire alarm panel.

The entire detection and activation system shall be in strict conformance with NFPA #13, 72, Factory Mutual Data Sheet 2-8N, and the Chicago Fire Prevention Code.

Supplementary protection will be provided by the existing monitor nozzles surrounding the Tank Farm area which will be converted to foam (M1A, M2A and M3A). Final design will ensure the monitors cover the top of the tanks.

<u>Tank Farm West: Area No. 16 (Dwg. No. FP-8 and FP 8-E)</u>
This area is protected with an existing automatic detection system consisting of line type heat detection (protectowire) on the diked wall and additional rate compensated heat detectors over the pumps and sump area.

Provide an automatically actuated deluge foam-water system for the dike area. System to be designed to provide a density of .17 GPM per square foot over the entire dike area. Dike foam makers to be used. Modify the existing detection system to actuate the deluge foam-water system. The deluge valve to be located in the new valve house.

Provide four electric manual pull stations to manually activate the deluge system located as shown on the drawings.

The protectowire and manual pull stations shall be wired in a Class A/Style D circuit so that a single open or ground will not stop an alarm signal. The local alarm/release panel shall be an "FCI-FC72-DL-2" mounted in a NEMA 12 enclosure. The control panel zones shall be arranged with Zone 1 as a Class A/Style D circuit with alarm output and release activation. Zone 2 shall be a Class B/Style B circuit for annunciation of a waterflow condition with an alarm output.

The control panel shall be mounted near the deluge valve with a common ten inch outside alarm bell. The control unit shall have a "C" set of contacts for remote alarm signal transmission and a set of "C" contacts for remote trouble supervision signals. These signals to be connected to the new plant fire alarm panel.

The entire detection and activation system shall be in strict conformance with NFPA #13, 72, Factory Mutual Data Sheet 2-8N, and the Chicago Fire Prevention Code.

Supplementary protection will be provided by the existing monitor nozzles surrounding the Tank Farm area which will be converted to foam (M1A, M2A and M3A). Final design will ensure the monitors cover the top of the tanks.

<u>Ignitable Container Management Building: Building No. 26 (Dwg. No. FP-9 and FP 7-E)</u>
This building currently is protected by a wet pipe sprinkler system. This system is to be converted to an automatic pre-action foam-water system with electric detection. The system is to be designed to provide a density of .60 GPM per square foot over the area of the building for the possible storage of Class 1B & 1C Liquids.

Provide an explosion proof air compressor with tank to provide supervisory air in the piping systems. All alarm devices to be explosion proof.

The pre-action detection system shall consist of "Fenwal" detect-a-fire Model 27-121-0 rate compensated heat detectors mounted in an explosion-proof manner. These detectors shall be no more than twelve feet from any partition or outside wall and not more than twenty-four feet between any detector. Provide five electric manual pull stations to manually activate the preaction system located as shown on the drawings. The detectors and manual pull stations shall be wired in a Class A/Style D circuit so that a single open or ground will not stop an alarm signal.

The local alarm/release panel shall be an "FCI-FC72-DL-3" mounted in a NEMA 9 enclosure. The control panel zones shall be arranged with Zone 1 as a Class A/Style D circuit with alarm output and release activation. Zone 2 shall be a Class B/Style B circuit for annunciation of a waterflow condition with an alarm output. Zone 3 shall supervise the high/low air switch.

The control panel shall be mounted along side the pre-action valve with a ten inch outside alarm bell. The control unit shall have a "C" set of contacts for remote alarm signal transmission and a set of "C" contacts for remote trouble supervision signals. These signals to be connected to the new plant fire alarm panel.

The entire detection and activation system shall be in strict conformance with NFPA #13, 72, Factory Mutual Data Sheet 2-8N, and the Chicago Fire Prevention Code.

<u>Proposed Container Handling Dock: Building No. 61 (Dwg. No. FP6 and FP7-E)</u>
Provide an automatic pre-action foam-water sprinkler system throughout the building. The system is to be designed to provide a density of .60 GPM per square foot over the area of the building for the possible storage of Class 1B & 1C Liquids.

Provide a valve house enclosure with heat and light located east of the building.

Provide an explosion proof air compressor with tank to provide supervisory air in the piping systems. All alarm devices to be explosion proof.

The pre-action detection system shall consist of "Fenwal" detect-a-fire Model 27-121-0 rate compensated heat detectors mounted in an explosion-proof manner. These detectors shall be no more than twelve feet from any partition or outside wall and not more than twenty-four feet between any detector. Provide five electric manual pull stations to manually activate the preaction system located as shown on the drawings. The detectors and manual pull stations shall be wired in a Class A/Style D circuit so that a single open or ground will not stop an alarm signal.

The local alarm/release panel shall be an "FCI-FC72-DL-3" mounted in a NEMA 9 enclosure. The control panel zones shall be arranged with Zone 1 as a Class A/Style D circuit with alarm output and release activation. Zone 2 shall be a Class B/Style B circuit for annunciation of a waterflow condition with an alarm output. Zone 3 shall supervise the high/low air switch.

The control panel shall be mounted along side the pre-action valve with a ten inch outside alarm bell. The control unit shall have a "C" set of contacts for remote alarm signal transmission and a set of "C" contacts for remote trouble supervision signals. These signals to be connected to the new plant fire alarm panel.

The entire detection and activation system shall be in strict conformance with NFPA #13, 72, Factory Mutual Data Sheet 2-8N, and the Chicago Fire Prevention Code.

Fuel Blending Operation: Building No. 43 (Dwg. No. FP-5 and FP 4-E)

This building currently has a wet pipe sprinkler system with an existing CO_2 system for the shredders. This system to be converted to an automatic pre-action foam-water system with electric detection. The system to be designed to provide a density of .60 GPM per square foot over the area of the fuel blending area in order to adequately protect the Class 1B & 1C flammable liquids that are to be stored in this building. In addition, the new foam-water system will be configured so that it adequately protects the existing Drum Crusher.

Provide an air compressor with tank for supervisory air in the piping system.

The pre-action detection system shall consist of "Fenwal" detect-a-fire Model 27-121-0 rate compensated heat detectors mounted in an explosion-proof manner. These detectors shall be no more than twelve feet from any partition or outside wall and not more than twenty-four feet between any detector. Provide two electric manual pull stations to manually activate the preaction system located as shown on the drawings. The detectors and manual pull stations shall be wired in a Class A/Style D circuit so that a single open or ground will not stop an alarm signal.

The local alarm/release panel shall be an "FCI-FC72-DL-3" mounted in a NEMA 12 enclosure. The control panel zones shall be arranged with Zone 1 as a Class A/Style D circuit with alarm output and release activation. Zone 2 shall be a Class B/Style B circuit for annunciation of a waterflow condition with an alarm output. Zone 3 shall supervise the high/low air switch.

The control panel shall be mounted near the pre-action valve with a ten inch outside alarm bell. The control unit shall have a "C" set of contacts for remote alarm signal transmission and a set of "C" contacts for remote trouble supervision signals. These signals shall be connected to the new plant fire alarm panel.

The entire detection and activation system shall be in strict conformance with NFPA #13, 72, Factory Mutual Data Sheet 2-8N, and the Chicago Fire Prevention Code.

Utility Building: Building No. 29 (Dwg. No. FP-7 and FP 6-E)
Provide a new wet pipe sprinkler system in this building. Provide a new cut-in to the 10" fire line.

The system to be designed for an Ordinary Hazard Group 2 Occupancy, .24 GPM per square foot over the most remote 1,500 square feet. Provide a local sprinkler alarm consisting of a 6" inside alarm bell at the riser and a 10" outside alarm bell. Connect the sprinklers flow switch to the new plant fire alarm panel.

Container Management Building: Building No. 25 (Dwg. No. FP-6 and FP 5-E)
This building is currently protected by a dry pipe sprinkler system. This system to be converted to an automatic pre-action foam-water sprinkler system with electric detection. The system to be designed for Class III Combustibles stored three high to provide a density of .25 GPM per square foot over the most remote 3,000 sq. ft.

Provide a new cut-in to the 10" fire line at the southeast corner of the building for a new valve area. Abandon the existing 4" lead-in at the northeast corner of the building. Provide an air compressor with tank for supervisory air in the piping system.

The pre-action detection system shall consist of "Fenwal" detect-a-fire Model 27-121-0 rate compensated heat detectors mounted in an explosion-proof manner. These detectors shall be no more than twelve feet from any partition or outside wall and not more than twenty-four feet between any detector. Provide four electric manual pull stations to manually activate the preaction system located as shown on the drawings. The detectors and manual pull stations shall be wired in a Class A/Style D circuit so that a single open or ground will not stop an alarm signal.

The local alarm/release panel shall be an "FCI-FC72-DL-3" mounted in a NEMA 12 enclosure. The control panel zones shall be arranged with Zone 1 as a Class A/Style D circuit with alarm output and release activation. Zone 2 shall be a Class B/Style B circuit for annunciation of a waterflow condition with an alarm output. Zone 3 shall supervise the high/low air switch.

The control panel shall be mounted near the pre-action valve with a ten inch outside alarm bell. The control unit shall have a "C" set of contacts for remote alarm signal transmission and a set of "C" contacts for remote trouble supervision signals. These signals shall be connected to the new plant fire alarm panel.

The entire detection and activation system shall be in strict conformance with NFPA #13, 72, Factory Mutual Data Sheet 2-8N, and the Chicago Fire Prevention Code.

Fire Pump House: Building No. 37 (Dwg. No. FP-11 and FP 9-E)
The existing 1,500 GPM diesel fire pump to remain. Locate the new diesel fuel tank inside fire pump house. Installation to be per NFPA 20.

Pump running alarm, pump trouble and low fuel oil alarms to be connected to the new plant fire alarm panel. Provide a new low water level alarm for the water storage tank and a new low temperature sensor in the pump house. Both signals to be connected to the new plant fire alarm panel. Provide a new wet pipe sprinkler system in the Fire Pump House to meet the requirements for Ordinary Hazard Group 2, a density of .24 GPM per square foot over entire area.

Electrical equipment within the Fire Pump House to be provided with shields. Provide a local sprinkler alarm consisting of a 6" inside alarm bell at the riser and a 10" alarm bell outside of the building. Connect the sprinkler flow switch to the new plant fire alarm panel.

Plant Wide Fire Alarm
The entire plant is currently being monitored by a "Federal 8000" fire alarm system with one expanded module panel located in the Incinerator Control Building. Replace the existing plant fire alarm panel with a new Notifier AM2020 intelligent, addressable fire alarm panel. The new fire alarm panel to monitor as a minimum the following:

1. All existing zones.
2. Alarm and trouble from all new foam/water system control panels.
3. New foam pump running, power failure, and transfer switch alarms.
4. New wet pipe sprinkler alarms.
5. New diesel fire pump alarms.
6. New low temperature sensors in all valve houses, valve areas, and pump rooms.

The new fire alarm panel to be located in the same area as the existing panels. Provide a Notifier AFP-200 intelligent fire alarm control panel for control functions. Provide a Notifier System 5000 fire alarm control panel in the guard shack for remote annunciation. Provide a Notifier PRN-2 printer in the Incinerator Control Building for hard copy print out. No crimp type connectors to be used.

Revisions of Underground Fire Main (Dwg. No. FP-1 Unless Otherwise Indicated)

The underground fire main to be revised as necessary for the construction of the following areas:

1. Existing Utilities Building
   a) Provide a new cut-in for the fire protection system for this building.

2. Proposed Container Handling Dock
   a) Provide a new cut-in for the fire protection system for this building.

3. Container Management Building
   a) Provide a new cut-in for the new valve area in the southeast corner of the building. Abandon the existing 4" lead-in.

4. Personnel Building
   a) Provide a new cut-in for the fire protection system for this building.

5. North Fire Main Loop
   a) Add two post indicator valves in the North leg of the 10" & 12" fire main loop to be able to isolate the section between the East Pump House and the Container Management Building.

6. Tank Truck Unloading Area
   a) Extend existing underground fire main into the new valve house.

7. Disconnect and plug the underground connections to the 10" fire main for Monitors M1A, M2A, and M3A. These are being converted to foam-water monitors.

All underground fire main piping to be cement-lined ductile iron with ductile iron fittings. Provide thrust blocks as required. All piping to have a minimum 5'-6" bury.

Central Foam Pumping System (Drawing No. FP-7 and FP 6-E)

1. Provide an in-line balanced pressure proportioning foam system consisting of the following:
   a) 4,000 gallon vertical atmospheric storage tank to be located in the utilities building.
   b) Required Ansulite 3X3 alcohol resistant foam concentrate or approved equal to fill 4,000 gallon tank and underground piping.
   c) 100 GPM @ 200 PSI foam liquid pump, postive displacement, 460 volt, 3 phase, limited service controller with automatic transfer switch for generator backup, and pressure regulating valve all to be located in the Utilities Building.

d) 2 GPM @ 200 PSI foam jockey pump, positive displacement, 460 volt, 3 phase, with controller to be located in the Utilities Building.

e) 6 Ansul Model IBP or approved equal In-line Balanced Pressure Proportioners (ILBP) to be located as follows:
   1) In valve room of existing Container Management Building.
   2) In the valve house of the Proposed Container Handling Dock.
   3) In the valve area of the existing Fuel Blending Operation Building.
   4) In the valve area of the existing Ignitable Container Management Building.
   5) In a new valve house at the Tank Truck Unloading Area (North side).
   6) In a new valve house at the Tank Farm (South side).

2. Provide a new underground foam supply piping network from the Utilities Building to each ILBP (Dwg. No. FP-3).
   a) All foam piping to be Sch. 40 stainless steel pipe with stainless steel welded fittings and have a minimum bury of 5'-6".
   b) Provide section valves in the foam supply lines.
   c) All piping to be sized to insure the friction loss in the foam concentrate piping is proportional to the friction loss in the water piping.
   d) All fittings and valves to be rated for the pressures in the systems.

<u>New Valve Houses</u>

Provide a new heated and lighted valve house for the following areas:

1. Tank Truck Unloading Area
   a) Valve house to be located North of Truck Unloading Area.
   b) Valve house to enclose the existing deluge system for the Truck Unloading Area, the new foam-water supply for Monitors 1A and New M9.
   c) Existing foam bladder tank for the deluge Truck Unloading Area to be removed and the system modified for the ILBP.
2. Tank Farm Area
   a) Valve house to be located South of Tank Farm along the South fence.
   b) Valve house to enclose the new deluge valves for the East and West Tank Farms, the Proposed Rail Car Unloading Area deluge system and new foam-water supply for Monitors 2A and 3A.

3. Proposed Container Handling Dock
   a) Valve house to be located east of the dock.
   b) Valve house to enclose the new pre-action valve for the dock.

Monitors M5, M6, M7 and M8 will continue to utilize their respective local foam tanks.

All valve houses and valve areas to have a low temperature sensor with connection to the new plant fire alarm panel. At each fire department connection, place a sign stating the maximum pressure that can be pumped into the system.

TESTING

1. Underground Piping
   a) All underground piping to be completely flushed. Flush at flows not less than 390 GPM for 4 inch pipe, 880 GPM for 6" pipe, 1,560 GPM for 8" inch pipe, 2,440 GPM for 10" pipe.
   b) Hydrostatic test all new underground pipe at not less than 200 PSI for two hours or 50 PSI above static pressure in excess of 150 PSI for two hours.

2. Overhead Piping
   a) Hydrostatic test all new overhead pipe at not less than 200 PSI for two hours or 50 PSI above the static pressure in excess of 150 PSI for two hours.

3. Foam-Water Systems
   a) Each foam-water system to be tested for correct foam concentration.
   b) Contractor to supply required test foam.

4. Fire Alarm System
   a) All electrical devices to be tested for proper operation.
   b) All alarm and trouble points to be checked for proper annunciation.

TW/ar
1216-94

RECEIVED DEC 23 1994 IEPA-DLPC

RECEIVED DEC 24 1994 IEPA-DLPC

GRINNELL

HYDRAULIC DESIGN INFORMATION SHEET

NAME CHEMICAL WASTE MANAGEMENT / CLEAN HARBORS DATE 12/19/94

LOCATION 11700 STONY ISLAND, CHICAGO, IL

BUILDING FUEL BLENDING OPERATION SYSTEM NO. ____

CONTRACTOR GRINNELL FIRE PROTECTION CONTRACT NO. ____

CALCULATED BY T. WALL DRAWING NO. FP5

CONSTRUCTION: ☐ COMBUSTIBLE ☒ NON-COMBUSTIBLE CEILING HEIGHT 27 FT.

OCCUPANCY EXTRA HAZARD

APPROVING AUTHORITIES ILL ENVIRONMENTAL PROTECTION AGENCY / CHICAGO FIRE DEPT.

SYSTEM DESIGN

☐ NFPA. 13: ☐ LT. HAZ. ORD. HAZ. GP. ☐ 1 ☐ 2 ☐ 3 ☐ EX. HAZ.

☐ NFPA 231 ☐ NFPA 231C: FIGURE ____; CURVE ____

☒ OTHER (Specify) NFPA 30

☐ SPECIFIC RULING ____ MADE BY ____ DATE ____

AREA OF SPRINKLER OPERATION 1306 FT²

DENSITY 0.60

AREA PER SPRINKLER 79 FT²

HOSE ALLOWANCE GPM: INSIDE —

HOSE ALLOWANCE GPM: OUTSIDE 750

RACK SPRINKLER ALLOWANCE —

SYSTEM TYPE

☐ WET ☐ DRY ☐ DELUGE ☒ PRE-ACTION

SPRINKLER OR NOZZLE

MAKE GRINNELL MODEL ISSUE C

SIZE 17/32" K-FACTOR 8.0

TEMPERATURE RATING 286°F

CALCULATION SUMMARY

GPM REQUIRED 1652 PSI REQUIRED 108.7 PUMP DISCHARGE (Specify Location)

"C" FACTOR USED: OVERHEAD 100 UNDERGROUND 140

WATER SUPPLY

~~**WATER FLOW TEST**~~

~~DATE & TIME ____~~

~~STATIC PSI ____~~

~~RESIDUAL PSI ____~~

~~GPM FLOWING ____~~

~~ELEVATION ____~~

PUMP DATA

RATED CAPACITY 1500

AT PSI 125

ELEVATION 2'-0"

TANK OR RESERVOIR

CAPACITY 350,000 GAL

ELEVATION 0'-0"

~~**WELL**~~

~~PROOF FLOW ____ GPM~~

LOCATION WEST PUMP HOUSE

SOURCE OF INFORMATION EXISTING

COMMODITY STORAGE

COMMODITY ____ CLASS ____ LOCATION ____

STORAGE HEIGHT ____ AREA ____ AISLE WIDTH ____

STORAGE METHOD: SOLID PILED ____ % PALLETIZED ____ % RACK ____ %

RACK

☐ SINGLE ROW ☐ CONVENTIONAL PALLET ☐ AUTOMATIC STORAGE ☐ ENCAPSULATED

☐ DOUBLE ROW ☐ SLAVE PALLET ☐ SOLID SHELVING ☐ NON-ENCAPSULATED

☐ MULTIPLE ROW ☐ OPEN

FLUE SPACING IN INCHES

LONGITUDINAL ____ TRANSVERSE ____

CLEARANCE FROM TOP OF STORAGE TO CEILING

____ FT. ____ IN.

HORIZONTAL BARRIERS PROVIDED ____

Date: 12/19/1994 CHFUEL

JOB TITLE: FUEL BLENDING OPERATION,PREACTION/FOAM .60/ENTIRE

WATER SUPPLY DATA

SOURCE NODE TAG	STATIC PRESS. (PSI)	RESID. PRESS. (PSI)	FLOW @ (GPM)	AVAIL. PRESS. @ (PSI)	TOTAL DEMAND (GPM)	REQ'D PRESS. (PSI)
PD	150.0	125.0	1500.0	120.1	1652.2	108.7

AGGREGATE FLOW ANALYSIS:

TOTAL FLOW AT SOURCE	1652.2 GPM
TOTAL HOSE STREAM ALLOWANCE AT SOURCE	0.0 GPM
OTHER HOSE STREAM ALLOWANCES	750.0 GPM
TOTAL DISCHARGE FROM ACTIVE SPRINKLERS	902.2 GPM

NODE ANALYSIS DATA

NODE TAG	ELEVATION (FT)	NODE TYPE	PRESSURE (PSI)	DISCHARGE (GPM)
1	26.5	K= 8.00	39.5	50.3
2	26.5	K= 8.00	40.6	51.0
3	26.5	- - - -	44.3	- - -
4	26.5	K= 8.00	42.6	52.2
5	26.5	K= 8.00	39.6	50.3
6	26.5	K= 8.00	40.7	51.1
7	26.5	- - - -	44.4	- - -
8	26.5	K= 8.00	42.7	52.2
9	27.0	K= 8.00	34.8	47.2
10	27.0	K= 8.00	35.8	47.9
11	27.0	- - - -	39.1	- - -
12	27.0	K= 8.00	37.5	49.0
13	26.7	K= 8.00	35.7	47.8
14	26.7	K= 8.00	36.8	48.5
15	26.7	- - - -	40.1	- - -
16	26.7	K= 8.00	38.5	49.6
17	26.7	K= 8.00	38.2	49.5
18	26.7	K= 8.00	39.3	50.2
19	26.7	- - - -	42.8	- - -
20	26.7	K= 8.00	41.2	51.3
21	26.3	K= 8.00	39.8	50.5
22	26.3	K= 8.00	40.9	51.2
23	26.3	- - - -	44.6	- - -
24	26.3	K= 8.00	42.9	52.4
25	26.5	- - - -	44.7	- - -
26	25.7	- - - -	46.9	- - -
27	24.8	- - - -	50.5	- - -
28	24.8	- - - -	52.4	- - -
TOR	8.0	- - - -	78.1	- - -
PROP	3.0	- - - -	91.7	- - -
BOR	3.0	- - - -	94.2	- - -
FBO	-6.0	HOSE STREAM	107.4	750.0
LOOP	-6.0	- - - -	110.2	- - -
LOOP1	-6.0	- - - -	110.3	- - -

Date: 12/19/1994

JOB TITLE: FUEL BLENDING OPERATION,PREACTION/FOAM .60/ENTIRE

NODE TAG	ELEVATION (FT)	NODE TYPE	PRESSURE (PSI)	DISCHARGE (GPM)
PUG	2.0	- - - -	107.6	- - -
SUP	2.0	- - - -	108.1	- - -
PD	2.0	SOURCE	108.7	1652.2

Date: 12/19/1994

JOB TITLE: FUEL BLENDING OPERATION,PREACTION/FOAM .60/ENTIRE

PIPE DATA

PIPE TAG / END NODES	ELEV. (FT)	NOZ. (K)	PT (PSI)	DISC. (GPM)	Q(GPM) VEL(FPS)	DIA(IN) HW(C) F.L./FT	LENGTH (FT)		PRESS. SUM. (PSI)
Pipe: 1					-50.3	1.610 PL	9.25	PF	1.2
1	26.5	8.0	39.5	50.3	7.9	100 FTG	----	PE	0.0
2	26.5	8.0	40.6	51.0		0.125 TL	9.25	PV	0.4
Pipe: 2					-101.3	1.610 PL	2.25	PF	3.6
2	26.5	8.0	40.6	51.0	16.0	100 FTG	T	PE	0.0
3	26.5	0.0	44.3	0.0		0.455 TL	7.96	PV	1.7
Pipe: 3					52.2	1.610 PL	7.00	PF	1.7
3	26.5	0.0	44.3	0.0	8.2	100 FTG	T	PE	0.0
4	26.5	8.0	42.6	52.2		0.133 TL	12.71	PV	0.5
Pipe: 4					-50.3	1.610 PL	9.25	PF	1.2
5	26.5	8.0	39.6	50.3	7.9	100 FTG	----	PE	0.0
6	26.5	8.0	40.7	51.1		0.125 TL	9.25	PV	0.4
Pipe: 5					-101.4	1.610 PL	2.25	PF	3.6
6	26.5	8.0	40.7	51.1	16.0	100 FTG	T	PE	0.0
7	26.5	0.0	44.4	0.0		0.456 TL	7.96	PV	1.7
Pipe: 6					52.2	1.610 PL	7.00	PF	1.7
7	26.5	0.0	44.4	0.0	8.2	100 FTG	T	PE	0.0
8	26.5	8.0	42.7	52.2		0.134 TL	12.71	PV	0.5
Pipe: 7					-47.2	1.610 PL	9.25	PF	1.0
9	27.0	8.0	34.8	47.2	7.4	100 FTG	----	PE	0.0
10	27.0	8.0	35.8	47.9		0.111 TL	9.25	PV	0.4
Pipe: 8					-95.1	1.610 PL	2.25	PF	3.2
10	27.0	8.0	35.8	47.9	15.0	100 FTG	T	PE	0.0
11	27.0	0.0	39.1	0.0		0.405 TL	7.96	PV	1.5
Pipe: 9					49.0	1.610 PL	7.00	PF	1.5
11	27.0	0.0	39.1	0.0	7.7	100 FTG	T	PE	0.0
12	27.0	8.0	37.5	49.0		0.119 TL	12.71	PV	0.4
Pipe: 10					-47.8	1.610 PL	9.25	PF	1.0
13	26.7	8.0	35.7	47.8	7.5	100 FTG	----	PE	0.0
14	26.7	8.0	36.8	48.5		0.113 TL	9.25	PV	0.4
Pipe: 11					-96.3	1.610 PL	2.25	PF	3.3
14	26.7	8.0	36.8	48.5	15.2	100 FTG	T	PE	0.0
15	26.7	0.0	40.1	0.0		0.415 TL	7.96	PV	1.5
Pipe: 12					49.6	1.610 PL	7.00	PF	1.5
15	26.7	0.0	40.1	0.0	7.8	100 FTG	T	PE	0.0
16	26.7	8.0	38.5	49.6		0.122 TL	12.71	PV	0.4
Pipe: 13					-49.5	1.610 PL	9.25	PF	1.1
17	26.7	8.0	38.2	49.5	7.8	100 FTG	----	PE	0.0
18	26.7	8.0	39.3	50.2		0.121 TL	9.25	PV	0.4

Date: 12/19/1994

JOB TITLE: FUEL BLENDING OPERATION,PREACTION/FOAM .60/ENTIRE

PIPE DATA (cont.)

PIPE TAG END NODES	ELEV. (FT)	NOZ. (K)	PT (PSI)	DISC. (GPM)	Q(GPM) VEL(FPS)	DIA(IN) HW(C) F.L./FT	LENGTH (FT)		PRESS. SUM. (PSI)
Pipe: 14					-99.6	1.610 PL	2.25	PF	3.5
18	26.7	8.0	39.3	50.2	15.7	100 FTG	T	PE	0.0
19	26.7	0.0	42.8	0.0		0.441 TL	7.96	PV	1.7
Pipe: 15					51.3	1.610 PL	7.00	PF	1.6
19	26.7	0.0	42.8	0.0	8.1	100 FTG	T	PE	0.0
20	26.7	8.0	41.2	51.3		0.130 TL	12.71	PV	0.4
Pipe: 16					-50.5	1.610 PL	9.25	PF	1.2
21	26.3	8.0	39.8	50.5	8.0	100 FTG	----	PE	0.0
22	26.3	8.0	40.9	51.2		0.125 TL	9.25	PV	0.4
Pipe: 17					-101.6	1.610 PL	2.25	PF	3.6
22	26.3	8.0	40.9	51.2	16.0	100 FTG	T	PE	0.0
23	26.3	0.0	44.6	0.0		0.458 TL	7.96	PV	1.7
Pipe: 18					52.4	1.610 PL	7.00	PF	1.7
23	26.3	0.0	44.6	0.0	8.3	100 FTG	T	PE	0.0
24	26.3	8.0	42.9	52.4		0.134 TL	12.71	PV	0.5
Pipe: 19					-144.1	1.610 PL	0.50	PF	5.4
11	27.0	0.0	39.1	0.0	22.7	100 FTG	T	PE	0.2
25	26.5	0.0	44.7	0.0		0.874 TL	6.21	PV	3.5
Pipe: 20					-145.9	1.610 PL	1.50	PF	6.4
15	26.7	0.0	40.1	0.0	23.0	100 FTG	T	PE	0.4
26	25.7	0.0	46.9	0.0		0.895 TL	7.21	PV	3.6
Pipe: 21					-151.0	1.610 PL	1.50	PF	6.9
19	26.7	0.0	42.8	0.0	23.8	100 FTG	T	PE	0.8
27	24.8	0.0	50.5	0.0		0.952 TL	7.21	PV	3.8
Pipe: 22					-154.0	1.610 PL	1.50	PF	7.1
23	26.3	0.0	44.6	0.0	24.3	100 FTG	T	PE	0.6
28	24.8	0.0	52.4	0.0		0.988 TL	7.21	PV	4.0
Pipe: 23					-153.5	4.026 PL	8.50	PF	0.1
3	26.5	0.0	44.3	0.0	3.9	100 FTG	----	PE	0.0
7	26.5	0.0	44.4	0.0		0.011 TL	8.50	PV	0.1
Pipe: 24					-307.1	4.026 PL	8.50	PF	0.3
7	26.5	0.0	44.4	0.0	7.7	100 FTG	----	PE	0.0
25	26.5	0.0	44.7	0.0		0.041 TL	8.50	PV	0.4
Pipe: 25					-451.2	4.026 PL	8.25	PF	1.9
25	26.5	0.0	44.7	0.0	11.4	100 FTG	2E	PE	0.3
26	25.7	0.0	46.9	0.0		0.083 TL	22.52	PV	0.9
Pipe: 26					-597.1	4.026 PL	8.70	PF	3.2
26	25.7	0.0	46.9	0.0	15.0	100 FTG	2E	PE	0.4
27	24.8	0.0	50.5	0.0		0.140 TL	22.97	PV	1.5

Date: 12/19/1994
JOB TITLE: FUEL BLENDING OPERATION,PREACTION/FOAM .60/ENTIRE
PIPE DATA (cont.)

