Intermediate
Remedial Design Phase Submittal

U.S. Army
Corps of Engineers

Operable Unit 1, Phase I Design
Claremont Polychemical Corp.
Superfund Site
Old Bethpage, New York

Contract DACW 41-90-D-0009
Delivery Order No. 0002

Volume 1 of 4

Prepared for:

Department of the Army
U.S. Army Engineer District
Kansas City Corps of Engineers
Kansas City, Missouri

February 12, 1993

SEC DONOHUE
Environment & Infrastructure

INTERMEDIATE DESIGN SUBMITTAL
CLAREMONT POLYCHEMICAL CORPORATION SUPERFUND SITE
OPERABLE UNIT 1
OLD BETHPAGE, NEW YORK

February 12, 1993

Prepared for:

U.S. ARMY CORPS OF ENGINEERS
KANSAS CITY DISTRICT
700 FEDERAL BUILDING
601 EAST 12TH STREET
KANSAS CITY, MISSOURI 64106

SEC Donohue Inc.
Environment & Infrastructure
4738 North 40th Street
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SEC DONOHUE RESPONSE TO COMMENTS ON THE
PRELIMINARY REMEDIAL DESIGN SUBMITTAL
OPERABLE UNIT I, PHASE I DESIGN
CLAREMONT POLYCHEMICAL CORPORATION SUPERFUND SITE,
OLD BETHPAGE, NEW YORK

Comments on the Preliminary Remedial Design Submittal were forwarded to SEC Donohue from the U.S. Army Corps of Engineers USEPA Region II, Kansas City and New York Districts, Missouri River Division, and the New York State Department of Environmental Conservation. The responses to these comments are presented by author according to the commentor's numbering system. The author's comments are attached to these responses for reference.

Response to Comments from Dick Kaplan, Remedial Project Manager, USEPA Region II

The process design analysis in the 65% submittal addresses all the comments and questions submitted by Mr. Kaplan relative to the preliminary design memorandum reviewed during the review conference held in Kansas City in November. Specifically the 65% design memorandum is contained in Appendix A in the design analysis. Appendix C contains a listing of equipment and catalog information for pieces of equipment included in the treatment plant .

Responses to comments from Kamal Gupta, Engineer, New York State Department of Environmental Conservation.

3. The units for the cleanup criteria for metals for the building are micrograms per 135 square inches of wiped per sample.

4. Incorporating off-site disposal treatment and disposl into the bid package was discussed during the November review meeting held in Kansas City. Subsequent to that meeting it was decided that incorporation of off-site treatment and disposal should not be included at this time due to the fact that it would be a substantive of change to the record in decision and would require EPA approval prior to such action taken. The operators of the soils treatment unit will be required to meet all applicable admission limitation as set by state or federal regulatory agencies as well as the bid specifications.

5. The design analysis requires that the soil treatment unit achieve a cleanup level for the treated soil of less than 200 micrograms per kilogram. This assumes that the soil is not a record listed waste which is the assumption that we are currently making given the record of decision requirement to replace the soils in the excavated area. The hotspot soils would not be mixed in order to meet the treatment limit but would be allowed to be mixed in order to facilitate processing of the soils through the unit. The treatment

scheme as is proposed in the 65% submittal requires all soil to be treated to a level at less than 200 micrograms per kilogram. A minimum percent removal has not been required since all soil must be treated and the percent removal would not actually be calculated since the influent concentrations in the soil will not be measured.

6. The project currently requires excavation to 3 feet in the areas shown on the drawings except in the area where higher concentrations were detected at SS10 in this location an 8-foot excavation will be required with confirmation sampling.

7. The contents of the pipes in the building have not been included in the requirement for removal of materials inside the building. It is not recommended that the bids specifications require the contractor to remove any fixed hardware from the building as this was originally not envisioned during the RAFS process. Directives from USEPA have indicated that all fixed hardware should be left in the bulding in place. The only containers or vessels that have ever been indicated to be cleaned were the dust collectors.

8. A long-term monitoring and maintenance plan will be developed as part of the Phase II design.

9. The groundwater quality standards referenced have been noted.

10. SEC Donohue has received Form 7619-3 and is in the process of evaluating the information required to complete this form. It has not been included with the 65% package at this time.

11. The U.S. Army Corp of Engineers has indicated that they intend to contract with SEC Donohue to prepare the O&M manual for this treatment facility.

12. The 65% submittal proposes a modest laboratory in the treatment facility to do process control, wet chemistry, and other various tests. It is our understanding at this time that the Nassau County will operate the treatment facility and make arrangement for the required monitoring deemed necessary by the state of New York. The ejection well and extraction wells for CPC that the Bethpage landfill extraction wells will adversely affect any of the wells proposed for the Phase I Design.

13. The predicted groundwater influent concentrations listed in Table 2-11 were estimated according to the note shown at the bottom of the table. Average concentrations were calculated for each extraction well no. 1, 2, and 3 using the data shown in the notes. For example, the average concentration and extraction well no. 1 was assumed to be that concentration which would be extracted from that well by arithmatically averaging the concentrations from monitoring wells 8A, 8B, and 8C.

Response to Comments from Ruth Izraeli, Hydrogeologist, USEPA Region II

1A. Please refer to the 65% Design Analysis for a discussion of the rationale for the location of the extraction wells. Briefly, the rationale for the location of the extraction wells is based on a capture zone analysis performed by SEC Donohue. This analysis suggested that three wells are required to control the contaminant plume based on the best available information as to where that contaminant plume is located, and using conservative estimates on hydraulic characteristics and aquifer thickness as presented in the Design Analysis.

1B. The Design Analysis provides clarification on the location of the contaminant plume. The design capture zone is estimated to control the width of the plume which is currently projected to be approximately 1,000 feet. This estimate is based upon the data presented in the RI/FS and the ROD. The projected extraction and treatment system is not sized to treat more water than is deemed necessary to provide hydraulic control over the contaminant plume.

1C. Chemistry data for the deeper portions of the aquifer in the extraction well area is not available. All of the existing monitoring wells near the extraction well locations were sampled during the predesign investigation. The extraction wells are designed to control contamination migrating away from the site. Wells further downgradient will be needed in the Phase II work to control that portion of the aquifer.

2. We agree that the groundwater treatment facility needs to be flexible, recognizing that the influent concentrations are very difficult to project. The flexibility inherent in the design of the treatment plant is discussed in the 65% Design Analysis.

3. Calculations and supporting documentation referred to in this comment are included in the 65% Design Analysis.

4. The capture zone analysis performed for locating the injection and extraction wells considered the relative effects that these wells may have on each other. The spacing presented in the 65% Design Analysis will address the requirements to locate the injection wells far enough away from the extraction wells to dissipate interacting effects.

5. The issue of long-term monitoring and target cleanup levels is discussed in the 65% Design Analysis.

6. A reference for Kinzelbach and Rausch is provided in the 65% submittal.

7. The text does state that monitoring wells will need to be installed to monitor the effectiveness of PCE removal. This activity is within the scope of the Phase II Design work to be performed by others.

8. The reference to separate phase will be removed from the Design Analysis.

9. We do not anticipate testing will be required for any extraction or injection system components at this time. Please refer to the 65% Design Analysis.

10. A better definition of the CPC groundwater plume and the evaluation of the impact of the Bethpage landfill extraction wells on capture zones will likely be included in the Phase II Design scope of work.

11. Please see the notes shown at the bottom of the table for an explanation of how the predicted groundwater influent concentrations listed in Table 2-11 were estimated.

Comments by William A. Lee, ED-GE, USACE, Kansas City District

3. The units for the building cleanup goals are micrograms per 135 square inches wiped per sample.

4. The water treatment facility will be built over the existing spill area after soils remediation is completed. There is a specification that will require that structural backfill standards be met, and the contractor will be responsible for assuring that any treated soil placed back into the excavation complies with the required specification.

5. Agreed.

6. The soil pile referred to in the comment will be graded during general site grading and will likely be done prior to freezing conditions.

7. We agree the word "removal" should be deleted.

8. The 65% Design Analysis will clarify the scale for the capture zone figures previously shown as Figures 2-4 and 2-5.

9. Agreed.

Comments by Boese, ED-GN, USACE

26. The 65% Design Analysis for the soil treatment indicates that the treated soil may be placed back into the excavation. However, the contractor will be responsible for assuring that the soil meets the specifications required by a structural backfill specification.

27. Blending to achieve a more uniform contaminant concentration is performed to facilitate treatment of the soil and is common practice for soils remediation projects.

28. All of the unresolved or key issues have been resolved as reflected in the 65% submittal.

29. The exterior walls of the building have never been planned for decontamination. The interior walls will be decontaminated as specified in the 65% submittal.

30. This will be clarified in the 65% submittal.

31. The reference to a second transformer in the calculation page in Appendix B is incorrect. Only one transformer exists at the site.

Comments from the Construction Division, U.S. Army Corps of Engineers, New York District

1. The specifications will include a requirement that the contractor backfill with material suitable as structural fill.

2. Agreed.

3. Agreed.

4. Agreed.

Comments from D. Bass, MRDEPTGG, USACE

7. Option 2 was selected for location of the treatment plant.

8. The injection wells will be installed during construction of Phase I. Additional injection wells may be required during Phase II. The downgradient part of the plume will be defined during Phase II.

9. Treatment will continue until the aquifer cleanup goals are achieved as defined in the operations plan for the treatment facility. The sentence referenced in the comment was from the Record of Decision.

10. One hundred thirty (130) gallons per minute is the production rate for each well.

11. The extraction wells are not being designed for significant increases in production should one of the wells be shut down. A temporary shutdown of one of the wells was discussed during the 35% design review. It was determined that temporarily taking one of the extraction wells off line would not present a problem as long as it was not for an extended period of time. Any reduced capacity of the wells over time would be handled by either installing new wells or refurbishing existing wells. The injection wells have been located to the east of the site, a sufficient distance to minimize recirculation of any injected groundwater.

12. The injection wells are proposed to the east of the site to be consistent with the ROD and the RI/FS.

13. Wells installed during this phase for extraction of groundwater are intended to control groundwater across the entire depth of the aquifer. Phase II design will investigate horizontal and vertical extent of contamination in other areas not previously investigated.

14. Agreed.

15. See response to No. 13. Some of this uncertainty will be addressed during the Phase II design.

16. Contacts with the New York State DEC have indicated that storage of treated effluent will not be required and that no permits are required for injection of treated water if it is treated to drinking water standards. This issue is discussed in the 65% Design Analysis.

Comments from Krista McGowan, ED-GH, USACE

28. Agreed.

29. Agreed.

30. Agreed.

31. Cubic yards of soil.

32. Agreed.

33. We are referring to the size of the hose and/or the nozzle used to direct the flow of steam.

34. Agreed. The sentence will be rephrased for the next submittal.

35. Trash means municipal waste; rubble implies construction waste.

36. Agreed.

37. Agreed.

38. Agreed.

39. Agreed.

40. Agreed.

41. Present design flow for extraction wells is 390 gallons per minute. The injection system will be designed to accommodate this flow.

42. Agreed. There is no evidence of this at CPC.

43. Agreed.

44. Agreed.

45. Agreed.

46. Agreed.

47. Agreed.

48. So noted.

RP/CPC65RDN/AE0

REVIEW COMMENTS

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION II
26 FEDERAL PLAZA, ROOM 2930
NEW YORK, NEW YORK 10278
FACSIMILE #: (212) 264-6607

Repeat 12/10/92
3:10 PM EST

FACSIMILE COVER SHEET

ADDRESSEE: Tom Urbaniak / U.S. ACE - Kansas City

OFFICE/PHONE: 816-426-5832 x-3026
FAX " " -5949

FROM: R. Kaplan

PHONE: 212-264-3819
FAX " " -6607

DATE: 12/10/92

OF PAGES: 6 (including cover sheet)

COMMENTS: Re - Claremont Polychem
Please!

Am transmitting a copy of Donohue's Prel. Design Memorandum - which we rec'd @ the 11/23 mtg - with my comments thereon. (I apologize for not getting them to you sooner - actually put them together on the flight home - but I have literally been buried w/ paperwork since getting back to N.Y.)

I think this is an extremely important document giving a very useful summary of the process equipment and their design bases. It should have been included in the 35% report ideally, even though incomplete. Would like Donohue to address comments and add'l info. as required. It should be resubmitted to us, along with Process Flow Diags. and a typical Eng. Flow Diag. (P&I) as promised, before the next report. Still working on getting my comments on 35% report to you - will do ASAP.

PLEASE NUMBER ALL PAGES

KK
11/23/92

CLAREMONT POLYCHEMICAL CORPORATION

PRELIMINARY DESIGN MEMORANDUM

Extraction Well System

No. of Units	3
Type	Submersible
Normal Capacity (GPM); TDH* (Ft.) (156 gpm-Des.)	130;
Horsepower	7.5;

Design Influent Flow

Normal Design Flow (GPM)	390
Peak Flow (Plant Hydraulic Capacity) (GPM) † & Design	468

Equalization Tank - (Locate outside)

No. of Units	1
Volume (Gallons) Normal	59,600 - Total or
Detention Time @ ~~Design~~ Flow (Hours)	2.5
Detention Time @ Peak Flow (Hours)	2.1
Type of Construction	Steel
Physical Dimensions (Feet)	26' Dia. x 15' SWD straight H,O depth
2, Mixing - How? Type & HP.	

Clarifier Feed Pumps (2 oper, plus 1 common spare)

No. of Units	3
Type	Centrifugal
Drive	Variable Speed motor
Capacity (GPM); Ft. H.C.	78 to 234;
Horsepower	5

Clarifiers - (Inside Bldg.)

No. of Units	2 @ 50%
Type	Solids Contact
Surface Overflow Rate (GPD/SF)	397
Diameter (Feet)	30
Nominal SWD (Feet)	12
Collection Mechanism	3 HP Scraper

* TDH = Total Dynamic Head. (To be added for all pumps & blowers)
** Horsepower(s) - estimated motor

Lime Feed System

Shipping Method	10% Lime Slurry
Lime Slurry Storage Tank (Gallons)	5,000
Dosage (mg/L)	100
Lime Slurry Transfer Pump (GPM)	30
Day Tank (Gallons)	600
~~Day Tank Solution Strength (%)~~	~~10~~
Mixing	Top Mounted Mixer, ½ HP
Feed Pump	
No. of Pumps	3
Capacity (gph)	0 to 15
Type	Metering

Polymer Feed System (Flocculant)

Shipping Method	55-Gallon Drum
Polymer Type	Liquid
Feed Pump	
No. of Pumps	3
Capacity (gph)	0 to 15
Type	Metering

Pressure Filter Feed Pumps

No. of Units	3
Type	Centrifugal
Drive	Variable Speed
Capacity (GPM)	78 to 234
Horsepower	5

Pressure Filters

No. of Units	3
Feed Rate (GPM/SF)	2
Surface Area Per Unit (SF)	97.5
Backwash Pump	
No. of Units	1
Type	Centrifugal
Capacity (GPM)	975
Backwash Rate (GPM/SF)	10
Backwash Blower	
No. of Units	1
Type	Positive Displacement
Capacity (SCFM)	390
Backwash Rate (SCFM/SF)	4

Filtered Water Storage Tank - Horizontal or Vertical ?

No. of Units	1
Volume (Gallons) - Open or Total ?	6,000
Detention Time @ Design Flow (Min)	15
Mixing - Purpose	Top Mounted Mixer

Acid Feed System (Neutralization) - Where on PFD? - What Acid

Storage Tank (Gallons) - Why so large? - Basis?	5,000	Matl. of Constr.?
Day Tank (Gallons)	200	Tanks &
Transfer Pump (GPM)	20	Pumps
Feed Pump		
No. of Pumps	2	
Capacity (gph) Des. - 120 gal/Day	0 to 5	
Type	Metering	

Air Strippers Feed Pumps

No. of Units	3 (2 Oper, 1 Common Spare
Type	Centrifugal
Capacity (GPM)	78 to 234
Drive	Variable Speed
Horsepower	5

Air Strippers - Oper. Temp. ?

No. of Units	2
Type of Packing Media ; Matl. of Constr.	2-inch Saddles ;
Air-To-Water Ratio	50
Tower Diameter (Feet) ; Height ; Matl. of Constr.	3.5
Packing Height	40
Airflow Rate (cfm)	1,564
Contaminant Removal Rates	
1,2-DCE (@ 1,047 ug/L) (%)	99.3 99.5
PCE (@ 1,345 ug/L)(%)	99.8 99.6
TCE (@ 2,078 ug/L)(%)	99.7 - 99.75

Design (min.)

Vapor Phase Carbon Adsorbers - Oper. Temp.?

No. of Units	2 in Series (or Parallel)
Carbon Capacity (lbs per unit) - Basis ?	10,000
Diameter (Feet) - "	8

Stripped Water Sump - Horizontal or Vertical ? Matl. of Constr.

No. of Units	1
Volume (Gallons) - Oper. or Total	4,000

Surge Time (or Holding Time) - ?

Air Strippers Effluent Pumps

No. of Units	2
Type	Centrifugal
Drive	Constant
Capacity	468
Horsepower	10

Liquid Phase Carbon Adsorbers

No. of Units	2 Series or Parallel
Carbon Capacity (lbs per unit) - Basis?	20,000
Diameter (Feet) - Basis?	10 - Based on Surface velocity

Treated Water Storage Tank -(Outside of Bldg.)

- Basis? Why so large?

No. of Units	1
Volume (Gallons) - Total or Oper?	59,600
Physical Dimensions (Feet)	26' dia x 15' SWD Sole H$_2$O supply.
Type of Construction	Steel

Clarifier Sludge Pumps

No. of Units	2
Type	Double Diaphragm
Drive	Air Operated - See below,
Capacity (gpm)	30

Sludge Holding/Thickening Tank

Holding Time ≥ Days

No. of Units	1
Volume (Gallons)	8,000
Diameter (Feet)	12
Height (Feet)	12
Collection Mechanism	Scraper

Filter Press Feed Pumps

No. of Units	2
Type	Double Diaphragm
Drive	Air Operated
Capacity (GPM)	30

Where does this come from? Compressor? Blower? To be stored?

Filter Press

No. of Units	2
Type	Recessed Chamber
Filter Cake Capacity (cf)	10
Pressure (psi)	100

RP/CPCS\RDN/AD1

New York State Department of Environmental Conservation
50 Wolf Road, Albany, New York 12233 7010

Thomas C. Jorling
Commissioner

December 8, 1992

12/14/92
Working Copy.

Mr. Dick Kaplan
Eastern NY/Caribbean Section 1
U.S. Environmental Protection Agency
Region 11
26 Federal Plaza
New York, NY 10278

cc: USACE/T. Urbaniak
via FAX DEC/K. Gupta
Comments as noted
RK 12/16
Thanks to K.G.

Re: Claremont Polychemical Site ID No. 130015

Dear Mr. Kaplan:

The New York State Department of Environmental Conservation (NYSDEC) has reviewed the Draft Predesign Investigation Report and Preliminary Remedial Design Submittal and provides the following comments:

Draft Predesign Investigation Report:

OK 1. Table 5-4: The NYS Ambient Water Quality Criteria for Selenium is 10 µg/l. This table should also include standards for magnesium, manganese and iron.

OK 2. Table 5-5: The NYS Ambient Water Quality Criteria for both bis(2-Ethylhexyl) Phthalate and Di-n-Butylphthalate is 50 µg/l.

Preliminary Remedial Design:

OK 3. 1.3.2. Building: The cleanup criteria for metals per wipe sample is given without units. Please specify the units.

F.V. OK per 11/23 mtg. 4. 2.2.2. Treatment Scheme: It is stated that excavated soil will be treated onsite in a mobile low-temperature thermal desorption (LTTD) unit. Since the quantity of soil which needs treatment is significantly lower than originally anticipated at the time of the feasibility studies, it is recommended that the bid document should have options for on-site LTTD and/or off-site treatment and disposal at a RCRA subtitle C facility. It is anticipated that by allowing off-site treatment and disposal significant savings can be achieved.

* Furthermore, can the operator of the LTTD guarantee that a) the contaminated soils will be adequately remedied and b) contaminating off gases will be completely captured and not vented to the ambient air, or at least be within regulated emission rates?

* Believe we were to consider off-site w/ treatment.

** Presumably specification will include appropriate requirements. Don't know what guarantees will be requested/offered; nor liabilities re failure to meet guarantees.