PIPE TAG END NODES	ELEV. (FT)	NOZ. (K)	PT (PSI)	DISC. (GPM)	Q(GPM) VEL(FPS)	DIA(IN) HW(C) F.L./FT	LENGTH (FT)		PRESS. SUM. (PSI)
Pipe: 27					-748.1	4.026 PL	8.70	PF	1.8
27	24.8	0.0	50.5	0.0	18.9	100 FTG	----	PE	0.0
28	24.8	0.0	52.4	0.0		0.212 TL	8.70	PV	2.4
Pipe: 28					-902.1	4.026 PL	33.00	PF	18.4
28	24.8	0.0	52.4	0.0	22.7	100 FTG	4E	PE	7.3
TOR	8.0	0.0	78.1	0.0		0.300 TL	61.55	PV	3.5
Pipe: 29					-902.1	4.026 PL	21.00	PF	11.4
TOR	8.0	0.0	78.1	0.0	22.7	100 FTG	CG	PE	2.2
PROP	3.0	0.0	91.7	0.0		0.300 TL	38.13	PV	3.5
Pipe: 30					FIXED PRESSURE LOSS DEVICE				
BOR	3.0	0.0	94.2	0.0	2.5 psi, 902.1 gpm				
PROP	3.0	0.0	91.7	0.0					
Pipe: 31					-902.1	4.280 PL	20.00	PF	9.3
BOR	3.0	0.0	94.2	0.0	20.1	140 FTG	ETG	PE	3.9
FBO	-6.0	H.S.	107.4	750.0		0.119 TL	78.00	PV	2.7
Pipe: 32					-1652.1	10.520 PL	318.00	PF	2.8
FBO	-6.0	H.S.	107.4	750.0	6.1	140 FTG	E3T2G	PE	0.0
LOOP	-6.0	0.0	110.2	0.0		0.005 TL	609.00	PV	0.3
Pipe: 32A					-1652.1	10.520 PL	20.00	PF	0.1
LOOP	-6.0	0.0	110.2	0.0	6.1	140 FTG	----	PE	0.0
LOOP1	-6.0	0.0	110.3	0.0		0.005 TL	20.00	PV	0.3
Pipe: 33					-1652.1	12.580 PL	350.00	PF	0.8
LOOP1	-6.0	0.0	110.3	0.0	4.3	140 FTG	2E	PE	-3.5
PUG	2.0	0.0	107.6	0.0		0.002 TL	438.00	PV	0.1
Pipe: 34					-1652.1	10.140 PL	2.50	PF	0.4
PUG	2.0	0.0	107.6	0.0	6.6	120 FTG	TG	PE	0.0
SUP	2.0	0.0	108.1	0.0		0.007 TL	57.50	PV	0.3
Pipe: 35					-1652.2	10.140 PL	7.50	PF	0.6
SUP	2.0	0.0	108.1	0.0	6.6	120 FTG	EC	PE	0.0
PD	2.0	SRCE	108.7	(N/A)		0.007 TL	84.50	PV	0.3

NOTES:

(1) Calculations were performed by the HASS 5.8.0 computer program under license no. 4 C1324C granted by
HRS Systems, Inc.
2193 Ranchwood Dr., N.E.
Atlanta, GA 30345

(2) The system has been balanced to provide an average imbalance at each node of 0.003 gpm and a maximum imbalance at any node of 0.093 gpm.

Date: 12/19/1994

JOB TITLE: FUEL BLENDING OPERATION,PREACTION/FOAM .60/ENTIRE

(3) Velocity pressures are printed for information only, and are not used in balancing the system. Maximum water velocity is 24.3 ft/sec at pipe 22.

(4) PIPE FITTINGS TABLE

Pipe Table Name: STANDARD.PIP

PAGE: A MATERIAL: S40 HWC: 120

Diameter (in)	Equivalent Fitting Lengths in Feet							
	E Ell	T Tee	L LngEll	C ChkVlv	B BfyVlv	G GatVlv	A AlmChk	D DPVlv
1.610	4.00	8.00	2.00	9.00	6.00	1.00	10.00	10.00
4.026	10.00	20.00	6.00	22.00	12.00	2.00	20.00	10.00
10.140	22.00	50.00	16.00	55.00	19.00	5.00	40.00	29.00

PAGE: D MATERIAL: DIRON HWC: 140

Diameter (in)	Equivalent Fitting Lengths in Feet					
	E Ell	T Tee	L LngEll	C ChkVlv	B BfyVlv	G GatVlv
4.280	18.00	36.00	11.00	39.00	22.00	4.00
10.520	35.00	80.00	26.00	88.00	30.00	8.00
12.580	44.00	97.00	29.00	105.00	34.00	10.00

RECEIVED DEC 23 1994 IEPA-DLPC

RECEIVED DEC 24 1994 IEPA-DLPC

GRINNELL

HYDRAULIC DESIGN INFORMATION SHEET

NAME CHEMICAL WASTE MANAGEMENT / CLEAN HARBORS DATE 12/10/94

LOCATION 11700 STONY ISLAND, CHICAGO, IL

BUILDING CONTAINER HANDLING DOCK SYSTEM NO. ____

CONTRACTOR GRINNELL FIRE PROTECTION CONTRACT NO. ____

CALCULATED BY T. WALL DRAWING NO. FP6

CONSTRUCTION: ☐ COMBUSTIBLE ☒ NON-COMBUSTIBLE CEILING HEIGHT 19 FT.

OCCUPANCY ____

APPROVING AUTHORITIES ILL ENVIRONMENTAL PROTECTION AGENCY / CHICAGO FIRE DEPT.

SYSTEM DESIGN

☐ NFPA. 13: ☐ LT. HAZ. ORD. HAZ. GP. ☐ 1 ☐ 2 ☐ 3 ☐ EX. HAZ.

☐ NFPA 231 ☐ NFPA 231C: FIGURE ____; CURVE ____

☒ OTHER (Specify) NFPA 30

☐ SPECIFIC RULING ____ MADE BY ____ DATE ____

AREA OF SPRINKLER OPERATION 2500 FT²

DENSITY .60

AREA PER SPRINKLER 74 FT²

HOSE ALLOWANCE GPM: INSIDE —

HOSE ALLOWANCE GPM: OUTSIDE 750

RACK SPRINKLER ALLOWANCE —

SYSTEM TYPE

☐ WET ☐ DRY ☐ DELUGE ☒ PRE-ACTION

SPRINKLER OR NOZZLE

MAKE GRINNELL MODEL ISSUE C

SIZE 17/32" K-FACTOR 8.0

TEMPERATURE RATING 286°F

CALCULATION SUMMARY

GPM REQUIRED 2322 PSI REQUIRED 82.4 AT PUMP DISCHARGE (Specify Location)

"C" FACTOR USED: OVERHEAD 120 UNDERGROUND 140

WATER SUPPLY

WATER FLOW TEST

DATE & TIME ____

STATIC PSI ____

RESIDUAL PSI ____

GPM FLOWING ____

ELEVATION ____

PUMP DATA

RATED CAPACITY 1500

AT PSI 125

ELEVATION 2'-0"

TANK OR RESERVOIR

CAPACITY 350,000 GAL

ELEVATION 0'-0"

WELL

PROOF FLOW ____ GPM

LOCATION WEST PUMP HOUSE

SOURCE OF INFORMATION EXISTING

COMMODITY STORAGE

COMMODITY ____ CLASS ____ LOCATION ____

STORAGE HEIGHT ____ AREA ____ AISLE WIDTH ____

STORAGE METHOD: SOLID PILED ____ % PALLETIZED ____ % RACK ____ %

RACK

☐ SINGLE ROW ☐ CONVENTIONAL PALLET ☐ AUTOMATIC STORAGE ☐ ENCAPSULATED

☐ DOUBLE ROW ☐ SLAVE PALLET ☐ SOLID SHELVING ☐ NON-ENCAPSULATED

☐ MULTIPLE ROW ☐ OPEN

FLUE SPACING IN INCHES

LONGITUDINAL ____ TRANSVERSE ____

CLEARANCE FROM TOP OF STORAGE TO CEILING

____ FT. ____ IN.

HORIZONTAL BARRIERS PROVIDED ____

Date: 12/18/1994 CONTHAN

JOB TITLE: CONTAINER HANDLING DOCK, PREACTION/FOAM .60/AREA

WATER SUPPLY DATA

SOURCE NODE TAG	STATIC PRESS. (PSI)	RESID. PRESS. (PSI)	FLOW @ (GPM)	AVAIL. PRESS. @ (PSI)	TOTAL DEMAND (GPM)	REQ'D PRESS. (PSI)
PD	150.0	125.0	1500.0	93.9	2321.8	82.4

AGGREGATE FLOW ANALYSIS:

TOTAL FLOW AT SOURCE	2321.8 GPM
TOTAL HOSE STREAM ALLOWANCE AT SOURCE	0.0 GPM
OTHER HOSE STREAM ALLOWANCES	750.0 GPM
TOTAL DISCHARGE FROM ACTIVE SPRINKLERS	1571.8 GPM

NODE ANALYSIS DATA

NODE TAG	ELEVATION (FT)	NODE TYPE	PRESSURE (PSI)	DISCHARGE (GPM)
1	18.0	K= 8.00	32.7	45.8
2	18.0	K= 8.00	32.9	45.9
3	18.0	K= 8.00	33.5	46.3
4	18.0	K= 8.00	34.9	47.3
5	18.0	- - - -	38.1	- - -
6	18.0	K= 8.00	34.0	46.6
7	18.0	K= 8.00	33.4	46.2
8	18.0	K= 8.00	32.7	45.8
9	18.0	K= 8.00	32.9	45.9
10	18.0	K= 8.00	33.5	46.3
11	18.0	K= 8.00	34.9	47.3
12	18.0	- - - -	38.1	- - -
13	18.0	K= 8.00	34.0	46.6
14	18.0	K= 8.00	33.4	46.2
15	18.0	K= 8.00	32.8	45.8
16	18.0	K= 8.00	33.0	45.9
17	18.0	K= 8.00	33.6	46.4
18	18.0	K= 8.00	35.0	47.3
19	18.0	- - - -	38.2	- - -
20	18.0	K= 8.00	34.1	46.7
21	18.0	K= 8.00	33.5	46.3
22	18.0	K= 8.00	32.9	45.9
23	18.0	K= 8.00	33.1	46.0
24	18.0	K= 8.00	33.8	46.5
25	18.0	K= 8.00	35.1	47.4
26	18.0	- - - -	38.4	- - -
27	18.0	K= 8.00	34.2	46.8
28	18.0	K= 8.00	33.6	46.4
29	18.0	K= 8.00	33.1	46.0
30	18.0	K= 8.00	33.3	46.2
31	18.0	K= 8.00	34.0	46.6
32	18.0	K= 8.00	35.3	47.6
33	18.0	- - - -	38.6	- - -
34	18.0	K= 8.00	34.2	46.8

Date: 12/18/1994

JOB TITLE: CONTAINER HANDLING DOCK, PREACTION/FOAM .60/AREA

NODE TAG	ELEVATION (FT)	NODE TYPE	PRESSURE (PSI)	DISCHARGE (GPM)
35	18.0	K= 8.00	33.2	46.1
36	18.0	K= 8.00	32.5	45.6
37	18.0	K= 8.00	31.2	44.7
38	18.0	K= 8.00	30.6	44.3
39	18.0	K= 8.00	30.5	44.2
40	16.0	- - - -	42.6	- - -
41	16.0	- - - -	42.6	- - -
42	16.0	- - - -	42.7	- - -
43	16.0	- - - -	42.9	- - -
44	16.0	- - - -	43.2	- - -
TOR	8.0	- - - -	51.1	- - -
PROP	3.0	- - - -	60.4	- - -
BOR	3.0	- - - -	62.9	- - -
CHD	-6.0	- - - -	71.2	- - -
LOOP2	-6.0	HOSE STREAM	75.8	750.0
LOOP	-6.0	- - - -	80.9	- - -
LOOP1	-6.0	- - - -	81.0	- - -
PUG	2.0	- - - -	79.2	- - -
SUP	2.0	- - - -	81.1	- - -
PD	2.0	SOURCE	82.4	2321.8

Date: 12/18/1994
JOB TITLE: CONTAINER HANDLING DOCK, PREACTION/FOAM .60/AREA
PIPE DATA

PIPE TAG / END NODES	ELEV. (FT)	NOZ. (K)	PT (PSI)	DISC. (GPM)	Q(GPM) VEL(FPS)	DIA(IN) HW(C) F.L./FT	LENGTH (FT)		PRESS. SUM. (PSI)
Pipe: 1					-45.8	2.067 PL	8.00	PF	0.2
1	18.0	8.0	32.7	45.8	4.4	120 FTG	----	PE	0.0
2	18.0	8.0	32.9	45.9		0.022 TL	8.00	PV	0.1
Pipe: 2					-91.6	2.067 PL	8.00	PF	0.6
2	18.0	8.0	32.9	45.9	8.8	120 FTG	----	PE	0.0
3	18.0	8.0	33.5	46.3		0.080 TL	8.00	PV	0.5
Pipe: 3					-138.0	2.067 PL	8.00	PF	1.4
3	18.0	8.0	33.5	46.3	13.2	120 FTG	----	PE	0.0
4	18.0	8.0	34.9	47.3		0.170 TL	8.00	PV	1.2
Pipe: 4					-185.2	2.067 PL	1.00	PF	3.2
4	18.0	8.0	34.9	47.3	17.7	120 FTG	T	PE	0.0
5	18.0	0.0	38.1	0.0		0.294 TL	11.00	PV	2.1
Pipe: 5					92.8	1.610 PL	7.00	PF	4.1
5	18.0	0.0	38.1	0.0	14.6	120 FTG	T	PE	0.0
6	18.0	8.0	34.0	46.6		0.276 TL	15.00	PV	1.4
Pipe: 6					46.2	1.610 PL	8.00	PF	0.6
6	18.0	8.0	34.0	46.6	7.3	120 FTG	----	PE	0.0
7	18.0	8.0	33.4	46.2		0.076 TL	8.00	PV	0.4
Pipe: 7					-45.8	2.067 PL	8.00	PF	0.2
8	18.0	8.0	32.7	45.8	4.4	120 FTG	----	PE	0.0
9	18.0	8.0	32.9	45.9		0.022 TL	8.00	PV	0.1
Pipe: 8					-91.7	2.067 PL	8.00	PF	0.6
9	18.0	8.0	32.9	45.9	8.8	120 FTG	----	PE	0.0
10	18.0	8.0	33.5	46.3		0.080 TL	8.00	PV	0.5
Pipe: 9					-138.0	2.067 PL	8.00	PF	1.4
10	18.0	8.0	33.5	46.3	13.2	120 FTG	----	PE	0.0
11	18.0	8.0	34.9	47.3		0.170 TL	8.00	PV	1.2
Pipe: 10					-185.3	2.067 PL	1.00	PF	3.2
11	18.0	8.0	34.9	47.3	17.7	120 FTG	T	PE	0.0
12	18.0	0.0	38.1	0.0		0.294 TL	11.00	PV	2.1
Pipe: 11					92.9	1.610 PL	7.00	PF	4.1
12	18.0	0.0	38.1	0.0	14.6	120 FTG	T	PE	0.0
13	18.0	8.0	34.0	46.6		0.277 TL	15.00	PV	1.4
Pipe: 12					46.2	1.610 PL	8.00	PF	0.6
13	18.0	8.0	34.0	46.6	7.3	120 FTG	----	PE	0.0
14	18.0	8.0	33.4	46.2		0.076 TL	8.00	PV	0.4
Pipe: 13					-45.8	2.067 PL	8.00	PF	0.2
15	18.0	8.0	32.8	45.8	4.4	120 FTG	----	PE	0.0
16	18.0	8.0	33.0	45.9		0.022 TL	8.00	PV	0.1

Date: 12/18/1994
JOB TITLE: CONTAINER HANDLING DOCK, PREACTION/FOAM .60/AREA
PIPE DATA (cont.)

PIPE TAG END NODES	ELEV. (FT)	NOZ. (K)	PT (PSI)	DISC. (GPM)	Q(GPM) VEL(FPS)	DIA(IN) HW(C) F.L./FT	LENGTH (FT)		PRESS. SUM. (PSI)
Pipe: 14					-91.8	2.067 PL	8.00	PF	0.6
16	18.0	8.0	33.0	45.9	8.8	120 FTG	----	PE	0.0
17	18.0	8.0	33.6	46.4		0.080 TL	8.00	PV	0.5
Pipe: 15					-138.1	2.067 PL	8.00	PF	1.4
17	18.0	8.0	33.6	46.4	13.2	120 FTG	----	PE	0.0
18	18.0	8.0	35.0	47.3		0.171 TL	8.00	PV	1.2
Pipe: 16					-185.5	2.067 PL	1.00	PF	3.2
18	18.0	8.0	35.0	47.3	17.7	120 FTG	T	PE	0.0
19	18.0	0.0	38.2	0.0		0.295 TL	11.00	PV	2.1
Pipe: 17					93.0	1.610 PL	7.00	PF	4.2
19	18.0	0.0	38.2	0.0	14.7	120 FTG	T	PE	0.0
20	18.0	8.0	34.1	46.7		0.277 TL	15.00	PV	1.4
Pipe: 18					46.3	1.610 PL	8.00	PF	0.6
20	18.0	8.0	34.1	46.7	7.3	120 FTG	----	PE	0.0
21	18.0	8.0	33.5	46.3		0.076 TL	8.00	PV	0.4
Pipe: 19					-45.9	2.067 PL	8.00	PF	0.2
22	18.0	8.0	32.9	45.9	4.4	120 FTG	----	PE	0.0
23	18.0	8.0	33.1	46.0		0.022 TL	8.00	PV	0.1
Pipe: 20					-92.0	2.067 PL	8.00	PF	0.6
23	18.0	8.0	33.1	46.0	8.8	120 FTG	----	PE	0.0
24	18.0	8.0	33.8	46.5		0.080 TL	8.00	PV	0.5
Pipe: 21					-138.5	2.067 PL	8.00	PF	1.4
24	18.0	8.0	33.8	46.5	13.2	120 FTG	----	PE	0.0
25	18.0	8.0	35.1	47.4		0.172 TL	8.00	PV	1.2
Pipe: 22					-185.9	2.067 PL	1.00	PF	3.3
25	18.0	8.0	35.1	47.4	17.8	120 FTG	T	PE	0.0
26	18.0	0.0	38.4	0.0		0.296 TL	11.00	PV	2.1
Pipe: 23					93.2	1.610 PL	7.00	PF	4.2
26	18.0	0.0	38.4	0.0	14.7	120 FTG	T	PE	0.0
27	18.0	8.0	34.2	46.8		0.278 TL	15.00	PV	1.5
Pipe: 24					46.4	1.610 PL	8.00	PF	0.6
27	18.0	8.0	34.2	46.8	7.3	120 FTG	----	PE	0.0
28	18.0	8.0	33.6	46.4		0.077 TL	8.00	PV	0.4
Pipe: 25					-46.0	2.067 PL	8.00	PF	0.2
29	18.0	8.0	33.1	46.0	4.4	120 FTG	----	PE	0.0
30	18.0	8.0	33.3	46.2		0.022 TL	8.00	PV	0.1
Pipe: 26					-92.2	2.067 PL	8.00	PF	0.6
30	18.0	8.0	33.3	46.2	8.8	120 FTG	----	PE	0.0
31	18.0	8.0	34.0	46.6		0.081 TL	8.00	PV	0.5

Date: 12/18/1994
JOB TITLE: CONTAINER HANDLING DOCK, PREACTION/FOAM .60/AREA
PIPE DATA (cont.)

PIPE TAG END NODES	ELEV. (FT)	NOZ. (K)	PT (PSI)	DISC. (GPM)	Q(GPM) VEL(FPS)	DIA(IN) HW(C) F.L./FT		LENGTH (FT)		PRESS. SUM. (PSI)
Pipe: 27					-138.8	2.067	PL	8.00	PF	1.4
31	18.0	8.0	34.0	46.6	13.3	120	FTG	----	PE	0.0
32	18.0	8.0	35.3	47.6		0.172	TL	8.00	PV	1.2
Pipe: 28					-186.4	2.067	PL	1.00	PF	3.3
32	18.0	8.0	35.3	47.6	17.8	120	FTG	T	PE	0.0
33	18.0	0.0	38.6	0.0		0.297	TL	11.00	PV	2.1
Pipe: 29					271.6	2.635	PL	7.00	PF	4.4
33	18.0	0.0	38.6	0.0	16.0	120	FTG	T	PE	0.0
34	18.0	8.0	34.2	46.8		0.183	TL	24.00	PV	1.7
Pipe: 30					224.9	2.635	PL	8.00	PF	1.0
34	18.0	8.0	34.2	46.8	13.2	120	FTG	----	PE	0.0
35	18.0	8.0	33.2	46.1		0.129	TL	8.00	PV	1.2
Pipe: 31					178.8	2.635	PL	8.00	PF	0.7
35	18.0	8.0	33.2	46.1	10.5	120	FTG	----	PE	0.0
36	18.0	8.0	32.5	45.6		0.084	TL	8.00	PV	0.7
Pipe: 32					133.2	2.067	PL	8.00	PF	1.3
36	18.0	8.0	32.5	45.6	12.7	120	FTG	----	PE	0.0
37	18.0	8.0	31.2	44.7		0.160	TL	8.00	PV	1.1
Pipe: 33					88.4	2.067	PL	8.00	PF	0.6
37	18.0	8.0	31.2	44.7	8.5	120	FTG	----	PE	0.0
38	18.0	8.0	30.6	44.3		0.075	TL	8.00	PV	0.5
Pipe: 34					44.2	2.067	PL	8.00	PF	0.2
38	18.0	8.0	30.6	44.3	4.2	120	FTG	----	PE	0.0
39	18.0	8.0	30.5	44.2		0.021	TL	8.00	PV	0.1
Pipe: 35					-278.1	2.635	PL	2.00	PF	3.6
5	18.0	0.0	38.1	0.0	16.4	120	FTG	T	PE	0.9
40	16.0	0.0	42.6	0.0		0.191	TL	19.00	PV	1.8
Pipe: 36					-278.1	6.357	PL	9.20	PF	0.0
40	16.0	0.0	42.6	0.0	2.8	120	FTG	----	PE	0.0
41	16.0	0.0	42.6	0.0		0.003	TL	9.20	PV	0.1
Pipe: 37					-278.1	2.635	PL	2.00	PF	3.6
12	18.0	0.0	38.1	0.0	16.4	120	FTG	T	PE	0.9
41	16.0	0.0	42.6	0.0		0.191	TL	19.00	PV	1.8
Pipe: 38					-556.2	6.357	PL	9.20	PF	0.1
41	16.0	0.0	42.6	0.0	5.6	120	FTG	----	PE	0.0
42	16.0	0.0	42.7	0.0		0.009	TL	9.20	PV	0.2
Pipe: 39					-278.4	2.635	PL	2.00	PF	3.6
19	18.0	0.0	38.2	0.0	16.4	120	FTG	T	PE	0.9
42	16.0	0.0	42.7	0.0		0.191	TL	19.00	PV	1.8

Date: 12/18/1994
JOB TITLE: CONTAINER HANDLING DOCK, PREACTION/FOAM .60/AREA
PIPE DATA (cont.)

PIPE TAG END NODES	ELEV. (FT)	NOZ. (K)	PT (PSI)	DISC. (GPM)	Q(GPM) VEL(FPS)	DIA(IN) HW(C) F.L./FT	LENGTH (FT)		PRESS. SUM. (PSI)
Pipe: 40					-834.6	6.357	PL 9.20	PF	0.2
42	16.0	0.0	42.7	0.0	8.4	120	FTG ----	PE	0.0
43	16.0	0.0	42.9	0.0		0.020	TL 9.20	PV	0.5
Pipe: 41					-279.0	2.635	PL 2.00	PF	3.7
26	18.0	0.0	38.4	0.0	16.4	120	FTG T	PE	0.9
43	16.0	0.0	42.9	0.0		0.192	TL 19.00	PV	1.8
Pipe: 42					-1113.7	6.357	PL 9.20	PF	0.3
43	16.0	0.0	42.9	0.0	11.3	120	FTG ----	PE	0.0
44	16.0	0.0	43.2	0.0		0.034	TL 9.20	PV	0.9
Pipe: 43					-458.0	3.260	PL 2.00	PF	3.8
33	18.0	0.0	38.6	0.0	17.6	120	FTG T	PE	0.9
44	16.0	0.0	43.2	0.0		0.171	TL 22.00	PV	2.1
Pipe: 44					-1571.7	6.357	PL 14.00	PF	4.4
44	16.0	0.0	43.2	0.0	15.9	120	FTG 3E	PE	3.5
TOR	8.0	0.0	51.1	0.0		0.065	TL 68.00	PV	1.7
Pipe: 45					-1571.7	6.357	PL 26.00	PF	7.1
TOR	8.0	0.0	51.1	0.0	15.9	120	FTG 2CG	PE	2.2
PROP	3.0	0.0	60.4	0.0		0.065	TL 110.00	PV	1.7
Pipe: 46					FIXED PRESSURE LOSS DEVICE				
BOR	3.0	0.0	62.9	0.0	2.5 psi, 1571.7 gpm				
PROP	3.0	0.0	60.4	0.0					
Pipe: 47					-1571.7	6.400	PL 14.00	PF	4.5
BOR	3.0	0.0	62.9	0.0	15.7	140	FTG ETG	PE	3.9
CHD	-6.0	0.0	71.2	0.0		0.047	TL 95.00	PV	1.7
Pipe: 48					-1571.7	6.400	PL 40.00	PF	4.6
CHD	-6.0	0.0	71.2	0.0	15.7	140	FTG TG	PE	0.0
LOOP2	-6.0	H.S.	75.8	750.0		0.047	TL 97.00	PV	1.7
Pipe: 49					-2321.7	10.520	PL 380.00	PF	5.1
LOOP2	-6.0	H.S.	75.8	750.0	8.6	140	FTG E2T2G	PE	0.0
LOOP	-6.0	0.0	80.9	0.0		0.009	TL 591.00	PV	0.5
Pipe: 50					-2321.7	10.520	PL 20.00	PF	0.2
LOOP	-6.0	0.0	80.9	0.0	8.6	140	FTG ----	PE	0.0
LOOP1	-6.0	0.0	81.0	0.0		0.009	TL 20.00	PV	0.5
Pipe: 51					-2321.7	12.580	PL 350.00	PF	1.6
LOOP1	-6.0	0.0	81.0	0.0	6.0	140	FTG 2EG	PE	-3.5
PUG	2.0	0.0	79.2	0.0		0.004	TL 448.00	PV	0.2
Pipe: 52					-2321.7	8.070	PL 2.50	PF	1.9
PUG	2.0	0.0	79.2	0.0	14.6	120	FTG TG	PE	0.0
SUP	2.0	0.0	81.1	0.0		0.042	TL 45.50	PV	1.4

Date: 12/18/1994
JOB TITLE: CONTAINER HANDLING DOCK, PREACTION/FOAM .60/AREA
PIPE DATA (cont.)

PIPE TAG END NODES	ELEV. (FT)	NOZ. (K)	PT (PSI)	DISC. (GPM)	Q(GPM) VEL(FPS)	DIA(IN) HW(C) F.L./FT	LENGTH (FT)		PRESS. SUM. (PSI)	
Pipe: 53					-2321.8	8.070	PL	7.50	PF	1.3
SUP	2.0	0.0	81.1	0.0	14.6	120	FTG	EG	PE	0.0
PD	2.0	SRCE	82.4	(N/A)		0.042	TL	31.50	PV	1.4

NOTES:

(1) Calculations were performed by the HASS 5.8.0 computer program under license no. 4 C1324C granted by
HRS Systems, Inc.
2193 Ranchwood Dr., N.E.
Atlanta, GA 30345

(2) The system has been balanced to provide an average imbalance at each node of 0.003 gpm and a maximum imbalance at any node of 0.160 gpm.

(3) Velocity pressures are printed for information only, and are not used in balancing the system. Maximum water velocity is 17.8 ft/sec at pipe 28.

(4) PIPE FITTINGS TABLE

Pipe Table Name: CUSTOM.PIP

PAGE: A MATERIAL: S40-TW HWC: 120

Diameter (in)	Equivalent Fitting Lengths in Feet E Ell	T Tee	L LngEl	C ChkVl	B BfyVl	G GatVl	A AlmCk	D DPVlv
1.610	4.00	8.00	2.00	9.00	6.00	1.00	10.00	10.00
2.067	5.00	10.00	3.00	11.00	6.00	1.00	10.00	10.00
2.635	8.00	17.00	6.00	19.00	10.00	1.00	14.00	14.00
3.260	9.00	20.00	7.00	22.00	13.00	1.00	18.00	13.00
6.357	18.00	38.00	11.00	40.00	13.00	4.00	35.00	24.00

PAGE: D MATERIAL: DIRON HWC: 140

Diameter (in)	Equivalent Fitting Lengths in Feet E Ell	T Tee	L LngEl	C ChkVl	B BfyVl	G GatVl
6.400	24.00	52.00	16.00	55.00	17.00	5.00
10.520	35.00	80.00	26.00	88.00	30.00	8.00
12.580	44.00	97.00	29.00	105.00	34.00	10.00

RECEIVED DEC 23 1994 IEPA-DLPC

DEC 24 1994 IEPA-DLPC

GRINNELL

HYDRAULIC DESIGN INFORMATION SHEET

NAME CHEMICAL WASTE MANAGEMENT / CLEAN HARBORS DATE 12/18/94

LOCATION 11700 STONY ISLAND, CHICAGO, IL

BUILDING CONTAINER MANAGEMENT BLDG. SYSTEM NO. ____

CONTRACTOR GRINNELL FIRE PROTECTION CONTRACT NO. ____

CALCULATED BY T. WALL DRAWING NO. FP6

CONSTRUCTION: ☐ COMBUSTIBLE ☒ NON-COMBUSTIBLE CEILING HEIGHT 14 FT.

OCCUPANCY ____

APPROVING AUTHORITIES ILL ENVIRONMENTAL PROTECTION AGENCY / CHICAGO FIRE DEPT.

SYSTEM DESIGN

☐ NFPA. 13: ☐ LT. HAZ. ORD. HAZ. GP. ☐ 1 ☐ 2 ☐ 3 ☐ EX. HAZ.

☐ NFPA 231 ☐ NFPA 231C: FIGURE ____; CURVE ____

☒ OTHER (Specify) NFPA 30

☐ SPECIFIC RULING ____ MADE BY ____ DATE ____

AREA OF SPRINKLER OPERATION 3000 FT²

DENSITY .25

AREA PER SPRINKLER 84 FT²

HOSE ALLOWANCE GPM: INSIDE —

HOSE ALLOWANCE GPM: OUTSIDE 500

RACK SPRINKLER ALLOWANCE —

SYSTEM TYPE

☐ WET ☐ DRY ☐ DELUGE ☒ PRE-ACTION

SPRINKLER OR NOZZLE

MAKE GRINNELL MODEL F950

SIZE 1/2" K-FACTOR 5.6

TEMPERATURE RATING 286°F

CALCULATION SUMMARY

GPM REQUIRED 1414 PSI REQUIRED 90.1 AT PUMP DISCHARGE (Specify Location)

"C" FACTOR USED: OVERHEAD 100 UNDERGROUND 140

WATER SUPPLY

~~**WATER FLOW TEST**~~

~~DATE & TIME ____~~

~~STATIC PSI ____~~

~~RESIDUAL PSI ____~~

~~GPM FLOWING ____~~

~~ELEVATION ____~~

PUMP DATA

RATED CAPACITY 1500

AT PSI 125

ELEVATION 2'-0"

TANK OR RESERVOIR

CAPACITY 350,000 GAL

ELEVATION 0'-0"

~~**WELL**~~

~~PROOF FLOW ____ GPM~~

LOCATION WEST PUMP HOUSE

SOURCE OF INFORMATION EXISTING

COMMODITY STORAGE

COMMODITY ____ CLASS ____ LOCATION ____

STORAGE HEIGHT ____ AREA ____ AISLE WIDTH ____

STORAGE METHOD: SOLID PILED ____ % PALLETIZED ____ % RACK ____ %

RACK

☐ SINGLE ROW ☐ CONVENTIONAL PALLET ☐ AUTOMATIC STORAGE ☐ ENCAPSULATED

☐ DOUBLE ROW ☐ SLAVE PALLET ☐ SOLID SHELVING ☐ NON-ENCAPSULATED

☐ MULTIPLE ROW ☐ OPEN

FLUE SPACING IN INCHES

LONGITUDINAL ____ TRANSVERSE ____

CLEARANCE FROM TOP OF STORAGE TO CEILING

____ FT. ____ IN.

HORIZONTAL BARRIERS PROVIDED ____

SPRINKLER SYSTEM HYDRAULIC ANALYSIS

Date: 12/18/1994 CHCONTMA

JOB TITLE: CONTAINER MANAGEMENT BLDG, PREACTION/FOAM .25/3000

WATER SUPPLY DATA

SOURCE NODE TAG	STATIC PRESS. (PSI)	RESID. PRESS. (PSI)	FLOW @ (GPM)	AVAIL. PRESS. @ (PSI)	TOTAL DEMAND (GPM)	REQ'D PRESS. (PSI)
PD	150.0	125.0	1500.0	127.6	1414.3	90.1

AGGREGATE FLOW ANALYSIS:

TOTAL FLOW AT SOURCE	1414.3 GPM
TOTAL HOSE STREAM ALLOWANCE AT SOURCE	0.0 GPM
OTHER HOSE STREAM ALLOWANCES	500.0 GPM
TOTAL DISCHARGE FROM ACTIVE SPRINKLERS	914.3 GPM

NODE ANALYSIS DATA

NODE TAG	ELEVATION (FT)	NODE TYPE	PRESSURE (PSI)	DISCHARGE (GPM)
1	13.0	K= 5.60	14.0	21.0
1A	13.0	K= 5.60	13.9	20.9
2	13.0	K= 5.60	14.6	21.4
3	13.0	K= 5.60	16.5	22.7
4	13.0	- - - -	17.9	- - -
5	13.0	K= 5.60	16.4	22.7
6	13.0	K= 5.60	16.7	22.9
7	13.0	K= 5.60	17.7	23.6
8	13.0	- - - -	18.7	- - -
9	13.0	K= 5.60	16.5	22.7
10	13.0	K= 5.60	16.7	22.9
11	13.0	K= 5.60	17.8	23.6
12	13.0	- - - -	18.8	- - -
13	13.0	K= 5.60	16.6	22.8
14	13.0	K= 5.60	16.9	23.0
15	13.0	K= 5.60	17.9	23.7
16	13.0	- - - -	18.9	- - -
17	13.0	K= 5.60	16.8	22.9
18	13.0	K= 5.60	17.1	23.1
19	13.0	K= 5.60	18.1	23.8
20	13.0	- - - -	19.1	- - -
21	13.0	K= 5.60	17.1	23.1
22	13.0	K= 5.60	17.4	23.3
23	13.0	K= 5.60	18.4	24.0
24	13.0	- - - -	19.5	- - -
25	13.0	K= 5.60	17.5	23.4
26	13.0	K= 5.60	17.8	23.6
27	13.0	K= 5.60	18.9	24.3
28	13.0	- - - -	19.9	- - -
29	13.0	K= 5.60	18.0	23.8
30	13.0	K= 5.60	18.3	24.0
31	13.0	K= 5.60	19.4	24.7
32	13.0	- - - -	20.5	- - -
33	13.0	K= 5.60	18.7	24.2

Date: 12/18/1994

JOB TITLE: CONTAINER MANAGEMENT BLDG, PREACTION/FOAM .25/3000

NODE TAG	ELEVATION (FT)	NODE TYPE	PRESSURE (PSI)	DISCHARGE (GPM)
34	13.0	K= 5.60	19.0	24.4
35	13.0	K= 5.60	20.2	25.2
36	13.0	- - - -	21.3	- - -
37	13.0	K= 5.60	19.5	24.8
38	13.0	K= 5.60	19.9	25.0
39	13.0	K= 5.60	21.1	25.7
40	13.0	- - - -	22.3	- - -
41	13.0	K= 5.60	20.6	25.4
42	13.0	K= 5.60	21.0	25.6
43	13.0	K= 5.60	22.2	26.4
44	13.0	- - - -	23.4	- - -
45	13.0	K= 5.60	21.9	26.2
46	13.0	K= 5.60	22.2	26.4
47	13.0	K= 5.60	23.6	27.2
48	13.0	- - - -	24.9	- - -
49	13.0	K= 5.60	28.1	29.7
50	13.0	- - - -	28.3	- - -
51	12.0	- - - -	20.6	- - -
52	12.0	- - - -	20.6	- - -
53	12.0	- - - -	20.7	- - -
54	12.0	- - - -	20.9	- - -
55	12.0	- - - -	21.1	- - -
56	12.0	- - - -	21.4	- - -
57	12.0	- - - -	21.9	- - -
58	12.0	- - - -	22.6	- - -
59	12.0	- - - -	23.4	- - -
60	12.0	- - - -	24.5	- - -
61	12.0	- - - -	25.7	- - -
62	12.0	- - - -	27.3	- - -
63	12.0	- - - -	29.1	- - -
TOR	8.0	- - - -	63.6	- - -
PROP	3.0	- - - -	82.0	- - -
BOR	3.0	- - - -	84.5	- - -
CMB	-6.0	HOSE STREAM	90.1	500.0
LOOP	-6.0	- - - -	91.5	- - -
LOOP1	-6.0	- - - -	91.5	- - -
PUG	2.0	- - - -	88.7	- - -
SUP	2.0	- - - -	89.5	- - -
PD	2.0	SOURCE	90.1	1414.3

Date: 12/18/1994
JOB TITLE: CONTAINER MANAGEMENT BLDG, PREACTION/FOAM .25/3000
PIPE DATA

PIPE TAG END NODES	ELEV. (FT)	NOZ. (K)	PT (PSI)	DISC. (GPM)	Q(GPM) VEL(FPS)	DIA(IN) HW(C) F.L./FT	LENGTH (FT)		PRESS. SUM. (PSI)
Pipe: 1A					-20.9	1.610	PL 4.00	PF	0.1
1A	13.0	5.6	13.9	20.9	3.3	100	FTG ----	PE	0.0
1	13.0	5.6	14.0	21.0		0.025	TL 4.00	PV	0.1
Pipe: 1					-41.9	1.610	PL 6.00	PF	0.5
1	13.0	5.6	14.0	21.0	6.6	100	FTG ----	PE	0.0
2	13.0	5.6	14.6	21.4		0.089	TL 6.00	PV	0.3
Pipe: 2					-63.2	1.610	PL 10.00	PF	1.9
2	13.0	5.6	14.6	21.4	10.0	100	FTG ----	PE	0.0
3	13.0	5.6	16.5	22.7		0.190	TL 10.00	PV	0.7
Pipe: 3					-86.0	1.610	PL 1.50	PF	1.5
3	13.0	5.6	16.5	22.7	13.5	100	FTG E	PE	0.0
4	13.0	0.0	17.9	0.0		0.336	TL 4.35	PV	1.2
Pipe: 4					-22.7	1.610	PL 10.00	PF	0.3
5	13.0	5.6	16.4	22.7	3.6	100	FTG ----	PE	0.0
6	13.0	5.6	16.7	22.9		0.029	TL 10.00	PV	0.1
Pipe: 5					-45.6	1.610	PL 10.00	PF	1.0
6	13.0	5.6	16.7	22.9	7.2	100	FTG ----	PE	0.0
7	13.0	5.6	17.7	23.6		0.104	TL 10.00	PV	0.3
Pipe: 6					-69.1	1.610	PL 1.50	PF	1.0
7	13.0	5.6	17.7	23.6	10.9	100	FTG E	PE	0.0
8	13.0	0.0	18.7	0.0		0.224	TL 4.35	PV	0.8
Pipe: 7					-22.7	1.610	PL 10.00	PF	0.3
9	13.0	5.6	16.5	22.7	3.6	100	FTG ----	PE	0.0
10	13.0	5.6	16.7	22.9		0.029	TL 10.00	PV	0.1
Pipe: 8					-45.6	1.610	PL 10.00	PF	1.0
10	13.0	5.6	16.7	22.9	7.2	100	FTG ----	PE	0.0
11	13.0	5.6	17.8	23.6		0.104	TL 10.00	PV	0.3
Pipe: 9					-69.3	1.610	PL 1.50	PF	1.0
11	13.0	5.6	17.8	23.6	10.9	100	FTG E	PE	0.0
12	13.0	0.0	18.8	0.0		0.225	TL 4.35	PV	0.8
Pipe: 10					-22.8	1.610	PL 10.00	PF	0.3
13	13.0	5.6	16.6	22.8	3.6	100	FTG ----	PE	0.0
14	13.0	5.6	16.9	23.0		0.029	TL 10.00	PV	0.1
Pipe: 11					-45.8	1.610	PL 10.00	PF	1.0
14	13.0	5.6	16.9	23.0	7.2	100	FTG ----	PE	0.0
15	13.0	5.6	17.9	23.7		0.105	TL 10.00	PV	0.4
Pipe: 12					-69.5	1.610	PL 1.50	PF	1.0
15	13.0	5.6	17.9	23.7	11.0	100	FTG E	PE	0.0
16	13.0	0.0	18.9	0.0		0.227	TL 4.35	PV	0.8

Date: 12/18/1994
JOB TITLE: CONTAINER MANAGEMENT BLDG, PREACTION/FOAM .25/3000
PIPE DATA (cont.)

PIPE TAG END NODES	ELEV. (FT)	NOZ. (K)	PT (PSI)	DISC. (GPM)	Q(GPM) VEL(FPS)	DIA(IN) HW(C) F.L./FT		LENGTH (FT)		PRESS. SUM. (PSI)
Pipe: 13					-22.9	1.610	PL	10.00	PF	0.3
17	13.0	5.6	16.8	22.9	3.6	100	FTG	----	PE	0.0
18	13.0	5.6	17.1	23.1		0.029	TL	10.00	PV	0.1
Pipe: 14					-46.1	1.610	PL	10.00	PF	1.1
18	13.0	5.6	17.1	23.1	7.3	100	FTG	----	PE	0.0
19	13.0	5.6	18.1	23.8		0.106	TL	10.00	PV	0.4
Pipe: 15					-69.9	1.610	PL	1.50	PF	1.0
19	13.0	5.6	18.1	23.8	11.0	100	FTG	E	PE	0.0
20	13.0	0.0	19.1	0.0		0.229	TL	4.35	PV	0.8
Pipe: 16					-23.1	1.610	PL	10.00	PF	0.3
21	13.0	5.6	17.1	23.1	3.6	100	FTG	----	PE	0.0
22	13.0	5.6	17.4	23.3		0.030	TL	10.00	PV	0.1
Pipe: 17					-46.5	1.610	PL	10.00	PF	1.1
22	13.0	5.6	17.4	23.3	7.3	100	FTG	----	PE	0.0
23	13.0	5.6	18.4	24.0		0.108	TL	10.00	PV	0.4
Pipe: 18					-70.5	1.610	PL	1.50	PF	1.0
23	13.0	5.6	18.4	24.0	11.1	100	FTG	E	PE	0.0
24	13.0	0.0	19.5	0.0		0.233	TL	4.35	PV	0.8
Pipe: 19					-23.4	1.610	PL	10.00	PF	0.3
25	13.0	5.6	17.5	23.4	3.7	100	FTG	----	PE	0.0
26	13.0	5.6	17.8	23.6		0.030	TL	10.00	PV	0.1
Pipe: 20					-47.0	1.610	PL	10.00	PF	1.1
26	13.0	5.6	17.8	23.6	7.4	100	FTG	----	PE	0.0
27	13.0	5.6	18.9	24.3		0.110	TL	10.00	PV	0.4
Pipe: 21					-71.3	1.610	PL	1.50	PF	1.0
27	13.0	5.6	18.9	24.3	11.2	100	FTG	E	PE	0.0
28	13.0	0.0	19.9	0.0		0.238	TL	4.35	PV	0.9
Pipe: 22					-23.8	1.610	PL	10.00	PF	0.3
29	13.0	5.6	18.0	23.8	3.7	100	FTG	----	PE	0.0
30	13.0	5.6	18.3	24.0		0.031	TL	10.00	PV	0.1
Pipe: 23					-47.7	1.610	PL	10.00	PF	1.1
30	13.0	5.6	18.3	24.0	7.5	100	FTG	----	PE	0.0
31	13.0	5.6	19.4	24.7		0.113	TL	10.00	PV	0.4
Pipe: 24					-72.4	1.610	PL	1.50	PF	1.1
31	13.0	5.6	19.4	24.7	11.4	100	FTG	E	PE	0.0
32	13.0	0.0	20.5	0.0		0.245	TL	4.35	PV	0.9
Pipe: 25					-24.2	1.610	PL	10.00	PF	0.3
33	13.0	5.6	18.7	24.2	3.8	100	FTG	----	PE	0.0
34	13.0	5.6	19.0	24.4		0.032	TL	10.00	PV	0.1

Date: 12/18/1994
JOB TITLE: CONTAINER MANAGEMENT BLDG, PREACTION/FOAM .25/3000
PIPE DATA (cont.)

PIPE TAG / END NODES	ELEV. (FT)	NOZ. (K)	PT (PSI)	DISC. (GPM)	Q(GPM) VEL(FPS)	DIA(IN) HW(C) F.L./FT		LENGTH (FT)		PRESS. SUM. (PSI)
Pipe: 26					-48.6	1.610	PL	10.00	PF	1.2
34	13.0	5.6	19.0	24.4	7.7	100	FTG	----	PE	0.0
35	13.0	5.6	20.2	25.2		0.117	TL	10.00	PV	0.4
Pipe: 27					-73.8	1.610	PL	1.50	PF	1.1
35	13.0	5.6	20.2	25.2	11.6	100	FTG	E	PE	0.0
36	13.0	0.0	21.3	0.0		0.253	TL	4.35	PV	0.9
Pipe: 28					-24.8	1.610	PL	10.00	PF	0.3
37	13.0	5.6	19.5	24.8	3.9	100	FTG	----	PE	0.0
38	13.0	5.6	19.9	25.0		0.034	TL	10.00	PV	0.1
Pipe: 29					-49.7	1.610	PL	10.00	PF	1.2
38	13.0	5.6	19.9	25.0	7.8	100	FTG	----	PE	0.0
39	13.0	5.6	21.1	25.7		0.122	TL	10.00	PV	0.4
Pipe: 30					-75.5	1.610	PL	1.50	PF	1.1
39	13.0	5.6	21.1	25.7	11.9	100	FTG	E	PE	0.0
40	13.0	0.0	22.3	0.0		0.264	TL	4.35	PV	1.0
Pipe: 31					-25.4	1.610	PL	10.00	PF	0.4
41	13.0	5.6	20.6	25.4	4.0	100	FTG	----	PE	0.0
42	13.0	5.6	21.0	25.6		0.035	TL	10.00	PV	0.1
Pipe: 32					-51.0	1.610	PL	10.00	PF	1.3
42	13.0	5.6	21.0	25.6	8.0	100	FTG	----	PE	0.0
43	13.0	5.6	22.2	26.4		0.128	TL	10.00	PV	0.4
Pipe: 33					-77.5	1.610	PL	1.50	PF	1.2
43	13.0	5.6	22.2	26.4	12.2	100	FTG	E	PE	0.0
44	13.0	0.0	23.4	0.0		0.277	TL	4.35	PV	1.0
Pipe: 34					-26.2	1.610	PL	10.00	PF	0.4
45	13.0	5.6	21.9	26.2	4.1	100	FTG	----	PE	0.0
46	13.0	5.6	22.2	26.4		0.037	TL	10.00	PV	0.1
Pipe: 35					-52.6	1.610	PL	10.00	PF	1.4
46	13.0	5.6	22.2	26.4	8.3	100	FTG	----	PE	0.0
47	13.0	5.6	23.6	27.2		0.135	TL	10.00	PV	0.5
Pipe: 36					-79.8	1.610	PL	1.50	PF	1.3
47	13.0	5.6	23.6	27.2	12.6	100	FTG	E	PE	0.0
48	13.0	0.0	24.9	0.0		0.293	TL	4.35	PV	1.1
Pipe: 37					-29.7	1.610	PL	1.50	PF	0.2
49	13.0	5.6	28.1	29.7	4.7	100	FTG	E	PE	0.0
50	13.0	0.0	28.3	0.0		0.047	TL	4.35	PV	0.1
Pipe: 38					-86.0	1.610	PL	1.00	PF	2.3
4	13.0	0.0	17.9	0.0	13.5	100	FTG	T	PE	0.4
51	12.0	0.0	20.6	0.0		0.336	TL	6.71	PV	1.2

Date: 12/18/1994
JOB TITLE: CONTAINER MANAGEMENT BLDG, PREACTION/FOAM .25/3000
PIPE DATA (cont.)

PIPE TAG END NODES	ELEV. (FT)	NOZ. (K)	PT (PSI)	DISC. (GPM)	Q(GPM) VEL(FPS)	DIA(IN) HW(C) F.L./FT	LENGTH (FT)		PRESS. SUM. (PSI)
Pipe: 39					-86.0	4.260 PL	8.33	PF	0.0
51	12.0	0.0	20.6	0.0	1.9	100 FTG	----	PE	0.0
52	12.0	0.0	20.6	0.0		0.003 TL	8.33	PV	0.0
Pipe: 40					-69.1	1.610 PL	1.00	PF	1.5
8	13.0	0.0	18.7	0.0	10.9	100 FTG	T	PE	0.4
52	12.0	0.0	20.6	0.0		0.224 TL	6.71	PV	0.8
Pipe: 41					-155.1	4.260 PL	8.33	PF	0.1
52	12.0	0.0	20.6	0.0	3.5	100 FTG	----	PE	0.0
53	12.0	0.0	20.7	0.0		0.009 TL	8.33	PV	0.1
Pipe: 42					-69.3	1.610 PL	1.00	PF	1.5
12	13.0	0.0	18.8	0.0	10.9	100 FTG	T	PE	0.4
53	12.0	0.0	20.7	0.0		0.225 TL	6.71	PV	0.8
Pipe: 43					-224.3	4.260 PL	8.33	PF	0.1
53	12.0	0.0	20.7	0.0	5.0	100 FTG	----	PE	0.0
54	12.0	0.0	20.9	0.0		0.017 TL	8.33	PV	0.2
Pipe: 44					-69.5	1.610 PL	1.00	PF	1.5
16	13.0	0.0	18.9	0.0	11.0	100 FTG	T	PE	0.4
54	12.0	0.0	20.9	0.0		0.227 TL	6.71	PV	0.8
Pipe: 45					-293.8	4.260 PL	8.33	PF	0.2
54	12.0	0.0	20.9	0.0	6.6	100 FTG	----	PE	0.0
55	12.0	0.0	21.1	0.0		0.029 TL	8.33	PV	0.3
Pipe: 46					-69.9	1.610 PL	1.00	PF	1.5
20	13.0	0.0	19.1	0.0	11.0	100 FTG	T	PE	0.4
55	12.0	0.0	21.1	0.0		0.229 TL	6.71	PV	0.8
Pipe: 47					-363.8	4.260 PL	8.33	PF	0.4
55	12.0	0.0	21.1	0.0	8.2	100 FTG	----	PE	0.0
56	12.0	0.0	21.4	0.0		0.042 TL	8.33	PV	0.5
Pipe: 48					-70.5	1.610 PL	1.00	PF	1.6
24	13.0	0.0	19.5	0.0	11.1	100 FTG	T	PE	0.4
56	12.0	0.0	21.4	0.0		0.233 TL	6.71	PV	0.8
Pipe: 49					-434.3	4.260 PL	8.33	PF	0.5
56	12.0	0.0	21.4	0.0	9.8	100 FTG	----	PE	0.0
57	12.0	0.0	21.9	0.0		0.059 TL	8.33	PV	0.6
Pipe: 50					-71.3	1.610 PL	1.00	PF	1.6
28	13.0	0.0	19.9	0.0	11.2	100 FTG	T	PE	0.4
57	12.0	0.0	21.9	0.0		0.238 TL	6.71	PV	0.9
Pipe: 51					-505.6	4.260 PL	8.33	PF	0.6
57	12.0	0.0	21.9	0.0	11.4	100 FTG	----	PE	0.0
58	12.0	0.0	22.6	0.0		0.078 TL	8.33	PV	0.9

Date: 12/18/1994
JOB TITLE: CONTAINER MANAGEMENT BLDG, PREACTION/FOAM .25/3000
PIPE DATA (cont.)

PIPE TAG / END NODES	ELEV. (FT)	NOZ. (K)	PT (PSI)	DISC. (GPM)	Q(GPM) VEL(FPS)	DIA(IN) HW(C) F.L./FT	LENGTH (FT)		PRESS. SUM. (PSI)
Pipe: 52					-72.4	1.610 PL	1.00	PF	1.6
32	13.0	0.0	20.5	0.0	11.4	100 FTG	T	PE	0.4
58	12.0	0.0	22.6	0.0		0.245 TL	6.71	PV	0.9
Pipe: 53					-578.0	4.260 PL	8.33	PF	0.8
58	12.0	0.0	22.6	0.0	13.0	100 FTG	----	PE	0.0
59	12.0	0.0	23.4	0.0		0.100 TL	8.33	PV	1.1
Pipe: 54					-73.8	1.610 PL	1.00	PF	1.7
36	13.0	0.0	21.3	0.0	11.6	100 FTG	T	PE	0.4
59	12.0	0.0	23.4	0.0		0.253 TL	6.71	PV	0.9
Pipe: 55					-651.8	4.260 PL	8.33	PF	1.0
59	12.0	0.0	23.4	0.0	14.7	100 FTG	----	PE	0.0
60	12.0	0.0	24.5	0.0		0.125 TL	8.33	PV	1.4
Pipe: 56					-75.5	1.610 PL	1.00	PF	1.8
40	13.0	0.0	22.3	0.0	11.9	100 FTG	T	PE	0.4
60	12.0	0.0	24.5	0.0		0.264 TL	6.71	PV	1.0
Pipe: 57					-727.3	4.260 PL	8.33	PF	1.3
60	12.0	0.0	24.5	0.0	16.4	100 FTG	----	PE	0.0
61	12.0	0.0	25.7	0.0		0.153 TL	8.33	PV	1.8
Pipe: 58					-77.5	1.610 PL	1.00	PF	1.9
44	13.0	0.0	23.4	0.0	12.2	100 FTG	T	PE	0.4
61	12.0	0.0	25.7	0.0		0.277 TL	6.71	PV	1.0
Pipe: 59					-804.7	4.260 PL	8.33	PF	1.5
61	12.0	0.0	25.7	0.0	18.1	100 FTG	----	PE	0.0
62	12.0	0.0	27.3	0.0		0.184 TL	8.33	PV	2.2
Pipe: 60					-79.8	1.610 PL	1.00	PF	2.0
48	13.0	0.0	24.9	0.0	12.6	100 FTG	T	PE	0.4
62	12.0	0.0	27.3	0.0		0.293 TL	6.71	PV	1.1
Pipe: 61					-884.5	4.260 PL	8.33	PF	1.8
62	12.0	0.0	27.3	0.0	19.9	100 FTG	----	PE	0.0
63	12.0	0.0	29.1	0.0		0.219 TL	8.33	PV	2.7
Pipe: 62					-29.7	1.610 PL	1.00	PF	0.3
50	13.0	0.0	28.3	0.0	4.7	100 FTG	T	PE	0.4
63	12.0	0.0	29.1	0.0		0.047 TL	6.71	PV	0.1
Pipe: 63					-914.2	4.260 PL	122.00	PF	32.8
63	12.0	0.0	29.1	0.0	20.6	100 FTG	2E	PE	1.7
TOR	8.0	0.0	63.6	0.0		0.233 TL	140.56	PV	2.8
Pipe: 64					-914.2	4.260 PL	26.00	PF	16.2
TOR	8.0	0.0	63.6	0.0	20.6	100 FTG	2CG	PE	2.2
PROP	3.0	0.0	82.0	0.0		0.233 TL	69.54	PV	2.8

Date: 12/18/1994
JOB TITLE: CONTAINER MANAGEMENT BLDG, PREACTION/FOAM .25/3000
PIPE DATA (cont.)