* i.e. - a maximum allowable "outlet concentration". Also, a minimum "% removal" to be specified to cover the case where the inlet concentration is low and it would be too easy to meet the outlet spec. (Per earlier telecon TV, DS, RK).

** However, I don't think it is necessary or desirable to preclude mixing as long as treatment takes place, and requirements of "*" are met.

5. 2.2.2.3. Treatment Design Criteria: The 200 µg/kg is not the treatment target level but rather a guide to establish the excavation limit. The treatment levels for LTTD must be established according to the RCRA Land Disposal Restrictions. In addition, the hot spot soils (S64,000 µg/kg) must not be mixed with the adjacent soil in order to meet the LDR or treatment targets, since dilution is not an acceptable method for meeting the ARARs.

Yes

*

**

6. 2.2.10.1. Volume Estimation: As decided in the meeting of November 23-24, 1992 at Kansas City, the depth limit of excavation shall be 3 feet except in the area of hot spots located at BB-15, SS-10 and SS-8 where the limit will be 8 feet or more as governed by the residual level of PCE less than 200 µg/kg.

OK

7. 2.3. Building Decontamination: The purpose of the building decontamination as correctly stated is to remove all hazardous material from the building, to eliminate potential risks to human health and the environment, and to allow unrestricted future use of the building. The consultant, SEC Donohue, therefore, must ensure that they have identified all areas of the potential source of the hazardous material, and included them in the remedial action. One potential source of hazardous material, the contents of the pipes, was discussed in the meeting of November 23-24, 1992, and therefore must be addressed.

OK

***

8. 2.4.3. Long Term Monitoring and Maintenance Requirements: A long term monitoring and maintenance plan must be an integral part of the remedial design. This section identifies this requirement but does not address it. Please specify at what stage this item will be addressed and ensure that this plan also includes the confirmation monitoring as detailed in section 2.4.8.

Although not set forth in the 4/92 RD Work Plan, are O&M Plan, should be included in the 95% Pre-final Des. Rpt.

9. Table 2-12: This table includes a Potential Effluent Limit for site related compounds based on SDWA MCLs, 6 NYCRR Part 700 to 705 and 10 NYCRR5. According to 6 NYCRR Part 700-705, September 1, 1991, the groundwater quality standards for benzene, arsenic and lead are 0.7, 25, and 25 µg/l, respectively.

Should be Maximum Allowable Concentrations (Effluent

10. Table 2-13: Method of achieving substantive requirements: In order to facilitate the Division of Air, NYSDEC in ensuring that the air stripper meets all the substantive requirements of 6 NYCRR 212, the consultant, SEC Donohue, must complete Form 7619-3 "Process Exhaust or Ventilation System " and submit it with the 65% design document to:

OK

Being sent to V.S.T.E. under separate cover, with Insttr.

Kamal Gupta, P.E.
Project Manager - Claremont Polychemical Site
Room 208, NYSDEC
50 Wolf Road, Albany, NY 12223-7010

There is no fee for this application.

See (p 3) for Equip. outside.

*** Equipment inside Bldg. belongs to Bldg.
1. Contaminated stuff can be disposed of, or cleaned & sold with proceeds to Bankruptcy Court.
2. Non-Contaminated Inventory belongs to Bankruptcy Court.

2.5.11. Unresolved Key Issues:

11. The design consultant, or remedial contractor, or USCOE must draft the O&M Manual since it is an integral part of the remediation. If the USCOE chooses the remedial contractor to perform this task, it should be included in the bidding documents.

O.K. agree(8)

12. The draft proposes that the State's input will be needed for on-site laboratory equipment. NYSDEC will not comment on this proposal, since we opine that unacceptable costs will be generated either for the State or the ultimate receiver of the site, viz., the Town of Oyster Bay.

However, the consultant is free to propose the most efficient means for data collection. Perhaps a cost analysis comparison between the on-site laboratory and off-site analysis at an independent laboratory should be made. Our prediction is that the off-site analysis will be more cost effective. **

If you have any questions, please call me at (518) 457-3976.

Sincerely,

Kamal Gupta/mc

Kamal Gupta
Federal Projects Section
Bureau of Eastern Remedial Action
Div. of Hazardous Waste Remediation

cc: D. Garbarini, USEPA-Region II
W. Lowden, NYSDOH

↑
?

* Re Item (7) on Page 2,
Equip. Outside of Bldg. – Belongs to lessee/maniac leasing who has option to remove non-contaminated equip.

** This should be developed w/the O&M Plan which presumably would include a sampling/analysis program.

DRAFT

RK 11/10/92

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION II

DATE: October 29, 1992

SUBJECT: Hydrogeological Review of the Claremont Polychemical Site Draft Predesign Investigation Report and Preliminary Remedial Design Submittal

FROM: Ruth L. Izraeli, Hydrogeologist
Technical and Pre-Remedial Support Section

TO: Rich Kaplan, Eastern New York/Caribbean Section I

In response to your request for review dated October 15, I have developed the comments which follow. Please note that several volumes of the RI/FS were not available at the time of review. Therefore, I could not evaluate some of the conclusions and analyses in these reports which were incorporated verbatim into the design (for example, the modelling which yielded the 200 ppb PCE "average soil column" cleanup level). In some cases, I have suggested that the contractor verify the direct applicability of these conclusions to the design. If you have any questions concerning these comments, please call me at extension 6687.

Preliminary Remedial Design Submittal

General Comments

1. **Extent of Contamination** - The most basic problem with this design is that significant uncertainties exist regarding the lateral and vertical extent of ground-water contamination, as well as the vertical and horizontal design dimensions of the ground water capture zone. Further, in several instances, specified design dimensions do not appear to correspond to actual or stated dimensions. These problems appear to be due, at least in part, to the use of maps which do not provide sufficient detail to allow precise measurements, or in some cases, the maps are simply not true to scale. To alleviate this problem, all key design assumptions concerning the areal extent of ground water requiring remediation, should be defined by plotting data points, capture zones etc. on accurate maps of an appropriate scale (i.e., no smaller than 1" = 400'). Specific examples of this problem are described below (Please note that this discussion is limited to the Phase 1, or "upgradient" portion of ground-water remediation):

   a. Length of plume - The ROD discusses pumping highly contaminated ground water at the boundary of the site, yet the preliminary design

indicates that the extraction wells will be located about 200 feet downgradient of the property boundary (the site boundary is defined by anywhere there is contamination). There is probably a good reason why the wells were located where they are, however this rationale was not provided. Was there a cutoff concentration that the "upgradient" portion of remediation is targeting; For example, all locations which contain contaminants posing greater than 10-4 excess cancer risk, or all locations where contaminants are over 100 times cleanup goals? The criteria used to locate the extraction wells must be clearly defined. Without clear-cut criteria, it is not possible to evaluated the proposed locations.

b. Width of plume - The preliminary design states that the width of the plume is 1000 feet. My examination of a map outlining the plume in the FS indicates that the plume is about 1300 feet wide. However, Figure 2-5 in the design shows that the capture zone will be over 2100 feet wide. If the scale indicated on Figure 2-5 is accurate, the design capture zone is about over twice as large as the plume of contamination, and the projected extraction and treatment system may be sized to treat **more than 250,000 gpd than is actually necessary.**

To prevent this type of design error, it is necessary to plot site contaminant data (PCE, and any other contaminants if they drive remediation and PCE does not) on an accurate map of appropriate size (i.e., 1" = 400'). Then the plume can be extrapolated using conservative assumptions. The next step would be plotting proposed extraction wells and their calculated capture zones on the map to ensure a "best fit", or minimum total pumping rate which will capture the entire plume.

c. Depth of plume - The preliminary design indicates that the plume extends to "at least 164' BLS. Although the design depths of the extraction wells are not explicitly stated, the report does indicate that the extraction wells will "penetrate only the upper 25 percent of the aquifer". Wells penetrating 25 percent of a 700 foot aquifer's saturated thickness would extend 175 below the water table (about 75 feet BLS), or to a depth of about 250 feet BLS. It is not at all clear why extraction wells are planned to extend to 250' BLS when contamination has only been identified to a depth of 164' BLS. Further, examination of the water quality data (although I was not able to find the well screen depths for a number of wells) suggests that the bulk of contamination does not extend much further than 120 feet BLS.

Before making the final determination of extraction well depths in the 65% design, all key water quality data should be plotted on cross-sections to try and better define the vertical extent of contamination. This exercise may indicate that the contamination below 120 feet does not require any

remediation or that it be adequately addressed by one well as opposed to three. Minimizing the amount of water pumped from depth could significantly decrease the volume of ground water to be pumped and treated, thereby **significantly reducing overall project costs.**

Therefore, the possibility of reducing the depths of most or all of planned extraction wells and installing additional deep wells should be considered. For example, given the significantly lower concentration of contaminants found at depth, it is very likely that the deeper ground-water contamination would be remediated much more quickly than the shallow contamination. This will allow the deeper wells to be shut off many years before the shallow wells can be. Another alternative might be to install the extraction wells in a manner which allows the deeper portion of the screened interval to be readily grouted and sealed off from the shallower portion.

2. **Design Flexibility** - The design of the ground water treatment system includes a brief discussion of the need for design flexibility. However, flexibility is not mentioned with regard to the ground-water extraction system. This is not consistent with EPA's finding that given the limited data typically available to design extraction systems, it is necessary to build sufficient flexibility into the design to allow for system modification based on performance evaluation. Obviously, if the initial system is not performing as planned, it will be necessary to modify the system in order to achieve remedial goals.

Therefore, the need for design flexibility in response to actual field performance must be explicitly provided for in the design. For example, the requirement that system performance is periodically evaluated and changes implemented as necessary, must be a part of the design. Such modifications may include changing pumping rates, shutting off wells, using a "pulsed" pumping schedule, grouting portions of well screens, or installing additional wells. The 65% design must address this need for flexibility.

3. **Calculations and Supporting Documentation** - The RD Workplan states that each design package will include calculations and supporting documentation for the extraction/injection/monitoring wells. Although capture zone modelling and partial penetration effects calculations are referred to in the design, these calculations and model inputs and outputs are not provided in the design package. This appears to be inconsistent with the requirements of the RD Workplan. Due to the critical nature of this information, its submittal should not be delayed until the 65% design and must be submitted to EPA as soon as possible. The calculations and modelling documentation should be complete, include all assumptions, provide the basis for these assumptions (e.g. - RI data, Bethpage modelling input, general reference, etc.), and be fully supported by complete references.

4. **Capture Zone Analysis** - The capture zone analysis must address the potential

effects of the injection wells as well as the Bethpage Landfill extraction system on the calculated capture zones. For example, the recharge wells may decrease the eastern perimeter of the capture zone unless they are located far enough away to dissipate any effect. However, this distance cannot be determined without doing the necessary calculations. In addition, pumping at the Bethpage Landfill was reported to start in February 1992. Operating data from this operation would be invaluable to the Claremont design, and should be evaluated.

Specific Comments

(5) Page 2-5, Long-term monitoring requirements - The report indicates that if the soil excavation is limited to 2 feet, long-term monitoring requirements will need to be more extensive than if the excavation addresses all soils containing over 200 ppb PCE. I am not sure this is correct. If the 200 ppb concentration is intended to be a vertical soil column average and not an absolute cleanup criteria, this conclusion would probably not be valid. Again, the issue regarding target cleanup levels must be resolved.

(6) Page 2-25 -26 - See general comment #3. regarding submittal of all calculations and supporting documentation. I was unable to find any reference by Kinzelbach & Rausch (1990). Please provide a full citation for this reference. If the document is not lengthy, please submit a copy with the model inputs and outputs.

(7) Page 2-26, Long-term monitoring - The text states that monitoring wells will be monitored to gauge the effectiveness of PCE removal. Other contaminants which are present above cleanup levels should also be periodically monitored. In addition to providing water level data, the installation of additional monitoring wells may also be necessary to evaluate the effectiveness of contaminant removal.

(8) Page 2-27 - Schedule Constraints - This discussion addresses the potential effect of NAPLs on cleanup timeframes. The conclusion drawn here that NAPLs can significantly increase cleanup timeframes is correct. However, the applicability of this statement to this design is unclear, since NAPLs have never been identified at the site. Further, since contaminant concentrations decrease markedly with depth and are not found at concentrations approaching 5% of the contaminants' solubilities, DNAPLs are not likely at the site. If the contractor has any other information which suggests DNAPLs are present at the site, it should be provided to EPA for evaluation.

(9) Page 2-28, Durability of Materials - This section states that "physical or chemical materials durability testing may be warranted for certain extraction/injection system design components." Since this testing will require up-front planning and time for implementation, it is necessary to specify the type and extent of testing proposed at this time. The rationale for all testing should also be provided.

(10) Page 2-29 - Unresolved/Key Issues - This list of unresolved issues should include, better definition of ground-water plume dimensions, the utility of pumping the shallow

and deep ground water zones of contamination separately, and the impact of the injection wells and Bethpage Landfill extraction wells on calculated capture zones.

11 Page 2-30, Groundwater Characterization - Please explain how the predicted groundwater influent concentrations listed in Table 2-11 were estimated. Simply stating that the concentrations were estimated based on the results of the latest round of ground water sampling data is not sufficient.

Draft Predesign Investigation Report

General Comments

From conversations with you as well as my reading of the ROD and this report, it is obvious that the definition of a soil cleanup criterion and the depth of excavation necessary to achieve this criterion are not clear. I strongly suggest that these issues are resolved before the current preliminary design document is finalized to provide a clear-cut basis for design.

Map scale - As is discussed above, the maps used to show ground water quality data are not sufficient to allow a determination of plume dimensions.

Specific Comments

Page 5-3 - The report does not indicate what the flow rates of the submersible pumps were. The Region 2 Quality Assurance specifies pumping rates of no greater than 100 ml/min to prevent volatilization of VOCs. Please indicate what the pumping rates during sampling were.

Page 6-2, Conclusions, Spill Area Soils - The ROD states that removal of soil to two feet BLS will achieve an average cleanup level of "much less than 200 PPB" of PCE. From conversations with the former RPM as well as the assumptions provided in the RD work plan, it appears that the 200 ppb cleanup level is not an absolute level, but is meant to be applied as a maximum average concentration as calculated over a vertical soil column. It would be very helpful if this section discussed whether the additional investigation found that vertically-averaged PCE concentrations exceed the 200 ppb criteria.

Page 6-4, item 1 - It is not clear how the volume of soil requiring remediation (1600 cu yds) was calculated here since the preliminary design indicates that excavation depths have not been finalized. Please explain.

cc. Dennis Santella, PSB PRTS
Doug Garbarini, NYCS -I

DRAFT

Comments by William A. Lee, ED-GE, on the Draft Design Investigation Report and the Preliminary Remedial Design Submittal, Operable Unit 1, Phase I Design. Claremont Polychemical Corp. Superfund Site, Old Bethpage, New York.

Item No.	Sheet or Paragraph	Page No.	Comment
1	Predesign Report TABLE 5-4		The Safe Drinking Water Act MCL for Selenium is 50 ug/l.
2	APPENDIX K		In all slug test analysis date, the radius of the casing and well is listed as 10.16 and 20.32, respectively. These are the diameters rather than the radii. K values should be re-calculated accordingly.
3	Remedial Design 1.3.2	1-9	What are the units for the table?
4	2.1.3	2-1	Strength characteristics of the soil may be altered by thermal treatment. If the water treatment plant is to be built on the soil remediation site, the characteristics of the treated soils should be investigated during treatability studies.
5	TABLE 2-3		Near the top of the second page of the table, the phrase "... characteristic hazardous wastes." should be in the third rather than the second column.
6	2.3.10.3	2-19	Frozen soil should not be graded.
7	2.3.10.5	2-19	The second and fourth sentences seem redundant. In the fifth sentence, recommend deleting the word "removal".
8	Figures 2-4 and 2-5.		A comparison of the figures with the drawings indicate that the scale for the figures is about 1:1900 rather than 1:6666 as stated.
9	2.4.11	2-29	In the second sentence, "...exclusion..." should be "...inclusion...".

start here

Claremont Polychemical - Comments on PIR and 35% Design

Num	Name	Office	Page/Sheet	Discipline	Rm/Detail
26	BOESE	ED-GN	DAR PG 2-4	GEO	

How will LTTD alter the physical properties of the treated soil? Will the volume decrease to the extent that additional backfill will be required to fill the excavation? Will the strength be reduced to the point where amendments must be added to the soil to increase the strength?

27 BOESE ED-GN DAR PG 2-5 GEO

First paragraph - This paragraph states that with a DRE of 99% the "hit" of 864000 ug/kg PCE would not be reduced to below the 200 ug/kg target level. The paragraph then says the soil with >200 ug/kg could be blended with other soil to achieve the target level. Is this not dilution? Is this acceptable?

28 BOESE ED-GN DAR PG 2-9 GEO

Paragraph 2.2.12 - It would seem that these Unresolved/Key Issues must be resolved prior to 65% design submittal.

29 BOESE ED-GN DAR APPNDX-B GEO

The calculations for deconning the building walls only takes into account the exterior walls. What about the interior walls? Will these need to be deconned too?

30 BOESE ED-GN DAR APPNDX-B GEO

The calculations for the quantity of asbestos material around the tanks shows a quantity of 24 cubic feet, whereas throughout the DAR the quantity is stated as 24 cubic yards. Please clarify.

31 BOESE ED-GN DAR APPNDX-B GEO

The sheet showing debris in and around building at CPC indicates the presence of 2 transformers. A second transformer has not been mentioned before. Is this other transformer just junk or is it hooked up? Please clarify.

DESIGN ATT	CONSTRUCTIBILITY REVIEW	DATE: 10/30/92	REF. NO. 1160 PAGE NO.	SHEET 1/1
35%				

DESIGNER/AE: SEC Donohue — PROJ MGR (NANCO/NAVFAC): C. Lyonberis.

PROJECT TITLE/DESCRIPTION: Operable Unit 1, phase I design - Claremont Polychemical Corp. Superfund Site. — PROJECT LOCATION: Old Bethpage, N.Y.

REVIEW AGENT: QAS/CONST.DIV./USAED,NY — REVIEWER: Guy Jean Baptiste P.E. — DISCIPLINE: Civ. Eng.

NO.	DWG/SPEC NO.	COMMENTS	DESIGNER REPLY AND ACTION TAKEN
1	#2.3	2.2.2 Treatment scheme. "Treated soil will be backfilled in the excavated areas." Since the area will be sodded, confirm that treated soil grows anything after the thermal treatment remove all the organic from it." At the "Wide Beach Development town of Brant project they tryied to use a soil treated by LTTD (same) treatment (specified here) as backfill material and it did not work. The treated soil did not behave as any classified soil material known.	
2		Table 2-3, delete "Training requirements for workers at hazardous waste operations are specified in 29 CFR 1910.120." Rewrite to read: "Training requirements for workers at hazardous waste operations are specified in 29 CFR 1910-120."	
3		For Table 2-7, 2-9 & 2-13 see comment #2	
4		Proposed specifications List. Assign another section number to "Letter of Commitment" because section 01305 shall be "Submittal Procedures" and section 01300 "Submittal descriptions."	