PIPE TAG END NODES	ELEV. (FT)	NOZ. (K)	PT (PSI)	DISC. (GPM)	Q(GPM) VEL(FPS)	DIA(IN) HW(C) F.L./FT	LENGTH (FT)		PRESS. SUM. (PSI)
Pipe: 65					FIXED PRESSURE LOSS DEVICE				
BOR	3.0	0.0	84.5	0.0	2.5 psi, 914.2 gpm				
PROP	3.0	0.0	82.0	0.0					
Pipe: 66					-914.2	6.400	PL 16.00	PF	1.7
BOR	3.0	0.0	84.5	0.0	9.1	140	FTG ETG	PE	3.9
CMB	-6.0	H.S.	90.1	500.0		0.017	TL 97.00	PV	0.6
Pipe: 67					-1414.2	10.520	PL 240.00	PF	1.4
CMB	-6.0	H.S.	90.1	500.0	5.2	140	FTG 2ET2G	PE	0.0
LOOP	-6.0	0.0	91.5	0.0		0.003	TL 406.00	PV	0.2
Pipe: 68					-1414.2	10.520	PL 20.00	PF	0.1
LOOP	-6.0	0.0	91.5	0.0	5.2	140	FTG ----	PE	0.0
LOOP1	-6.0	0.0	91.5	0.0		0.003	TL 20.00	PV	0.2
Pipe: 69					-1414.2	12.580	PL 350.00	PF	0.6
LOOP1	-6.0	0.0	91.5	0.0	3.7	140	FTG 2EG	PE	-3.5
PUG	2.0	0.0	88.7	0.0		0.001	TL 448.00	PV	0.1
Pipe: 70					-1414.2	8.070	PL 2.50	PF	0.8
PUG	2.0	0.0	88.7	0.0	8.9	100	FTG TG	PE	0.0
SUP	2.0	0.0	89.5	0.0		0.023	TL 33.19	PV	0.5
Pipe: 71					-1414.3	8.070	PL 7.50	PF	0.6
SUP	2.0	0.0	89.5	0.0	8.9	100	FTG EG	PE	0.0
PD	2.0	SRCE	90.1	(N/A)		0.023	TL 24.63	PV	0.5

NOTES:

(1) Calculations were performed by the HASS 5.8.0 computer program under license no. 4 C1324C granted by
HRS Systems, Inc.
2193 Ranchwood Dr., N.E.
Atlanta, GA 30345

(2) The system has been balanced to provide an average imbalance at each node of 0.001 gpm and a maximum imbalance at any node of 0.058 gpm.

(3) Velocity pressures are printed for information only, and are not used in balancing the system. Maximum water velocity is 20.6 ft/sec at pipe 64.

Date: 12/18/1994
JOB TITLE: CONTAINER MANAGEMENT BLDG, PREACTION/FOAM .25/3000

(4) PIPE FITTINGS TABLE

Pipe Table Name: CUSTOM.PIP

PAGE: A MATERIAL: S40-TW HWC: 120

Diameter (in)	Equivalent Fitting Lengths in Feet							
	E Ell	T Tee	L LngEl	C ChkVl	B BfyVl	G GatVl	A AlmCk	D DPVlv
1.610	4.00	8.00	2.00	9.00	6.00	1.00	10.00	10.00
4.260	13.00	26.00	8.00	29.00	16.00	3.00	26.00	13.00

PAGE: D MATERIAL: DIRON HWC: 140

Diameter (in)	Equivalent Fitting Lengths in Feet					
	E Ell	T Tee	L LngEl	C ChkVl	B BfyVl	G GatVl
6.400	24.00	52.00	16.00	55.00	17.00	5.00
10.520	35.00	80.00	26.00	88.00	30.00	8.00
12.580	44.00	97.00	29.00	105.00	34.00	10.00

RECEIVED
DEC 23 1994
IEPA-DLPC

RECEIVED
DEC 24 1994
IEPA-DLPC

GRINNELL
HYDRAULIC DESIGN INFORMATION SHEET

NAME CHEMICAL WASTE MANAGEMENT / CLEAN HARBORS DATE 12/19/94
LOCATION 11700 STONY ISLAND, CHICAGO, IL
BUILDING UTILITIES BUILDING SYSTEM NO. _____
CONTRACTOR GRINNELL FIRE PROTECTION CONTRACT NO. _____
CALCULATED BY T. WALL DRAWING NO. FP7
CONSTRUCTION: ☐ COMBUSTIBLE ☒ NON-COMBUSTIBLE CEILING HEIGHT 19 FT.
OCCUPANCY _____
APPROVING AUTHORITIES ILL ENVIRONMENTAL PROTECTION AGENCY / CHICAGO FIRE DEPT.

SYSTEM DESIGN

☒ NFPA. 13: ☐ LT. HAZ. ORD. HAZ. GP. ☐ 1 ☐ 2 ☐ 3 ☐ EX. HAZ.
☐ NFPA 231 ☐ NFPA 231C: FIGURE _____; CURVE _____
☐ OTHER (Specify) _____
☐ SPECIFIC RULING _____ MADE BY _____ DATE _____

AREA OF SPRINKLER OPERATION 1500
DENSITY .24
AREA PER SPRINKLER 113
HOSE ALLOWANCE GPM: INSIDE —
HOSE ALLOWANCE GPM: OUTSIDE 500
RACK SPRINKLER ALLOWANCE —

SYSTEM TYPE
☒ WET ☐ DRY ☐ DELUGE ☐ PRE-ACTION

SPRINKLER OR NOZZLE
MAKE GRINNELL MODEL F950
SIZE 1/2" K-FACTOR 5.6
TEMPERATURE RATING 286°F

CALCULATION SUMMARY
GPM REQUIRED 975 PSI REQUIRED 92.5 AT PUMP DISCHARGE (Specify Location)
"C" FACTOR USED: OVERHEAD 120 UNDERGROUND 140

WATER SUPPLY

~~WATER FLOW TEST~~
~~DATE & TIME _____~~
~~STATIC PSI _____~~
~~RESIDUAL PSI _____~~
~~GPM FLOWING _____~~
~~ELEVATION _____~~

PUMP DATA
RATED CAPACITY 1500
AT PSI 125
ELEVATION 2'-0"

TANK OR RESERVOIR
CAPACITY 350,000 GAL
ELEVATION 0'-0"

~~WELL~~
~~PROOF FLOW _____ GPM~~

LOCATION WEST PUMP HOUSE
SOURCE OF INFORMATION EXISTING

COMMODITY STORAGE

COMMODITY _____ CLASS _____ LOCATION _____
STORAGE HEIGHT _____ AREA _____ AISLE WIDTH _____
STORAGE METHOD: SOLID PILED _____ % PALLETIZED _____ % RACK _____ %

RACK
☐ SINGLE ROW ☐ CONVENTIONAL PALLET ☐ AUTOMATIC STORAGE ☐ ENCAPSULATED
☐ DOUBLE ROW ☐ SLAVE PALLET ☐ SOLID SHELVING ☐ NON-ENCAPSULATED
☐ MULTIPLE ROW ☐ OPEN

FLUE SPACING IN INCHES
LONGITUDINAL _____ TRANSVERSE _____

CLEARANCE FROM TOP OF STORAGE TO CEILING
_____ FT. _____ IN.

HORIZONTAL BARRIERS PROVIDED _____

Date: 12/19/1994 CHUTIL

JOB TITLE: UTILITIES BUILDING (WET) .24/1500

WATER SUPPLY DATA

SOURCE NODE TAG	STATIC PRESS. (PSI)	RESID. PRESS. (PSI)	FLOW @ (GPM)	AVAIL. PRESS. @ (PSI)	TOTAL DEMAND (GPM)	REQ'D PRESS. (PSI)
PD	150.0	125.0	2500.0	145.6	975.1	92.5

AGGREGATE FLOW ANALYSIS:

TOTAL FLOW AT SOURCE	975.1 GPM
TOTAL HOSE STREAM ALLOWANCE AT SOURCE	0.0 GPM
OTHER HOSE STREAM ALLOWANCES	500.0 GPM
TOTAL DISCHARGE FROM ACTIVE SPRINKLERS	475.1 GPM

NODE ANALYSIS DATA

NODE TAG	ELEVATION (FT)	NODE TYPE	PRESSURE (PSI)	DISCHARGE (GPM)
1	18.0	K= 5.60	23.2	27.0
2	18.0	K= 5.60	23.6	27.2
3	18.0	K= 5.60	24.9	27.9
4	18.0	K= 5.60	27.6	29.4
5	18.0	K= 5.60	32.4	31.9
6	18.0	K= 5.60	37.0	34.1
7	18.0	K= 5.60	43.9	37.1
8	18.0	K= 5.60	46.8	38.3
9	18.0	- - - -	50.1	- - -
10	18.0	K= 5.60	38.8	34.9
11	18.0	K= 5.60	39.3	35.1
12	18.0	K= 5.60	41.4	36.0
13	18.0	K= 5.60	44.0	37.2
14	18.0	K= 5.60	48.6	39.1
15	18.0	K= 5.60	50.8	39.9
16	18.0	- - - -	53.4	- - -
17	17.0	- - - -	56.3	- - -
18	17.0	- - - -	58.3	- - -
TOR	17.0	- - - -	63.5	- - -
BOR	2.0	- - - -	86.1	- - -
UB	-6.0	HOSE STREAM	93.5	500.0
LOOP	-6.0	- - - -	94.7	- - -
LOOP1	-6.0	- - - -	94.7	- - -
PUG	2.0	- - - -	91.6	- - -
SUP	2.0	- - - -	91.9	- - -
PD	2.0	SOURCE	92.5	975.1

Date: 12/19/1994
JOB TITLE: UTILITIES BUILDING (WET) .24/1500
PIPE DATA

PIPE TAG END NODES	ELEV. (FT)	NOZ. (K)	PT (PSI)	DISC. (GPM)	Q(GPM) VEL(FPS)	DIA(IN) HW(C) F.L./FT	LENGTH (FT)		PRESS. SUM. (PSI)
Pipe: 1					-27.0	1.452 PL	7.50	PF	0.3
1	18.0	5.6	23.2	27.0	5.2	120 FTG	----	PE	0.0
2	18.0	5.6	23.6	27.2		0.047 TL	7.50	PV	0.2
Pipe: 2					-54.2	1.452 PL	7.50	PF	1.3
2	18.0	5.6	23.6	27.2	10.5	120 FTG	----	PE	0.0
3	18.0	5.6	24.9	27.9		0.169 TL	7.50	PV	0.7
Pipe: 3					-82.1	1.452 PL	7.50	PF	2.7
3	18.0	5.6	24.9	27.9	15.9	120 FTG	----	PE	0.0
4	18.0	5.6	27.6	29.4		0.364 TL	7.50	PV	1.7
Pipe: 4					-111.5	1.452 PL	7.50	PF	4.8
4	18.0	5.6	27.6	29.4	21.6	120 FTG	----	PE	0.0
5	18.0	5.6	32.4	31.9		0.642 TL	7.50	PV	3.1
Pipe: 5					-143.4	1.610 PL	7.50	PF	4.6
5	18.0	5.6	32.4	31.9	22.6	120 FTG	----	PE	0.0
6	18.0	5.6	37.0	34.1		0.618 TL	7.50	PV	3.4
Pipe: 6					-177.5	1.610 PL	7.50	PF	6.9
6	18.0	5.6	37.0	34.1	28.0	120 FTG	----	PE	0.0
7	18.0	5.6	43.9	37.1		0.917 TL	7.50	PV	5.3
Pipe: 7					-214.6	2.067 PL	7.50	PF	2.9
7	18.0	5.6	43.9	37.1	20.5	120 FTG	----	PE	0.0
8	18.0	5.6	46.8	38.3		0.386 TL	7.50	PV	2.8
Pipe: 8					-252.9	2.067 PL	1.25	PF	3.3
8	18.0	5.6	46.8	38.3	24.2	120 FTG	E	PE	0.0
9	18.0	0.0	50.1	0.0		0.523 TL	6.25	PV	3.9
Pipe: 9					-34.9	1.452 PL	7.50	PF	0.6
10	18.0	5.6	38.8	34.9	6.8	120 FTG	----	PE	0.0
11	18.0	5.6	39.3	35.1		0.075 TL	7.50	PV	0.3
Pipe: 10					-70.0	1.452 PL	7.50	PF	2.0
11	18.0	5.6	39.3	35.1	13.6	120 FTG	----	PE	0.0
12	18.0	5.6	41.4	36.0		0.271 TL	7.50	PV	1.2
Pipe: 11					-106.0	1.610 PL	7.50	PF	2.7
12	18.0	5.6	41.4	36.0	16.7	120 FTG	----	PE	0.0
13	18.0	5.6	44.0	37.2		0.353 TL	7.50	PV	1.9
Pipe: 12					-143.2	1.610 PL	7.50	PF	4.6
13	18.0	5.6	44.0	37.2	22.6	120 FTG	----	PE	0.0
14	18.0	5.6	48.6	39.1		0.616 TL	7.50	PV	3.4
Pipe: 13					-182.2	2.067 PL	7.50	PF	2.1
14	18.0	5.6	48.6	39.1	17.4	120 FTG	----	PE	0.0
15	18.0	5.6	50.8	39.9		0.285 TL	7.50	PV	2.0

Date: 12/19/1994
JOB TITLE: UTILITIES BUILDING (WET) .24/1500
PIPE DATA (cont.)

PIPE TAG / END NODES	ELEV. (FT)	NOZ. (K)	PT (PSI)	DISC. (GPM)	Q(GPM) VEL(FPS)	DIA(IN) HW(C) F.L./FT	LENGTH (FT)		PRESS. SUM. (PSI)
Pipe: 14					-222.1	2.067 PL	1.25	PF	2.6
15	18.0	5.6	50.8	39.9	21.2	120 FTG	E	PE	0.0
16	18.0	0.0	53.4	0.0		0.411 TL	6.25	PV	3.0
Pipe: 15					-252.9	2.067 PL	1.00	PF	5.8
9	18.0	0.0	50.1	0.0	24.2	120 FTG	T	PE	0.4
17	17.0	0.0	56.3	0.0		0.523 TL	11.00	PV	3.9
Pipe: 16					-252.9	2.727 PL	15.00	PF	2.0
17	17.0	0.0	56.3	0.0	13.9	120 FTG	----	PE	0.0
18	17.0	0.0	58.3	0.0		0.136 TL	15.00	PV	1.3
Pipe: 17					-222.1	2.067 PL	1.00	PF	4.5
16	18.0	0.0	53.4	0.0	21.2	120 FTG	T	PE	0.4
18	17.0	0.0	58.3	0.0		0.411 TL	11.00	PV	3.0
Pipe: 18					-475.1	2.727 PL	6.00	PF	5.2
18	17.0	0.0	58.3	0.0	26.1	120 FTG	E	PE	0.0
TOR	17.0	0.0	63.5	0.0		0.435 TL	12.00	PV	4.6
Pipe: 19					-475.1	2.727 PL	16.00	PF	16.1
TOR	17.0	0.0	63.5	0.0	26.1	120 FTG	CB	PE	6.5
BOR	2.0	0.0	86.1	0.0		0.435 TL	37.00	PV	4.6
Pipe: 20					-475.1	4.280 PL	50.00	PF	3.9
BOR	2.0	0.0	86.1	0.0	10.6	140 FTG	ETG	PE	3.5
UB	-6.0	H.S.	93.5	500.0		0.036 TL	108.00	PV	0.8
Pipe: 21					-975.1	10.520 PL	368.00	PF	1.1
UB	-6.0	H.S.	93.5	500.0	3.6	140 FTG	E3T2G	PE	0.0
LOOP	-6.0	0.0	94.7	0.0		0.002 TL	659.00	PV	0.1
Pipe: 22					-975.1	10.520 PL	20.00	PF	0.0
LOOP	-6.0	0.0	94.7	0.0	3.6	140 FTG	----	PE	0.0
LOOP1	-6.0	0.0	94.7	0.0		0.002 TL	20.00	PV	0.1
Pipe: 23					-975.1	12.580 PL	350.00	PF	0.3
LOOP1	-6.0	0.0	94.7	0.0	2.5	140 FTG	2EG	PE	-3.5
PUG	2.0	0.0	91.6	0.0		0.001 TL	448.00	PV	0.0
Pipe: 24					-975.1	8.071 PL	2.50	PF	0.3
PUG	2.0	0.0	91.6	0.0	6.1	120 FTG	TG	PE	0.0
SUP	2.0	0.0	91.9	0.0		0.008 TL	41.50	PV	0.3
Pipe: 25					-975.1	8.071 PL	7.50	PF	0.6
SUP	2.0	0.0	91.9	0.0	6.1	120 FTG	EC	PE	0.0
PD	2.0	SRCE	92.5	(N/A)		0.008 TL	70.50	PV	0.3

Date: 12/19/1994
JOB TITLE: UTILITIES BUILDING (WET) .24/1500

NOTES:

(1) Calculations were performed by the HASS 5.8.0 computer program under license no. 4 C1324C granted by
HRS Systems, Inc.
2193 Ranchwood Dr., N.E.
Atlanta, GA 30345

(2) The system has been balanced to provide an average imbalance at each node of 0.005 gpm and a maximum imbalance at any node of 0.126 gpm.

(3) Velocity pressures are printed for information only, and are not used in balancing the system. Maximum water velocity is 28.0 ft/sec at pipe 6.

(4) PIPE FITTINGS TABLE

Pipe Table Name: STANDARD.PIP

PAGE: A MATERIAL: S40 HWC: 120

Diameter (in)	Equivalent Fitting Lengths in Feet							
	E Ell	T Tee	L LngEll	C ChkVlv	B BfyVlv	G GatVlv	A AlmChk	D DPVlv
1.610	4.00	8.00	2.00	9.00	6.00	1.00	10.00	10.00
2.067	5.00	10.00	3.00	11.00	6.00	1.00	10.00	10.00
8.071	18.00	35.00	13.00	45.00	12.00	4.00	35.00	27.00

PAGE: D MATERIAL: DIRON HWC: 140

Diameter (in)	Equivalent Fitting Lengths in Feet					
	E Ell	T Tee	L LngEll	C ChkVlv	B BfyVlv	G GatVlv
4.280	18.00	36.00	11.00	39.00	22.00	4.00
10.520	35.00	80.00	26.00	88.00	30.00	8.00
12.580	44.00	97.00	29.00	105.00	34.00	10.00

RECEIVED DEC 23 1994 IEPA-DLPC

RECEIVED DEC 24 1994 IEPA-DLPC

GRINNELL

HYDRAULIC DESIGN INFORMATION SHEET

NAME CHEMICAL WASTE MANAGEMENT / CLEAN HARBORS DATE 12/19/94

LOCATION 11700 STONY ISLAND, CHICAGO, IL

BUILDING RAIL CAR UNLOADING CANOPY SYSTEM NO. ____

CONTRACTOR GRINNELL FIRE PROTECTION CONTRACT NO. ____

CALCULATED BY T. WALL DRAWING NO. FP8

CONSTRUCTION: ☐ COMBUSTIBLE ☒ NON-COMBUSTIBLE CEILING HEIGHT 21 FT.

OCCUPANCY ____

APPROVING AUTHORITIES ILL ENVIRONMENTAL PROTECTION AGENCY / CHICAGO FIRE DEPT.

SYSTEM DESIGN

☐ NFPA. 13: ☐ LT. HAZ. ORD. HAZ. GP. ☐ 1 ☐ 2 ☐ 3 ☐ EX. HAZ.

☐ NFPA 231 ☐ NFPA 231C: FIGURE ____; CURVE ____

☒ OTHER (Specify) NFPA 16

☐ SPECIFIC RULING ____ MADE BY ____ DATE ____

AREA OF SPRINKLER OPERATION 3650 FT²

DENSITY .17

AREA PER SPRINKLER 80 FT²

HOSE ALLOWANCE GPM: INSIDE —

HOSE ALLOWANCE GPM: OUTSIDE 500

RACK SPRINKLER ALLOWANCE —

SYSTEM TYPE

☐ WET ☐ DRY ☒ DELUGE ☐ PRE-ACTION

SPRINKLER OR NOZZLE

MAKE GRINNELL MODEL F950

SIZE 1/2" K-FACTOR 5.6

TEMPERATURE RATING OPEN

CALCULATION SUMMARY

GPM REQUIRED 1458 PSI REQUIRED 104.6 AT PUMP DISCHARGE (Specify Location)

"C" FACTOR USED: OVERHEAD 120 UNDERGROUND 140

WATER SUPPLY

~~**WATER FLOW TEST**~~

~~DATE & TIME ____~~

~~STATIC PSI ____~~

~~RESIDUAL PSI ____~~

~~GPM FLOWING ____~~

~~ELEVATION ____~~

PUMP DATA

RATED CAPACITY 1500

AT PSI 125

ELEVATION 2'-0"

TANK OR RESERVOIR

CAPACITY 350,000 GAL

ELEVATION 0'-0"

~~**WELL**~~

~~PROOF FLOW ____ GPM~~

LOCATION WEST PUMP HOUSE

SOURCE OF INFORMATION EXISTING

COMMODITY STORAGE

COMMODITY ____ CLASS ____ LOCATION ____

STORAGE HEIGHT ____ AREA ____ AISLE WIDTH ____

STORAGE METHOD: SOLID PILED ____ % PALLETIZED ____ % RACK ____ %

RACK

☐ SINGLE ROW ☐ CONVENTIONAL PALLET ☐ AUTOMATIC STORAGE ☐ ENCAPSULATED

☐ DOUBLE ROW ☐ SLAVE PALLET ☐ SOLID SHELVING ☐ NON-ENCAPSULATED

☐ MULTIPLE ROW ☐ OPEN

FLUE SPACING IN INCHES

LONGITUDINAL ____ TRANSVERSE ____

CLEARANCE FROM TOP OF STORAGE TO CEILING

____ FT. ____ IN.

HORIZONTAL BARRIERS PROVIDED ____

SPRINKLER SYSTEM HYDRAULIC ANALYSIS

Date: 12/19/1994 CHRAILC

JOB TITLE:- RAIL CAR UNLOADING, DELUGE .17/AREA

WATER SUPPLY DATA

SOURCE NODE TAG	STATIC PRESS. (PSI)	RESID. PRESS. (PSI)	FLOW @ (GPM)	AVAIL. PRESS. @ (PSI)	TOTAL DEMAND (GPM)	REQ'D PRESS. (PSI)
PD	150.0	125.0	1500.0	126.3	1457.7	104.6

AGGREGATE FLOW ANALYSIS:

TOTAL FLOW AT SOURCE	1457.7 GPM
TOTAL HOSE STREAM ALLOWANCE AT SOURCE	0.0 GPM
OTHER HOSE STREAM ALLOWANCES	500.0 GPM
TOTAL DISCHARGE FROM ACTIVE SPRINKLERS	957.7 GPM

NODE ANALYSIS DATA

NODE TAG	ELEVATION (FT)	NODE TYPE	PRESSURE (PSI)	DISCHARGE (GPM)
1	20.0	K= 5.60	8.6	16.4
2	20.0	K= 5.60	8.6	16.4
3	20.0	K= 5.60	8.7	16.5
4	20.0	K= 5.60	8.9	16.7
5	20.0	K= 5.60	9.3	17.0
6	20.0	K= 5.60	9.8	17.5
7	20.0	K= 5.60	10.5	18.2
8	20.0	K= 5.60	11.6	19.1
9	20.0	K= 5.60	12.9	20.1
10	20.0	K= 5.60	14.7	21.5
11	20.0	K= 5.60	16.9	23.0
12	20.0	K= 5.60	17.8	23.6
13	20.0	K= 5.60	18.8	24.3
14	20.0	K= 5.60	20.1	25.1
15	20.0	K= 5.60	21.6	26.0
16	20.0	K= 5.60	23.3	27.1
17	20.0	- - - -	28.0	- - -
18	20.0	K= 5.60	8.1	16.0
19	20.0	K= 5.60	8.2	16.0
20	20.0	K= 5.60	8.2	16.1
21	20.0	K= 5.60	8.4	16.3
22	20.0	K= 5.60	8.8	16.6
23	20.0	K= 5.60	9.3	17.1
24	20.0	K= 5.60	10.0	17.7
25	20.0	K= 5.60	11.0	18.6
26	20.0	K= 5.60	12.3	19.6
27	20.0	K= 5.60	14.0	20.9
28	20.0	K= 5.60	16.1	22.4
29	20.0	K= 5.60	16.9	23.0
30	20.0	K= 5.60	17.9	23.7
31	20.0	K= 5.60	19.1	24.5
32	20.0	K= 5.60	20.5	25.4
33	20.0	K= 5.60	22.2	26.4
34	20.0	- - - -	26.6	- - -

Date: 12/19/1994
JOB TITLE: RAIL CAR UNLOADING, DELUGE .17/AREA

NODE TAG	ELEVATION (FT)	NODE TYPE	PRESSURE (PSI)	DISCHARGE (GPM)
35	20.0	K= 5.60	7.0	14.8
36	20.0	K= 5.60	7.0	14.8
37	20.0	K= 5.60	7.1	14.9
38	20.0	K= 5.60	7.3	15.1
39	20.0	K= 5.60	7.6	15.4
40	20.0	K= 5.60	8.0	15.8
41	20.0	K= 5.60	8.6	16.5
42	20.0	K= 5.60	9.5	17.2
43	20.0	K= 5.60	10.6	18.2
44	20.0	K= 5.60	12.1	19.5
45	20.0	K= 5.60	16.7	22.9
46	20.0	K= 5.60	17.4	23.4
47	20.0	K= 5.60	18.3	24.0
48	20.0	K= 5.60	19.4	24.7
49	20.0	K= 5.60	20.7	25.5
50	20.0	K= 5.60	22.3	26.4
51	20.0	- - - -	26.5	- - -
52	20.0	- - - -	28.9	- - -
53	2.0	- - - -	63.2	- - -
54	2.0	- - - -	73.7	- - -
TOR	8.0	- - - -	78.0	- - -
BOR	3.0	HOSE STREAM	89.2	500.0
PROP2	3.0	- - - -	89.6	- - -
PROP1	3.0	- - - -	92.1	- - -
UG	1.0	- - - -	97.5	- - -
TF	-6.0	- - - -	102.0	- - -
LOOP	-6.0	- - - -	105.1	- - -
LOOP1	-6.0	- - - -	105.2	- - -
PUG	2.0	- - - -	102.4	- - -
SUP	2.0	- - - -	103.2	- - -
PD	2.0	SOURCE	104.6	1457.7

Date: 12/19/1994
JOB TITLE: RAIL CAR UNLOADING, DELUGE .17/AREA
PIPE DATA

PIPE TAG / END NODES	ELEV. (FT)	NOZ. (K)	PT (PSI)	DISC. (GPM)	Q(GPM) VEL(FPS)	DIA(IN) HW(C) F.L./FT	LENGTH (FT)		PRESS. SUM. (PSI)
Pipe: 1					-16.4	2.067 PL	8.00	PF	0.0
1	20.0	5.6	8.6	16.4	1.6	120 FTG	----	PE	0.0
2	20.0	5.6	8.6	16.4		0.003 TL	8.00	PV	0.0
Pipe: 2					-32.8	2.067 PL	8.00	PF	0.1
2	20.0	5.6	8.6	16.4	3.1	120 FTG	----	PE	0.0
3	20.0	5.6	8.7	16.5		0.012 TL	8.00	PV	0.1
Pipe: 3					-49.4	2.067 PL	8.00	PF	0.2
3	20.0	5.6	8.7	16.5	4.7	120 FTG	----	PE	0.0
4	20.0	5.6	8.9	16.7		0.025 TL	8.00	PV	0.1
Pipe: 4					-66.1	2.067 PL	8.00	PF	0.3
4	20.0	5.6	8.9	16.7	6.3	120 FTG	----	PE	0.0
5	20.0	5.6	9.3	17.0		0.044 TL	8.00	PV	0.3
Pipe: 5					-83.1	2.067 PL	8.00	PF	0.5
5	20.0	5.6	9.3	17.0	7.9	120 FTG	----	PE	0.0
6	20.0	5.6	9.8	17.5		0.067 TL	8.00	PV	0.4
Pipe: 6					-100.6	2.067 PL	8.00	PF	0.8
6	20.0	5.6	9.8	17.5	9.6	120 FTG	----	PE	0.0
7	20.0	5.6	10.5	18.2		0.095 TL	8.00	PV	0.6
Pipe: 7					-118.8	2.067 PL	8.00	PF	1.0
7	20.0	5.6	10.5	18.2	11.4	120 FTG	----	PE	0.0
8	20.0	5.6	11.6	19.1		0.129 TL	8.00	PV	0.9
Pipe: 8					-137.9	2.067 PL	8.00	PF	1.4
8	20.0	5.6	11.6	19.1	13.2	120 FTG	----	PE	0.0
9	20.0	5.6	12.9	20.1		0.170 TL	8.00	PV	1.2
Pipe: 9					-158.0	2.067 PL	8.00	PF	1.8
9	20.0	5.6	12.9	20.1	15.1	120 FTG	----	PE	0.0
10	20.0	5.6	14.7	21.5		0.219 TL	8.00	PV	1.5
Pipe: 10					-179.5	2.067 PL	8.00	PF	2.2
10	20.0	5.6	14.7	21.5	17.2	120 FTG	----	PE	0.0
11	20.0	5.6	16.9	23.0		0.277 TL	8.00	PV	2.0
Pipe: 11					-202.5	2.635 PL	8.00	PF	0.8
11	20.0	5.6	16.9	23.0	11.9	120 FTG	----	PE	0.0
12	20.0	5.6	17.8	23.6		0.106 TL	8.00	PV	1.0
Pipe: 12					-226.1	2.635 PL	8.00	PF	1.0
12	20.0	5.6	17.8	23.6	13.3	120 FTG	----	PE	0.0
13	20.0	5.6	18.8	24.3		0.130 TL	8.00	PV	1.2
Pipe: 13					-250.4	2.635 PL	8.00	PF	1.3
13	20.0	5.6	18.8	24.3	14.7	120 FTG	----	PE	0.0
14	20.0	5.6	20.1	25.1		0.157 TL	8.00	PV	1.5

Date: 12/19/1994
JOB TITLE: RAIL CAR UNLOADING, DELUGE .17/AREA
PIPE DATA (cont.)

PIPE TAG END NODES	ELEV. (FT)	NOZ. (K)	PT (PSI)	DISC. (GPM)	Q(GPM) VEL(FPS)	DIA(IN) HW(C) F.L./FT	LENGTH (FT)		PRESS. SUM. (PSI)
Pipe: 14					-275.5	2.635 PL	8.00	PF	1.5
14	20.0	5.6	20.1	25.1	16.2	120 FTG	----	PE	0.0
15	20.0	5.6	21.6	26.0		0.188 TL	8.00	PV	1.8
Pipe: 15					-301.5	2.635 PL	8.00	PF	1.8
15	20.0	5.6	21.6	26.0	17.7	120 FTG	----	PE	0.0
16	20.0	5.6	23.3	27.1		0.222 TL	8.00	PV	2.1
Pipe: 16					-328.5	2.635 PL	1.00	PF	4.7
16	20.0	5.6	23.3	27.1	19.3	120 FTG	T	PE	0.0
17	20.0	0.0	28.0	0.0		0.260 TL	18.00	PV	2.5
Pipe: 17					-16.0	2.067 PL	8.00	PF	0.0
18	20.0	5.6	8.1	16.0	1.5	120 FTG	----	PE	0.0
19	20.0	5.6	8.2	16.0		0.003 TL	8.00	PV	0.0
Pipe: 18					-32.0	2.067 PL	8.00	PF	0.1
19	20.0	5.6	8.2	16.0	3.1	120 FTG	----	PE	0.0
20	20.0	5.6	8.2	16.1		0.011 TL	8.00	PV	0.1
Pipe: 19					-48.0	2.067 PL	8.00	PF	0.2
20	20.0	5.6	8.2	16.1	4.6	120 FTG	----	PE	0.0
21	20.0	5.6	8.4	16.3		0.024 TL	8.00	PV	0.1
Pipe: 20					-64.3	2.067 PL	8.00	PF	0.3
21	20.0	5.6	8.4	16.3	6.1	120 FTG	----	PE	0.0
22	20.0	5.6	8.8	16.6		0.042 TL	8.00	PV	0.3
Pipe: 21					-80.9	2.067 PL	8.00	PF	0.5
22	20.0	5.6	8.8	16.6	7.7	120 FTG	----	PE	0.0
23	20.0	5.6	9.3	17.1		0.063 TL	8.00	PV	0.4
Pipe: 22					-98.0	2.067 PL	8.00	PF	0.7
23	20.0	5.6	9.3	17.1	9.4	120 FTG	----	PE	0.0
24	20.0	5.6	10.0	17.7		0.090 TL	8.00	PV	0.6
Pipe: 23					-115.7	2.067 PL	8.00	PF	1.0
24	20.0	5.6	10.0	17.7	11.1	120 FTG	----	PE	0.0
25	20.0	5.6	11.0	18.6		0.123 TL	8.00	PV	0.8
Pipe: 24					-134.2	2.067 PL	8.00	PF	1.3
25	20.0	5.6	11.0	18.6	12.8	120 FTG	----	PE	0.0
26	20.0	5.6	12.3	19.6		0.162 TL	8.00	PV	1.1
Pipe: 25					-153.9	2.067 PL	8.00	PF	1.7
26	20.0	5.6	12.3	19.6	14.7	120 FTG	----	PE	0.0
27	20.0	5.6	14.0	20.9		0.209 TL	8.00	PV	1.5
Pipe: 26					-174.8	2.067 PL	8.00	PF	2.1
27	20.0	5.6	14.0	20.9	16.7	120 FTG	----	PE	0.0
28	20.0	5.6	16.1	22.4		0.264 TL	8.00	PV	1.9

Date: 12/19/1994
JOB TITLE: RAIL CAR UNLOADING, DELUGE .17/AREA
PIPE DATA (cont.)

PIPE TAG END NODES	ELEV. (FT)	NOZ. (K)	PT (PSI)	DISC. (GPM)	Q(GPM) VEL(FPS)	DIA(IN) HW(C) F.L./FT	LENGTH (FT)		PRESS. SUM. (PSI)
Pipe: 27					-197.2	2.635	PL 8.00	PF	0.8
28	20.0	5.6	16.1	22.4	11.6	120	FTG ----	PE	0.0
29	20.0	5.6	16.9	23.0		0.101	TL 8.00	PV	0.9
Pipe: 28					-220.2	2.635	PL 8.00	PF	1.0
29	20.0	5.6	16.9	23.0	13.0	120	FTG ----	PE	0.0
30	20.0	5.6	17.9	23.7		0.124	TL 8.00	PV	1.1
Pipe: 29					-243.9	2.635	PL 8.00	PF	1.2
30	20.0	5.6	17.9	23.7	14.4	120	FTG ----	PE	0.0
31	20.0	5.6	19.1	24.5		0.150	TL 8.00	PV	1.4
Pipe: 30					-268.4	2.635	PL 8.00	PF	1.4
31	20.0	5.6	19.1	24.5	15.8	120	FTG ----	PE	0.0
32	20.0	5.6	20.5	25.4		0.179	TL 8.00	PV	1.7
Pipe: 31					-293.7	2.635	PL 8.00	PF	1.7
32	20.0	5.6	20.5	25.4	17.3	120	FTG ----	PE	0.0
33	20.0	5.6	22.2	26.4		0.211	TL 8.00	PV	2.0
Pipe: 32					-320.1	2.635	PL 1.00	PF	4.5
33	20.0	5.6	22.2	26.4	18.8	120	FTG T	PE	0.0
34	20.0	0.0	26.6	0.0		0.248	TL 18.00	PV	2.4
Pipe: 33					-14.8	2.067	PL 8.00	PF	0.0
35	20.0	5.6	7.0	14.8	1.4	120	FTG ----	PE	0.0
36	20.0	5.6	7.0	14.8		0.003	TL 8.00	PV	0.0
Pipe: 34					-29.7	2.067	PL 8.00	PF	0.1
36	20.0	5.6	7.0	14.8	2.8	120	FTG ----	PE	0.0
37	20.0	5.6	7.1	14.9		0.010	TL 8.00	PV	0.1
Pipe: 35					-44.6	2.067	PL 8.00	PF	0.2
37	20.0	5.6	7.1	14.9	4.3	120	FTG ----	PE	0.0
38	20.0	5.6	7.3	15.1		0.021	TL 8.00	PV	0.1
Pipe: 36					-59.7	2.067	PL 8.00	PF	0.3
38	20.0	5.6	7.3	15.1	5.7	120	FTG ----	PE	0.0
39	20.0	5.6	7.6	15.4		0.036	TL 8.00	PV	0.2
Pipe: 37					-75.1	2.067	PL 8.00	PF	0.4
39	20.0	5.6	7.6	15.4	7.2	120	FTG ----	PE	0.0
40	20.0	5.6	8.0	15.8		0.055	TL 8.00	PV	0.3
Pipe: 38					-90.9	2.067	PL 8.00	PF	0.6
40	20.0	5.6	8.0	15.8	8.7	120	FTG ----	PE	0.0
41	20.0	5.6	8.6	16.5		0.079	TL 8.00	PV	0.5
Pipe: 39					-107.4	2.067	PL 8.00	PF	0.9
41	20.0	5.6	8.6	16.5	10.3	120	FTG ----	PE	0.0
42	20.0	5.6	9.5	17.2		0.107	TL 8.00	PV	0.7

Date: 12/19/1994
JOB TITLE: RAIL CAR UNLOADING, DELUGE .17/AREA
PIPE DATA (cont.)

PIPE TAG END NODES	ELEV. (FT)	NOZ. (K)	PT (PSI)	DISC. (GPM)	Q(GPM) VEL(FPS)	DIA(IN) HW(C) F.L./FT	LENGTH (FT)		PRESS. SUM. (PSI)
Pipe: 40					-124.6	2.067 PL	8.00	PF	1.1
42	20.0	5.6	9.5	17.2	11.9	120 FTG	----	PE	0.0
43	20.0	5.6	10.6	18.2		0.141 TL	8.00	PV	1.0
Pipe: 41					-142.9	2.067 PL	8.00	PF	1.5
43	20.0	5.6	10.6	18.2	13.7	120 FTG	----	PE	0.0
44	20.0	5.6	12.1	19.5		0.182 TL	8.00	PV	1.3
Pipe: 42					-162.3	2.067 PL	10.00	PF	4.6
44	20.0	5.6	12.1	19.5	15.5	120 FTG	2E	PE	0.0
45	20.0	5.6	16.7	22.9		0.230 TL	20.00	PV	1.6
Pipe: 43					-185.2	2.635 PL	8.00	PF	0.7
45	20.0	5.6	16.7	22.9	10.9	120 FTG	----	PE	0.0
46	20.0	5.6	17.4	23.4		0.090 TL	8.00	PV	0.8
Pipe: 44					-208.5	2.635 PL	8.00	PF	0.9
46	20.0	5.6	17.4	23.4	12.3	120 FTG	----	PE	0.0
47	20.0	5.6	18.3	24.0		0.112 TL	8.00	PV	1.0
Pipe: 45					-232.5	2.635 PL	8.00	PF	1.1
47	20.0	5.6	18.3	24.0	13.7	120 FTG	----	PE	0.0
48	20.0	5.6	19.4	24.7		0.137 TL	8.00	PV	1.3
Pipe: 46					-257.2	2.635 PL	8.00	PF	1.3
48	20.0	5.6	19.4	24.7	15.1	120 FTG	----	PE	0.0
49	20.0	5.6	20.7	25.5		0.165 TL	8.00	PV	1.5
Pipe: 47					-282.6	2.635 PL	8.00	PF	1.6
49	20.0	5.6	20.7	25.5	16.6	120 FTG	----	PE	0.0
50	20.0	5.6	22.3	26.4		0.197 TL	8.00	PV	1.9
Pipe: 48					-309.1	2.635 PL	1.00	PF	4.2
50	20.0	5.6	22.3	26.4	18.2	120 FTG	T	PE	0.0
51	20.0	0.0	26.5	0.0		0.232 TL	18.00	PV	2.2
Pipe: 49					-328.5	4.260 PL	9.00	PF	0.9
17	20.0	0.0	28.0	0.0	7.4	120 FTG	T	PE	0.0
52	20.0	0.0	28.9	0.0		0.025 TL	35.00	PV	0.4
Pipe: 50					629.2	4.260 PL	1.00	PF	2.3
52	20.0	0.0	28.9	0.0	14.2	120 FTG	T	PE	0.0
34	20.0	0.0	26.6	0.0		0.083 TL	27.00	PV	1.3
Pipe: 51					309.1	4.260 PL	8.00	PF	0.2
34	20.0	0.0	26.6	0.0	7.0	120 FTG	----	PE	0.0
51	20.0	0.0	26.5	0.0		0.022 TL	8.00	PV	0.3
Pipe: 52					-957.7	4.260 PL	120.00	PF	26.5
52	20.0	0.0	28.9	0.0	21.6	120 FTG	2E	PE	7.8
53	2.0	0.0	63.2	0.0		0.181 TL	146.00	PV	3.1

Date: 12/19/1994
JOB TITLE: RAIL CAR UNLOADING, DELUGE .17/AREA
PIPE DATA (cont.)

PIPE TAG END NODES	ELEV. (FT)	NOZ. (K)	PT (PSI)	DISC. (GPM)	Q(GPM) VEL(FPS)	DIA(IN) HW(C) F.L./FT	LENGTH (FT)		PRESS. SUM. (PSI)
Pipe: 53					-957.7	4.260	PL 32.00	PF	10.5
53	2.0	0.0	63.2	0.0	21.6	120	FTG 2E	PE	0.0
54	2.0	0.0	73.7	0.0		0.181	TL 58.00	PV	3.1
Pipe: 54					-957.7	4.260	PL 12.00	PF	6.9
54	2.0	0.0	73.7	0.0	21.6	120	FTG 2E	PE	-2.6
TOR	8.0	0.0	78.0	0.0		0.181	TL 38.00	PV	3.1
Pipe: 55					-957.7	4.260	PL 21.00	PF	9.1
TOR	8.0	0.0	78.0	0.0	21.6	120	FTG TG	PE	2.2
BOR	3.0	H.S.	89.2	500.0		0.181	TL 50.00	PV	3.1
Pipe: 56					-1457.7	6.357	PL 6.00	PF	0.3
BOR	3.0	H.S.	89.2	500.0	14.7	120	FTG ----	PE	0.0
PROP2	3.0	0.0	89.6	0.0		0.056	TL 6.00	PV	1.5
Pipe: 57					FIXED PRESSURE LOSS DEVICE				
PROP1	3.0	0.0	92.1	0.0	2.5 psi, 1457.7 gpm				
PROP2	3.0	0.0	89.6	0.0					
Pipe: 58					-1457.7	6.357	PL 3.00	PF	4.5
PROP1	3.0	0.0	92.1	0.0	14.7	120	FTG TC	PE	0.9
UG	1.0	0.0	97.5	0.0		0.056	TL 81.00	PV	1.5
Pipe: 59					-1457.7	8.510	PL 20.00	PF	1.5
UG	1.0	0.0	97.5	0.0	8.2	140	FTG 2ETG	PE	3.0
TF	-6.0	0.0	102.0	0.0		0.010	TL 149.00	PV	0.5
Pipe: 60					-1457.7	10.520	PL 555.00	PF	3.1
TF	-6.0	0.0	102.0	0.0	5.4	140	FTG E3T2G	PE	0.0
LOOP	-6.0	0.0	105.1	0.0		0.004	TL 846.00	PV	0.2
Pipe: 61					-1457.7	10.520	PL 20.00	PF	0.1
LOOP	-6.0	0.0	105.1	0.0	5.4	140	FTG ----	PE	0.0
LOOP1	-6.0	0.0	105.2	0.0		0.004	TL 20.00	PV	0.2
Pipe: 62					-1457.7	12.580	PL 350.00	PF	0.7
LOOP1	-6.0	0.0	105.2	0.0	3.8	140	FTG 2EG	PE	-3.5
PUG	2.0	0.0	102.4	0.0		0.002	TL 448.00	PV	0.1
Pipe: 63					-1457.7	8.070	PL 2.50	PF	0.8
PUG	2.0	0.0	102.4	0.0	9.1	120	FTG TG	PE	0.0
SUP	2.0	0.0	103.2	0.0		0.018	TL 45.50	PV	0.6
Pipe: 64					-1457.7	8.070	PL 7.50	PF	1.4
SUP	2.0	0.0	103.2	0.0	9.1	120	FTG EC	PE	0.0
PD	2.0	SRCE	104.6	(N/A)		0.018	TL 77.50	PV	0.6

Date: 12/19/1994
JOB TITLE: RAIL CAR UNLOADING, DELUGE .17/AREA

NOTES:

(1) Calculations were performed by the HASS 5.8.0 computer program under license no. 4 C1324C granted by
HRS Systems, Inc.
2193 Ranchwood Dr., N.E.
Atlanta, GA 30345

(2) The system has been balanced to provide an average imbalance at each node of 0.002 gpm and a maximum imbalance at any node of 0.111 gpm.

(3) Velocity pressures are printed for information only, and are not used in balancing the system. Maximum water velocity is 21.6 ft/sec at pipe 55.

(4) PIPE FITTINGS TABLE

Pipe Table Name: CUSTOM.PIP

PAGE: A MATERIAL: S40-TW HWC: 120

Diameter (in)	Equivalent Fitting Lengths in Feet							
	E Ell	T Tee	L LngEl	C ChkVl	B BfyVl	G GatVl	A AlmCk	D DPVlv
2.067	5.00	10.00	3.00	11.00	6.00	1.00	10.00	10.00
2.635	8.00	17.00	6.00	19.00	10.00	1.00	14.00	14.00
4.260	13.00	26.00	8.00	29.00	16.00	3.00	26.00	13.00
6.357	18.00	38.00	11.00	40.00	13.00	4.00	35.00	24.00

PAGE: D MATERIAL: DIRON HWC: 140

Diameter (in)	Equivalent Fitting Lengths in Feet					
	E Ell	T Tee	L LngEl	C ChkVl	B BfyVl	G GatVl
8.510	31.00	60.00	22.00	78.00	21.00	7.00
10.520	35.00	80.00	26.00	88.00	30.00	8.00
12.580	44.00	97.00	29.00	105.00	34.00	10.00

RECEIVED
DEC 23 1994
IEPA-DLPC

RECEIVED
DEC 24 1994
IEPA-DLPC

GRINNELL
HYDRAULIC DESIGN INFORMATION SHEET

NAME CHEMICAL WASTE MANAGEMENT / CLEAN HARBORS DATE 12/19/94
LOCATION 11700 STONY ISLAND, CHICAGO, IL
BUILDING TANK FARM WEST SYSTEM NO. ____
CONTRACTOR GRINNELL FIRE PROTECTION CONTRACT NO. ____
CALCULATED BY T. WALL DRAWING NO. FP8
CONSTRUCTION: ☐ COMBUSTIBLE ☒ NON-COMBUSTIBLE CEILING HEIGHT N/A FT.
OCCUPANCY ____
APPROVING AUTHORITIES ILL ENVIRONMENTAL PROTECTION AGENCY / CHICAGO FIRE DEPT.

SYSTEM DESIGN

☐ NFPA. 13: ☐ LT. HAZ. ORD. HAZ. GP. ☐ 1 ☐ 2 ☐ 3 ☐ EX. HAZ.
☐ NFPA 231 ☐ NFPA 231C: FIGURE ____; CURVE ____
☒ OTHER (Specify) NFPA 16
☐ SPECIFIC RULING ____ MADE BY ____ DATE ____

AREA OF SPRINKLER OPERATION 1976 FT2
DENSITY .17
AREA PER ~~SPRINKLER~~ FOAM MAKER 247 FT2
HOSE ALLOWANCE GPM: INSIDE —
HOSE ALLOWANCE GPM: OUTSIDE 500
RACK SPRINKLER ALLOWANCE —

SYSTEM TYPE
☐ WET ☐ DRY ☒ DELUGE ☐ PRE-ACTION

SPRINKLER OR NOZZLE
MAKE ANSUL MODEL FLR-90
SIZE 2 1/2" K-FACTOR VARIES
TEMPERATURE RATING OPEN

CALCULATION SUMMARY
GPM REQUIRED 837 PSI REQUIRED 85.2 AT PUMP DISCHARGE (Specify Location)
"C" FACTOR USED: OVERHEAD 120 UNDERGROUND 140

WATER SUPPLY

~~WATER FLOW TEST~~
~~DATE & TIME ____~~
~~STATIC PSI ____~~
~~RESIDUAL PSI ____~~
~~GPM FLOWING ____~~
~~ELEVATION ____~~

PUMP DATA
RATED CAPACITY 1500
AT PSI 125
ELEVATION 2'-0"

TANK OR RESERVOIR
CAPACITY 350,000 GAL
ELEVATION 0'-0"

~~WELL~~
~~PROOF FLOW ____ GPM~~

LOCATION WEST PUMP HOUSE
SOURCE OF INFORMATION EXISTING

COMMODITY STORAGE

COMMODITY ____ CLASS ____ LOCATION ____
STORAGE HEIGHT ____ AREA ____ AISLE WIDTH ____
STORAGE METHOD: SOLID PILED ____ % PALLETIZED ____ % RACK ____ %

RACK

☐ SINGLE ROW ☐ CONVENTIONAL PALLET ☐ AUTOMATIC STORAGE ☐ ENCAPSULATED
☐ DOUBLE ROW ☐ SLAVE PALLET ☐ SOLID SHELVING ☐ NON-ENCAPSULATED
☐ MULTIPLE ROW ☐ OPEN

FLUE SPACING IN INCHES
LONGITUDINAL ____ TRANSVERSE ____

CLEARANCE FROM TOP OF STORAGE TO CEILING
____ FT. ____ IN.

HORIZONTAL BARRIERS PROVIDED ____

Date: 12/19/1994

JOB TITLE: TANK FARM WEST, DELUGE/FOAM .17/AREA

WATER SUPPLY DATA

SOURCE NODE TAG	STATIC PRESS. (PSI)	RESID. PRESS. (PSI)	FLOW @ (GPM)	AVAIL. PRESS. @ (PSI)	TOTAL DEMAND (GPM)	REQ'D PRESS. (PSI)
PD	150.0	125.0	1500.0	141.5	837.4	85.2

AGGREGATE FLOW ANALYSIS:

TOTAL FLOW AT SOURCE	837.4 GPM
TOTAL HOSE STREAM ALLOWANCE AT SOURCE	0.0 GPM
OTHER HOSE STREAM ALLOWANCES	500.0 GPM
TOTAL DISCHARGE FROM ACTIVE SPRINKLERS	337.4 GPM

NODE ANALYSIS DATA

NODE TAG	ELEVATION (FT)	NODE TYPE	PRESSURE (PSI)	DISCHARGE (GPM)
1A	2.5	K= 6.31	42.4	41.1
1	2.0	- - - -	42.8	- - -
2	2.0	- - - -	43.0	- - -
2A	2.5	K= 6.31	42.6	41.2
3	2.0	- - - -	44.0	- - -
4	3.5	- - - -	41.5	- - -
4A	4.0	K= 6.31	41.1	40.5
5	3.5	- - - -	41.1	- - -
5A	4.0	K= 6.31	40.7	40.3
6	3.5	- - - -	40.6	- - -
6A	4.0	K= 6.31	40.2	40.0
7	3.5	- - - -	40.5	- - -
7A	4.0	K= 6.31	40.2	40.0
9	2.0	- - - -	52.6	- - -
9A	2.5	K= 6.31	52.2	45.6
10	2.0	- - - -	59.9	- - -
10A	2.5	K= 6.31	59.5	48.7
11	2.0	- - - -	67.4	- - -
12	1.0	- - - -	68.1	- - -
13	1.0	- - - -	73.8	- - -
TOR	6.0	- - - -	75.1	- - -
BOR	3.0	HOSE STREAM	77.8	500.0
PROP2	3.0	- - - -	78.0	- - -
PROP1	3.0	- - - -	80.4	- - -
UG	1.0	- - - -	83.0	- - -
TF	-6.0	- - - -	86.5	- - -
LOOP	-6.0	- - - -	87.6	- - -
LOOP1	-6.0	- - - -	87.7	- - -
PUG	2.0	- - - -	84.5	- - -
SUP	2.0	- - - -	84.8	- - -
PD	2.0	SOURCE	85.2	837.4

Date: 12/19/1994

JOB TITLE: TANK FARM WEST, DELUGE/FOAM .17/AREA

PIPE DATA

PIPE TAG END NODES	ELEV. (FT)	NOZ. (K)	PT (PSI)	DISC. (GPM)	Q(GPM) VEL(FPS)	DIA(IN) HW(C) F.L./FT	LENGTH (FT)		PRESS. SUM. (PSI)
Pipe: 1					-41.1	2.469 PL	1.00	PF	0.1
1A	2.5	6.3	42.4	41.1	2.8	120 FTG	ET	PE	0.2
1	2.0	0.0	42.8	0.0		0.008 TL	19.00	PV	0.1
Pipe: 2					-41.1	2.469 PL	26.00	PF	0.2
1	2.0	0.0	42.8	0.0	2.8	120 FTG	----	PE	0.0
2	2.0	0.0	43.0	0.0		0.008 TL	26.00	PV	0.1
Pipe: 3					41.2	2.469 PL	1.00	PF	0.1
2	2.0	0.0	43.0	0.0	2.8	120 FTG	ET	PE	-0.2
2A	2.5	6.3	42.6	41.2		0.008 TL	19.00	PV	0.1
Pipe: 4					-82.3	2.469 PL	32.00	PF	1.0
2	2.0	0.0	43.0	0.0	5.5	120 FTG	E	PE	0.0
3	2.0	0.0	44.0	0.0		0.028 TL	38.00	PV	0.2
Pipe: 5					160.8	2.469 PL	14.00	PF	1.9
3	2.0	0.0	44.0	0.0	10.8	120 FTG	E	PE	-0.6
4	3.5	0.0	41.5	0.0		0.095 TL	20.00	PV	0.8
Pipe: 6					40.5	2.469 PL	1.00	PF	0.1
4	3.5	0.0	41.5	0.0	2.7	120 FTG	ET	PE	-0.2
4A	4.0	6.3	41.1	40.5		0.007 TL	19.00	PV	0.0
Pipe: 7					120.3	2.469 PL	7.00	PF	0.4
4	3.5	0.0	41.5	0.0	8.1	120 FTG	----	PE	0.0
5	3.5	0.0	41.1	0.0		0.056 TL	7.00	PV	0.4
Pipe: 8					40.3	2.469 PL	1.00	PF	0.1
5	3.5	0.0	41.1	0.0	2.7	120 FTG	ET	PE	-0.2
5A	4.0	6.3	40.7	40.3		0.007 TL	19.00	PV	0.0
Pipe: 9					80.0	2.469 PL	19.00	PF	0.5
5	3.5	0.0	41.1	0.0	5.4	120 FTG	----	PE	0.0
6	3.5	0.0	40.6	0.0		0.026 TL	19.00	PV	0.2
Pipe: 10					40.0	2.469 PL	1.00	PF	0.1
6	3.5	0.0	40.6	0.0	2.7	120 FTG	ET	PE	-0.2
6A	4.0	6.3	40.2	40.0		0.007 TL	19.00	PV	0.0
Pipe: 11					40.0	2.469 PL	7.00	PF	0.1
6	3.5	0.0	40.6	0.0	2.7	120 FTG	----	PE	0.0
7	3.5	0.0	40.5	0.0		0.007 TL	7.00	PV	0.0
Pipe: 12					40.0	2.469 PL	1.00	PF	0.1
7	3.5	0.0	40.5	0.0	2.7	120 FTG	ET	PE	-0.2
7A	4.0	6.3	40.2	40.0		0.007 TL	19.00	PV	0.0
Pipe: 16					-243.1	2.469 PL	39.00	PF	8.6
3	2.0	0.0	44.0	0.0	16.3	120 FTG	3.00	PE	0.0
9	2.0	0.0	52.6	0.0		0.204 TL	42.00	PV	1.8

Date: 12/19/1994
JOB TITLE: TANK FARM WEST, DELUGE/FOAM .17/AREA
PIPE DATA (cont.)

PIPE TAG END NODES	ELEV. (FT)	NOZ. (K)	PT (PSI)	DISC. (GPM)	Q(GPM) VEL(FPS)	DIA(IN) HW(C) F.L./FT	LENGTH (FT)		PRESS. SUM. (PSI)
Pipe: 17					45.6	2.469 PL	1.00	PF	0.2
9	2.0	0.0	52.6	0.0	3.1	120 FTG	ET	PE	-0.2
9A	2.5	6.3	52.2	45.6		0.009 TL	19.00	PV	0.1
Pipe: 18					-288.7	2.469 PL	26.00	PF	7.3
9	2.0	0.0	52.6	0.0	19.3	120 FTG	----	PE	0.0
10	2.0	0.0	59.9	0.0		0.281 TL	26.00	PV	2.5
Pipe: 19					48.7	2.469 PL	1.00	PF	0.2
10	2.0	0.0	59.9	0.0	3.3	120 FTG	ET	PE	-0.2
10A	2.5	6.3	59.5	48.7		0.010 TL	19.00	PV	0.1
Pipe: 20					-337.3	2.469 PL	8.00	PF	7.5
10	2.0	0.0	59.9	0.0	22.6	120 FTG	T	PE	0.0
11	2.0	0.0	67.4	0.0		0.375 TL	20.00	PV	3.4
Pipe: 21					-337.3	3.068 PL	2.00	PF	0.3
11	2.0	0.0	67.4	0.0	14.6	120 FTG	----	PE	0.4
12	1.0	0.0	68.1	0.0		0.130 TL	2.00	PV	1.4
Pipe: 22					-337.3	3.068 PL	30.00	PF	5.7
12	1.0	0.0	68.1	0.0	14.6	120 FTG	2E	PE	0.0
13	1.0	0.0	73.8	0.0		0.130 TL	44.00	PV	1.4
Pipe: 23					-337.3	3.068 PL	12.00	PF	3.4
13	1.0	0.0	73.8	0.0	14.6	120 FTG	2E	PE	-2.2
TOR	6.0	0.0	75.1	0.0		0.130 TL	26.00	PV	1.4
Pipe: 24					-337.3	4.026 PL	21.00	PF	1.5
TOR	6.0	0.0	75.1	0.0	8.5	120 FTG	TG	PE	1.3
BOR	3.0	H.S.	77.8	500.0		0.035 TL	43.00	PV	0.5
Pipe: 25					-837.3	6.065 PL	4.00	PF	0.1
BOR	3.0	H.S.	77.8	500.0	9.3	120 FTG	----	PE	0.0
PROP2	3.0	0.0	78.0	0.0		0.025 TL	4.00	PV	0.6
Pipe: 26					FIXED PRESSURE LOSS DEVICE				
PROP1	3.0	0.0	80.4	0.0	2.5 psi, 837.3 gpm				
PROP2	3.0	0.0	78.0	0.0					
Pipe: 27					-837.3	6.065 PL	3.00	PF	1.6
PROP1	3.0	0.0	80.4	0.0	9.3	120 FTG	TC	PE	0.9
UG	1.0	0.0	83.0	0.0		0.025 TL	65.00	PV	0.6
Pipe: 28					-837.3	8.510 PL	20.00	PF	0.5
UG	1.0	0.0	83.0	0.0	4.7	140 FTG	2ETG	PE	3.0
TF	-6.0	0.0	86.5	0.0		0.004 TL	149.00	PV	0.2
Pipe: 29					-837.3	10.520 PL	555.00	PF	1.1
TF	-6.0	0.0	86.5	0.0	3.1	140 FTG	E3T2G	PE	0.0
LOOP	-6.0	0.0	87.6	0.0		0.001 TL	846.00	PV	0.1

Date: 12/19/1994
JOB TITLE: TANK FARM WEST, DELUGE/FOAM .17/AREA
PIPE DATA (cont.)