06 NOV 92 07:27:56
Project Number: S-864 Project Name: Claremont Polychem
Location: Old Bethpage, NY

Review: Draft, Predesign Invest Rprt

#7 DWG 6 -- GEO 2<--BASS,D.<--MRDEPTGG<--MRDHTWRM
Geologist (RV), FTS 864-7310, COM (402) 221-7310
> .RM/DETAIL:
> Option 2 for Site Layout appears to make more sense than
> Option 1. Location of treatment plant has benefit of less
> piping required from extraction wells and to injection
> wells. Also has benefit of allowing time for wells to be
> installed and pump tested (to determine capacity) prior to
> construction of treatment plant (which may allow time for
> modification to plant capacity if needed).
> >MRD (Hite, M): CONCUR
Status: ACTIVE

#8 1-9 -- GEO 3<--BASS,D.<--MRDEPTGG<--MRDHTWRM
Geologist (RV), FTS 864-7310, COM (402) 221-7310
> .RM/DETAIL:1.3.1
> Ground water restoration. This section does not detail
> what phase injection wells will be installed under. Also,
> how is the "downgradient" part of the plume defined?
> >MRD (Hite, M): CONCUR
Status: ACTIVE

#9 1-9 -- GEO 4<--BASS,D.<--MRDEPTGG<--MRDHTWRM
Geologist (RV), FTS 864-7310, COM (402) 221-7310
> Ground water restoration. The penultimate sentence in this
> section is awkward. It appears the ground water will not
> meet MCLs after being "significantly treated". Unless
> explained better, it appears the statement should say that
> treatment will continue (regardless of "upgradient" or
> "downgradient" plume) until water is below MCLs, period.
> >MRD (Hite, M): CONCUR
Status: ACTIVE

#10 2-24 -- GEO 5<--BASS,D.<--MRDEPTGG<--MRDHTWRM
Geologist (RV), FTS 864-7310, COM (402) 221-7310
> .RM/DETAIL:2.4.2
> 2nd sentence. Is 130 gpm the total production rate, or the
> rate for each well? Same comment applies in the last
> paragraph in this section on page 2-25.
> >MRD (Hite, M): CONCUR
Status: ACTIVE

06 NOV 92 07:27:56 Page 3
Project Number: S-864 Project Name: Claremont Polychem
Location: Old Bethpage, NY

Review: Draft, Predesign Invest Rprt

#11 2-26 -- GEO 6<--BASS,D.<--MRDEPTGG<--MRDHTWRM
Geologist (RV), FTS 864-7310, COM (402) 221-7310
> .RM/DETAIL:2.4.2.2
> Include in design criteria for extraction wells: temporary
> increased production that may be required from other wells
> when one well is taken off line for maintenance; provisions
> for maintenance of wells if there is historical evidence of
> biofouling or encrustation at other production wells in the
> vicinity; provisions for reduced capacity of wells over
> time; minimization of recirculation of injected ground
> water.
> >MRD (Hite, M): CONCUR
Status: ACTIVE

#12 2-26 -- GEO 7<--BASS,D.<--MRDEPTGG<--MRDHTWRM
Geologist (RV), FTS 864-7310, COM (402) 221-7310
> Ground water injection system. Why not locate injection
> wells downgradient of the plume and create a hydraulic
> barrier to stop migration while the plume is being treated?
> If the injection wells are not located sufficiently
> cross-gradient they may provide additional driving force to
> carry contamination downward or downgradient. Also, most of
> the design criteria noted in the previous comment apply to
> injection wells also.
> >MRD (Hite, M): CONCUR
Status: ACTIVE

#13 2-27 -- GEO 8<--BASS,D.<--MRDEPTGG<--MRDHTWRM
Geologist (RV), FTS 864-7310, COM (402) 221-7310
> .RM/DETAIL:2.4.9.1
> If you don't know the maximum depth of the plume, how can
> you know how deep to place your screens (or how long they
> should be) in wells installed during this phase? This
> appears to be a major hole in the design process at this
> time.
> >MRD (Hite, M): CONCUR
Status: ACTIVE

#14 2-28 -- GEO 9<--BASS,D.<--MRDEPTGG<--MRDHTWRM
Geologist (RV), FTS 864-7310, COM (402) 221-7310
> .RM/DETAIL:2.4.9.5
> Potential problems as discussed in this paragraph should
> also be addressed in the treatment process design (design
> should allow as much flexibility as possible to minimize
> these problems or correct for them during operation if
> possible).
> >MRD (Hite, M): CONCUR
Status: ACTIVE

06 NOV 92 07:27:56 Page 4
Project Number: S-864 Project Name: Claremont Polychem
Location: Old Bethpage, NY

Review: Draft, Predesign Invest Rprt

#15 2-29 -- GEO 10<--BASS,D.<--MRDEPTGG<--MRDHTWRM
Geologist (RV), FTS 864-7310, COM (402) 221-7310
> .RM/DETAIL:2.4.11
> A major unresolved issue is the depth of contamination near
> the Phase I extraction wells. I cannot see the design
> going much further without that piece of information, at
> least given the information presented in this preliminary
> submittal. If there is a plan to deal with this
> uncertainty, or an element of the design that is not
> described in this document, please include it in future
> submittals.
> >MRD (Hite, M): CONCUR
Status: ACTIVE

#16 TABLE 2-9 -- GEO 11<--BASS,D.<--MRDEPTGG<--MRDHTWRM
Geologist (RV), FTS 864-7310, COM (402) 221-7310
> .RM/DETAIL:
> EPA UIC permit. The substantive requirements make it look
> as though you will have to deal with 3 months worth of
> treated effluent prior to installation of injection wells.
> Is this the case? If so, will effluent be discharged to a
> local sewer (sanitary or storm) or will treatment plant
> only operate long enough to collect data on effluent, shut
> down, and store water until permit for injection wells is
> waived or issued?
> >MRD (Hite, M): CONCUR
Status: ACTIVE
Comment Management Menu1. Choose Comments2. Sort Comments3. Browse Through Chosen

DRAFT

24. Table 5-2, following p. 5-8. Data for SW-2 is missing from this table.

25. p. 6-3, sec. 6.1, pp1, last sentence. PCE and toluene were (not "was") reported ....

26. p. 6-3, sec. 6.1, pp2, first sentence. ... higher in comparison to (not "than") RI data results.

27. p. 6-3, sec. 6.2, third bullet. ... piles...however, they (not "it") will be graded....
Fifth bullet: ... 2000 linear (not "lineal") feet....

Preliminary Remedial Design Submittal start here.

28. p. 1-5, sec. 1.2.1.4 Use of the word "substantial" makes no sense. Do you mean "submittal"?

29. p. 1-7, sec. 1.2.3.1, first sentence. Delete the commas between "sewer" and "utilities" and "water" and "services".
Second sentence: The sanitary sewer.... makes more sense.

30. p. 2-1, sec. 2.1.2, second bullet. Replacement of what? Third, fourth, and fifth bullets: Presumably, you would not inject the groundwater without treating it first. The logical sequence would be extraction, treatment, then reinjection.

31. p. 2-6, sec. 2.2.10.1, seventh sentence. 1900 and 5900 what? Give the units to which these quantities refer.

32. p. 2-12, sec. 2.3.2, pp1, third sentence. "Debris" is misspelled.

33. Table 2-5, Note at bottom. The phrase "various sizes of high pressure hot water steam cleaning" does not make sense. Steam forms clouds. Are you referring to the size of the water droplets comprising the steam or to the size of the hose and/or nozzle used to direct the flow of steam?

34. p. 2-18, sec. 2.3.10.1. Rephrase the first sentence so it makes sense.

35. p. 2-18, sec. 2.3.10.1, pp2. Are "trash" and "rubble" being used synonymously or do they refer to separate kinds of material?

36. p. 2-19, sec. 2.3.10.4, second sentence. ... to be performed are (not "is") not anticipated ....

37. p. 2-19, sec. 2.3.10.5, last sentence. Delete the word "removal" following "ACM".

38. p. 2-22, sec. 2.3.12, pp3, first sentence. ... are (not "is") only estimated.

39. Figure 2-4. Include a north arrow.

40. Figure 2-5. Include a north arrow. Number the wells to correspond to Table 2-11.

41. p. 2-26, sec. 2.4.2, Groundwater injection system. This paragraph implies that groundwater will be extracted faster than it will be reinjected. Clarify this.

42. p. 2-27, sec. 2.4.7, first sentence. "Adsorb" not "absorb". This paragraph is true if there is free product at residual saturation. Is there any evidence of this at Claremont?

43. p. 2-29, sec. 2.4.11, second sentence. Do you mean "inclusion"? This sentence makes no sense as written.

44. Table 2-10, third bullet. What are you trying to say here? This makes no sense. Reword so it does.

45. Table 2-12, Note 2, second sentence. "Stringiest" might be an appropriate adjective for describing pizza toppings, but does not seem to apply to environmental regulations. Is "most stringent" what you meant to say?

46. p. 2-40, sec. 2.6.1.2, pp2, second-last sentence. Delete the word "in" between "minimize" and "erosion".

47. p. 2-40, sec. 2.6.2, pp3. This sentence makes no sense. Existing utilities are those which are already there and do not require installation. Do you mean new utilities?

48. Appendix A, Table of contamination ranges of metals in subsurface borings.... Second column. These "background ranges" are too general to be cited for this purpose. Connor and Shacklette (1975) got most of their data from Paleozoic rocks of the Midwest. This data cannot be used as "background" for geologically dissimilar deposits of Cretaceous age on Long Island. Dragun (1988) is even worse because he lumps together all geologic units in the United States to arrive at an "average". If there are no published sources of background trace element geochemistry for the Magothy Formation, you should first check to see whether such data might be found in any unpublished theses on the Magothy Formation, or, failing that, data from geologically similar Cretaceous sediments from another part of the country might be used.

Appendices (vol. 2, Draft Predesign Investigation Report)

49. Why was no mention made in any of the field logs of the dead bees in SW-2?

REVIEW MEETING MINUTES

PRELIMINARY PREDESIGN AND DESIGN SUBMITTAL
REVIEW MEETING MINUTES
CLAREMONT POLYCHEMICAL CORPORATION SUPERFUND SITE

The preliminary predesign and design submittal review meeting was held in Kansas City on November 23 and 24, 1992. The agenda for the meeting is attached. In attendance on November 23 in the afternoon were the following:

Tom Urbaniak	USACE-KC	Technical Manager
Dick Kaplan	USEPA Region 2	Remedial Project Manager
Kamal Gupta	NYSDEC	Remedial Project Manager
Bill Lee	USACE-KC	Process Engineer
Kirk Boese	USACE-KC	Environmental Engineer
Mary Robards	USACE-KC	Geologist
Dave Shultz	SEC Donohue	Project Manager
Murat Akuyrek	SEC Donohue	Process Engineer

In attendance on November 24 in the morning were the following:

Tom Urbaniak	USACE-KC	Technical Manager
Dick Kaplan	USEPA Region 2	Remedial Project Manager
Kamal Gupta	NYSDEC	Remedial Project Manager
Bill Lee	USACE-KC	Process Engineer
Kirk Boese	USACE-KC	Environmental Engineer
Jerry Montgomery	USACE-KC	Chemist
Dave Shultz	SEC Donohue	Project Manager

The meeting opened at 1:30 p.m. on November 23 with introductions. The goals for the meeting were discussed and it was agreed that:

- Issues to be resolved would be the focal point for the review.
- Comments received prior to the meeting which did not include comments from New York DEC addressing issues on the predesign and the design packages would be addressed by SEC Donohue in a response to comments submittal to be submitted with the 65 percent package.
- The focus for the review meeting would be Section 4 of the agenda, the preliminary design submittal, and the comments pertaining to the draft predesign report would be handled in the response to comments.

The group then focused on design-related issues in agenda Item No. 4. Issues discussed resolution, actions to be taken, and assignments are presented below by agenda item.

4.1 Groundwater Treatment Plant

1. Issue: Design contaminant concentrations. Predicted influent concentrations to the treatment plant are presented in Table 2-11. Dick asked if, in fact, the treatment plant was being designed for these values. Murat explained that the influent concentrations that were being used as the basis of design were not as was shown in Table 2-11.

   Resolution: Murat indicated that in some cases, depending on the parameter, the influent design basis ranged from three to four times the concentration shown on Table 2-11.

   Action Required: Include design parameters in the 65 percent submittal.

   Assignment: SEC Donohue.

2. Issue: The process flow sheet presented by Murat was discussed. Redundancies for the air stripper tower and the filter press were specifically discussed.

   Resolution: Murat agreed to let Tom Urbaniak know the impact of one tower versus two. Regarding the issue of the number of filter presses, since the meeting, it was determined one press and one air stripper are acceptable to NYDEC.

   Action Required: Determine the impact of one tower versus two.

   Assignment: SEC Donohue to recommend number of towers and presses in 65 percent package.

3. Issue: Percent solids specification on the filter presses and whether the contractor would have to meet effluent quality standards in the discharge from the treatment plant.

   Resolution: The issue of specifying percent solids on the filter press cake was not resolved. The effluent quality limitation issue was resolved by agreeing that the contractor would have to meet effluent quality discharge criteria during the startup period for the treatment plant.

Action Required: Resolve filter press cake specification.

Assignment: SEC Donohue.

4. Issue: The treatment plant effluent limits and establishing those limits were discussed.

   Resolution: Since the meeting, Kamal indicated that an SPDES permit application would not need to be completed to establish effluent limits per Section 703.6 of the New York State Code.

   Action Required: Determine how the limits will be established.

   Assignment: SEC Donohue.

5. Issue: Table 2-12 was discussed to make it clear as to where the effluent limitation was coming from; that is, which regulatory agency.

   Resolution: It was agreed to change Table 2-12 to reflect the source of the design effluent limitation, i.e. New York State DEC or New York State Department of Health, or USEPA. Table 2-12 will be assumed to represent effluent standards.

   Action Required: Revise Table 2-12

   Assignment: SEC Donohue.

6. Issue: The option 2 plan submitted in the package was discussed.

Resolution; It was agreed that Option 2 would be chosen where the treatment plant would be located in the soils contaminated area.

Action Required: Incorporate Option 2 into the 65 percent submittal.

Assignment: SEC Donohue.

7. Issue: Dick inquired as to whether or not the injection well area could accommodate the additional injection wells to be required as part of Phase 2.

   Resolution: SEC Donohue is only designing the injection area to accommodate the design flow for the Phase 1 plant, however, it was indicated that the State University of New York property should accommodate the additional design flow which would result from Phase 2.

Action Required: SEC Donohue will provide an indication of what the spacing requirements will be for the injection wells for Phase 1. The Phase 2 contractor can then utilize that information in deciding the space requirements for the additional wells related to Phase 2.

Assignment: SEC Donohue to submit spacing requirements as part of the 65 percent submittal.

8. Issue: Lab requirements were discussed and whether or not a laboratory was necessary in the treatment plant building.

Resolution: Kamal has indicated the County will operate the lab. The monitoring frequency and analyte list was not resolved. SEC Donohue will assume that only laboratory space for process control testing will be required.

Action Required: Incorporate into 65 percent design.

Assignment: SEC Donohue.

9. Issue: Degree of automation for process control of the treatment plant.

Resolution: It was agreed that the treatment plant would be manned by an operator, one shift per day. Automation would be sufficient for continued operation. Kamal has indicated that Nassau County will operate the plant and the laboratory.

Action Required: Implement the appropriate level of automation in plant design, to include auto-dialer system.

Assignment: SEC Donohue.

10. Issue: O&M manual preparation was discussed. Dick indicated that he felt it was important that SEC Donohue prepare the O&M manual.

Resolution: It was agreed that SEC Donohue would be the most logical choice for preparation of the O&M manual.

Action Required: Contract modification needs to be issued to include the preparation of the O&M manual in SEC Donohue's contract.

Assignment: Tom Urbaniak.

11. Issue: Effluent standards for the treatment plant.

Resolution: The effluent standards which will be applied to the treatment plant will be absolute values. Any background concentration will not be taken into consideration in establishing those effluent standards, however, background concentrations may influence cleanup goals for the aquifer.

Action Required: None.

Assignment: None.

4.2 Groundwater Extraction and Injection

1. Issue: Dick inquired as to whether the proposed injection well area could accommodate additional wells resulting from Phase 2 design.

Resolution: Dave indicated that we were preparing as part of the injection well Phase 1 design a prediction of the radius of influent of each injection well and that we would make that information available to EPA and Corps for use by Ebasco in design of Phase 2.

Action Required: Submit radius of influence calculations as part of the 65 percent submittal.

Assignment: SEC Donohue.

2. Issue: We discussed the need to have a meeting with State University of New York and the State Park officials soon to present to them the proposed plan on impacts to their property from the injection and extraction wells.

Resolution: It was agreed that these meetings were necessary and should be held as soon as possible.

Action Required: Establish dates for meetings with State University of New York and the State Park officials.

Assignment: Dick Kaplan.

3. Issue: Injection well and extraction well construction materials.

Resolution: It was resolved that the materials of construction for these wells would be proposed by SEC Donohue as part of the 65 percent submittal.

Action Required: Incorporate recommended construction materials in the 65 percent package.

Assignment: SEC Donohue.

4.3 Building Decon

1. Issue: The lease holders authorized to use the building may have equipment that they own in the building at this time.

   Resolution: It was decided that a meeting was necessary with the lease holders to provide them the opportunity to remove any equipment that they own from the site. This is necessary for SEC Donohue to be able to estimate the types and quantities of material to be removed during construction.

   Action Required: Set up a meeting with the current lease holders and resolve the equipment issue.

   Assignment: Dick Kaplan.

2. Issue: Pipelines in the building have not been sampled. We discussed whether or not these lines need to be cut and the contents dealt with. We also discussed what could be stated about the building with respect to certifying that it is clean.

   Resolution: This issue is not resolved.

   Action Required: Discuss with Carlos Ramos this issue regarding any materials left in the building which would be inside the pipelines.

   Assignment: Dick Kaplan.

4.4 Soils Treatment

1. Issue: We discussed the limits of excavation and how this should be handled.

   Resolution: It was agreed that the contractor would be required to excavate a maximum of 3 feet indepth in the entire spill area as delineated in the drawings. With the exception of the area in SS8, 10, and 15 where excavation would proceed to a depth (of 8 feet with confirmation sampling) to achieve a PCE target concentration of 200 mg/kg.

Action Required: Incorporate into the 65 percent submittal.

Assignment: SEC Donohue.

2. Issue: We discussed redeposition of treated soil and whether or not the land disposal restrictions would apply.

   Resolution: Kamal indicated that his opinion was that the soil is a listed waste based on organic solvents being spilled in that area which he interpreted to be F001 and F002 wastes. Therefore, we would have to treat to meet the land disposal restrictions. He indicated that a waiver might be a possibility. It was pointed out however, that the ROD specifies treated soil be redeposited on-site.

   Confirm that the soils are not RCRA listed waste.

   Assignment: Dick Kaplan.

3. Issue: Pages 2-4 and 2-5 in Section 2.2.2.3 of the design report.

   Resolution: Remove reference to mixing to dilute the concentrations of PCE in the soil.

   Action Required: Correct these tables.

   Assignment: SEC Donohue.

4. Issue: Design drawings for the soils cleanup area and whether or not cut-lines need to be established.

   Resolution: It was agreed that cut-lines to 3 feet in all areas except the hot spot would be shown. In the hot spot, excavation would proceed to 8 feet, with confirmation sampling required.

   Action Required: Incorporate into the 65 percent submittal.

   Assignment: SEC Donohue.

5. Issue: Including an alternate specification allowing for off-site disposal of the soils in the spill area.

   Resolution: It was decided after the meeting in discussions with USACE that the bid package should not allow the contractor the option of submitting a bid for off-site disposal, since this is not consistent with the ROD.

Action Required: Incorporate into the 65 percent.

Assignment: SEC Donohue.

6. Issue: Establishment of air emissions limits.

Resolution: Kamal indicated since the meeting that the 65 percent package will be sent to the NYS air control group for them to establish air emission standards.

Action Required: Coordinate this requirement with the 65 percent specifications.

Assignment: SEC Donohue.

4.5 General Site Issues

1. Issue: Project bidding.

Resolution: It was agreed that all pieces of the project would be bid together and that the USACE will request an invitation for bids.

Action Required: None.

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CLAREMONT POLYCHEMICAL CORP.
AGENDA
DRAFT PRE-DESIGN AND PRELIMINARY DESIGN REVIEW MEETING
NOVEMBER 23-24, 1992

Schedule	Items
	1.0 Introduction
	2.0 Meeting Goals
	2.1 Resolve Pre-Design Report Comments and Issues
	2.2 Resolve Preliminary Design Comments and Issues
	2.3 Set Meeting Schedule
	3.0 Draft Pre-Design Report
	4.0 Preliminary Design
	4.1 Groundwater Treatment Plant
	4.2 Groundwater Extraction and Injection
	4.3 Building Decon
	4.4 Soils Treatment
	4.5 General Site Issues
	5.0 Meeting Summary and Wrap-Up

Kamal Gupta	NYSDEC
Dick Kaplan	USEPA
Tom Urbaniak	USACE
Mary Robards	USACE
Bill Lee	USACE - EDG
Kirk Boese	USACE

RP/CPC65RDN/AE4

HEALTH AND SAFETY DESIGN ANALYSIS

HEALTH AND SAFETY DESIGN ANALYSIS
Intermediate Design Phase
Operable Unit 1 Remedial Action
Claremont Polychemical Corporation
Superfund Site
Old Bethpage, New York

SEC Donohue Inc.
4738 N. 40th Street
Sheboygan, WI 53083

1.0 INTRODUCTION

This document presents the design analysis (DA) for the Health and Safety component of the selected remedial action (RA) for operable Unit 1 of Claremont Polychemical Corporation (CPC) site. Background information for the CPC site and the selected RA can be found in the Remedial Investigation Report (Ebasco 1990), the Preliminary Remedial Design Report (SEC Donohue 1992), and the Record of Decision (USEPA, 1990). The DA details functional and technical requirements, design objectives and provisions, and coordination with other contractors and outside agencies. The DA provides the necessary evaluations required to prepare the design specifications for Health and Safety during the RA.