PIPE TAG END NODES	ELEV. (FT)	NOZ. (K)	PT (PSI)	DISC. (GPM)	Q(GPM) VEL(FPS)	DIA(IN) HW(C) F.L./FT	LENGTH (FT)		PRESS. SUM. (PSI)
Pipe: 30					-837.3	10.520	PL 20.00	PF	0.0
LOOP	-6.0	0.0	87.6	0.0	3.1	140	FTG ----	PE	0.0
LOOP1	-6.0	0.0	87.7	0.0		0.001	TL 20.00	PV	0.1
Pipe: 31					-837.3	12.580	PL 350.00	PF	0.3
LOOP1	-6.0	0.0	87.7	0.0	2.2	140	FTG 2ETG	PE	-3.5
PUG	2.0	0.0	84.5	0.0		0.001	TL 545.00	PV	0.0
Pipe: 32					-837.3	8.070	PL 2.50	PF	0.3
PUG	2.0	0.0	84.5	0.0	5.3	120	FTG TG	PE	0.0
SUP	2.0	0.0	84.8	0.0		0.006	TL 41.50	PV	0.2
Pipe: 33					-837.4	8.070	PL 7.50	PF	0.4
SUP	2.0	0.0	84.8	0.0	5.3	120	FTG EC	PE	0.0
PD	2.0	SRCE	85.2	(N/A)		0.006	TL 70.50	PV	0.2

NOTES:

(1) Calculations were performed by the HASS 5.8.0 computer program under license no. 4 C1324C granted by
HRS Systems, Inc.
2193 Ranchwood Dr., N.E.
Atlanta, GA 30345

(2) The system has been balanced to provide an average imbalance at each node of 0.003 gpm and a maximum imbalance at any node of 0.100 gpm.

(3) Velocity pressures are printed for information only, and are not used in balancing the system. Maximum water velocity is 22.6 ft/sec at pipe 20.

(4) PIPE FITTINGS TABLE

Pipe Table Name: STANDARD.PIP

PAGE: A MATERIAL: S40 HWC: 120

Diameter (in)	E Ell	T Tee	L LngEll	C ChkVlv	B BfyVlv	G GatVlv	A AlmChk	D DPVlv
	Equivalent Fitting Lengths in Feet							
2.469	6.00	12.00	4.00	14.00	7.00	1.00	10.00	10.00
3.068	7.00	15.00	5.00	16.00	10.00	1.00	13.00	10.00
4.026	10.00	20.00	6.00	22.00	12.00	2.00	20.00	10.00
6.065	14.00	30.00	9.00	32.00	10.00	3.00	28.00	19.00

PAGE: D MATERIAL: DIRON HWC: 140

Diameter (in)	E Ell	T Tee	L LngEll	C ChkVlv	B BfyVlv	G GatVlv
	Equivalent Fitting Lengths in Feet					
8.510	31.00	60.00	22.00	78.00	21.00	7.00
10.520	35.00	80.00	26.00	88.00	30.00	8.00
12.580	44.00	97.00	29.00	105.00	34.00	10.00

RECEIVED
DEC 23 1994
IEPA-DLPC

RECEIVED
DEC 24 1994
IEPA-DLPC

GRINNELL
HYDRAULIC DESIGN INFORMATION SHEET

NAME CHEMICAL WASTE MANAGEMENT / CLEAN HARBORS DATE 12/19/94
LOCATION 11700 STONY ISLAND, CHICAGO, IL
BUILDING IGNITABLE CONTAINER MANAGEMENT BLDG SYSTEM NO. ____
CONTRACTOR GRINNELL FIRE PROTECTION CONTRACT NO. ____
CALCULATED BY T. WALL DRAWING NO. FP9
CONSTRUCTION: ☐ COMBUSTIBLE ☒ NON-COMBUSTIBLE CEILING HEIGHT 24 FT.
OCCUPANCY ____
APPROVING AUTHORITIES ILL ENVIRONMENTAL PROTECTION AGENCY / CHICAGO FIRE DEPT.

SYSTEM DESIGN

☐ NFPA. 13: ☐ LT. HAZ. ORD. HAZ. GP. ☐ 1 ☐ 2 ☐ 3 ☐ EX. HAZ.
☐ NFPA 231 ☐ NFPA 231C: FIGURE ____; CURVE ____
☒ OTHER (Specify) NFPA 30
☐ SPECIFIC RULING ____ MADE BY ____ DATE ____

AREA OF SPRINKLER OPERATION 2460 FT²
DENSITY .60
AREA PER SPRINKLER 77 FT²
HOSE ALLOWANCE GPM: INSIDE —
HOSE ALLOWANCE GPM: OUTSIDE 750
RACK SPRINKLER ALLOWANCE —

SYSTEM TYPE
☐ WET ☐ DRY ☐ DELUGE ☒ PRE-ACTION

SPRINKLER OR NOZZLE
MAKE GRINNELL MODEL ISSUE C
SIZE 17/32" K-FACTOR 8.0
TEMPERATURE RATING 286°F

CALCULATION SUMMARY
GPM REQUIRED 2313 PSI REQUIRED 91.9 AT PUMP DISCHARGE (Specify Location)
"C" FACTOR USED: OVERHEAD 120 UNDERGROUND 140

WATER SUPPLY

~~WATER FLOW TEST~~
~~DATE & TIME ____~~
~~STATIC PSI ____~~
~~RESIDUAL PSI ____~~
~~GPM FLOWING ____~~
~~ELEVATION ____~~

PUMP DATA
RATED CAPACITY 1500
AT PSI 125
ELEVATION 2'-0"

TANK OR RESERVOIR
CAPACITY 350,000 GAL
ELEVATION 0'-0"

~~WELL~~
~~PROOF FLOW ____ GPM~~

LOCATION WEST PUMP HOUSE
SOURCE OF INFORMATION EXISTING

COMMODITY STORAGE

COMMODITY ____ CLASS ____ LOCATION ____
STORAGE HEIGHT ____ AREA ____ AISLE WIDTH ____
STORAGE METHOD: SOLID PILED ____ % PALLETIZED ____ % RACK ____ %

RACK
☐ SINGLE ROW ☐ CONVENTIONAL PALLET ☐ AUTOMATIC STORAGE ☐ ENCAPSULATED
☐ DOUBLE ROW ☐ SLAVE PALLET ☐ SOLID SHELVING ☐ NON-ENCAPSULATED
☐ MULTIPLE ROW ☐ OPEN

FLUE SPACING IN INCHES
LONGITUDINAL ____ TRANSVERSE ____

CLEARANCE FROM TOP OF STORAGE TO CEILING
____ FT. ____ IN.

HORIZONTAL BARRIERS PROVIDED ____

SPRINKLER SYSTEM HYDRAULIC ANALYSIS

Date: 12/19/1994 CHIGNIT

JOB TITLE: IGNITABLE CONTAINER MANAGEMENT BLDG, PREACTION/FOAM .60

WATER SUPPLY DATA

SOURCE NODE TAG	STATIC PRESS. (PSI)	RESID. PRESS. (PSI)	FLOW @ (GPM)	AVAIL. PRESS. @ (PSI)	TOTAL DEMAND (GPM)	REQ'D PRESS. (PSI)
PD	150.0	125.0	1500.0	94.3	2313.0	91.9

AGGREGATE FLOW ANALYSIS:

TOTAL FLOW AT SOURCE	2313.0 GPM
TOTAL HOSE STREAM ALLOWANCE AT SOURCE	0.0 GPM
OTHER HOSE STREAM ALLOWANCES	750.0 GPM
TOTAL DISCHARGE FROM ACTIVE SPRINKLERS	1563.0 GPM

NODE ANALYSIS DATA

NODE TAG	ELEVATION (FT)	NODE TYPE	PRESSURE (PSI)	DISCHARGE (GPM)
1	23.5	K= 8.00	33.1	46.0
2	23.5	K= 8.00	33.2	46.1
3	23.5	K= 8.00	33.8	46.5
4	23.5	K= 8.00	35.1	47.4
5	23.5	K= 8.00	37.2	48.8
6	23.5	K= 8.00	38.6	49.7
7	23.5	- - - -	44.6	- - -
8	23.5	K= 8.00	43.4	52.7
9	23.5	K= 8.00	43.2	52.6
10	23.5	K= 8.00	33.1	46.0
11	23.5	K= 8.00	33.3	46.1
12	23.5	K= 8.00	33.9	46.5
13	23.5	K= 8.00	35.1	47.4
14	23.5	K= 8.00	37.3	48.8
15	23.5	K= 8.00	38.7	49.7
16	23.5	- - - -	44.7	- - -
17	23.5	K= 8.00	43.4	52.7
18	23.5	K= 8.00	43.2	52.6
19	23.5	K= 8.00	33.2	46.1
20	23.5	K= 8.00	33.4	46.2
21	23.5	K= 8.00	34.0	46.6
22	23.5	K= 8.00	35.2	47.5
23	23.5	K= 8.00	37.4	48.9
24	23.5	K= 8.00	38.8	49.8
25	23.5	- - - -	44.9	- - -
26	23.5	K= 8.00	43.6	52.8
27	23.5	K= 8.00	43.4	52.7
28	23.5	K= 8.00	33.5	46.3
29	23.5	K= 8.00	33.7	46.4
30	23.5	K= 8.00	34.3	46.8
31	23.5	K= 8.00	35.5	47.7
32	23.5	K= 8.00	37.7	49.1
33	23.5	K= 8.00	39.1	50.1
34	23.5	- - - -	45.2	- - -

Date: 12/19/1994

JOB TITLE: IGNITABLE CONTAINER MANAGEMENT BLDG, PREACTION/FOAM .60

NODE TAG	ELEVATION (FT)	NODE TYPE	PRESSURE (PSI)	DISCHARGE (GPM)
35	23.5	K= 8.00	43.9	53.0
36	23.5	K= 8.00	43.7	52.9
37	22.5	- - - -	48.6	- - -
38	22.5	- - - -	48.7	- - -
39	22.5	- - - -	48.9	- - -
40	22.5	- - - -	49.3	- - -
TOR	8.0	- - - -	60.2	- - -
PROP	3.0	- - - -	69.4	- - -
BOR	3.0	- - - -	71.9	- - -
ICM	-6.0	HOSE STREAM	80.3	500.0
LOOP3	-6.0	HOSE STREAM	86.0	250.0
LOOP	-6.0	- - - -	90.5	- - -
LOOP1	-6.0	- - - -	90.6	- - -
PUG	2.0	- - - -	88.8	- - -
SUP	2.0	- - - -	90.6	- - -
PD	2.0	SOURCE	91.9	2313.0

Date: 12/19/1994
JOB TITLE: IGNITABLE CONTAINER MANAGEMENT BLDG, PREACTION/FOAM .60
PIPE DATA

PIPE TAG / END NODES	ELEV. (FT)	NOZ. (K)	PT (PSI)	DISC. (GPM)	Q(GPM) VEL(FPS)	DIA(IN) HW(C) F.L./FT	LENGTH (FT)		PRESS. SUM. (PSI)
Pipe: 1					-46.0	2.067 PL	7.30	PF	0.2
1	23.5	8.0	33.1	46.0	4.4	120 FTG	----	PE	0.0
2	23.5	8.0	33.2	46.1		0.022 TL	7.30	PV	0.1
Pipe: 2					-92.1	2.067 PL	7.30	PF	0.6
2	23.5	8.0	33.2	46.1	8.8	120 FTG	----	PE	0.0
3	23.5	8.0	33.8	46.5		0.081 TL	7.30	PV	0.5
Pipe: 3					-138.6	2.067 PL	7.30	PF	1.3
3	23.5	8.0	33.8	46.5	13.3	120 FTG	----	PE	0.0
4	23.5	8.0	35.1	47.4		0.172 TL	7.30	PV	1.2
Pipe: 4					-186.0	2.067 PL	7.30	PF	2.2
4	23.5	8.0	35.1	47.4	17.8	120 FTG	----	PE	0.0
5	23.5	8.0	37.2	48.8		0.296 TL	7.30	PV	2.1
Pipe: 5					-234.8	2.470 PL	7.30	PF	1.4
5	23.5	8.0	37.2	48.8	15.7	120 FTG	----	PE	0.0
6	23.5	8.0	38.6	49.7		0.191 TL	7.30	PV	1.7
Pipe: 6					-284.5	2.470 PL	5.00	PF	6.0
6	23.5	8.0	38.6	49.7	19.1	120 FTG	T	PE	0.0
7	23.5	0.0	44.6	0.0		0.273 TL	22.00	PV	2.4
Pipe: 7					105.2	2.067 PL	2.30	PF	1.3
7	23.5	0.0	44.6	0.0	10.1	120 FTG	T	PE	0.0
8	23.5	8.0	43.4	52.7		0.103 TL	12.30	PV	0.7
Pipe: 8					52.6	2.067 PL	7.30	PF	0.2
8	23.5	8.0	43.4	52.7	5.0	120 FTG	----	PE	0.0
9	23.5	8.0	43.2	52.6		0.029 TL	7.30	PV	0.2
Pipe: 9					-46.0	2.067 PL	7.30	PF	0.2
10	23.5	8.0	33.1	46.0	4.4	120 FTG	----	PE	0.0
11	23.5	8.0	33.3	46.1		0.022 TL	7.30	PV	0.1
Pipe: 10					-92.2	2.067 PL	7.30	PF	0.6
11	23.5	8.0	33.3	46.1	8.8	120 FTG	----	PE	0.0
12	23.5	8.0	33.9	46.5		0.081 TL	7.30	PV	0.5
Pipe: 11					-138.7	2.067 PL	7.30	PF	1.3
12	23.5	8.0	33.9	46.5	13.3	120 FTG	----	PE	0.0
13	23.5	8.0	35.1	47.4		0.172 TL	7.30	PV	1.2
Pipe: 12					-186.1	2.067 PL	7.30	PF	2.2
13	23.5	8.0	35.1	47.4	17.8	120 FTG	----	PE	0.0
14	23.5	8.0	37.3	48.8		0.296 TL	7.30	PV	2.1
Pipe: 13					-235.0	2.470 PL	7.30	PF	1.4
14	23.5	8.0	37.3	48.8	15.7	120 FTG	----	PE	0.0
15	23.5	8.0	38.7	49.7		0.192 TL	7.30	PV	1.7

Date: 12/19/1994
JOB TITLE: IGNITABLE CONTAINER MANAGEMENT BLDG, PREACTION/FOAM .60
PIPE DATA (cont.)

PIPE TAG / END NODES	ELEV. (FT)	NOZ. (K)	PT (PSI)	DISC. (GPM)	Q(GPM) VEL(FPS)	DIA(IN) HW(C) F.L./FT	LENGTH (FT)		PRESS. SUM. (PSI)
Pipe: 14					-284.7	2.470 PL	5.00	PF	6.0
15	23.5	8.0	38.7	49.7	19.1	120 FTG	T	PE	0.0
16	23.5	0.0	44.7	0.0		0.273 TL	22.00	PV	2.4
Pipe: 15					105.3	2.067 PL	2.30	PF	1.3
16	23.5	0.0	44.7	0.0	10.1	120 FTG	T	PE	0.0
17	23.5	8.0	43.4	52.7		0.103 TL	12.30	PV	0.7
Pipe: 16					52.6	2.067 PL	7.30	PF	0.2
17	23.5	8.0	43.4	52.7	5.0	120 FTG	----	PE	0.0
18	23.5	8.0	43.2	52.6		0.029 TL	7.30	PV	0.2
Pipe: 17					-46.1	2.067 PL	7.30	PF	0.2
19	23.5	8.0	33.2	46.1	4.4	120 FTG	----	PE	0.0
20	23.5	8.0	33.4	46.2		0.022 TL	7.30	PV	0.1
Pipe: 18					-92.3	2.067 PL	7.30	PF	0.6
20	23.5	8.0	33.4	46.2	8.8	120 FTG	----	PE	0.0
21	23.5	8.0	34.0	46.6		0.081 TL	7.30	PV	0.5
Pipe: 19					-139.0	2.067 PL	7.30	PF	1.3
21	23.5	8.0	34.0	46.6	13.3	120 FTG	----	PE	0.0
22	23.5	8.0	35.2	47.5		0.173 TL	7.30	PV	1.2
Pipe: 20					-186.5	2.067 PL	7.30	PF	2.2
22	23.5	8.0	35.2	47.5	17.8	120 FTG	----	PE	0.0
23	23.5	8.0	37.4	48.9		0.298 TL	7.30	PV	2.1
Pipe: 21					-235.4	2.470 PL	7.30	PF	1.4
23	23.5	8.0	37.4	48.9	15.8	120 FTG	----	PE	0.0
24	23.5	8.0	38.8	49.8		0.192 TL	7.30	PV	1.7
Pipe: 22					-285.3	2.470 PL	5.00	PF	6.0
24	23.5	8.0	38.8	49.8	19.1	120 FTG	T	PE	0.0
25	23.5	0.0	44.9	0.0		0.274 TL	22.00	PV	2.5
Pipe: 23					105.5	2.067 PL	2.30	PF	1.3
25	23.5	0.0	44.9	0.0	10.1	120 FTG	T	PE	0.0
26	23.5	8.0	43.6	52.8		0.104 TL	12.30	PV	0.7
Pipe: 24					52.7	2.067 PL	7.30	PF	0.2
26	23.5	8.0	43.6	52.8	5.0	120 FTG	----	PE	0.0
27	23.5	8.0	43.4	52.7		0.029 TL	7.30	PV	0.2
Pipe: 25					-46.3	2.067 PL	7.30	PF	0.2
28	23.5	8.0	33.5	46.3	4.4	120 FTG	----	PE	0.0
29	23.5	8.0	33.7	46.4		0.023 TL	7.30	PV	0.1
Pipe: 26					-92.7	2.067 PL	7.30	PF	0.6
29	23.5	8.0	33.7	46.4	8.9	120 FTG	----	PE	0.0
30	23.5	8.0	34.3	46.8		0.082 TL	7.30	PV	0.5

Date: 12/19/1994
JOB TITLE: IGNITABLE CONTAINER MANAGEMENT BLDG, PREACTION/FOAM .60
PIPE DATA (cont.)

PIPE TAG / END NODES	ELEV. (FT)	NOZ. (K)	PT (PSI)	DISC. (GPM)	Q(GPM) VEL(FPS)	DIA(IN) HW(C) F.L./FT	LENGTH (FT)		PRESS. SUM. (PSI)
Pipe: 27					-139.6	2.067 PL	7.30	PF	1.3
30	23.5	8.0	34.3	46.8	13.3	120 FTG	----	PE	0.0
31	23.5	8.0	35.5	47.7		0.174 TL	7.30	PV	1.2
Pipe: 28					-187.3	2.067 PL	7.30	PF	2.2
31	23.5	8.0	35.5	47.7	17.9	120 FTG	----	PE	0.0
32	23.5	8.0	37.7	49.1		0.300 TL	7.30	PV	2.2
Pipe: 29					-236.4	2.470 PL	7.30	PF	1.4
32	23.5	8.0	37.7	49.1	15.8	120 FTG	----	PE	0.0
33	23.5	8.0	39.1	50.1		0.194 TL	7.30	PV	1.7
Pipe: 30					-286.4	2.470 PL	5.00	PF	6.1
33	23.5	8.0	39.1	50.1	19.2	120 FTG	T	PE	0.0
34	23.5	0.0	45.2	0.0		0.276 TL	22.00	PV	2.5
Pipe: 31					105.9	2.067 PL	2.30	PF	1.3
34	23.5	0.0	45.2	0.0	10.1	120 FTG	T	PE	0.0
35	23.5	8.0	43.9	53.0		0.105 TL	12.30	PV	0.7
Pipe: 32					52.9	2.067 PL	7.30	PF	0.2
35	23.5	8.0	43.9	53.0	5.1	120 FTG	----	PE	0.0
36	23.5	8.0	43.7	52.9		0.029 TL	7.30	PV	0.2
Pipe: 33					-389.8	3.070 PL	1.00	PF	3.6
7	23.5	0.0	44.6	0.0	16.9	120 FTG	T	PE	0.4
37	22.5	0.0	48.6	0.0		0.170 TL	21.00	PV	1.9
Pipe: 34					-389.8	6.357 PL	10.50	PF	0.1
37	22.5	0.0	48.6	0.0	3.9	120 FTG	----	PE	0.0
38	22.5	0.0	48.7	0.0		0.005 TL	10.50	PV	0.1
Pipe: 35					-390.0	3.070 PL	1.00	PF	3.6
16	23.5	0.0	44.7	0.0	16.9	120 FTG	T	PE	0.4
38	22.5	0.0	48.7	0.0		0.170 TL	21.00	PV	1.9
Pipe: 36					-779.8	6.357 PL	10.50	PF	0.2
38	22.5	0.0	48.7	0.0	7.9	120 FTG	----	PE	0.0
39	22.5	0.0	48.9	0.0		0.018 TL	10.50	PV	0.4
Pipe: 37					-390.8	3.070 PL	1.00	PF	3.6
25	23.5	0.0	44.9	0.0	16.9	120 FTG	T	PE	0.4
39	22.5	0.0	48.9	0.0		0.170 TL	21.00	PV	1.9
Pipe: 38					-1170.5	6.357 PL	10.50	PF	0.4
39	22.5	0.0	48.9	0.0	11.8	120 FTG	----	PE	0.0
40	22.5	0.0	49.3	0.0		0.037 TL	10.50	PV	0.9
Pipe: 39					-392.4	3.070 PL	1.00	PF	3.6
34	23.5	0.0	45.2	0.0	17.0	120 FTG	T	PE	0.4
40	22.5	0.0	49.3	0.0		0.172 TL	21.00	PV	1.9

Date: 12/19/1994
JOB TITLE: IGNITABLE CONTAINER MANAGEMENT BLDG, PREACTION/FOAM .60
PIPE DATA (cont.)

PIPE TAG END NODES	ELEV. (FT)	NOZ. (K)	PT (PSI)	DISC. (GPM)	Q(GPM) VEL(FPS)	DIA(IN) HW(C) F.L./FT	LENGTH (FT)		PRESS. SUM. (PSI)
Pipe: 40					-1562.9	6.357	PL 37.00	PF	4.7
40	22.5	0.0	49.3	0.0	15.8	120	FTG 2E	PE	6.3
TOR	8.0	0.0	60.2	0.0		0.064	TL 73.00	PV	1.7
Pipe: 41					-1562.9	6.357	PL 26.00	PF	7.0
TOR	8.0	0.0	60.2	0.0	15.8	120	FTG 2CG	PE	2.2
PROP	3.0	0.0	69.4	0.0		0.064	TL 110.00	PV	1.7
Pipe: 42					FIXED PRESSURE LOSS DEVICE				
BOR	3.0	0.0	71.9	0.0	2.5 psi, 1562.9 gpm				
PROP	3.0	0.0	69.4	0.0					
Pipe: 43					-1562.9	6.400	PL 15.00	PF	4.5
BOR	3.0	0.0	71.9	0.0	15.6	140	FTG ETG	PE	3.9
ICM	-6.0	H.S.	80.3	500.0		0.046	TL 96.00	PV	1.6
Pipe: 44					-2062.9	6.400	PL 22.00	PF	5.7
ICM	-6.0	H.S.	80.3	500.0	20.6	140	FTG T	PE	0.0
LOOP3	-6.0	H.S.	86.0	250.0		0.078	TL 74.00	PV	2.8
Pipe: 45					-2312.9	10.520	PL 320.00	PF	4.4
LOOP3	-6.0	H.S.	86.0	250.0	8.5	140	FTG 3ET2G	PE	0.0
LOOP	-6.0	0.0	90.5	0.0		0.009	TL 521.00	PV	0.5
Pipe: 46					-2312.9	10.520	PL 20.00	PF	0.2
LOOP	-6.0	0.0	90.5	0.0	8.5	140	FTG ----	PE	0.0
LOOP1	-6.0	0.0	90.6	0.0		0.009	TL 20.00	PV	0.5
Pipe: 47					-2312.9	12.580	PL 350.00	PF	1.6
LOOP1	-6.0	0.0	90.6	0.0	6.0	140	FTG 2EG	PE	-3.5
PUG	2.0	0.0	88.8	0.0		0.004	TL 448.00	PV	0.2
Pipe: 48					-2312.9	8.070	PL 2.50	PF	1.9
PUG	2.0	0.0	88.8	0.0	14.5	120	FTG TG	PE	0.0
SUP	2.0	0.0	90.6	0.0		0.041	TL 45.50	PV	1.4
Pipe: 49					-2313.0	8.070	PL 7.50	PF	1.3
SUP	2.0	0.0	90.6	0.0	14.5	120	FTG EG	PE	0.0
PD	2.0	SRCE	91.9	(N/A)		0.041	TL 31.50	PV	1.4

NOTES:

(1) Calculations were performed by the HASS 5.8.0 computer program under license no. 4 C1324C granted by
HRS Systems, Inc.
2193 Ranchwood Dr., N.E.
Atlanta, GA 30345

(2) The system has been balanced to provide an average imbalance at each node of 0.004 gpm and a maximum imbalance at any node of 0.188 gpm.

Date: 12/19/1994
JOB TITLE: IGNITABLE CONTAINER MANAGEMENT BLDG, PREACTION/FOAM .60

(3) Velocity pressures are printed for information only, and are not used in balancing the system. Maximum water velocity is 20.6 ft/sec at pipe 44.

(4) PIPE FITTINGS TABLE

Pipe Table Name: CUSTOM.PIP

PAGE: A MATERIAL: S40-TW HWC: 120

Diameter (in)	Equivalent Fitting Lengths in Feet							
	E Ell	T Tee	L LngEl	C ChkVl	B BfyVl	G GatVl	A AlmCk	D DPVlv
2.067	5.00	10.00	3.00	11.00	6.00	1.00	10.00	10.00
6.357	18.00	38.00	11.00	40.00	13.00	4.00	35.00	24.00

PAGE: D MATERIAL: DIRON HWC: 140

Diameter (in)	Equivalent Fitting Lengths in Feet					
	E Ell	T Tee	L LngEl	C ChkVl	B BfyVl	G GatVl
6.400	24.00	52.00	16.00	55.00	17.00	5.00
10.520	35.00	80.00	26.00	88.00	30.00	8.00
12.580	44.00	97.00	29.00	105.00	34.00	10.00

RECEIVED
DEC 23 1994
IEPA-DLPC

RECEIVED
DEC 24 1994
IEPA-DLPC

GRINNELL
HYDRAULIC DESIGN INFORMATION SHEET

NAME CHEMICAL WASTE MANAGEMENT / CLEAN HARBORS DATE 12/19/94
LOCATION 11700 STONY ISLAND, CHICAGO, IL
BUILDING PERSONNEL BUILDING SYSTEM NO.
CONTRACTOR GRINNELL FIRE PROTECTION CONTRACT NO.
CALCULATED BY T. WALL DRAWING NO. FP 10
CONSTRUCTION: ☐ COMBUSTIBLE ☒ NON-COMBUSTIBLE CEILING HEIGHT 8-0 FT.
OCCUPANCY
APPROVING AUTHORITIES ILL ENVIRONMENTAL PROTECTION AGENCY / CHICAGO FIRE DEPT.