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2.0 GENERAL PARAMETERS

Details of the scope and purpose of the Health and Safety components and brief summaries of applicable decision making documents, hazard characterization, and the Health and Safety Plan are provided below. Technical provisions are in Specification No. 01155 and are governed by federal rules and regulations (primarily 40 CFR 1910, 40 CFR 1926, and OSHA).

2.1 SCOPE AND OBJECTIVES

The scope and objectives of the Health and Safety Specification are driven by regulations and industry practices. The primary objective of the specification is to ensure protection of on-site workers, on-site visitors, off-site personnel, and the environment.

2.2 PREVIOUS DECISION-MAKING DOCUMENTS

This section is not applicable to the Health and Safety DA or specification No. 01155.

2.3 HAZARD CHARACTERIZATION

Hazards at the CPC site may include the following:

- Physical slip/trip/fall hazards

Slip/trip/fall hazards may exist during the following building decontamination activities: asbestos removal, condensor tank draining, dust removal from roof dust collectors, and miscellaneous debris and equipment removal. Slip/trip/fall hazards may also exist during the excavation of Spill Area Soil.

- Heavy equipment hazards

These hazards may occur during RA activities which require heavy equipment. Such activities may include excavation, debris removal, well installation, and treatment plant construction.

- Heat/cold stress

Personnel may experience heat or cold stress during any outside activities.

- Chemical hazards

Personnel may be exposed to chemical exposure hazards during soil excavation, ACM removal, contaminated debris removal, tank draining, and groundwater extraction activities.

- Burn Hazards

Potential burn hazards may exist during Low Temperature Enhanced Volatilization (LTEV) treatment, during decontamination if acid washes are used, and during water sampling if acid preservatives are used.

- Overhead Hazards

Overhead items, such as power lines and building roofs, may pose a hazard when tall equipment (such as cranes) are used.

2.4 HEALTH AND SAFETY PLAN

The general contractor will prepare a Health and Safety Plan prior to initiation of the RA, which will address potential threats to on-site workers, the surrounding community, and the environment.

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3.0 FUNCTIONAL AND TECHNICAL REQUIREMENTS

This section presents some of the functional and technical requirements for Health and Safety during the RA. Responsibilities, general requirements, and regulatory requirements are described below.

3.1 RESPONSIBILITIES

Health and Safety responsibilities are outlined below.

Owner - adhere to the Contractor's Site Safety, Health, and Emergency Response Plan (SHERP)
Engineer - adhere to the Contractor's SHERP
Contractor - prepare, implement, and adhere to the SHERP in order to minimize potential risk to human health and the environment

3.2 GENERAL REQUIREMENTS

The SHERP will address all RA components and personnel. Health and safety concerns for both on-site workers and the general public will be addressed. Personal health/safety protection will be a requirement for remediation contractors and construction observers. The remediation contractors will furnish decontamination facilities and personal protective equipment for all contractor, support staff, and representatives of the contracting officer.

Personal protective equipment and safety concerns will vary between remediation contractors. Accordingly, prior to construction, they will establish and maintain the appropriate work zones for their activities. They will appoint a site safety officer to administer their safety program.

The safety concerns of the general public will be addressed as the design proceeds.

3.3 REGULATORY REQUIREMENTS

Each remediation contractor will abide by the appropriate local, state, and federal construction and chemical-related safety regulations as is usual and customary in the construction industry. In addition, each contractor will be required to initiate, establish, and maintain an on-site safety program, and be responsible for means and methods of their work. Methods to comply with regulatory requirements will be specified in the Contractor's SHERP.

Pertinent regulatory requirements are identified in Specifications No. 01155: Health, Safety, and Emergency Requirements and No. 01060: Regulatory Requirements.

4.0 DESIGN OBJECTIVES AND PROVISIONS

This section describes the tasks and general health and safety concerns associated with each component of the CPC RA.

4.1 GENERAL

The Contractor will submit a SHERP which, when implemented, will protect on-site personnel and will minimize the potential risk to the community and the environment. The SHERP will include, at a minimum, safe work practices, action levels for particulates and site contaminants, required levels of personal protection, and emergency response procedures.

4.2 WORK ZONES AND SITE CONTROL

Work zones will be established around each work area. Areas in which contaminated soil, building material, or debris is removed, transported, staged, or treated will be designated as exclusion zones (EZs). No personnel may enter an EZ unless he/she has met the requirements for training and medical surveillance specified in the SHERP and is wearing appropriate personal protective equipment (PPE), also specified in the SHERP. The area adjacent to the EZs will be designated as the Contamination Reduction Zone (CRZ). All personnel and equipment must be decontaminated in the CRZ before passing to the outlying area. Outlying non-contaminated area will be designated as the support zone.

Site access will be controlled by the Contractor. Site access will be only through the main gate and the existing perimeter fence will be maintained as necessary. A security guard service will monitor the front gate and support area in the absence of site personnel, or when otherwise required.

4.3 SUPPORT FACILITIES

Temporary site facilities will be required to support Health and Safety Activities. These support facilities will include, but are not limited to, an office trailer, decontamination pads, personnel decontamination facilities, and equipment decontamination facilities.

4.4 BUILDING DECONTAMINATION

Health and Safety hazards which may be encountered during building decontamination include: Slip/trip/fall hazards, physical hazards, heavy equipment, heat/cold stress, and chemical hazards, and overhead hazards.

Some examples of the requirements necessary to perform the decontamination procedures inside and outside the building are as follows: During decontamination of the dust

collectors, scaffolding may be required, crane safety may be required, and fall protection may be required. In addition to those requirements just mentioned, the requirements for respirator protection, contractor safety, and OSHA requirements would need to be followed. The remaining building decontamination and procedures outside the building are also governed by some general OSHA regulations, and the tank work is governed by federal, state, and local regulations.

Air emissions from building decontamination activities must be controlled. High pressure washwater used for decontamination should be contained within the building. Drains shall be plugged and run-on/run-off controls should be implemented to protect the environment.

4.5 ASBESTOS REMOVAL

The asbestos abatement portion of the project is governed by specific regulations for the asbestos industry. Regulations associated with asbestos abatement projects include a variety of OSHA regulations including respiratory wear and electrical lockout procedures. High-lift operations and fall protection may be required when working on overhead piping. Also, emissions during asbestos removal will be contained within the room from which it is being removed. The Contractor is required to be knowledgeable of all applicable regulations and to comply with them.

4.6 SURFACE DEBRIS MANAGEMENT

Surface debris located within the Spill Area will be cleared prior to excavation and placed in an area designated by the Owner. Spill Area surface debris is considered to be non-hazardous.

The Process Building contains paper, sheetrock, and other miscellaneous non-salvageable porous debris as well as salvageable equipment. Salvageable debris will be managed with salvageable building materials. Non-salvageable building debris will be transported off-site as hazardous.

4.7 EXCAVATION OF CONTAMINATED SOIL

Fugitive dust and vapor emissions are possible during excavation. Excavation emissions will be controlled using water sprays, dust suppressants or foam covers. The Contractor is responsible for determining the required frequency for implementing these control measures.

If particulate or vapor emission action levels are exceeded during excavation, PPE may be upgraded or work may be ceased and emergency procedures (off-site notification or excavation) may be required.

The contractor will be responsible for controlling their work zones for excavation or confined space. The contractor is assumes to be aware of rules and regulations governing their means and methods.

4.8 DEBRIS DECONTAMINATION

Salvageable material from inside the building will be decontaminated and recycled. Non-salvageable material inside the Process Building will be disposed of off-site as hazardous. Non-salvageable material located outside the building in two known, existing piles, will be spread and graded to match the existing topography.

4.9 SEGREGATION OF WASTES FOR OFF-SITE DISPOSAL

Non-salvageable material removed during soil pre-treatment processing will be considered hazardous and will be staged in a temporary storage area in compliance with 40 CFR 262 and other applicable regulations. This material will be disposed off-site at an approved, permitted facility.

Process materials from soil and groundwater treatment, liquids from personnel and equipment decontamination, disposable personal protective equipment, and non-salvageable trash and debris from inside the Process Building will be disposed off-site according to regulations. The Contractor will be responsible for segregating the wastes and arranging for off-site disposal.

4.10 SALVAGEABLE MATERIALS

Salvageable materials from inside the Process Building will be decontaminated and recycled. Salvageable materials from outside the building will also be recycled.

4.11 TREATED SPILL AREA

Treated soil will be backfilled in the excavation area. Particulate emissions will be controlled during backfilling using water sprays, dust suppressants, or foam covers.

4.12 LOW-TEMPERATURE ENHANCED VOLATILIZATION

Air emissions from the LTEV unit will be controlled by an air pollution control system as described in Chapter 12 of the RA DA report. Emissions will be continuously monitored to ensure and document that the required standards are met. Other special health and safety concerns associated with remedial activities for the soil component would be for LTEV process operation workers. These concerns would be process-type operation hazards associated with thermal, mechanical and electrical maintenance. These risks would be addressed and minimized through operating procedures specified in the LTEV Contractor's Operation and Maintenance Plan.

4.13 GROUNDWATER EXTRACTION WELL DRILLING, INSTALLATION, AND DEVELOPMENT

Contaminants within extracted groundwater are likely to pose risks to human health and the environment. Exposure routes include ingestion, direct contact, and inhalation of

volatile emissions. Well drilling and installation may pose physical hazards. The Health and Safety Plan will govern on-site and off-site well installation, pumping, injection, maintenance, and monitoring activities.

4.14 GROUNDWATER TREATMENT SYSTEMS

The air stripping towers will have vapor phase carbon adsorbers to minimize health risk to off-site receptors. The air leaving the air stripping towers will be designed to meet the applicable community air emission standards.

The tanks involved with the metals precipitation stage will have open tops. The building design will include ventilation system such that health risk to treatment system operators will be minimized.

4.15 POST-TREATMENT SAMPLING AND TESTING

Post-treatment sampling and testing will be performed in accordance with the appropriate specifications and regulations. The SHERP must be followed on-site until laboratory analysis verifies that Operable Unit 1 of the CPC site has been adequately remediated.

4.16 RESIDUALS MANAGEMENT

Residuals from treatment and decontamination activities will be managed as a potential hazard until analytical results indicate otherwise. Furthermore, residuals will be managed in accordance with all applicable rules and regulations and the SHERP.

4.17 WEATHER CONSIDERATIONS

Potential hazards due to weather include, but are not limited to, seasonal storms and temperature extremes. Summer storms may create potential electrical and slip/trip/fall hazards and summer temperatures may help induce heat stress. Winter snow and temperature conditions may increase the potential for slip/trip/fall hazards and cold stress. The Contractor will specify in the SHERP methods to monitor for prevent and respond to weather-induced hazards.

4.18 DEMOBILIZATION/SITE RESTORATION

The site, including the Process Building, will be restored to saleable condition according to the specifications. Remediation must be verified by analytical results before demobilization can begin. The Contractor cannot demobilize until approval from the Contract Officer is received. Prior to removal from the site, all decontaminated equipment and material will be recorded and logged by the Contractor's Health and Safety Officer.

5.0 COORDINATION

This section describes coordination of site health and safety activities and procedures with outside agencies and subcontractors.

5.1 AGENCIES

The SHERP will be approved by the NYDEC and USEPA before RA activities begin. Any activities not specified in the SHERP must be communicated to appropriate state and federal agencies. Local regulations may apply and local contacts may be required.

5.2. REGULATIONS AND PERMITS

All applicable permits must be completed by the Contractor and approved by the appropriate federal, state, or local agency. A copy of each completed and approved permit must be sent to the Contract Officer before work can begin. All work performed at the CPC site as part of this RA must comply with all pertinent regulations and permits.

5.3 EXCAVATION/TREATMENT/OFF-SITE DISPOSAL COORDINATION

All excavation, treatment, and disposal activities must be performed according to applicable regulations. To facilitate compliance, coordination with government agencies, other contractors, and disposal facilities will be required. The Contractor will be responsible for initiating and maintaining this coordination.

5.4 UTILITIES

Electric, water, and sewer utilities are available to the CPC site; however, electric and water services were disconnected after CPC operations ceased. Sanitary sewer was not disconnected but may be inoperable. The contractor is responsible for verifying operational utilities before work begins.

No existing agreements for primary service are in place with the Plainfield Water District, Nassau County Public Works, Long Island Light, or New York England Telephone Company.

The Contractor will be responsible for determining utility requirements and establishing service with the local utilities for any utilities needed for site work activities.

5.5 ENVIRONMENTAL PROTECTION

Remediation and decontamination activities will be performed in such a manner that disturbance to the surrounding area is minimized. Dust, noise, traffic, odor, erosion and sediment controls will be implemented to minimize potential environmental impacts.

Dust, noise, traffic, odor, erosion and sedimentation will be limited in accordance with local and state regulations and ordnances. No contaminated soil, water, or air emissions will be allowed off-site. The Contractor will be responsible for determining and meeting these requirements. The Contractor will include emergency procedures in the SHERP in case unacceptable emissions or other hazards impact the environment.

5.6 SITE SECURITY AND SIGNAGE

Security will be maintained by the Contractor during all RA activities. Site access will be only through the main gate and the existing perimeter fence will be repaired or maintained as necessary to restrict access at other locations. A security guard will control access, maintain a visitor log, an entry log, and provide periodic inspection of perimeter fencing.

A temporary project identification and information sign will be installed at the entrance to the site. Warning signs will be posted about every 500 feet along the perimeter fence. Signs will also be posted inside work areas.

5.7 TRASH DISPOSAL AND SANITARY DISCHARGE

Rubbish, debris and non-hazardous waste generated during on-site activities will be frequently disposed of off-site.

Temporary sanitary facilities will be provided at time of soil remediation mobilization. Sanitary waste will be collected and removed from the site on a regular schedule and disposed of properly.

The Contractor will be responsible for arranging trash disposal and sanitary services during the RA at the CPC site.

RP/CPC65RDN

1.0 GENERAL DESCRIPTION

1.1 PURPOSE

This design submittal represents the intermediate (65 percent) design phase submittal for the Phase I design of the Operable Unit 1, for the Claremont Polychemical Corporation (CPC) Superfund Site. Operable Unit 1 consists of soil, groundwater, and building remediation. The Phase 2 remedial design of Operable Unit 1 will address monitoring and downgradient groundwater extraction and treatment, but is not included in the scope of this design document. The intermediate design submittal shall:

- Define and present the functional requirements of the soil, groundwater, and building remediation design aspects of this project.
- Permit the users review and approval of the designers interpretation of the users requirements and agency directives.
- Provide a basis on which to construct the project.
- Provide an opinion of probable construction and remediation costs for the project.
- Present resolution discussion of previous review comments.
- Present discussion of unresolved issues to promote resolution as the design of the project proceeds.

This intermediate design submittal consists of a drawing set and four Volume design analysis which addresses the following topics:

- A section addressing our response to the concept design review questions.
- Individual design analysis associated with the excavation and treatment of contaminated soil, the groundwater extraction system, and the groundwater treatment system including re-injection, in which each major element of the design is discussed.
- A health and safety design analysis.
- A chemical data management specification.
- An analysis on potentially required NYSDEP and/or USEPA permit requirements.

- A listing of required specifications that will be developed for the project and selected draft specifications associated with the performance-based construction.

- A Code B cost estimate and construction schedule.

- A draft bid schedule.

1.2 AUTHORIZATION

Included as Appendix A to this section is a copy of the August 5, 1992, USACE Scope of Work for the Claremont Polychemical Site, Superfund Design Activity, Old Bethpage, New York, providing specific instructions to the architect/engineer on the scope of services for this project. The scope of services is associated with the Phase I design of Operable Unit 1 - soil, groundwater, and building decontamination.

Under Contract No. DACW41-90-D-0009, we have received Delivery Order No. 0002 and subsequent modifications to complete this scope of work through the 95 percent design phase. We have negotiated but have not yet received funding for the 100 percent design phase of this project.

In addition, we have been recording pertinent telephone conversations we have had in association with the design of this project on Confirmation Notices. These Confirmation Notices have been transmitted to the USACE project manager on a periodic basis to keep USACE appraised of the discussions being conducted in association with the design of this project. In addition, monthly progress letters have been prepared advising progress achieved, status of the project, and unresolved issues discussion.

Included as Appendix B to this section is a copy of our final design drawing list identifying the drawings proposed to be produced for the final design of this project.

1.3 SCOPE

The scope of work includes the remedial action design for the CPC Site as given in the Record of Decision and consisting of the following combination of source control alternatives and active groundwater restoration:

- Excavation and on-site treatment of contaminated soil by low temperature thermal extraction of volatile or organic contaminants, followed by a redeposition of treated soils into the excavated areas.

- Extraction of contaminated groundwater and treatment by air stripping and carbon adsorption, followed by re-injection.

- Building decontamination.

The remediation consists of two phases. Phase 1 includes soil treatment, on-site extraction, treatment and injection of groundwater, disposal of sludge, and building decontamination. Phase 2 involves PCE plume monitoring, installation of off-site extraction wells and treatment plant expansion. The scope of this work addresses only Phase 1 activities.

The objective of the remediation is to reduce concentrations of contaminants at the site to levels that will not threaten human health or the environment.

1.3.1 Site History and Status

The CPC site is an abandoned production facility located in central Long Island, in the village of Old Bethpage, Town of Oyster Bay, Nassau County, New York.

CPC manufactured pigments for plastics, inks, coated metallic tanks, and vinyl stabilizers at the site from about 1968 to 1980. Organics, solvents, resins, and wash wastes (mineral spirits) were the principal wastes generated. A solvent recovery system was operated at the site. Sludges and solid wastes were reportedly removed to the Old Bethpage landfill until the late 1970s when access was terminated. Thereafter, sludges were deposited in drums or old metal tanks located above ground on the eastern side of the site. Plant floor drains connect to a former on-site wastewater treatment system. One process generated a liquid waste which was discharged from the wastewater treatment system to the three leaching basins to the southwest. Pigment dust collectors were located on the roof of the building.

By mortgages and agreements in 1969 and 1973, CPC relinquished the facility and operations to Winding Road Estates and Winding Road Properties. The facility continued to operate as CPC until operations ceased in 1980. Most of the equipment has been removed from the process building. A 10,000-gallon underground fuel storage tank and 14 tanks (2,000 to 6,000 gallons) located to the south of the building were removed during July and August 1991 by a United States Environmental Protection Agency (USEPA) contractor. The tanks were used to store solvents and plasticizers. According to USEPA laboratory results, no soil contamination was detected around or below any of these tanks. Therefore, additional contamination investigations in this area will not be performed.

From November 1979 to April 1980, the Nassau County Health Department (NCHD) noted 2,000 to 3,000 drums containing resins, inks, and organic solvents present in the eastern portion of the site. These drums had been removed by September 1980 when NCHD inspectors discovered a 75-foot by 75-foot area of visibly contaminated soils (e.g., red inks and solvents) in the eastern portion of the site (designated the spill area). In October 1980, NCHD ordered a remedial action involving excavation of soils in the spill area. Soils were removed from the spill area to a depth of 10 feet and spread on plastic

sheets in the eastern portion of the site for volatilization of organic compounds. However, it is assumed that soils were not properly aerated or moved after their initial placement on the plastic sheets. The excavated spill area was partially backfilled with native soils. Work was stopped due to receivership issues. A monitoring well south of the spill area was installed by CPC per direction from NCHD in November of 1980. Groundwater samples taken by NCHD from this well indicated the presence of groundwater contamination under the site. NCHD notified CPC of its responsibility to clean up the site.

On June 1, 1981, a Consent Order requiring cleanup was issued to CPC (Winding Road Properties). After action was taken, the New York State Department of Environmental Conservation (NYSDEC) and CPC (Winding Road Properties) signed an Administrative Order in 1984 requiring cleanup. Again, no action was taken by the company, and after two notices to the New York State Clearing House, the site was ranked and placed on the National Priorities List in November 1987.

The site has recently been used by two tenants, L&L Excavating Corporation and Maniac Leasing. L&L maintains sand, gravel, and soil piles on-site. In addition, L&L has deposited large quantities of demolition debris north of the process building in the past. A chain link fence separates this area from the rest of the site. The quantity of debris has varied, sometimes changing daily. Maniac Leasing used the southern and southeastern portions of the site to park and wash large trucks, store roll-off containers, and store clean fill material. At present, neither company is allowed to bring anything onto the site. Each company may, with prior USEPA permission, remove their own equipment or supplies.

The most likely future use of the site is for light industrial purposes (e.g. manufacturing or warehousing), similar to the usage of the surrounding properties. The New York Department of Law has expressed the desire to sell the property or a portion of the property after remediation is complete. To accommodate this desire the extracted groundwater treatment facility will be constructed in the area of the contaminated soil after the soil has been remediated.

1.3.2 General Site Characteristics

The 9.5-acre site includes a 35,000-square foot, two-story concrete building and various support items such as treatment tanks, above- and below-ground storage tanks, leaching basins, dry wells, and water supply wells. The Old Bethpage Landfill is immediately to the west. The site is underlain by approximately 750 feet of unconsolidated sand, silt, clay, and gravel of the Cretaceous Magothy Formation, a sole-source aquifer in central Long Island. Silt and clay horizons within the Magothy Formation are more abundant in the north-central part of the site, and the proportion of sand increases to the south. The water table of the unconfined aquifer lies at 65 to 70 feet below the surface, and groundwater flow is to the south-southeast.

The majority of the site is relatively flat with elevations ranging from approximately 128 to 134 feet above mean sea level. Continued dumping and grading of fill material by L&L Excavating in the northern portion of the site has created approximately 5 feet of relief in the northeast quadrant of the site. A 0.6-foot depression in an area approximately 25 feet by 25 feet marks the location of the previously identified spill area from which soil was excavated as part of a remediation measure. Piles of fill materials have been located in the northern, eastern, and central portions of the site. As of January 1990, large soil piles created with materials from off-site were located along the eastern boundary, in the extreme northeast corner of the site, in the middle of the eastern part of the site, between the building and eastern site boundary. As of April 1990, most of these materials have been graded over the site area. Steep slopes, approximately 20 to 30 feet high, bound the site to the east and south. The Old Bethpage landfill creates approximately 125 feet of relief to the west of the site.

Site-specific geologic information was obtained from the RI. Both studies indicate that the subsurface stratigraphy is represented by unconsolidated deposits of variegated, poor to well graded, fine to medium grained sand with some silt and clay and trace amounts of gravel of the Magothy Formation. Man-made material comprises the uppermost 2 to 6 feet below grade within the northern and eastern portions of the site. This material recently was deposited by one of the current site tenants (L&L Excavating Corp.) and is composed of concrete, construction debris, asphalt, tires and gravel. The Magothy Formation underlies the fill to a depth of at least 175 feet (maximum depth drilled) below grade across the site. Alternating sand, silt, and clay horizons 40 to 60 feet below surface 6.5 to 9 feet in thickness are more abundant in the north-central portion of the site.

The C.A. Rich investigation indicated that the site is underlain by well-stratified fine to medium sand with silt lenses, abundant peat laminae and discontinuous sand layers. Abundant silt and clay horizons interbedded with fine to medium sand were observed within the north-central portion of the site. An apparent lack of stratigraphic correlation between adjacent borings suggested that the clay and sand beds were discontinuous (C.A. Rich, 1986). Boring logs of municipal water supply wells north of the site revealed a similar stratigraphic pattern of silt and clay horizons, suggesting that the site is located at or near a contact between a predominantly sandy portion of the Magothy Formation to the south, and an alternating sand and clay portion to the north (C.A. Rich, 1986).

Grain size distribution analyses show that the site soils are from 40 to 90 percent sand. Silt and clay content range from 3 to 49 percent and gravel content from 0 to 42 percent. The moisture content of soil samples collected above the water table (unsaturated) range from 4 percent at the surface (0 to 2 feet) to 15.8 percent at depth (8 to 10 feet). Specific gravity ranged from 2.63 to 2.71. Total organic carbon (TOC) analyses indicate percent organic levels from 1.4 in a well graded silty sand with gravel to 0.036 in a silty sand.

Bethpage State Park and the SUNY campus, which lie immediately south and east of the site, respectively, provide forested and open field environments in the midst of the highly developed land characteristic of Nassau County. The CPC site itself however, has been significantly disturbed over an extended time period and provides virtually no natural habitat for wildlife nor aquatic environments.

Prior to CPC's operation, the site apparently served as a borrow pit or quarry. In recent years the site has been subject to dumping, grading, and routine vehicular traffic. The absence of usable habitats for fish, the unfavorable conditions for wildlife, the prevailing land use in the area and the relative isolation of the site combine to minimize ecological concerns regarding this site. The New York Heritage Program and United States Fish and Wildlife Service have indicated that except for occasional transient appearances common to Long Island, no threatened or endangered species are known in the site area.

Areas of contamination at the site include:

- The surface and subsurface soils in the spill area, which is comprised of approximately 21,000 square feet of area east of the process building area contaminated with PCE and related solvents.

- The process building including walls, floors, floor drains, roof dust collectors, and an unknown amount of equipment are contaminated with metals. Asbestos is present in several rooms of the Process Building. Above-ground storage tanks contain fuel and possibly waste oil. Soil contaminated from tank overfilling and spillage exists in areas near the tanks and loading dock.
- The groundwater beneath and downgradient of the site is contaminated with PCE and related VOCs which apparently originated from the spill area.

1.3.3 Land Use

The location of the CPC site is in an area comprised of light industrial, commercial, and institutional properties (Old Bethpage Landfill, State University of New York (SUNY) Agricultural and Technical College at Farmingdale, and Bethpage State Park). The Suffolk County line is roughly 800 feet east of the site.

The site is bounded on the west and north by commercial lots. Industrial activities on the north lots included an infectious waste incinerator which ceased operation in June 1986, and a paper recycling facility which has been operating since January 1987. The Oyster Bay Solid Waste Disposal Complex, which includes Old Bethpage Landfill, is west of the adjacent lots, across Winding Road. The SUNY Agricultural and Technical College, Farmingdale is to the east of the site. To the south is Bethpage State Park (with golf courses) and adjacent to the site at its southwest corner is Park Stables, a private and public riding stable. The Town of Oyster Bay previously operated two incinerators one-half mile from the site and north of the landfill.

Elementary schools are located approximately 6,600 feet to the south and 4,500 feet northwest of the site. The closest residences are less than 1/2-mile away from the Claremont Site on the west side of the landfill. The nearest public water supply well is located 3,500 feet northwest of the site. Farmingdale water district wells N1937, N6644, and N7852, are located more than 7,000 feet south of the site. Groundwater recharge basins are located 1,800 and 2,500 feet north of the site, and 1,000 feet south of the site. The communities within two miles of CPC obtain their public water from well fields up and downgradient. Downgradient well fields are as close as 4,000 feet south of CPC.

1.3.4 Criteria

Project design criteria and guidance were provided in:

- The Scope of Work dated August 5, 1992.
- The concept design submittal review comments and comment follow-up.
- The information obtained during the pre-design investigation phase conducted under this project and the Pre-design Investigation Report dated October 12, 1992.
- The RI/FS completed by Ebasco in 1990.
- The Record of Decision dated 1990.

1.3.5 Description of Selected Remedy

The ROD concluded that the preferred alternative to remediate the site will achieve substantial risk reduction through a combination of the following selected remedial actions:

- On-site treatment using low temperature enhanced volatilization of soil contaminants.
- Building decontamination.
- Active restoration of the groundwater.
- Underground storage tank removal and off-site disposal.

1.3.6 On-site Soil Treatment

PCE-contaminated soil in the spill area will be treated in a mobile enhanced volatilization (low-temperature thermal desorber) unit brought on-site. Low-temperature thermal desorption consists of a feed system, thermal processor, possible afterburner, and air pollution control devices. The contaminated soil is heated to volatilize the contaminants.

The volatilized compound and moisture from the contaminated soil may be burned in an afterburner to provide complete destruction. Alternatively, the contaminant-laden gas may be treated by an activated carbon adsorption unit. The contaminated carbon would be sent off-site for regeneration or disposal. Treated soil would be stored for sampling. Soil meeting the cleanup goal for PCE will then be used as backfill in the excavated areas.

1.3.7 Building Decontamination

The inside contaminated surfaces of the building (i.e., walls, floors, and hoods) will be decontaminated using dusting, vacuuming, and wiping procedures. In addition, dust collectors on the roof will be emptied. The collected dust will be transported to an off-site USEPA-permitted treatment and disposal facility. The contaminated water in the floor drains and condensers also will be removed and disposed off-site.

1.3.8 Groundwater Restoration

The groundwater remedy specifies implementation in two phases. Phase 1 includes installation of extraction wells to treat the concentrated groundwater plume. Phase 2 includes installation of an extraction well(s) for the downgradient groundwater plume requiring the installation of additional treatment trains. The extracted groundwater will be treated for metals and volatile organic compound (VOC) removal, then injected back into the aquifer. After the downgradient plume is significantly treated, on-site extraction and treatment of 0.5 mgd would continue until applicable standards are attained. This design, as noted previously, addresses only Phase 1 of the groundwater remedy.

1.3.9 Underground Storage Tank Removal and Disposal

UST removal and off-site disposal was completed by USEPA as of August 1991. The procedure consisted of excavating the overburden soils, pumping the tank contents, tank cleaning, removal of the tanks and ancillary equipment, off-site disposal/treatment of the tanks, equipment and liquid waste, and backfilling with on-site soil.

APPENDIX A

SCOPE OF WORK

FOR

CLAREMONT POLYCHEMICAL SITE
SUPERFUND DESIGN ACTIVITY
OLD BETHPAGE, NEW YORK

Operable Unit 1 - Soil, Groundwater, and Building

PHASE I DESIGN

US ENVIRONMENTAL PROTECTION AGENCY
EMERGENCY AND REMEDIAL RESPONSE DIVISION
REGION II

US ARMY CORPS OF ENGINEERS
KANSAS CITY DISTRICT
CEMRK-ED-TS

DONOHUE AND ASSOCIATES
SHEBOYGAN, WISCONSIN

18 December 1990
Revised: 27 March 1991
Revised: 30 December 1991
Updated: 5 August 1992

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SCOPE OF WORK

CLAREMONT POLYCHEMICAL SITE

SUPERFUND PREDESIGN ACTIVITY

OLD BETHPAGE, NEW YORK

1. INTRODUCTION.

a. The Claremont Polychemical Site is an abandoned production facility located in the community of Old Bethpage, Town of Oyster Bay, Nassau County, in central Long Island, New York. The 9.5 acre site includes a 35,000 square foot, two-story concrete building and various support items such as treatment tanks, above- and below-ground storage tanks, leaching basins, dry wells, and water supply wells. The Old Bethpage Landfill is immediately to the west. The site is underlain by approximately 750 ft. of unconsolidated sand, silt, clay, and gravel of the Cretaceous Magothy Formation, a sole-source aquifer in central Long Island. Silt and clay horizons within the Magothy Formation are more abundant in the north-central part of the site, and the proportion of sand increases to the south. The water table of the unconfined aquifer lies at 65-70 ft. below the surface, and groundwater flow is to the south-southeast.

b. From 1968 until its closure in 1980, Claremont Polychemical manufactured inks and pigments for plastics, coated metal flakes, and vinyl stabilizers. The principal wastes generated were organic solvents, resins, and wash wastes (mineral spirits).

c. Initial concern for contamination was linked to a 1979 discovery of several thousand abandoned, leaking drums on the site by the Nassau County Department of Health. Limited, preliminary investigations conducted at the site indicated contamination of soil and groundwater by volatile organic chemicals. The Claremont Polychemical site was proposed for inclusion on the National Priorities List in October, 1984, and was listed in June, 1986. A Remedial Investigation/Feasibility Study (RI/FS) for Operable Unit 1 (overall site remediation) was undertaken by Ebasco Services, Inc. in 1988. The purpose of this investigation was to determine the nature and extent of the contamination and to develop remedial alternatives for the site. Tetrachloroethene (PCE) was identified as the contaminant of concern in soils and groundwater. The approximate location and extent of a groundwater contamination plume emanating from Claremont was determined. The Old Bethpage Landfill is the source of another plume. These plumes are supposedly distinct in chemistry, depth, and areal extent. Pump and treat remediation of the landfill plume was scheduled to begin in the fall of 1991.

d. Remedial action for the Claremont Polychemical site as given in the Record of Decision (ROD) consists of the following combination of source control alternatives and active groundwater restoration:

1) Excavation and on-site treatment of contaminated soil by low

temperature thermal extraction of volatile organic contaminants, followed by redeposition of treated soils into the excavated areas.

2) Extraction of contaminated groundwater and treatment by air stripping and carbon adsorption, followed by reinjection.

3) Building decontamination.

4) Excavation, removal, and off-site treatment/disposal of underground tanks, tank contents, and associated contaminated soils.

e. The remediation involves two phases:

1) Phase I includes soil treatment, onsite extraction, treatment, and injection of groundwater, disposal of sludge, and building decontamination.

2) Phase II involves PCE plume monitoring, installation of offsite extraction wells, and treatment plant expansion.

3) This scope of work addresses Phase I.

f. The objective of the remediation is to reduce concentrations of contaminants at the site to levels that will not threaten human health or the environment.

g. Additional data is needed during Phase I to delineate the areal extent of soil contamination and to more accurately determine the horizontal and vertical extent of the groundwater contamination plume in the area of the two onsite extraction wells as shown in the Record of Decision.

2. GENERAL REQUIREMENTS AND STANDARDS

a. General Requirements. General requirements of this scope shall consist of providing professional engineering, scientific and technical services to prepare a comprehensive, detailed work plan for Initial Predesign Activities and Phase I Remedial Design Activities of Operable Unit 1 at the Claremont Polychemical Superfund Site pursuant to the Record of Decision dated September 28, 1990. The approved work plan will establish technical requirements and levels of effort for negotiating the remaining portion of this contract.

b. Project Manager.

1) The Architect-Engineer (A-E) shall assign a principal or key employee to serve as the Project Manager. The Project Manager shall oversee the coordination of the entire project design and shall be capable of administering all instructions from this office and obtaining answers to all questions from this office during and after the design work.

2) During execution of the work under the contract, the A-E shall keep in close liaison with the CE project manager who will coordinate the work with the EPA and other parties. All requests made by the EPA and other

parties shall be referred to the CE project manager.

c. Review of Progress and Technical Adequacy. At appropriate times, representatives of the Contracting Officer may review the progress and technical adequacy of the work. Such review will not relieve the A-E from performing all contract requirements, except as may be waived by written instruction.

d. Progress Chart. Within 10 working days after approval of the Final Work Plan, the A-E shall submit a progress chart to show the proposed schedule for completion of design. The progress chart shall be prepared in reproducible form and submitted to the CE Project Manager for approval. The actual progress shall be updated and submitted by the 15th of each month and may be included with the request for payment. Progress charts must be revised to reflect modifications and other approved changes in scheduling.

e. Progress Report. By the 15th of each month, the A/E shall submit to the CE Project Manager a progress report. Copies shall also be furnished to the EPA Project Manager and the New York State Department of Environmental Conservation Project Manager. This progress report shall be prepared in letter form in accordance with the following format:

PROGRESS REPORT

SITE NAME:

PREPARED BY:

REPRESENTING:

DATE:

REPORTING PERIOD:

1) Progress Made this Reporting Period - Description of progress made during the reporting period, including problem areas encountered, and recommendations.

2) Anticipated Problem Areas and Recommended Solutions - Anticipated problems and recommendations for resolution, including technical and scheduling implications.

3) Problems Resolved - Results obtained relating to previously identified problem areas.

4) Deliverables Submitted - Deliverables completed and submitted, and dates of those submittals; deliverables anticipated to be submitted, and

reasons due dates may need to be revised. Any delays should be fully explained.

5) Upcoming Events/Activities Planned - Important upcoming dates: field surveys, meetings, et cetera; major tasks to be performed within the next reporting period.

6) Key Staffing Changes - Any changes in key personnel assigned to the work, including but not limited to consultant, contractor or subcontractor personnel.

7) Percentage Complete - Level of technical completion achieved, reported as percent completed.

8) Data - Copies of daily contractor reports.

f. Services to be Furnished by the Government. The Government will provide liaison with EPA and reproduction of the contract drawings and specifications for advertising purposes.

g. Environmental Permits. The A-E shall insure that the project is in full compliance with the requirements of all applicable Federal, state and local clean air, clean water and solid waste disposal standards and the Federal Endangered Species Act. The A-E shall incorporate into the plans and specifications a requirement that all off-site disposal shall be in compliance with the policies stated in the Procedure for Planning and Implementing Off-Site pages 45933 thru 45937. The A-E shall insure that off-site disposal is in compliance with the Revised Procedures for Implementing Off-Site Response Actions - Final Interim, EPA Directive 9834.11 - November 13, 1987. The A-E shall insure that the final design packages submitted will be consistent with the technical requirements of all applicable or relevant and appropriate federal and state environmental regulations. The A-E shall identify the off-site disposal/discharge permits that are required and the time required to process the permit applications in the Design Analysis.

h. Verification of Existing Conditions. The A-E is responsible for making the necessary field visits to assess existing conditions and to obtain such detail information as is required to complete the design. All data shown on drawings shall be verified by the Architect-Engineer and the A-E shall obtain all data as required to insure the complete and proper design of the project. The A-E shall verify from existing maps and utility contacts the location of all utility lines. Existing information shall be used whenever possible.

i. Conferences.

1) The A-E shall be represented by up to three (3) persons familiar with all aspects of the work submitted.

2) The A-E shall be responsible for taking notes and preparing the minutes for all conferences e.g. review conferences. Conference notes will be prepared in typed form, signed by the Project Manager, and distributed

to this office within five (5) working days after date of conference.

a) These minutes shall include the date, place and a list of attendants, including organization and telephone number. Comments made during the conference, or decision affecting criteria changes, must be recorded in the basic conference notes. Any augmentation of written comments should be documented by the conference notes.

b) Written comments presented by attendants shall be attached to each report with the conference action noted. Conference action shall be "A" for an approved comment, "D" for a disapproved comment, "W" for a comment that has been withdrawn, and "E" for a comment that has an exception noted. Functional/criteria comments annotated "F" are mandatory and must be included in the project documents. Technical comments annotated "T" are provided for consideration. Indicate comments not incorporated and provide an explanation for rejection.

j. Confirmation Notices. The Architect-Engineer will be required to provide a record of all discussions, verbal directions, telephone conversations, biweekly telephonic conferences, etc., participated in by the Architect-Engineer and his representatives on matters relative to this contract and the work, irrespective of whom the other participants may have been. These records, entitled "Confirmation Notices, will be numbered sequentially and shall fully identify participating personnel, subject discussed, and any conclusions reached. The A-E shall forward to the Contracting Officer or his representative within five (5) working days a reproducible copy of said confirmation notices.

k. Value Engineering.

1) Value engineering potential study items are required on the work covered under this contract. Within 25 working days after completion of the Pre-Design Investigation, the A-E shall identify several features of the project offering potential for value engineering studies. These features may include layout, principle features of construction, criteria, or any item having "high cost low value" where value improvement can be accomplished. The items identified for potential value engineering effort shall be submitted to the CE project manager. If an alternative is apparent to the proposed item without further study, then the proposed alternate(s) shall be listed with the list of features submitted. Upon receipt of the list of items and features submitted by the A-E firm, the Government reserves the right to do one of the following:

a) Implement some, all, or none of the changes proposed and modify the contract for the design A-E firm to further perform formal value engineering studies on any or all of the items submitted. Within 14 days after receipt of these items, the CE project manager will indicate to the A-E which items are to be implemented and which items are to be subjected to formal value engineering study. At that time, the contract will be modified for the additional work resulting from the formal value engineering studies.

b) Appoint a value engineering team of Government personnel and perform the value engineering studies working closely with the design A- E firm, furnishing the results upon completion.

c) Use a separate A-E firm under an indefinite delivery contract to perform the value engineering studies working closely with the design A-E firm, furnishing the results upon completion.

2) As the design progresses, and the design A-E determines some other features of the project that offer VE study potential, then these items and any alternatives considered should be submitted to the CE project manager for consideration.

l. Design Codes.

1) The A-E shall be responsible for incorporation of all applicable information.

2) The facilities, systems and equipment design standards of the Occupational Safety and Health Act, Code of Federal Regulations, Title 29, Chapter XVII, Parts 1910 and 1926, as applicable, will be incorporated by the A-E into all engineering design and analyses furnished pursuant to this contract. Any problem in incorporating these standards due to conflict with other technical criteria will be promptly submitted to the Contracting Officer for decision.