SYSTEM DESIGN

☒ NFPA. 13: ☐ LT. HAZ. ORD. HAZ. GP. ☐ 1 ☐ 2 ☐ 3 ☐ EX. HAZ.
☐ NFPA 231 ☐ NFPA 231C: FIGURE ; CURVE
☐ OTHER (Specify)
☐ SPECIFIC RULING MADE BY DATE

AREA OF SPRINKLER OPERATION 2000 FT²
DENSITY .15
AREA PER SPRINKLER VARIES
HOSE ALLOWANCE GPM: INSIDE —
HOSE ALLOWANCE GPM: OUTSIDE 500
RACK SPRINKLER ALLOWANCE —

SYSTEM TYPE
☒ WET ☐ DRY ☐ DELUGE ☐ PRE-ACTION

SPRINKLER OR NOZZLE
MAKE GRINNELL MODEL F972
SIZE 1/2" K-FACTOR 5.6
TEMPERATURE RATING 155° F

CALCULATION SUMMARY
GPM REQUIRED 961 PSI REQUIRED 48 AT PUMP DISCHARGE (Specify Location)
"C" FACTOR USED: OVERHEAD 120 UNDERGROUND 140

WATER SUPPLY

~~WATER FLOW TEST~~
~~DATE & TIME~~
~~STATIC PSI~~
~~RESIDUAL PSI~~
~~GPM FLOWING~~
~~ELEVATION~~

PUMP DATA
RATED CAPACITY 1500
AT PSI 125
ELEVATION 2'-0"

TANK OR RESERVOIR
CAPACITY 350,000 GAL
ELEVATION 0'-0"

~~WELL~~
~~PROOF FLOW GPM~~

LOCATION WEST PUMP HOUSE
SOURCE OF INFORMATION

COMMODITY STORAGE

COMMODITY CLASS LOCATION
STORAGE HEIGHT AREA AISLE WIDTH
STORAGE METHOD: SOLID PILED % PALLETIZED % RACK %

RACK
☐ SINGLE ROW ☐ CONVENTIONAL PALLET ☐ AUTOMATIC STORAGE ☐ ENCAPSULATED
☐ DOUBLE ROW ☐ SLAVE PALLET ☐ SOLID SHELVING ☐ NON-ENCAPSULATED
☐ MULTIPLE ROW ☐ OPEN

FLUE SPACING IN INCHES
LONGITUDINAL TRANSVERSE

CLEARANCE FROM TOP OF STORAGE TO CEILING
FT. IN.

HORIZONTAL BARRIERS PROVIDED

SPRINKLER SYSTEM HYDRAULIC ANALYSIS

Date: 12/19/1994 CHPER

JOB TITLE: PERSONNEL BUILDING (WET) .15/2000

WATER SUPPLY DATA

SOURCE NODE TAG	STATIC PRESS. (PSI)	RESID. PRESS. (PSI)	FLOW @ (GPM)	AVAIL. PRESS. @ (PSI)	TOTAL DEMAND (GPM)	REQ'D PRESS. (PSI)
PD	150.0	125.0	1500.0	139.0	961.0	48.0

AGGREGATE FLOW ANALYSIS:

TOTAL FLOW AT SOURCE	961.0 GPM
TOTAL HOSE STREAM ALLOWANCE AT SOURCE	0.0 GPM
OTHER HOSE STREAM ALLOWANCES	500.0 GPM
TOTAL DISCHARGE FROM ACTIVE SPRINKLERS	461.0 GPM

NODE ANALYSIS DATA

NODE TAG	ELEVATION (FT)	NODE TYPE	PRESSURE (PSI)	DISCHARGE (GPM)
1	8.0	K= 5.60	7.6	15.4
2	8.0	K= 5.60	8.3	16.2
3	8.0	K= 5.60	11.2	18.7
4	8.0	K= 5.60	11.3	18.9
5	8.0	K= 5.60	7.5	15.4
6	8.0	K= 5.60	8.4	16.3
7	8.0	K= 5.60	11.3	18.8
8	8.0	K= 5.60	11.4	18.9
9	8.0	K= 5.60	7.7	15.5
10	8.0	K= 5.60	7.3	15.1
11	8.0	- - - -	8.0	- - -
12	8.0	K= 5.60	8.5	16.3
13	8.0	- - - -	9.0	- - -
14	8.0	K= 5.60	8.6	16.4
15	8.0	- - - -	9.2	- - -
16	8.0	K= 5.60	10.6	18.3
17	8.0	K= 5.60	7.3	15.1
18	8.0	K= 5.60	7.0	14.8
18A	8.0	K= 5.60	7.1	14.9
19	8.0	- - - -	7.5	- - -
20	8.0	K= 5.60	11.1	18.7
21	8.0	K= 5.60	9.9	17.6
22	8.0	K= 5.60	10.5	18.1
23	8.0	K= 5.60	9.9	17.6
24	8.0	- - - -	10.9	- - -
25	8.0	K= 5.60	11.0	18.6
26	8.0	- - - -	11.6	- - -
27	8.0	K= 5.60	8.7	16.6
28	8.0	K= 5.60	9.3	17.1
29	8.0	K= 5.60	10.7	18.3
30	8.0	K= 5.60	8.7	16.5
31	8.0	K= 5.60	9.3	17.1
32	8.0	K= 5.60	12.5	19.8
33	8.0	- - - -	12.8	- - -

Date: 12/19/1994

JOB TITLE: PERSONNEL BUILDING (WET) .15/2000

NODE TAG	ELEVATION (FT)	NODE TYPE	PRESSURE (PSI)	DISCHARGE (GPM)
34	8.0	- - - -	12.9	- - -
35	8.0	- - - -	13.4	- - -
36	8.0	- - - -	15.3	- - -
37	8.0	- - - -	15.7	- - -
38	8.0	- - - -	20.2	- - -
TOR	8.0	- - - -	33.8	- - -
BOR	1.0	- - - -	40.9	- - -
PTC	-6.0	HOSE STREAM	50.1	500.0
LOOP1	-6.0	- - - -	50.6	- - -
PUG	2.0	- - - -	47.4	- - -
SUP	2.0	- - - -	47.7	- - -
PD	2.0	SOURCE	48.0	961.0

Date: 12/19/1994
JOB TITLE: PERSONNEL BUILDING (WET) .15/2000
PIPE DATA

PIPE TAG END NODES	ELEV. (FT)	NOZ. (K)	PT (PSI)	DISC. (GPM)	Q(GPM) VEL(FPS)	DIA(IN) HW(C) F.L./FT		LENGTH (FT)		PRESS. SUM. (PSI)
Pipe: 1					-15.4	1.104	PL	10.00	PF	0.8
1	8.0	5.6	7.6	15.4	5.2	120	FTG	E	PE	0.0
2	8.0	5.6	8.3	16.2		0.063	TL	12.00	PV	0.2
Pipe: 2					-31.6	1.104	PL	12.00	PF	2.8
2	8.0	5.6	8.3	16.2	10.6	120	FTG	----	PE	0.0
3	8.0	5.6	11.2	18.7		0.236	TL	12.00	PV	0.8
Pipe: 3					-50.3	1.452	PL	3.00	PF	1.6
3	8.0	5.6	11.2	18.7	9.7	120	FTG	T	PE	0.0
33	8.0	0.0	12.8	0.0		0.147	TL	11.00	PV	0.6
Pipe: 4					-18.9	1.104	PL	11.00	PF	1.5
4	8.0	5.6	11.3	18.9	6.3	120	FTG	T	PE	0.0
33	8.0	0.0	12.8	0.0		0.091	TL	16.00	PV	0.3
Pipe: 5					-15.4	1.104	PL	12.33	PF	0.9
5	8.0	5.6	7.5	15.4	5.1	120	FTG	E	PE	0.0
6	8.0	5.6	8.4	16.3		0.062	TL	14.33	PV	0.2
Pipe: 6					-31.6	1.104	PL	12.00	PF	2.8
6	8.0	5.6	8.4	16.3	10.6	120	FTG	----	PE	0.0
7	8.0	5.6	11.3	18.8		0.237	TL	12.00	PV	0.8
Pipe: 7					-50.4	1.452	PL	3.00	PF	1.6
7	8.0	5.6	11.3	18.8	9.8	120	FTG	T	PE	0.0
34	8.0	0.0	12.9	0.0		0.148	TL	11.00	PV	0.6
Pipe: 8					-18.9	1.104	PL	11.00	PF	1.5
8	8.0	5.6	11.4	18.9	6.3	120	FTG	T	PE	0.0
34	8.0	0.0	12.9	0.0		0.092	TL	16.00	PV	0.3
Pipe: 9					-15.5	1.104	PL	2.00	PF	0.3
9	8.0	5.6	7.7	15.5	5.2	120	FTG	E	PE	0.0
11	8.0	0.0	8.0	0.0		0.064	TL	4.00	PV	0.2
Pipe: 10					-15.1	1.104	PL	6.50	PF	0.7
10	8.0	5.6	7.3	15.1	5.1	120	FTG	T	PE	0.0
11	8.0	0.0	8.0	0.0		0.060	TL	11.50	PV	0.2
Pipe: 11					-30.6	1.104	PL	4.75	PF	1.1
11	8.0	0.0	8.0	0.0	10.3	120	FTG	----	PE	0.0
13	8.0	0.0	9.0	0.0		0.223	TL	4.75	PV	0.7
Pipe: 12					-16.3	1.104	PL	2.33	PF	0.5
12	8.0	5.6	8.5	16.3	5.5	120	FTG	T	PE	0.0
13	8.0	0.0	9.0	0.0		0.070	TL	7.33	PV	0.2
Pipe: 13					-47.0	1.452	PL	1.50	PF	0.2
13	8.0	0.0	9.0	0.0	9.1	120	FTG	----	PE	0.0
15	8.0	0.0	9.2	0.0		0.130	TL	1.50	PV	0.6

Date: 12/19/1994
JOB TITLE: PERSONNEL BUILDING (WET) .15/2000
PIPE DATA (cont.)

PIPE TAG END NODES	ELEV. (FT)	NOZ. (K)	PT (PSI)	DISC. (GPM)	Q(GPM) VEL(FPS)	DIA(IN) HW(C) F.L./FT		LENGTH (FT)		PRESS. SUM. (PSI)
Pipe: 14					-16.4	1.104	PL	4.08	PF	0.6
14	8.0	5.6	8.6	16.4	5.5	120	FTG	T	PE	0.0
15	8.0	0.0	9.2	0.0		0.070	TL	9.08	PV	0.2
Pipe: 15					-63.4	1.452	PL	6.33	PF	1.4
15	8.0	0.0	9.2	0.0	12.3	120	FTG	----	PE	0.0
16	8.0	5.6	10.6	18.3		0.226	TL	6.33	PV	1.0
Pipe: 16					-81.6	1.682	PL	7.83	PF	2.8
16	8.0	5.6	10.6	18.3	11.8	120	FTG	T	PE	0.0
35	8.0	0.0	13.4	0.0		0.176	TL	15.83	PV	0.9
Pipe: 17					-15.1	1.104	PL	3.50	PF	0.2
17	8.0	5.6	7.3	15.1	5.1	120	FTG	----	PE	0.0
19	8.0	0.0	7.5	0.0		0.061	TL	3.50	PV	0.2
Pipe: 18					-14.8	1.104	PL	4.00	PF	0.5
18	8.0	5.6	7.0	14.8	5.0	120	FTG	T	PE	0.0
19	8.0	0.0	7.5	0.0		0.058	TL	9.00	PV	0.2
Pipe: 18A					-14.9	1.104	PL	2.50	PF	0.4
18A	8.0	5.6	7.1	14.9	5.0	120	FTG	T	PE	0.0
19	8.0	0.0	7.5	0.0		0.059	TL	7.50	PV	0.2
Pipe: 19					-44.9	1.104	PL	8.00	PF	3.6
19	8.0	0.0	7.5	0.0	15.0	120	FTG	----	PE	0.0
20	8.0	5.6	11.1	18.7		0.452	TL	8.00	PV	1.5
Pipe: 20					-63.6	1.452	PL	2.08	PF	2.3
20	8.0	5.6	11.1	18.7	12.3	120	FTG	T	PE	0.0
35	8.0	0.0	13.4	0.0		0.227	TL	10.08	PV	1.0
Pipe: 21					-17.6	1.104	PL	8.00	PF	0.6
21	8.0	5.6	9.9	17.6	5.9	120	FTG	----	PE	0.0
22	8.0	5.6	10.5	18.1		0.080	TL	8.00	PV	0.2
Pipe: 22					-35.7	1.104	PL	1.25	PF	0.4
22	8.0	5.6	10.5	18.1	12.0	120	FTG	----	PE	0.0
24	8.0	0.0	10.9	0.0		0.297	TL	1.25	PV	1.0
Pipe: 23					-17.6	1.104	PL	5.50	PF	1.0
23	8.0	5.6	9.9	17.6	5.9	120	FTG	ET	PE	0.0
24	8.0	0.0	10.9	0.0		0.080	TL	12.50	PV	0.2
Pipe: 24					-53.3	1.452	PL	4.25	PF	0.7
24	8.0	0.0	10.9	0.0	10.3	120	FTG	----	PE	0.0
26	8.0	0.0	11.6	0.0		0.164	TL	4.25	PV	0.7
Pipe: 25					-18.6	1.104	PL	1.50	PF	0.6
25	8.0	5.6	11.0	18.6	6.2	120	FTG	T	PE	0.0
26	8.0	0.0	11.6	0.0		0.088	TL	6.50	PV	0.3

Date: 12/19/1994
JOB TITLE: PERSONNEL BUILDING (WET) .15/2000
PIPE DATA (cont.)

PIPE TAG END NODES	ELEV. (FT)	NOZ. (K)	PT (PSI)	DISC. (GPM)	Q(GPM) VEL(FPS)	DIA(IN) HW(C) F.L./FT	LENGTH (FT)		PRESS. SUM. (PSI)
Pipe: 26					-71.9	1.452 PL	6.67	PF	4.2
26	8.0	0.0	11.6	0.0	13.9	120 FTG	T	PE	0.0
37	8.0	0.0	15.7	0.0		0.285 TL	14.67	PV	1.3
Pipe: 27					-16.6	1.104 PL	8.00	PF	0.6
27	8.0	5.6	8.7	16.6	5.5	120 FTG	----	PE	0.0
28	8.0	5.6	9.3	17.1		0.071 TL	8.00	PV	0.2
Pipe: 28					-33.6	1.104 PL	5.33	PF	1.4
28	8.0	5.6	9.3	17.1	11.3	120 FTG	----	PE	0.0
29	8.0	5.6	10.7	18.3		0.265 TL	5.33	PV	0.9
Pipe: 29					-52.0	1.104 PL	2.67	PF	4.6
29	8.0	5.6	10.7	18.3	17.4	120 FTG	T	PE	0.0
36	8.0	0.0	15.3	0.0		0.594 TL	7.67	PV	2.0
Pipe: 30					-16.5	1.104 PL	8.00	PF	0.6
30	8.0	5.6	8.7	16.5	5.5	120 FTG	----	PE	0.0
31	8.0	5.6	9.3	17.1		0.071 TL	8.00	PV	0.2
Pipe: 31					-33.6	1.104 PL	12.00	PF	3.2
31	8.0	5.6	9.3	17.1	11.3	120 FTG	----	PE	0.0
32	8.0	5.6	12.5	19.8		0.265 TL	12.00	PV	0.9
Pipe: 32					-53.4	1.452 PL	27.00	PF	7.7
32	8.0	5.6	12.5	19.8	10.3	120 FTG	3ET	PE	0.0
38	8.0	0.0	20.2	0.0		0.164 TL	47.00	PV	0.7
Pipe: 33					-69.2	2.727 PL	8.00	PF	0.1
33	8.0	0.0	12.8	0.0	3.8	120 FTG	----	PE	0.0
34	8.0	0.0	12.9	0.0		0.012 TL	8.00	PV	0.1
Pipe: 34					-138.5	2.727 PL	12.25	PF	0.5
34	8.0	0.0	12.9	0.0	7.6	120 FTG	----	PE	0.0
35	8.0	0.0	13.4	0.0		0.044 TL	12.25	PV	0.4
Pipe: 35					-283.7	2.727 PL	11.00	PF	1.8
35	8.0	0.0	13.4	0.0	15.6	120 FTG	----	PE	0.0
36	8.0	0.0	15.3	0.0		0.168 TL	11.00	PV	1.6
Pipe: 36					-335.7	2.727 PL	2.00	PF	0.5
36	8.0	0.0	15.3	0.0	18.4	120 FTG	----	PE	0.0
37	8.0	0.0	15.7	0.0		0.229 TL	2.00	PV	2.3
Pipe: 37					-407.5	2.727 PL	13.67	PF	4.5
37	8.0	0.0	15.7	0.0	22.4	120 FTG	----	PE	0.0
38	8.0	0.0	20.2	0.0		0.328 TL	13.67	PV	3.4
Pipe: 38					-460.9	2.727 PL	27.00	PF	13.6
38	8.0	0.0	20.2	0.0	25.3	120 FTG	E	PE	0.0
TOR	8.0	0.0	33.8	0.0		0.412 TL	33.00	PV	4.3

Date: 12/19/1994
JOB TITLE: PERSONNEL BUILDING (WET) .15/2000
PIPE DATA (cont.)

PIPE TAG END NODES	ELEV. (FT)	NOZ. (K)	PT (PSI)	DISC. (GPM)	Q(GPM) VEL(FPS)	DIA(IN) HW(C) F.L./FT	LENGTH (FT)		PRESS. SUM. (PSI)
Pipe: 39					-460.9	3.352	PL 7.00	PF	4.1
TOR	8.0	0.0	33.8	0.0	16.8	120	FTG CG	PE	3.0
BOR	1.0	0.0	40.9	0.0		0.151	TL 27.00	PV	1.9
Pipe: 40					-460.9	4.280	PL 104.00	PF	6.2
BOR	1.0	0.0	40.9	0.0	10.3	140	FTG 2ETG	PE	3.0
PTC	-6.0	H.S.	50.1	500.0		0.034	TL 180.00	PV	0.7
Pipe: 41					-960.9	10.520	PL 250.00	PF	0.4
PTC	-6.0	H.S.	50.1	500.0	3.5	140	FTG ----	PE	0.0
LOOP1	-6.0	0.0	50.6	0.0		0.002	TL 250.00	PV	0.1
Pipe: 42					-960.9	12.580	PL 350.00	PF	0.3
LOOP1	-6.0	0.0	50.6	0.0	2.5	140	FTG 2EG	PE	-3.5
PUG	2.0	0.0	47.4	0.0		0.001	TL 448.00	PV	0.0
Pipe: 43					-960.9	8.070	PL 2.50	PF	0.3
PUG	2.0	0.0	47.4	0.0	6.0	120	FTG TG	PE	0.0
SUP	2.0	0.0	47.7	0.0		0.008	TL 41.50	PV	0.2
Pipe: 44					-961.0	8.070	PL 7.50	PF	0.2
SUP	2.0	0.0	47.7	0.0	6.0	120	FTG EG	PE	0.0
PD	2.0	SRCE	48.0	(N/A)		0.008	TL 29.50	PV	0.2

NOTES:

(1) Calculations were performed by the HASS 5.8.0 computer program under license no. 4 C1324C granted by
HRS Systems, Inc.
2193 Ranchwood Dr., N.E.
Atlanta, GA 30345

(2) The system has been balanced to provide an average imbalance at each node of 0.002 gpm and a maximum imbalance at any node of 0.098 gpm.

(3) Velocity pressures are printed for information only, and are not used in balancing the system. Maximum water velocity is 25.3 ft/sec at pipe 38.

Date: 12/19/1994
JOB TITLE: PERSONNEL BUILDING (WET) .15/2000

(4) PIPE FITTINGS TABLE

Pipe Table Name: STANDARD.PIP

PAGE: A MATERIAL: S40 HWC: 120

Diameter (in)	Equivalent Fitting Lengths in Feet							
	E Ell	T Tee	L LngEll	C ChkVlv	B BfyVlv	G GatVlv	A AlmChk	D DPVlv

PAGE: D MATERIAL: DIRON HWC: 140

Diameter (in)	Equivalent Fitting Lengths in Feet					
	E Ell	T Tee	L LngEll	C ChkVlv	B BfyVlv	G GatVlv
4.280	18.00	36.00	11.00	39.00	22.00	4.00
10.520	35.00	80.00	26.00	88.00	30.00	8.00
12.580	44.00	97.00	29.00	105.00	34.00	10.00

RECEIVED
DEC 23 1994
IEPA-DLPC

RECEIVED
DEC 24 1994
IEPA-DLPC

GRINNELL
HYDRAULIC DESIGN INFORMATION SHEET

NAME CHEMICAL WASTE MANAGEMENT / CLEAN HARBORS DATE 12/20/94
LOCATION 11700 STONY ISLAND, CHICAGO, IL
BUILDING UNDERGROUND FOAM CONCENTRATE LINE SYSTEM NO.
CONTRACTOR GRINNELL FIRE PROTECTION CONTRACT NO.
CALCULATED BY T. WALL DRAWING NO. FP3
CONSTRUCTION: ☐ COMBUSTIBLE ☒ NON-COMBUSTIBLE CEILING HEIGHT ____ FT.
OCCUPANCY
APPROVING AUTHORITIES ILL ENVIRONMENTAL PROTECTION AGENCY / CHICAGO FIRE DEPT.

SYSTEM DESIGN

☐ NFPA. 13: ☐ LT. HAZ. ORD. HAZ. GP. ☐ 1 ☐ 2 ☐ 3 ☐ EX. HAZ.
☐ NFPA 231 ☐ NFPA 231C: FIGURE ____; CURVE ____
☐ OTHER (Specify)
☐ SPECIFIC RULING ____ MADE BY ____ DATE ____

AREA OF SPRINKLER OPERATION
DENSITY
AREA PER SPRINKLER
HOSE ALLOWANCE GPM: INSIDE
HOSE ALLOWANCE GPM: OUTSIDE
RACK SPRINKLER ALLOWANCE

SYSTEM TYPE
☐ WET ☐ DRY ☐ DELUGE ☐ PRE-ACTION

SPRINKLER OR NOZZLE
MAKE ____ MODEL ____
SIZE ____ K-FACTOR ____
TEMPERATURE RATING

CALCULATION SUMMARY
GPM REQUIRED ____ PSI REQUIRED ____ (Specify Location)
"C" FACTOR USED: OVERHEAD ____ UNDERGROUND ____

WATER SUPPLY

~~WATER FLOW TEST~~
~~DATE & TIME~~
~~STATIC PSI~~
~~RESIDUAL PSI~~
~~GPM FLOWING~~
~~ELEVATION~~

PUMP DATA
RATED CAPACITY 1500
AT PSI 125
ELEVATION 2'-0"

TANK OR RESERVOIR
CAPACITY 350,000 GAL
ELEVATION 0'-0"

~~WELL~~
~~PROOF FLOW ____ GPM~~

LOCATION WEST PUMP HOUSE
SOURCE OF INFORMATION

COMMODITY STORAGE

COMMODITY ____ CLASS ____ LOCATION ____
STORAGE HEIGHT ____ AREA ____ AISLE WIDTH ____
STORAGE METHOD: SOLID PILED ____ % PALLETIZED ____ % RACK ____ %

RACK

☐ SINGLE ROW ☐ CONVENTIONAL PALLET ☐ AUTOMATIC STORAGE ☐ ENCAPSULATED
☐ DOUBLE ROW ☐ SLAVE PALLET ☐ SOLID SHELVING ☐ NON-ENCAPSULATED
☐ MULTIPLE ROW ☐ OPEN

FLUE SPACING IN INCHES
LONGITUDINAL ____ TRANSVERSE ____

CLEARANCE FROM TOP OF STORAGE TO CEILING
____ FT. ____ IN.

HORIZONTAL BARRIERS PROVIDED

GRINNELL

CONTRACT NO. _____ SHEET NO 1 OF 2

NAME CHEMICAL WASTE MANAGEMENT DATE 12/20/94

LOCATION CONTAINER HANDLING DOCK – FOAM CONC. PIPING

NOZZLE TYPE & LOCATION	FLOW IN G.P.M.	PIPE SIZE	FITTING & DEVICES	PIPE EQUIV. LENGTH	FRICTION LOSS P.S.I./FT	REQUIRED P.S.I.	HYD. REF. PT ⬡	ELEV.	NOTES
AT	Q			LGTH. 2		PT 70.00	A	3	AT IBLP
			C-9	FTG. 13		PF 2.70			
14BP	Q 47	1½	E-4	TOT. 15	.18	PE .43			
(1572)	Q ↓		4E-20	LGTH. 160		PT 73.13	B	2	
			T-10	FTG. 30		PF 20.90			
	Q 47	2		TOT. 190	.11	PE 3.46			
FOR HOSE (750)	Q 23		3G-3C-19	LGTH. 250		PT 97.49	C	-6	
			2T-24	FTG. 82		PF 46.48			
	Q 70	2½	6E-36	TOT. 332	.14	PE- 3.46			
	Q			LGTH.		PT 140.51	D	2	AT PUMP DISCHARGE
				FTG.		PF			
	Q			TOT.		PE			
	Q			LGTH.		PT			
				FTG.		PF			
	Q			TOT.		PE			
	Q FOAM PUMP DISCHARGES			LGTH.		PT		100 GPM	
				FTG.		PF			
	Q			TOT.		PE		@ 200 PSI	
	Q			LGTH.		PT			
				FTG.		PF			
	Q			TOT.		PE			
	Q			LGTH.		PT			
				FTG.		PF			
	Q			TOT.		PE			
	Q			LGTH.		PT			
				FTG.		PF			
	Q			TOT.		PE			
	Q			LGTH.		PT			
				FTG.		PF			
	Q			TOT.		PE			
	Q			LGTH.		PT			
				FTG.		PF			
	Q			TOT.		PE			
	Q			LGTH.		PT			
				FTG.		PF			
	Q			TOT.		PE			
	Q			LGTH.		PT			
				FTG.		PF			
	Q			TOT.		PE			
	Q			LGTH		PT			
				FTG.		PF			
	Q			TOT.		PE			
	Q			LGTH.		PT			
				FTG.		PF			
	Q			TOT.		PE			
	Q			LGTH.		PT			
				FTG.		PF			
	Q			TOT.		PE			
	Q			LGTH.		PT			
				FTG.		PF			
	Q			TOT.		PE			
						PT			