3) The intent of the Government is to design within environmental requirements currently in effect. If in the opinion of the A-E, compliance with current regulation cannot be accomplished due to engineering problems, he will immediately notify the Contracting Officer in writing with recommendations.

m. Title I. The A-E shall prepare and submit to the U.S. Army Engineer District, Kansas City, partial payment estimates in accordance with "Instructions for Completion of ENG Form 93" dated 5 January 1983. All partial payments shall be based on work completed as of the 15th day of the report month and shall be submitted to the office of the Contracting Officer by the 18th day of the month. The U.S. Army Engineer District, Kansas City, will prepare supporting payment documents after obtaining necessary approvals and forward all documents to the U.S. Army Engineer District, Omaha, for issuance of the payment check. All questions regarding payments shall be directed to the U.S. Army Engineer District, Kansas City. Payment under this contract, for which property or services are provided in a series of partial executions or deliveries, will be made within 15 days after receipt of an invoice which has been properly executed by the Architect- Engineer, approved by the Contracting Officer, and received at the paying office.

n. Additional Conferences. Payment for furnishing the services of technically qualified representatives to attend additional conferences, when so requested in writing by the Contracting Officer, will be made at a rate per hour for the discipline involved plus travel expenses computed in accordance with Government Joint Travel Regulations in effect at the time travel is

performed and actual cost of transportation. Payment for attending additional conferences shall be made after submittal of a separate ENG Form 93, which shall not be assigned a partial payment estimate number.

3. QUALITY OF WORK

a. Work and services defined in the work plan shall be described so as to be performed in accordance with accepted engineering and scientific practices utilizing state-of-the-art methods and techniques. The work plan will be reviewed by appropriate disciplines within the Corps of Engineers (CE) and Federal and State regulatory agencies. Review comments shall be addressed and annotated comments furnished. Resolution of all comments shall have been accomplished before the work plan will be accepted as "Final." The work plan shall establish criteria, methods, techniques, and practices which will assure a quality Remedial Design fully compliant with this Scope of Work. Upon approval, no deviation will be permitted without prior approval of the Contracting Officer. Quality assurance oversight of field activities will be performed by the CE.

4. RELEASE OF INFORMATION

a. Information and data concerning this work shall not be discussed or released in any form to any party without the express consent of the Government. Inquiries shall be directed to the Contracting Officer or the Corps of Engineers Project Manager. Classified information obtained from this office shall be treated in accordance with instructions in regard to such matters.

5. REGULATORY AND STATUTORY COMPLIANCE

a. The design criteria provided or referenced are intended to serve as a guide for the Architect-Engineer (A-E) in the preparation of a proposal for professional services which will satisfactorily meet design and construction standards for the proposed project. All aspects of this project are to meet all applicable or relevant and appropriate Federal (EPA, DOT, etc.), State (NYSDEC) and local regulations to the extent known site information is available. Additional specific criteria are furnished for the A-E as described in the "Documents Listing." Compliance assurance shall be the responsibility of the A-E.

6. A-E RESPONSIBILITY

a. The A-E shall perform and shall assume all responsibility for the accuracy and completeness of the design work and services for the project. Quality of design work accomplished under the contract will be a determining factor in consideration of the A-E for future work. This contract will remain in force until construction of the project has been completed. During this period, the A-E will be responsible for the correction or revision of any negligent design errors or deficiencies in its design, drawings and specifications. Should design changes as a result of revised criteria be required during this period, the A-E may be required to perform the necessary

redesign work. In those instances, the contract will be modified accordingly, including an adjustment in the contract amount.

b. If discrepancies, omissions, or other errors in the drawings and specifications are discovered after the final submission, the A-E shall revise the specifications and contract drawings or prepare sketches and provide the necessary data, including a detailed cost estimate, to permit issuance of amendments or modifications by the Government.

c. Should the A-E receive any direction or criteria that is not included in this contract that requires additional effort beyond the contract criteria, the A-E shall notify the Contracting Officer in writing, describing the change(s) and impact on the effort.

7. WORK TO BE PERFORMED

a. Title I services: Develop a comprehensive, detailed work plan for Predesign Activities (Task 1), Predesign Investigations (Task 2), and Phase I Design Activities (Task 3, 4, 5 and 6) of Operable Unit 1 at the Claremont Polychemical Site, Old Bethpage, New York. The work plan shall be prepared such that design components and the total design package will satisfy all requirements of the Record of Decision related to the Phase I Design of the two onsite extraction wells, associated treatment facilities, sludge disposal, soils remediation, and building decontamination. The work plan shall consist of a remedial design Work Plan with attachments, Field Investigations Plan, a Chemical Data Acquisition Plan, and a Site Safety and Health Plan, and shall provide detailed descriptions of methods, techniques, practices, criteria, and equipment proposed to accomplish all design work.

b. The Architect-Engineer shall perform and shall assume all responsibility for the accuracy and completeness of the following design work and services. Quality of design work accomplished under the contract will be a determining factor in consideration of the A-E for future work.

c. Review existing documents for information. Existing information relevant to preparation of the work plan is contained in the EPA Record of Decision and the EPA final drafts of the Plant Site Remedial Investigation and Feasibility Study dated 16 July 1990.

1) Predesign Activities (Task 1):

a) Progress Chart. A chart showing anticipated start and duration of major work elements shall be included.

b) Organization Chart. A chart showing key design team members and respective responsibilities shall be furnished.

c) Site Safety and Health Plan (SSHP). A Site Safety and Health Plan shall be prepared in accordance with Appendix 1 of this scope.

d) Chemical Data Acquisition Plan (CDAP). A Chemical Data Acquisition Plan shall be prepared in accordance with Appendix 2 of this

scope.

2) Predesign Investigations (Task 2): The work plan shall provide detailed descriptions of methods, procedures, equipment and locations of all proposed design field investigations. Field investigations shall be of sufficient type and extent to fully define remediation methods and estimate quantities.

a) Drilling and Sampling. All proposed drilling and sampling equipment and methods shall be fully described. Drilling and sampling operations shall be supervised, and drilling logs prepared, by a qualified, experienced field geologist or geotechnical engineer at each operating drill rig. Not less than 25% of all borings greater than 10 feet in depth shall be continuously sampled for descriptive logging purposes. Each and every boring greater than 10 feet in depth shall be geophysically logged for Spontaneous Potential, Resistivity and Natural Gamma Radiation. Descriptive logs shall be prepared in accordance with Appendix 3 of this scope.

b) Geotechnical Samples. The work plan shall describe geotechnical sampling and testing requirements necessary to characterize subsurface materials.

c) Monitoring Wells. The work plan shall fully describe proposed monitoring well locations, depths, screened intervals, construction materials, development methods, and other details necessary to define the contaminated groundwater plume. Accurate well construction diagrams shall be prepared for each well installed. Construction diagrams shall be prepared in accordance to requirements provided in Appendix 3. Well development shall be adequately performed and documented in accordance to requirements provided in Appendix 3. Monitoring wells are to be designed in accordance with accepted criteria for screen slot opening and filter pack gradation. It is the responsibility of the A-E to properly plan, design, and test monitoring wells so that they are suitable to produce representative groundwater samples in sufficient quantity and quality for chemical testing. Turbid samples will not be accepted. If, due to inadequate design or construction, monitoring wells are installed that are not functional or not in accordance with specifications, they shall be repaired or replaced at no additional cost to the government. If a monitoring well is disapproved by the Contracting Officer, or is abandoned by the A-E for any reason, the hole shall be plugged in accordance with state regulations, if applicable, or by removing any grout and regrouting the hole from bottom to top with neat cement grout by the A- E at no additional cost to the government.

d) Soil samples. The work plan shall describe soil sampling locations, equipment, depths, and collection and documentation procedures necessary to define the extent of soil contamination.

e) Surveying. Coordinates shall be to the closest 1.0 foot and referenced to the State Plane Coordinate System. If the State Plane Coordinate System is not readily available, an existing local grid system shall be used. Elevations to the closest 0.01 foot shall be provided. These

elevations shall be referenced to the National Geodetic Vertical Datum of 1929. If the 1929 Datum is not readily available, the existing local vertical datum shall be used.

f) On-Site Underground Storage Tank Removal Report. The report shall include, but not be exclusive of, a table of contents, written summary of the tank removal process, work performed by A-E, description of testing performed, location maps, photographic album and verify the underground tank removal performed by EPA. Details of soil conditions and contamination, contents and intergety of removed tanks, and a detailed documentation of what was accomplished shall be incorporated into the report.

g) Uncertain Field Conditions (option): In the event field investigations reveal that contamination extends beyond the areas that had previously been indicated, the A-E shall perform investigations to further define the extent of contamination at the Contracting Officers' discretion. This includes provisions for both sampling and laboratory analysis.

(1) Fee Schedule. The disiplines of the Project Manager, Engineers, Health and Safety personnel, and other support personnel will be used necessary. The costs for this item shall not exceed $50,000, including reproduction, telephone, and related tasks.

(2) Fee Adjustment. Should the services for uncertain field conditions to be performed under this contract require greater manhours than those allowable under the cost ceiling above for uncertain field conditions or should the Contracting Officer direct the Architect-Engineer in writing to provide additional manhours of services, the lump sum fee set forth above will be adjusted to reflect such decrease or increase provided that such decrease or increase in fee is based on the manhour rates specified in the contract.

h) Treatability Studies (option). In the event that the treatability studies become necessary, the A-E shall prepare and implement the methods, procedures, data collection and data interpretation for groundwater and soil treatability studies and incorporate the study into the work plan and results into the report.

i) Design Analysis Report. The work plan shall include an outline for the design analysis report. The design analysis report will include but will not be limited to design data, calculations, assumptions, working drawings, design concepts, an outline of preliminary technical specifications and a list of proposed construction drawings. The design analysis shall be prepared in accordance with all Federal, State, and the local statutes, regulations, codes and environmental policies, and other instructions provided by the CE Project Manager.

3) Design Submittals (Task 3, 4, 5, & 6): Preliminary, Intermediate, Prefinal and Final Design. The work plan shall include a description of the organization and content of preliminary, intermediate, prefinal and final design packages with provisions to incorporate, or resolve to the Government's satisfaction, technical review comments. It shall also

include provisions to develop an Operations and Maintenance Manual.

a) 35 Percent Preliminary Design (Task 3):

(1) Pre-Design Investigations. Perform the pre-design investigations included in the approved work plan developed under Task 1. A report of all activities including lab results, well installations, boring logs shall be submitted as part of the design analysis in Task 3.

(2) Provide concept design, general plans, and treatment scheme layouts for treatment and cleanup of the site. General plans should include verifying site conditions, e.g., rights-of-way, project boundaries, topographic details, utilities, etc.

(3) Prepare a code "B" cost estimate and construction schedule.

(4) Provide a list of required permits with requirements and restrictions.

b) 65 Percent Intermediate Design (Task 4):

(1) Incorporate 35 percent design review comments.

(2) Prepare preliminary construction plans and specifications for accomplishing the following activities at the Claremont Polychemical Site. (Unless otherwise noted, detailed plans and specifications shall be developed.)

(a) Excavation and treatment of contaminated soils on the site.

(b) Groundwater extraction system.

(c) Groundwater treatment system including disposal of all solids or residuals.

(3) Prepare draft design analysis report in which each major element of design is discussed. Included in this report shall be a separately bound Health and Safety Design Analysis.

(4) Prepare a code "B" cost estimate and construction schedule.

(5) Prepare Chemical Data Management Specifications.

(6) Prepare all required NYSDEP and/or USEPA permit applications with available supporting data.

(7) Prepare draft Bid Schedule (65 percent).

(8) Attend intermediate design review conference at the CE, Kansas City District Office.

c) 95 Percent Prefinal Design (Task 5):

(1) Incorporate all review comments.

(2) Prepare prefinal construction plans and specifications (started under Task 4). At this stage, the plans and specifications are to be essentially ready for advertisement except for minor CE comments which may develop upon CE review of this 95 percent design.

(3) Complete design analysis.

(4) Prepare a code "C" cost estimate and construction schedule.

(5) Prepare 95 percent bid schedule.

(6) Conduct a plan-in-hands check of drawings and specifications against existing conditions.

d) 100 Percent Final Design (Task 6):

(1) Incorporate all review comments.

(2) Prepare final plans and specifications.

(3) Prepare final code "C" cost estimate for bidding.

(4) Prepare final construction schedule.

(5) Prepare final Bid Schedule.

(6) Complete final design analysis.

(7) Proyide support to the Government for questions during advertisement, incorporation of comments through amendments during advertisement, and attendance at the prebid conference and site inspection for potential bidders.

(8) Provide one cost estimate revision required as a result of amendments issued during the advertisement period.

d. Unscheduled Travel (option). Perform unscheduled travel to attend meetings which may have bearing upon solving unforseen problems during remedial design investigation, remedial construction and public meetings/information meetings. This item would cover travel expenses in accordance with the current Joint Travel Regulations (JTR) and time charged to the project during travel.

1) Fee Schedule. The disciplines of the Project Manager, Engineers, Health and Safety personnel, and other support personnel will be used necessary. The costs for this item shall not exceed $25,000, including reproduction, telephone, and related tasks.

2) Fee Adjustment. Should the services for unscheduled travel to be performed under this contract require fewer manhours than those allowable under the cost ceiling above for unscheduled travel or should the Contracting Officer direct the Architect-Engineer in writing to provide additional manhours of services, the lump sum fee set forth above will be adjusted to reflect such decrease or increase provided that such decrease or increase in fee is based on the manhour rates specified in the contract. Travel will be paid at a rate not to exceed the current Joint Travel Regulations in effect at the time travel is performed.

e. Title II Services (option). At the option of the Government, the following Title II services may be added:

1) Visit(s) to the project site during the construction period when so requested in writing by the Contracting Officer.

2) Check and recommend approval (or disapproval) of the shop drawings furnished by the remedial action contractor during the construction period.

3) On-site resident engineer support:

a) Testing and certification.

b) Assistance with change orders and claims.

c) Assistance with pay estimate.

d) Construction progress and schedule control.

e) Data evaluation.

4) Review of Remedial Action Contractor's Site Safety and Health Plan and other plans required to be submitted by the Remediation Contractor.

5) Inspections:

a) QA inspection personnel and records.

b) Verification of required work; and

6) Final site verification:

a) Testing.

b) Records and confirmation.

c) Final document.

7) Record Drawings

a) Prepare record drawings showing the changes made during

construction, based on the marked up drawings, prints, and other data furnished by the Remediation Contractor.

8. WORK PLAN SUBMITTAL

a. The A-E will be required to make submissions at the following various stages of the project:

1) Initial Predesign Activities
2) Predesign Investigations Report
3) 35% Preliminary Design
4) 65% Intermediate Design
5) 95% Pre Final Design
6) 100% Final Design

b. All drawings, analyses, and specifications shall be reviewed for accuracy, completeness, and organization, and physically assembled in sets in one office several working days prior to scheduled submittal to permit an overall coordination review and interference check by the A-E.

1) Drawings: The contractor shall be responsible for preparing data which will operate on the Kansas City District's existing Intergraph Corporation's computer aided design and drafting CADD system. This system is utilizing interactive graphics design system (IGDS) with version 8.8.1 operating system. This may be accomplished using direct translators, initial graphics exchange specification (IGES), standard interchange format (SIF), or whatever method the contractor deems appropriate. The government will not be involved in the translation process. The government will only accept the final product suitable for full operation on the target system. All data should be delivered on standard VAX/VMS 1600 or 6250 BPI nine track tapes.

c. The work plan shall be submitted as single bound documents accompanied by letters of transmittal. A complete submission must be received by the Government before it will undertake review; partial submissions will not be accepted without prior approval. Office addresses for submittals and numbers of copies to be sent to each office are attached. Design documents for all contract levels of design shall be mailed directly to each addressee by overnight courier service.

d. The A-E shall complete the design work and services as follows:

1) Draft Work Plan Submittal. The A-E shall coordinate with the Project Manager the submittal of the Draft Work Plan. .

2) Draft Work Plan Review Conference. The review conference will be held upon completion of the Draft Work Plan review.

3) Draft Final Work Plan Submittal. The A-E shall resubmit the Work Plan, with review comments incorporated, and a schedule of the tasks within sixteen (16) working days following the Draft Work Plan review conference.

4) Final Work Plan Submittal. The A-E shall resubmit the Work Plan, with review comments incorporated, and a schedule of the tasks within five (5) working days following approval of the Work Plan.

5) Cost Proposal. A cost proposal for the incorporation of the Work Plan and a schedule of the tasks shall follow the Final Work Plan submittal within five (5) working days.

6) Predesign Investigation. The A-E shall mobilize and begin predesign investigation activities within twenty (20) working days after negotiations are completed on the Final Work Plan.

7) Draft Predesign Investigation Report. The A-E shall submit the Draft Predesign Investigation Report within forty (40) working days following receipt of the laboratory data validation.

8) Final Predesign Investigation Report. The A-E shall submit the Draft Predesign Investigation Report within ten (10) working days following the review of the draft report.

9) 35% Preliminary Design. The A-E shall submit the 35% Draft Design within thirty (30) working days after submittal of the Draft Predesign Investigation Report.

10) 65% Intermediate Design. The A-E shall submit the design within forty (40) working days following the 35% review conference. The 65% review conference will be held upon completion of the review.

11) 95% Pre Final Design. The A-E shall submit the design within twenty (20) working days following the 65% review conference.

12) 100% Final Design. The A-E shall submit the design within fifteen (15) working days following the 95% review conference.

13) Design services shall begin as outlined in the project schedule. Should the start of each phase or portions there of be delayed more than six (6) months by causes other than the A-E's negligence, the remaining phases or portions may be renegotiated at the A-E's request.

e. Additional instructions for Title I work:

1) Task 2 Design Investigations Submittal - Field Activities: No work shall begin until the work plan has been approved by CEMRK project/technical manager.

2) 35% Conceptual and 65% Intermediate Design Submittals. Design analyses, narrative descriptions, draft and outline specifications and criteria tabulations shall be assembled. Information contained in previously provided documents need not be reiterated, but should be referenced as appropriate. All project components shall be described in narrative form including decision rationale. Results of investigations and analyses shall be given. Specification requirements shall be submitted in accordance with

Instructions for Preparation of Bidding Documents for Construction Contracts. Any unresolved items or criteria required to complete the final design shall be provided by separate listing.

3) Final Design, Submittals, and Review. The final design and design documents shall be furnished in two separate submittals.

a) 95% Pre Final Submittal. The advance final submittals of drawings, typed technical specifications, design analysis and a construction cost estimate (Code "C") shall be a completed set of documents (each bound separately) that could be used for advertising without review.

b) 100% Final Submittal. The final submission provides project documents that are ready for advertisement. The A-E will furnish signed original tracings, final reproducible specifications, updated design analysis and updated construction cost estimate (Code "C"), all corrected to reflect final review conference comments. The final corrected tracings shall be transmitted by registered or guaranteed mail. Unless specifically requested by the Government, delivery by person will not be necessary.

f. Title II. The Architect-Engineer shall complete all work and services under Title II of the contract as follows:

1) Shop Drawing Services. Check and recommend approval (or disapproval) of each complete submittal of shop and working drawings, catalogs, samples, etc., as required by the contract drawings and specifications, within ten (10) working days after receipt thereof, unless the Contracting Officer is notified that a longer time will be required and of the reasons therefore.

2) Visits to the Project Site During Construction. Need for visits to the project site during construction will be determined and requested as required by the Contracting Officer.

9. CONFERENCES

a. Following work plan submittal and review, a review conference will be held at the CE offices in Kansas City, Missouri. Not more than three key company representatives familiar with work plan preparation and content shall attend. The work plan shall include provisions for review conferences in Kansas City following each design submittal. The A-E shall attend any and all conferences, in addition to those specified when so requested in writing by the Contracting Officer. The A-E shall prepare an agenda for all conferences and distribute to all attendants at the conference. The A-E shall maintain minutes of all meetings with copies distributed to all attendants and the Contracting Officer within five (5) working days of the meeting.

10. SCHEDULE

a. See paragraph 9. WORK PLAN SUBMITTAL for detailed information.

11. AUTHORIZATION

a. The design of this project is authorized by the Corps/EPA Interagency Agreement No. DW96941519-01 dated 26 September 1990. Pursuant to the provisions of FAR 36-209, the A-E is advised that as a designer of the project, you will not be permitted to bid on the construction contract for the project.

b. The provisions of FAR 36.209 do not apply to subcontractors whose input during the design phase does not materially affect the course of the design work. For example, if a government prime contractor, selects a vendor (subcontractor) to conduct a treatability test under the prime contractor's oversight, the subcontractor would not be barred from later bidding on the implementation of the selected remedy (construction).

12. PROGRAMMED CONSTRUCTION COST

a. The Architect-Engineer (A-E), throughout his participation in the project, shall bear in mind that the interest of the Government is to perform a project which is economical in design, construction, operation and maintenance.

b. Prepare construction cost estimates in accordance with the USACE Kansas City District manual "Preparation of Final Design Construction Cost Estimates for Hazardous Waste Cleanup Projects", dated January 1985 (revised July 1989). The contractor will utilize M-CACES to prepare the cost estimate for the 65-, 95- and 100-percent designs.

FS $4.9 gw 1.0 MGD $1.2 soil
= 186,000 capital

c. The anticipated construction cost excluding contingencies and Supervision and Administration is $18,300,000. If the design indicates this amount will be exceeded, the A-E will so advise the Contracting Officer and provide supporting data and recommendations for reduction of cost. Any proposed deviations from criteria or scope to achieve the limitation must be cleared prior to implementation.

13. INSURANCE - LIABILITY TO THIRD PERSONS - COMMERCIAL ORGANIZATIONS.

a. This Clause will be modified by the mutual agreement of the parties hereto within 180 days of the EPA's promulgation of final guidelines for carrying out the provisions of Section 119 of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended (CERCLA).

b. The A-E further agrees that it will make diligent efforts throughout contract performance in accordance with the following guidelines to obtain equate pollution liability insurance at a "fair and reasonable price."

c. Within 30 days of signing the indemnification agreement, the A-E must submit to the Contracting Officer written documentation concerning the efforts they have made to date to secure pollution liability insurance coverage (e.g., an A-E could submit a written statement from an insurance broker stating that the A-E has attempted to secure pollution liability coverage from insurance carriers in the past 6 months).

d. If the A-E has secured pollution liability coverage, he must submit

to the Government a copy of the policy and declaration page; and every 12 months the A-E must submit to the Contracting Officer written documentation addressing the additional efforts the A-E has made to secure pollution liability insurance coverage including:

1) Copies of applications submitted to three known underwriters of pollution liability insurance.

2) A status report of any pollution liability insurance obtained. The report would include: (1) type of coverage; (2) premium charges; (3) limits of coverage; (4) deductible levels, and any other major terms and conditions of the insurance coverage. A copy of the actual policy and declaration page may be provided in lieu of a written status report.

3) If pollution liability coverage was denied by an underwriter, a summary of the reasons why such coverage was denied.

4) A status report concerning the alternative pollution liability risk transfer mechanisms the A-E has pursued other than commercial pollution liability insurance (e.g., risk retention groups, purchasing groups, association captives).

e. The A-E agrees to the extent and in the manner required by the Contracting Officer, to submit for the approval of the Contracting Officer all insurance maintained by the A-E in connection with the performance of this contract and for which the A-E seeks reimbursement hereunder. The A- E's submission shall include documentation demonstrating its diligent efforts to obtain pollution liability insurance.

f. The A-E shall be reimbursed for the portion allocable to this contract, the reasonable cost of insurance (including reserves for self-insurance) as required or approved pursuant to the provisions of this clause.

1) Pursuant to Section 119 of CERCLA, the EPA will hold harmless and indemnify the A-E against any liability (including the expenses of litigation or settlement) for negligence arising out of the A-E's performance in carrying out response action activities. Such indemnification shall apply only to liability not compensated by insurance or otherwise and shall apply to liability which results from a release of any hazardous substances or pollutant or contaminant if such release arises out of the response action activities of this contract. Further, any liability within the deductible amounts of the A-E's insurance will not be covered under this clause.

2) For purposes of paragraph f, if the Contracting Officer has determined that the insurance identified in paragraph b is not available at a reasonable cost, the Government will hold harmless and indemnify the A-E for liability to the extent such liability exceeds $100,000.

3) The A-E shall not be reimbursed for liabilities as defined in paragraph f (including the expenses of litigation or settlement) that were caused by the conduct of the A-E (including any conduct of its directors, managers, staff, representatives or employees) which was grossly negligent,

constituted intentional misconduct, or demonstrated a lack of good faith. Further, the A-E shall not be indemnified for liability arising under strict tort liability or any other basis of liability other than negligence.

g. The EPA may discharge its liability under this clause by making payments directly to the A-E or directly to parties to whom the A-E may be liable.

h. With prior written approval of the Contracting Officer, the A-E may include in any subcontract under this contract the same provisions in this clause whereby the A-E shall indemnify the subcontractor. Such a subcontractor shall provide the same rights and duties and the same provisions for notice, furnishings of evidence or proof, and the like, between the A-E and the subcontractor as are established by this clause. Similar indemnification may be provided for subcontractors at any time upon the same terms and conditions. Subcontractors providing for indemnification within the purview of this clause shall provide for prompt notification to the A-E which is covered by this clause, and shall entitle the Government, at its election, to control, or assist in the settlement or defense of any such claim or action. The EPA will indemnify the A-E with respect to his obligation to subcontractors under such subcontract provisions. The EPA may discharge its obligations under this paragraph by making payments directly to subcontractors or to parties to whom the subcontractors may be liable.

i. If insurance coverage required or approved by the Contracting Officer is reduced without the Contracting Officer's approval, the liability of the EPA under this clause will not be increased by reason of such reduction.

j. The A-E shall:

1) Promptly notify the Contracting Officer and the Assistant Administrator OSWER, EPA, of any claim or action against the A-E or any subcontractor which reasonably may be expected to involve indemnification under this clause.

2) Furnish evidence or proof of any claim covered by this clause in the manner and form required by the EPA.

3) Immediately furnish the EPA copies of all pertinent papers received by the A-E. The EPA may direct, control, or assist the settlement or defense of any such claim or action. The A-E shall comply with the EPA's directions, and execute any authorizations required in regard to such settlement or defense.

4) Submit any disagreements concerning EPA indemnification to the Assistant Administrator OSWER, EPA, for resolution.

k. Nothing in this clause shall be construed as an indemnification agreement between the U.S. Army Corps of Engineers, the A-E or any subcontractor.

14. SPECIFICATIONS

a. Specifications shall be prepared using Corps of Engineers Guide Specifications and in accordance with the "Preparation of Bidding Documents for Construction Contracts" (POBD). If a particular item is not included within the guide specifications, a non-proprietary specification may be developed utilizing the same format as guide specifications. Departure from the guide specifications is not authorized without specific approval. No specification developed shall contravene or modify the Contract Clauses.

b. The Government will develop the following parts:

1) Front cover.

2) Solicitation Provisions.

3) Contract Clauses

4) SF 1442 (Bid Form), except Bidding Schedule.

5) Table of Contents for Division 1 through 16.

6) Special Clauses (with A-E input as required).

c. The A-E shall complete the parts listed below. A reference to the descriptive portion of the POBD each item.

1) Bidding Schedule (Section 2).

2) Indices and Draft Table of Contents for Divisions 1 through 16 (Section 3)

3) Project-Specific Special Clauses (Section 4) including:

a) Sheet number, drawing number, title and date for each drawing.

4) Technical Provisions (Section 5).

5) Develop Divisions 1 through 16.

6) Develop Submittal Register (Engineer Form 4288). Complete columns 3, 4, 5, and 6; and column 12 when necessary.

d. Format shall be in accordance with POBD, Section 5, paragraph 9.

e. Typing will be in accordance with POBD, Section 6.

f. Proprietary (sole source) Specifications will not be used unless approved by the Division Engineer. Where such approval has been obtained, the general paragraph of the specification for this item shall state, "This (description) is a sole source item available from (list name and address of

manufacturer). The second sentence of subparagraph "a" of the Contract Clauses paragraph titled MATERIAL AND WORKMANSHIP does not apply. If criteria presented or special situations require other than stated above, the Contracting Officer will be notified and approval obtained prior to incorporation into the specifications.

g. Non-Proprietary Specifications. When approved, a performance specification may be developed from manufacturer's literature. For each item specified in this manner a listing of three manufacturers with model numbers meeting this specification will be inserted into the design analysis. A specified item may be written in the manner of a performance specification but is considered proprietary if only one manufacturer can meet its requirements.

15. COORDINATION OF PLANS AND SPECIFICATIONS

a. The importance of careful checking and coordination of plans, specifications and other project documents cannot be overemphasized. It shall be the responsibility of the A-E to check and coordinate all project data prior to all submittals. Deficiencies, ambiguities, conflicts and inconsistencies shall be rectified prior to submittal of documents. The letter of transmittal shall certify that all documents have been checked and coordinated prior to submittal and it shall be signed by a principal of the A-E firm.

b. All USACE and USEPA review comments will be forwarded to Donohue and Associates, Inc. Comments will be resolved through teleconferences with the reviewers followed by written responses. All design review comments from the USACE will be electronically transmitted via the Automated Review Management System (ARMS). Donohue and Associates, Inc. will interface with and utilize the ARMS program when responding to comments.

DOCUMENTS LISTING
Claremont Polychemical Site Old Bethpage New York
Superfund Remedial Action Design

1. * Record of Decision.

2. * Scope of Work with Design Task List.

3. Previous Site Reports: Remedial Investigation and Feasibility Study.

4. * Instructions for Preparation of Bidding Documents for Construction Contracts, April 1988.

5. ER 1110-1-1807, dated 30 July 1990, Standards Manual for U.S. Army Corps of Engineers Computer-Aided Design and Drafting (CADD) Systems.

6. Preparation of Construction Cost Estimates for Hazardous Waste Cleanup Projects, Issue No. 1, dated January, 1985 (revised July 1989).

7. * EM 1110-2-1302, Cost Estimates, 15 January 1982.

8. * Design Analysis Guidelines, April 1983.

9. * April 1986 Index of the Department of the Army Technical Manuals (TM's).

10. * February 1985 List of Engineering Technical Letters (ETL).

11. * EP 310-1-5, Index of Guide Specifications, dated 15 July 1987.

12. Applicable specifications selected from above EP-310-1-5 Index.

13. * Design Document Distribution and Mailing List included in the Scope of Work.

14. * COE Kansas City District Drafting Standards, dated January 1984.

15. * Forms: (For additional copies, AE shall reproduce as needed.)

ENG Form 93 - Payment Estimate Form
ENG Form 1741 - Cost Estimating Form
DA Form 5417R - 5420R - Cost Estimating Forms
MRD Form 0691 - Comment Form

16. * Instructions for Completion of ENG Form 93 - Payment Estimate.

17. * ER-1110-1-263, Chemical Data Quality Management for Hazardous Wastes Remedial Activities with appendices, dated 15 December 1989.

18. EPA Superfund Remedial Design and Remedial Action Guidance Document, EPA Directive 9355.0-4A (June 1986).

* Indicates material furnished with Request for Proposal. All other documents are to be obtained by A-E as needed.

LIST OF ADDRESSES FOR SUBMITTALS
Claremont Polychemical Site, Old Bethpage, New York.

Commander
U.S. Army Engineer District, Kansas City
ATTN: CEMRK-ED-TS (Mr. Thomas F. Urbaniak)
700 Federal Building, 601 East 12th Street
Kansas City, Missouri 64106-2896

Commander
U.S. Army Corps of Engineers
ATTN: CEMP-RS (Noel Urban)
20 Massachusetts Avenue, N.W.
Washington, D.C. 20314-1000

Commander
U.S. Army Engineer Division, Missouri River
ATTN: CEMRD-ED-CP (Mr. Eric Hines)
P.O. Box 103 Downtown Station
12565 West Center Road
Omaha, Nebraska 68101-0103

Commander
U.S. Army Engineer District, New York
ATTN: CENAN-CO-CE (Mr. Victor Di Meglio)
26 Federal Plaza
New York, New York 10278

U.S. Environmental Protection Agency, Region II
ATTN: Mr. ~~Carlos Ramos~~, ~~Room 29-100~~ DICK KAPLAN Room 2930
26 Federal Plaza
New York, New York 10278

New York State Department of Environmental Conservation.
ATTN: Mr. Kamal Gupta, Rm 401
50 Wolf Road
Albany, New York 12233-7010

Note: See Table 1 - Design Document Distribution Chart for submittal requirements.

DESIGN DOCUMENT DISTRIBUTION
Claremont Polychemical Site Old Bethpage, New York

	Tasks 1 & 2	35% Pre-liminary Design	65% Inter-mediate Design	95% Advance Final Design	100 % Final Design
CEMRK-ED-TS	7	14	14	14	4 copies 1 orig.
CEMP-RS		1		1	
CEMRD-ED-CP	3	3	3	3	3
CENAN-CO		6	6	6	6
EPA Region II	5	5	5	5	5
NYSDEC	6	6	6	6	6
TOTAL	21	35	34	35	24 copies 1 orig.

TABLE 1

Notes:

1) Submit 3 copies of corrections of final design analysis at 100% final design stage to CEMRK-ED-TS.

2) A-E should retain one record copy, also submit original tracings and specifications at 100% final design stage.

3) All cost estimates will be sent to CEMRK-ED-TS for review and distribution.

4) The number of copies to be distributed as indicated in the above table is for each stage (65, 95, and 100%). For example: at the 65% design, six copies of the design submittals are to be sent to CEMRD-ED-EA.

5) One copy of plans at 35%, 65%, 95%, and 100% shall be provided at 1/2 scale to CEMRK-ED-TS.

6) Copies furnished to NYSDEC will be mailed to EPA. EPA will forward the documents.

SEND Right to State - their copies.

APPENDIX B

Donohue
Engineers & Architects

SHEET COUNT FORM

PROJECT CPC

PROJECT NO. 19422 DATE 1-15-03

STRUCTURE / DESCRIPTION

BLOCK ___ SITE IDENTIFIER ___

DRAWING NO.	SHEET TITLE (Description)	DRAWING STATUS: RESPONSIBLE DISCIPLINE	START CONSTR. DRAWINGS	DSGN REVIEW CORRECTIONS	Q.C. CORRECTIONS	PERCENT COMPLETE
	TITLE SHEET					
G-1	INDEX TO DRAWINGS					
G-	LOCATION & VICINITY MAPS					
01-G-2	A/S ABBR. & SYMB					
G-3	CIVIL					
4	PROCESS					
5	"					
6	PLBG HVAC					
7	P&ID					
8	"					
9	ELECTRICAL					
10	HYD. PROFILE					
02-CF-1	SITE FACILITIES					
2	GRADING & PAVING					
3	PIPING					
4	ELECT.					
5	EXTRACTION / INJECTION WELL LOCATION					
09-N-1	EQUAL./CHEM CONTACT/SETTLE.					
2	CHEMICAL SYSTEMS					
3	NEUTRALIZATION / FILTRATION/COMPRESSOR					
4	AIR STRIPPER					
5	CARBON ADSORBER					
6	SLUDGE PRESS					
7 7						
02-CR-1	SOIL REMEDIATION STAGING					
02-CR-2	SOIL REMEDIATION PLAN					
02-CR-3	SOIL REMEDIATION CROSS-SECTIONS					
02-CR-4	BUILDING DECONTAMINATION PLAN					

Donohue
Engineers & Architects

SHEET COUNT FORM

PROJECT CPC

PROJECT NO. 18422 DATE 1-[illegible]-[illegible]

STRUCTURE / DESCRIPTION [illegible]

BLOCK ____ SITE IDENTIFIER ____

DRAWING NO.	SHEET TITLE (Description)	DRAWING STATUS				
		RESPONSIBLE DISCIPLINE	START CONSTR. DRAWINGS	DSGN REVIEW CORRECTIONS	Q.C. CORRECTIONS	PERCENT COMPLETE
10 AS - 1	PLANS - FOUNDATION					
2	PLANS -					
3	ROOF PLAN / ELEVATIONS					
4	SECTIONS, DETAILS					
5	PLANS CATWALKS					
6						
10 - M - 1	PROCESS PLANS					
2	"					
3	" SECTIONS					
4	"					
10 - P - 1	PLBG PLANS					
2	SCHEDULE, RISERS					
10 - H - 1	HVAC PLAN					
2	SCHEDULE DETAILS					
10 - E - 1	ELECT POWER					
2	" LTG					
99. C - 1	CIVIL DETAILS					
A - 1	ARC - DETAILS					
S - 1	STR DETAILS					
M - 1/2	PRO DETAILS					
PH - 1	PLB HV DETAILS					
E - 1	ELECT DETAILS					
E 2	" PANELS FIXTURES					
M - 1	" RISERS					
M - 2	" DETAILS					

2.0 CIVIL DESIGN ANALYSIS

2.1 GENERAL PARAMETERS

1. The groundwater treatment plant is located east of the process building in the former spill area. Thus, the treatment plant would be constructed after soil remediation is complete. This will allow the option of selling a larger percentage of the property after startup of the treatment plant. The 1.3 acre plant site is approximately 240 feet in both north-south and east-west directions.

2. The existing topography at the site consists of an approximately 25 foot high bank on the east boundary that rises at 3:1 slope from its bottom located approximately 30 feet from the proposed treatment plant. The bank also rises at a 3:1 slope along the south boundary from its bottom located approximately 50 feet north of the south property line. The relatively flat plant site lies between the bank bottom and the process building. The surface drains westerly at a 2.5 percent slope toward the existing access road.

3. The soil in the spill area construction site is generally silty and clayey sand with approximately 10 to 20 percent gravel. The natural moisture content of the subsurface soil ranges from 5 to 16 percent. It is anticipated that soil remediation will be required of an approximately 21,000 square foot area. Contaminated soil will be excavated and stockpiled. The stockpiled soil will then be treated, tested, and placed back in the excavation area. Solid residuals will be disposed of/treated at an off-site licensed facility. Liquid residuals will either be treated in the on-site, groundwater treatment plant if in place, or disposed of/treated at an off-site licensed facility.

4. The soil remediation contractor will be required to clear and grade the area needed for soil remediation activities. Included in the site preparation is the removal of trees and an existing soil pile. The tree line extends approximately 70 feet into the site on the east boundary and approximately 90 feet into the site on the south boundary. The soil pile lies along the east bank varying in height from 0 to 15 feet. The pile extends north from the toe of the south bank approximately 250 feet and varies in width from 35 feet to 90 feet. The contractor will grade the area to approximate natural grade prior to soil remediation excavation activities. The area will be graded to approximate final subgrade elevation for the new facilities after the excavation area is backfilled. There are no known environmentally sensitive items to be mitigated during construction of this project. Normal erosion control efforts (silt fences, hay bales, etc.) should be satisfactory to prevent siltation of downstream areas.

2.2 FUNCTIONAL AND TECHNICAL CONSIDERATIONS

1. The proposed grading plan maintains the existing site drainage pattern with the surface draining westerly toward the existing access road and process plant drainage

system. Sheet flow is used to the maximum extent to reduce erosion potential on steep slopes and distribute the surface runoff across the relatively flat construction area. Channelized flow around buildings will have erosion protection devices installed at outlet points to limit erosion to the maximum possible extent.

2. At the present time it is anticipated that select granular material will be required to be hauled in from off-site. This off-site borrow will be used for the road base course, plant site surface material and utility system construction and should be readily compactible to the required degree. Excess uncontaminated clay or soil material from the proposed site will be temporarily stockpiled for use in regrading the new plant site following soil remediation. Any remaining portions will be moved to the landfill for use as cover material. An off-site borrow location for earth materials has yet to be designated.

3. The layout of the site was based upon vehicle and equipment accessibility, existing topography, process system hydraulics, minimum pumping, and minimum process piping installation.

4. The groundwater treatment plant was located at a finished ground elevation (134.5 feet) to match the existing site grade. The lower level finished floor elevation was set slightly higher at 135.0 feet. The finished ground elevation at the east face of the plant building is set at 137.5 feet, slightly lower than the finished floor elevation (138.0 feet) of the east portion of the building. The finished foundation elevations for the treated storage tanks and flow equalization basin is set at 140.3 feet, slightly higher than the finished ground elevation (140.0 feet) at the up slope side of the structures. The finished foundation slab elevations for the air strippers and carbon absorbers is set at 135.0 feet slightly higher than the finished ground elevation (134.5).

5. The site will be secured with a 6-foot high chain link fence along the south and east property lines. A north fence line will be located approximately 10 feet off the treatment plant building connecting the existing CPC process building and the east property fence. The west fence line will connect the southeast corner of the CPC process building and the south property fence. A 20-foot wide double swing gate will be located in the west fence at the access road and a 10-foot wide single swing gate will be located in the north fence for access to the yard area.