GRINNELL

CONTRACT NO. _____ SHEET NO 2 OF 2

NAME CHEMICAL WASTE MANAGEMENT DATE 12/20/92

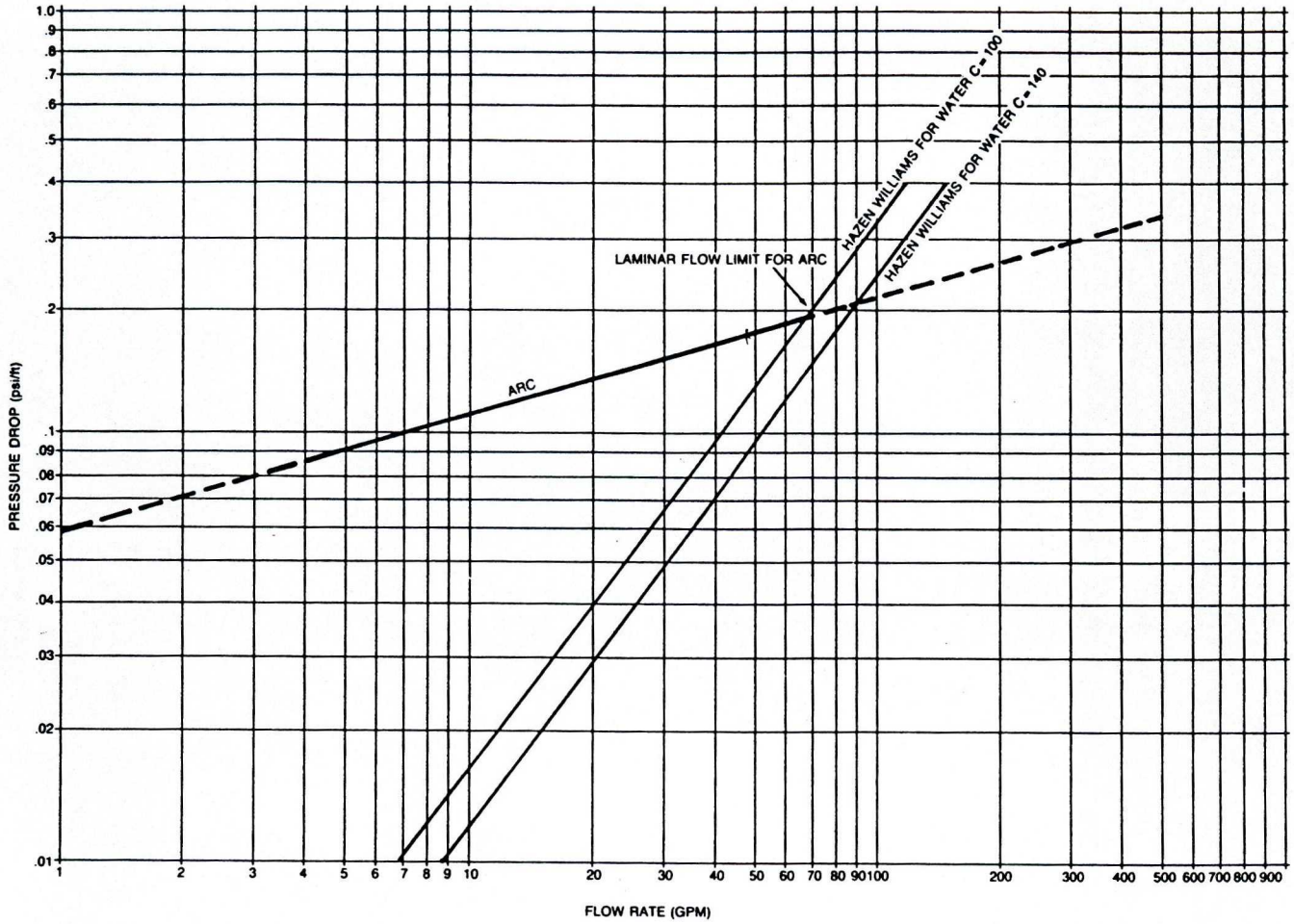
LOCATION MONITOR NOZZLES - FOAM CONC. PIPING

NOZZLE TYPE & LOCATION	FLOW IN G.P.M.	PIPE SIZE	FITTING & DEVICES	PIPE EQUIV. LENGTH	FRICTION LOSS P.S.I./FT	REQUIRED P.S.I.	HYD. REF. PT ⬡	ELEV.	NOTES
AT ILBP	Q			LGTH. 2		PT 110.00	E	3	AT JBLP
		1½	C-9	FTG. 13	.16	PF 2.40			
(1000 GPM)	Q 30		E-4	TOT. 15		PE .87			
	Q		6E-30	LGTH. 195		PT 113.27	F	1	
		2		FTG. 30	.096	PF 21.60			
	Q 30			TOT. 225		PE 3.03			
PICK UP	Q 30		26-2	LGTH. 130		PT 137.90	G	-6	
		2½	C-19	FTG. 51	.087	PF 15.75			
(2000 GPM)	Q 60		5E-30	TOT. 181		PE -3.46			
	Q			LGTH.		PT 150.19	D	2	AT PUMP DISCHARGE
				FTG.		PF			
	Q			TOT.		PE			
	Q			LGTH.		PT			
				FTG.		PF			
	Q			TOT.		PE			
	Q			LGTH.		PT			
				FTG.		PF			
	Q			TOT.		PE			
	Q			LGTH.		PT			
				FTG.		PF			
	Q			TOT.		PE			
	Q			LGTH.		PT			
				FTG.		PF			
	Q			TOT.		PE			
	Q			LGTH.		PT			
				FTG.		PF			
	Q			TOT.		PE			
	Q			LGTH.		PT			
				FTG.		PF			
	Q			TOT.		PE			
	Q			LGTH.		PT			
				FTG.		PF			
	Q			TOT.		PE			
	Q			LGTH.		PT			
				FTG.		PF			
	Q			TOT.		PE			
	Q			LGTH.		PT			
				FTG.		PF			
	Q			TOT.		PE			
	Q			LGTH.		PT			
				FTG.		PF			
	Q			TOT.		PE			
	Q			LGTH.		PT			
				FTG.		PF			
	Q			TOT.		PE			
	Q			LGTH.		PT			
				FTG.		PF			
	Q			TOT.		PE			
	Q			LGTH.		PT			
				FTG.		PF			
	Q			TOT.		PE			
						PT			

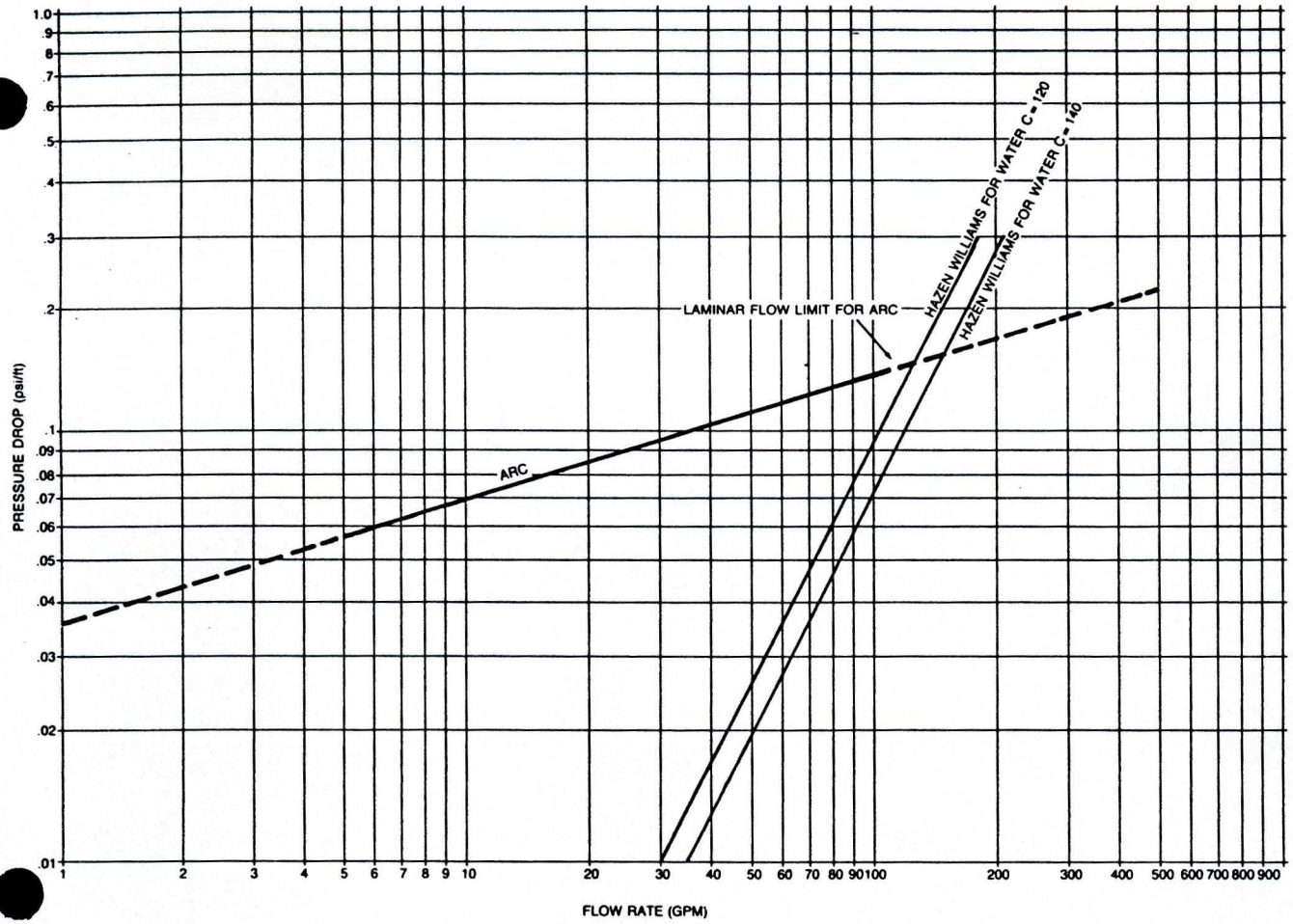
ANSUL®

FRICTION LOSS DATA FOR ANSULITE® ARC (Alcohol Resistant Concentrate)

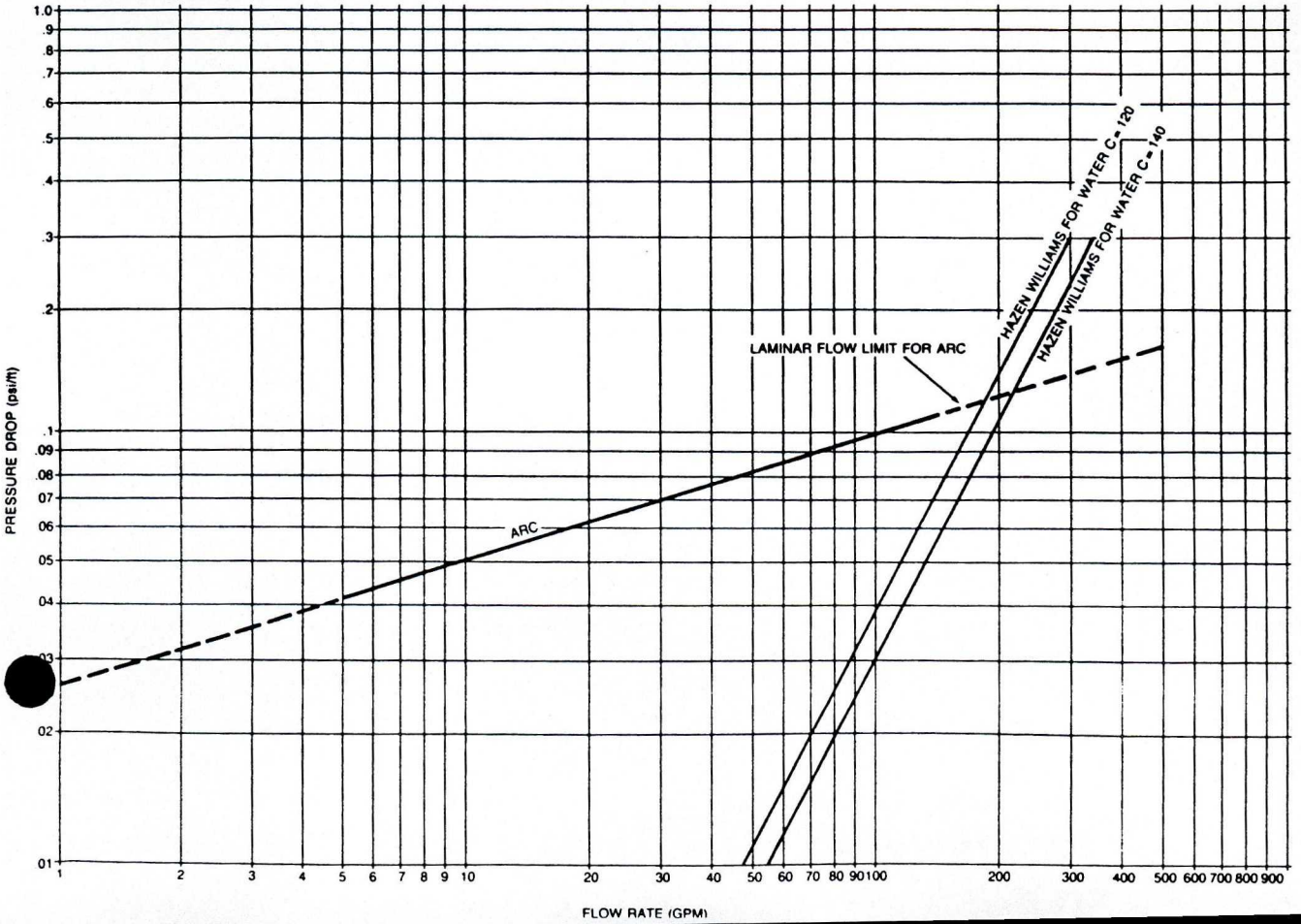
PRESSURE DROP VS. FLOW RATE 1 1/2 IN. SCHEDULE 40 PIPE



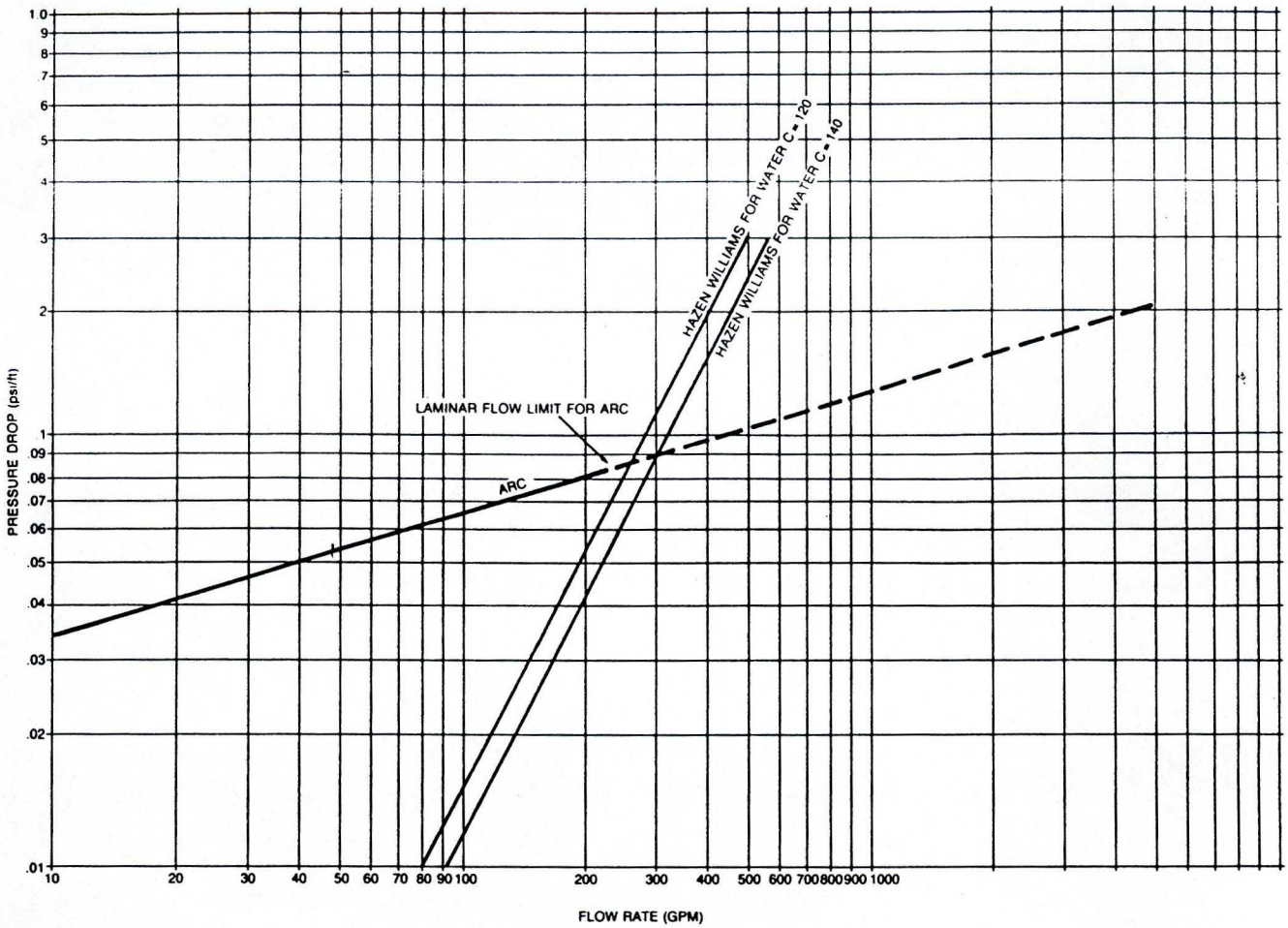
PRESSURE DROP VS. FLOW RATE 2 IN. SCHEDULE 40 PIPE



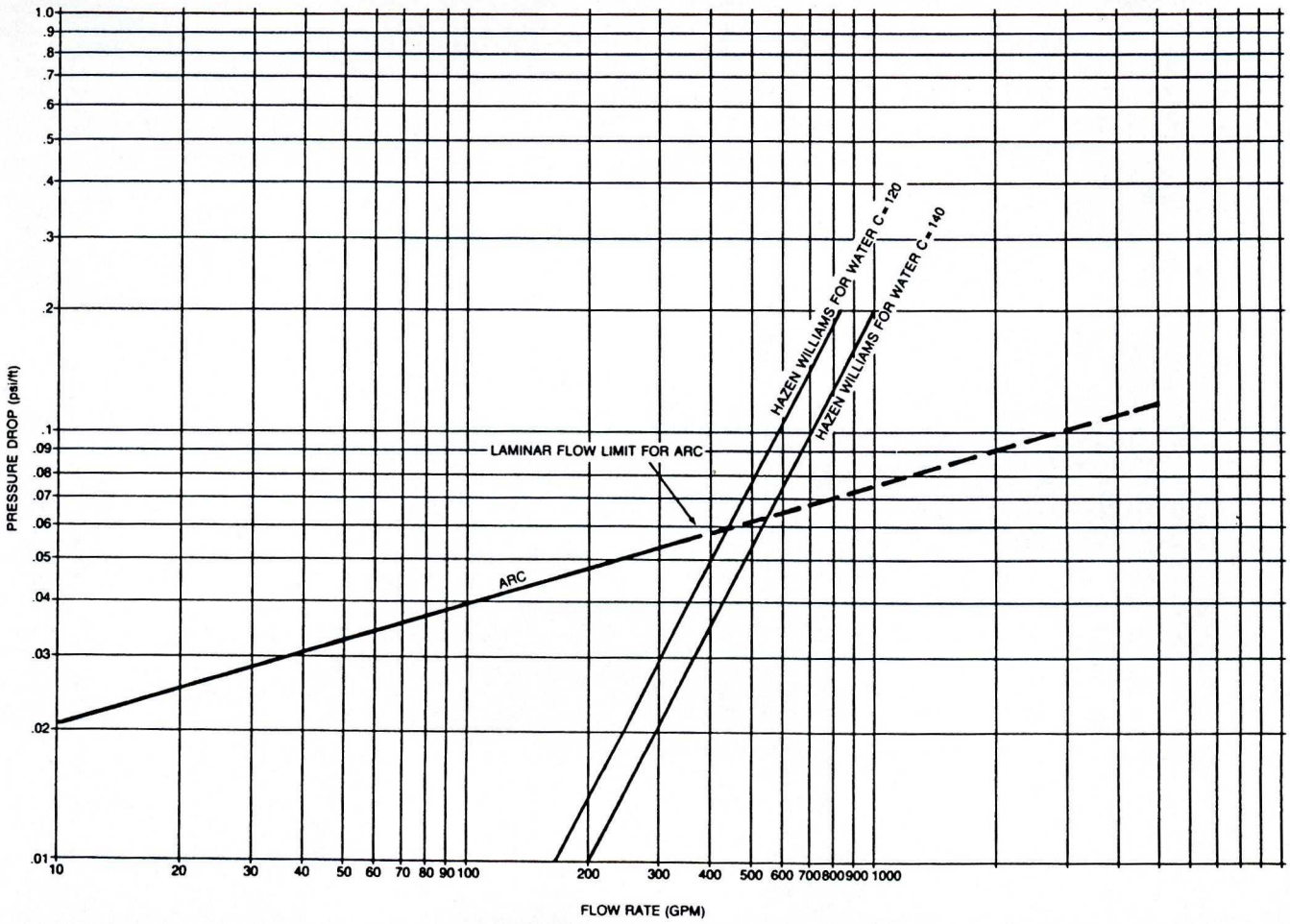
PRESSURE DROP VS. FLOW RATE 2 1/2 IN. SCHEDULE 40 PIPE



PRESSURE DROP VS. FLOW RATE 3 IN. SCHEDULE 40 PIPE



PRESSURE DROP VS. FLOW RATE 4 IN. SCHEDULE 40 PIPE



USEPA

State of Illinois
ENVIRONMENTAL PROTECTION AGENCY

Mary A. Gade, Director

2200 Churchill Road, Springfield, IL 62794-9276

April 12, 1995

Mr. Paul A. Ahearn
Manager, Regulatory Compliance
Clean Harbors Environmental Services, Inc.
1200 Crown Colony Drive
P.O. Box 9137
Quincy, MA 02269-9137

0316000051 -- Cook County
Clean Harbors, Inc.
Log No. B-16-M-2
RCRA Permit File

Dear Mr. Ahearn:

The Agency received comments on the Fire Suppression System from Chuck March & Associates dated March 24, 1995. A copy of these comments are attached to this letter.

As indicated in Attachment D to the Draft RCRA Permit, the design of the system must be approved by the Agency prior to construction, and the system must be operational before CHCI can place ignitable wastes in the units covered by system.

If you have any questions regarding this letter, please feel free to call Rob Watson, P.E. at 217-524-3265.

Sincerely,

Harry A. Chappel, P.E.
Hazardous Waste Branch Manager
Permit Section, Bureau of Land

HAC:WRW

ATTACHMENT

cc: Matt Dunn, IAG
George Hamper, USEPA, Region V
Tony Martig, USEPA, Region V (SP-14J)

RECEIVED
APR 18 1995
PCB CONTROL SECTION
US EPA, REGION V

Printed on Recycled Paper

C. MARCH & ASSOCIATES, INC.

413 South Catherine Avenue • LaGrange, IL 60525-6311 • (708)352-3211 • FAX (708)352-3701

March 24, 1995

RECEIVED
MAR 31 1995
PERMIT SECTION

Mr. Rob Watson
Illinois Environmental Protection Agency
Division of Land Pollution Control
2200 Churchill Road
P.O. Box 19276
Springfield, IL 62794

RE: Clean Harbors of Chicago, Inc. Fire Suppression Drawings and Specifications Scope Review

Dear Mr. Watson:

As requested, we have completed a review of the following documents, to determine if the proposed systems for the new Clean Harbor site meet the intent of the required fire protection for the former Chemical Waste Management site, as presented in the Design Basis Document for that project dated January 22, 1992. This review is only conducted to identify proposed systems that are not consistent with the requirements of the Phase II fire protection program, and other program oriented documents as referenced in this letter. This review is not intended to be a comprehensive code compliance analysis. For your benefit, any obvious discrepancies or code violations will be noted. Approval of these drawings is still subject to the requirements of the officials of the City of Chicago.

REFERENCE DOCUMENTS

The following documents were used in reference in review of this submittal:

DRAWING NUMBER / DOCUMENT	REVISION	DATED
Cover	2	12/14/94
FP1	6	12/14/94
FP2	5	12/14/94
FP3	5	12/14/94
FP4	3	12/14/94
FP5	3	12/14/94
FP6	3	12/14/94
FP7	4	12/14/94
FP8	4	12/14/94

DRAWING NUMBER / DOCUMENT	REVISION	DATED
FP9	4	12/14/94
FP10	3	12/14/94
FP11	2	12/14/94
FP12	3	12/14/94
FP1-E2	2	12/14/94
FP2-E	2	12/14/94
FP3-E	2	12/14/94
FP4-E	2	12/14/94
FP5-3	3	12/14/94
FP6-E	2	12/14/94
FP7-E	2	12/14/94
FP8-E	2	12/14/94
FP9-E	2	12/14/94
FP10-E	2	12/14/94
Specifications Pages 1 through 14	5	12/20/94
Drawing No. SK-1, dated 3/4/92		3/4/92
Hydraulic Calculations, Fuel Blending Operation		12/19/94
Hydraulic Calculations, Container Handling Bldg.		12/18/94
Hydraulic Calculations, Container Management Bldg.		12/18/94
Hydraulic Calculations, Utilities Building		12/19/94
Hydraulic Calculations, Rail Car Unloading Canopy		12/19/94
Hydraulic Calculations, Tank Farm West		12/19/94
Hydraulic Calculations, Tank Farm East		12/19/94
Hydraulic Calculations, Ignitable Container Mgmt. Bldg.		12/19/94
Hydraulic Calculations, Personnel Building		12/19/94

DRAWING NUMBER / DOCUMENT	REVISION	DATED
Hydraulic Calculations, Underground Foam Concentrate		12/20/94
Olympic Engineering Letter by: J. Singh		12/21/94
Automatic and Manual Water Based Fixed Fire Suppression System Design Basis Document for Phase II Fire Protection, C.W.M. Chemical Services, Inc. at the Chicago Incinerator		1/22/92
Professional Loss Control, Inc. Letter by L. Paul Herman Review of Phase II Fire Protection Plan		7/27/93
CWM Chemical Services, Inc. Letter by Jim Doyle, responding to 1/27/93 PLC letter.		3/18/93
Illinois EPA Letter by James A. Janssen regarding Fire Protection and Prevention Issues		6/01/93
Phase II Fire Protection System HAZOP Data Sheets for Nodes 001-008		6/07/93 - 6/09/93
C. March & Associates, Inc. Letter by C. March regarding Review of Fire Suppression Submittal		08/29/94
C. March & Associates Letter by C. March regarding Review Status		02/14/95
Gage-Babcock & Associates, Inc. Letter by Gerald Schultz Response to February 14, 1995 letter		02/28/95

COMMENTS

1. No hydraulic calculations were provided to verify the densities for the existing suppression systems in the truck unloading platform (area 15) and the laboratory building (area 8) as called for in the project specification.

2. The documentation provided did show that the monitor nozzles protecting the truck staging area (area 59) can cover all parking locations. The contractor should identify the range and flow of the monitor nozzles, showing the area of coverage on a drawing. Provide hydraulic calculations to verify the pressures available at the nozzle, accounting for all losses including the hydrant or other supply piping, as well as the monitor arm. The contractor should verify all the areas of the truck staging area can be reached by at least one monitor nozzle.

3. The submittal indicates that the new fire pump in the east pump house is to be based on the design by Techknow Consultants as shown on Drawing SK-1. The contractor did not, however, address the comments in the PLC letter of 1/27/93 regarding the fire pump design. Also, no details were provided for the sprinklers called out to be installed in the building on Drawing SK-1. The contractor should provide the necessary sprinkler system documentation, and address the comments on the reference Drawing SK-1 from the PLC letter.

4. The calculations submitted by Grinnell have modeled fire pump as a municipal water supply, and not as a fire pump supply. Since the pressure available from a fire pump in excess of its rated capacity (1500 gpm in this case) drops off rapidly, the technique used by Grinnell is not accurate for those systems that flow in excess of 1500 gpm. Therefore, the calculations for the fuel blending, the container handling dock, and the ignitable container management building are not correct. Also, all calculations should be run to show the actual flow in a building, at the total available water supply. This calculation is necessary to verify the actual foam flow requirement for each individual hazard. Foam concentrate supply calculations should be revised as necessary, to reflect the actual foam concentrate flow requirements with the sprinkler systems flowing at their maximum demand.

5. The central foam pumping system, consisting of the 4,000 gal. foam concentrate tank and a 100 gpm at 200 psi foam concentrate pump is consistent with earlier site designs. However, no calculations have been provided to verify the capacity of the system. Since the means of protection have changed in several buildings, and the use of monitor nozzles has also changed, calculations should be provided to show that sufficient foam pressure and volume is available at each ILBP under all operating conditions.

The calculations should confirm the foam equipment design for the worst case operating scenarios for each foam water system. The design requiring the highest foam pressure is determined with both fire pumps running, maximum city pressure, and one sprinkler flowing in a pre-action system. The worst case condition for flow would be both fire pumps running, maximum city pressure and the maximum design area for the largest building. The calculations should also verify the manufacturer's recommendation for foam pressure in excess of available water pressure are met at each ILBP.

The maximum foam concentrate storage capacity is based on the required operating time for either the building systems, and/or the monitor nozzles. Operating time should be provided as discussed in the Phase II Fire Protection Design Basis Document, NFPA 30, Factory Mutual Guidelines, Equipment Manufacturer's Recommendations, and/or City of Chicago Requirements. Total concentrate storage capacity should be based on the highest flow rate for the maximum duration system.

The calculations provided by Grinnell in their response indicate that the flow and capacity of the foam systems is based on four monitor nozzles of 500 gpm each flowing. This calculation is not adequate, since the actual flow of the monitor nozzles anticipated at the available water pressure should be used to determine the required capacity and flow rate. Insufficient details have been provided regarding the monitor nozzles, piping arrangements, and calculated flow rates at available flows and pressures. This information should be provided.

6. The fire alarm system drawings still do not indicate the available stand-by operation time. Grinnell indicates these calculations will be provided with the shop drawings.

7. Clean Harbors has not yet resolved the actual design density to be used for the foam water system for the railcar canopy, tank farm systems, and truck unloading area. Minimum design densities would also need to be reviewed for those systems using 17/32" orifice sprinklers. This work is still under review by Clean Harbors. Once the densities are established, revised hydraulic calculations must be provided.

8. The contractor should verify that the wafer check valve used in the single riser foam water systems, such as that shown on sheet FP-5, would not likely impact the straight run requirement upstream of the proportioner.

9. The contractor has indicated they will provide additional submittal information on the type of pipe and various other devices.

The preceding comments relate to the system design work as shown on the submitted documents. For your reference, additional fire protection issues that apply to the site, are still applicable, however are beyond the scope of this fire suppression and detection system design submittal. These issues include: periodic testing; fire protection impairment plans; tank inspection practices; fire pump and foam system annual testing; tank level inspection; motorized valve operation testing; testing of monitors; annual testing of Halon systems; coordination with the Chicago Fire Department and building construction approval. These items were addressed in Illinois EPA letters and the Phase II Fire Protection HAZOP. If you have any further questions, please feel free to contact me.

Sincerely,

C. MARCH & ASSOCIATES, INC.

Charles J. March, P.E.
Principal Engineer

CJM:lem
REF:DATA\IEPACLN.HAR

RECEIVED
APR 28 1995
PCB CONTROL SECTION
US EPA, REGION V