6. Site utilities will generally consist of process piping for plant operations and other piping required to connect the proposed utility systems with the off-site gas, water, sanitary sewer, electric, and communication facilities. The piping proposed for the process systems and for the utilities will be as follows:

   Gravity flow process piping - ductile iron or PVC (poly vinyl chloride) pipe.

   Pressurized (pumped) process piping - ductile iron or PVC pipe.

Natural gas systems - polyethylene pipe.

Tank drains and sanitary systems - PVC pipe.

Water lines - ductile iron or PVC pipe.

Extracted groundwater and treated water piping - PVC pipe.

7. An agreement for connecting to existing utility systems will be required with the Plainfield Water District, Nassau County Public Works, Long Island Light Co., and the New York New England Telephone Company.

8. These piping systems should provide appropriate degrees of service and design lifetimes for their intended use. Seismic design considerations will be incorporated into the design of utilities during detailed design work.

9. The access road to the treatment plant facility follows the existing entrance drive from Winding Road to a proposed asphalt paved road which will terminate at the two south overhead doors in the treatment plant. The building approach to the east overhead door will require a 3-foot rise to allow for the difference in floor levels in the treatment plant. The east driveway, which is handicap accessible to the control room entrance, will service as the parking area. An asphalt paved surface area will be provided to permit semitrailer truck access to the treatment plant. The paved area is adequate for accommodating the turning movements of a WB-50 design vehicle.

2.3 DESIGN OBJECTIVES AND PROVISIONS

1. The proposed designs provide for the efficient and cost-effective operation of the groundwater treatment plant. The plant location, layout (both for elevation and location on-site), and utility systems serve to support the overall design objective of providing a functional treatment plant for the duration of groundwater remediation process.

2.4 CALCULATIONS

1. Calculations for preliminary roadway paving are included as Appendix A to this section.

2.5 COORDINATION WITH OUTSIDE AGENCIES

1. There are no known permits which are required specifically for the work proposed in this section such as highway, sanitary, water, wetland, floodway, zoning, or stormwater permits.

APPENDIX A

SEC DONOHUE
Environment & Infrastructure

CALCULATION SHEET

PROJECT NO. ____

CLIENT [illegible] SUBJECT [illegible] DESIGN ANALYSIS

PROJECT G.P.C

Prepared By [illegible] Date [illegible]
Reviewed By ____ Date ____
Approved By ____ Date ____

PRELIMINARY
BITUMINOUS PAVEMENT DESIGN
FOR
GROUNDWATER TREATMENT PLANT

DESIGNED PER TM 5-822-5 [illegible]
CHAP. 5 [illegible] DESIGN, FLEXIBLE
PAVEMENTS FOR ROADS, STREETS, [illegible]
[illegible] AREAS

<u>[illegible]:</u> [illegible] I TRAFFIC [illegible]
CLASS F STREET
[illegible] STREET [illegible]
[illegible]

<u>[illegible]:</u>
FROM TABLE [illegible]

SUB[illegible] MATERIAL:

- [illegible] AND [illegible]
  [illegible]
  [illegible]

- CBR OF [illegible]

- [illegible]
  [illegible]

FROM [illegible] DENSITY
[illegible] OF COMPACTED [illegible] REQUIRED

FROM [illegible] THE [illegible]
[illegible] 75 [illegible]

SEC DONOHUE
Environment & Infrastructure

CALCULATION SHEET

PAGE ____ OF 4
PROJECT NO. ____

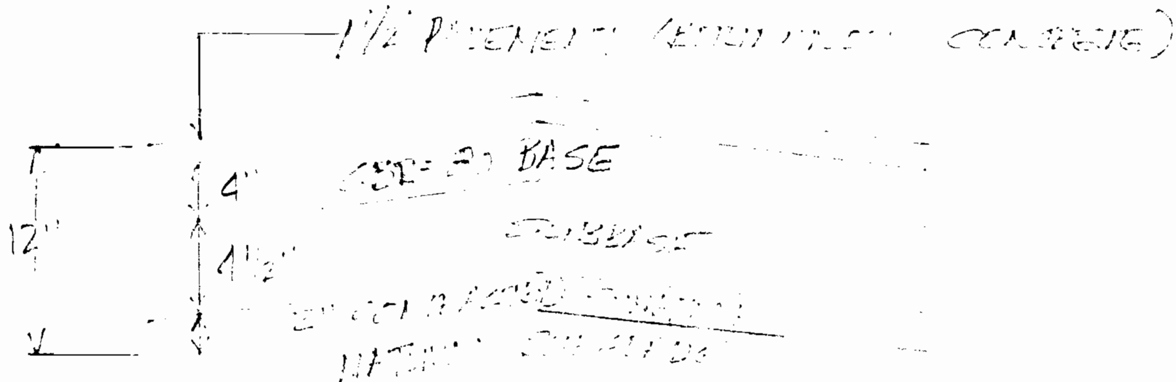
CLIENT U.S. ARMY COE
SUBJECT PAVEMENT DESIGN
PROJECT GRC
Prepared By [illegible] Date [illegible]
Reviewed By ____ Date ____
Approved By ____ Date ____

THEREFORE 2" OF
COMPACTED [illegible] IS NECESSARY
COMPACTED TO 90% [illegible]

PAVEMENT MATERIAL

FROM TABLE 2 FOR BASE COURSE [illegible] OF 80 / [illegible] BASE PAVEMENT THICKNESS OF MULTIPLE BIT SURFACE TREATMENTS AND 4" OF BASE COURSE ARE REQUIRED. HOWEVER FOR [illegible] OF APPEARANCE 1½" OF [illegible] SURFACE IS PROPOSED.

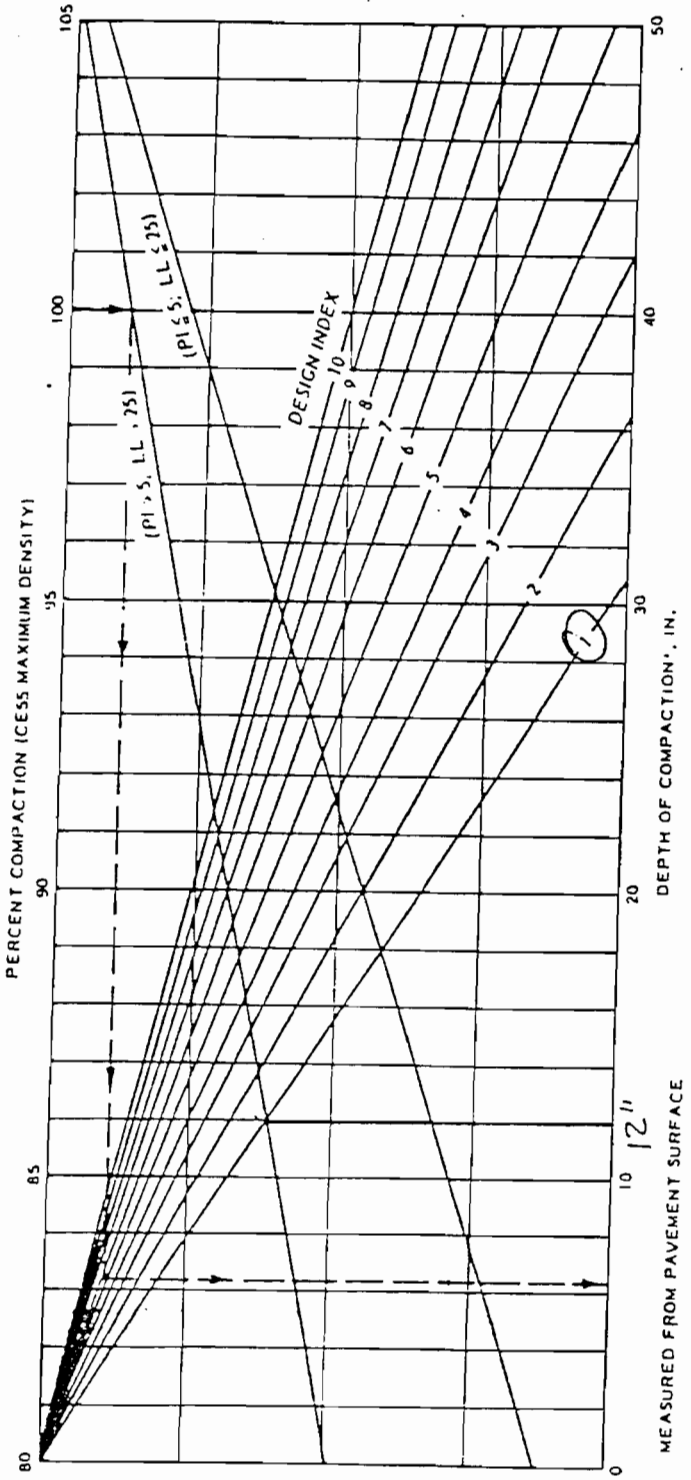
PAVEMENT DESIGN



FROM FIGURE [illegible] 5½" [illegible] 11.

THEREFORE A CBR OF 20 IS ADEQUATE FOR THE SUBBASE

3 of 4



DEPTH REQUIRED FOR COMPACTION OF SUBGRADE = 12"

Figure 2. Depth of Compaction for Select Materials and Subgrades of Conventional Flexible Pavements

4 of 4

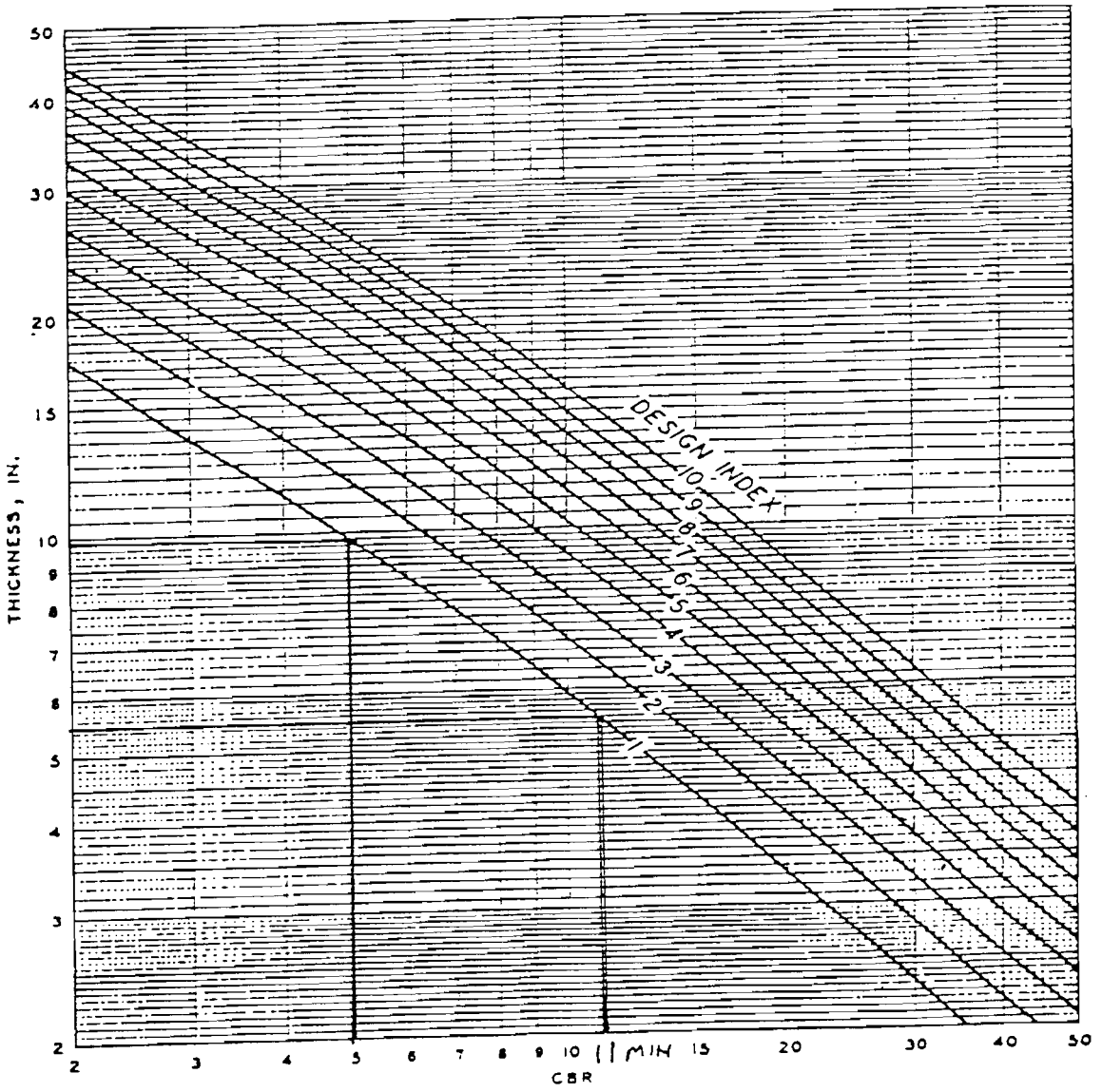


Figure 3. Thickness Design Requirements

3.0 ARCHITECTURAL DESIGN ANALYSIS

3.1 GENERAL PARAMETERS

1. The groundwater treatment building will principally be used to house equipment and control systems used for the extraction and treatment of contaminated groundwater. Space has been provided for related support and administrative functions.

2. The building construction has been chosen for cost-effectiveness and economy. The building has been designed in accordance with Codes, Rules, and Regulations of the State of New York Volume 9 executive (B) Part 600, Chapter 1, State Uniform Fire Prevention and Building Code, Subchapter B, Building Construction and Part 1150 Subchapter C, Fire Prevention with supplement Number 10 dated October 31, 1992.

3. Activities will consist of treatment related tasks including sludge loading, chemical treatment, and pumping activities. A control room has been provided to house administrative functions such as personnel support, laboratory, control panel, motor control panels, office, and toilet room.

4. The treatment facilities will have a maximum designed occupancy of one full-time employee plus occasional laboratory technician and visitors.

5. The building is a standard temporary design, with an anticipated 20-year life span.

3.2 FUNCTIONAL AND TECHNICAL REQUIREMENTS

1. Functional areas are generally described as process, mechanical, and personnel support areas. Major area requirements have been provided in accordance with the architect, engineer contract, and the building program input.

   Square Foot Summary

Control Room	621 sq. ft.
Process	5,139 sq. ft.

2. The design will conform to various building code standards such as NFPA 101, State of New York Building Code, OSHA, and ANSI handicapped accessibility standards for egress, person and equipment clearances, sanitary facilities, and emergency eyewash and shower.

3. Equipment and furnishings include laboratory cabinets and equipment, toilet room accessories, fire extinguishers, building mechanical and electrical equipment and controls, and process equipment and controls.

4. All employees must be fully ambulatory and orientation trained in order to perform work tasks. The administration building office and toilet room areas are designed to meet ANSI handicapped accessibility standards.

5. Building security will be by locks on the exterior doors to prevent illegal entry and fencing around the site with limited access openings.

6. The control room will be furnished with a standard size office desk and posture chair.

3.3 DESIGN OBJECTIVES AND PROVISIONS

1. The building is a one-story, two-level, 5,900 square foot preengineered metal building with a gable pitched roof. The size and configuration is determined by the required enclosure of the process equipment and maintenance clearance.

2. Exterior materials are painted metal panel ribs for the walls and roof. The doors are hollow metal and coiling metal.

3. The walls are site built composition metal panels and insulation supported on subgirts.

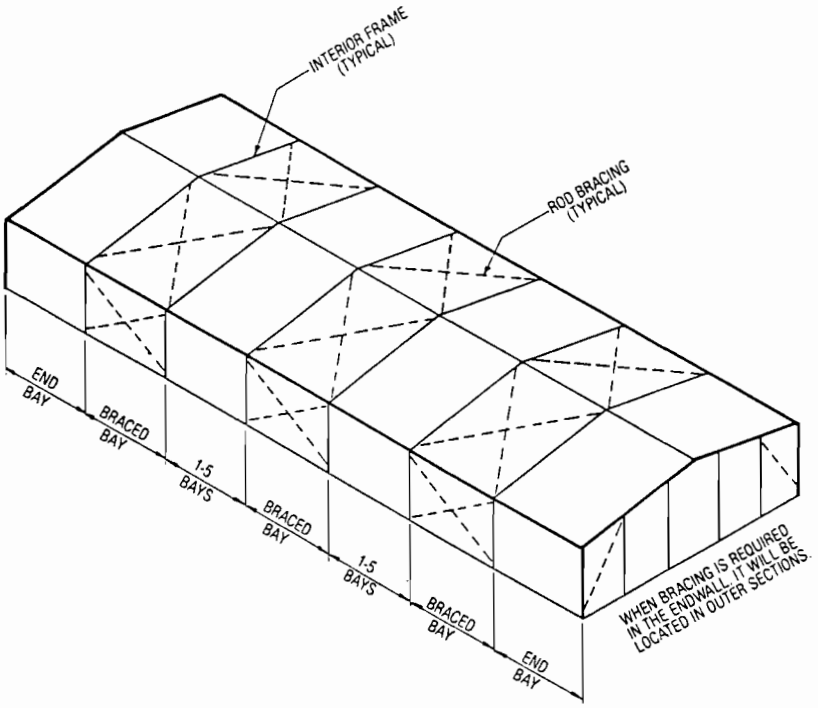
4. Interior finishes are interior metal liner to a height of 7 feet with exposed insulation above in the industrial process areas and painted gypsum wall board in the control and toilet room. Floors are sealed concrete in the process areas and resilient in the control room and toilet room. The ceiling of the control room is suspended acoustic tile.

3.4 PRODUCT INFORMATION

1. Refer to Appendix A for information on the pre-engineered metal building proposed for this project.

RP/CPC65RDN/AC1

APPENDIX A



NOTES

1. Buildings are braced for the following reasons:
   (A) To sustain wind loads.
   (B) To sustain seismic loads.
   (C) To sustain longitudinal loads from crane systems.
   (D) For erection purposes.

2. Buildings can be adequately braced by one or a combination of the following methods:
   (A) Diaphragm action of roof and/or wall units.
   (B) X-bracing (sections in tension).
   (C) Knee braces.
   (D) Struts (sections in compression).
   (E) Portal frames.
   (F) Moment base columns.

3. Star DuraRib, StarMark and StarCFW panels are capable of resisting wind loads through in-plane shear resistance, referred to as "Diaphragm Action" for certain width buildings. Refer to data section.

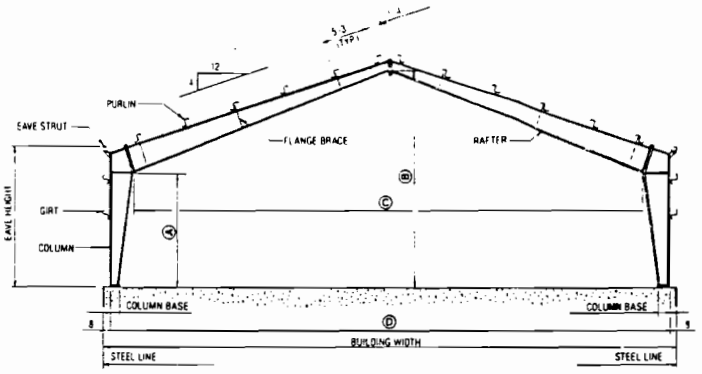
4. Standard Star buildings assume either diaphragm action of paneled roof and walls, or rod X-bracing in sustaining endwall wind loads.

5. It is assumed that endwalls are framed using post and beam frames. The X-bracing could be located in the sidewall end bay when a rigid frame is used in the endwall.

6. Unless load requirements are to the contrary, it is recommended that Star buildings be braced as follows:
   (A) 4 or less bay buildings ..... one bay braced.
   (B) 5 to 9 bay buildings ..... two bays braced.
   (C) 10 to 15 bay buildings ..... three bays braced.
   (D) 16 to 21 bay buildings ..... four bays braced.
   (E) Longer buildings generally require an expansion joint. Units each side of the expansion joint should be braced as individual buildings.
   (F) Economy may determine the number of bays braced for wind loads. There may be fewer or more bays braced than indicated in (A) through (D).

7. All buildings with crane systems, continuous band of light transmitting panels, or rigid insulation must have rod bracing.

8. Roof and sidewall rod bracing must be located in the same bay or additional struts may be required.



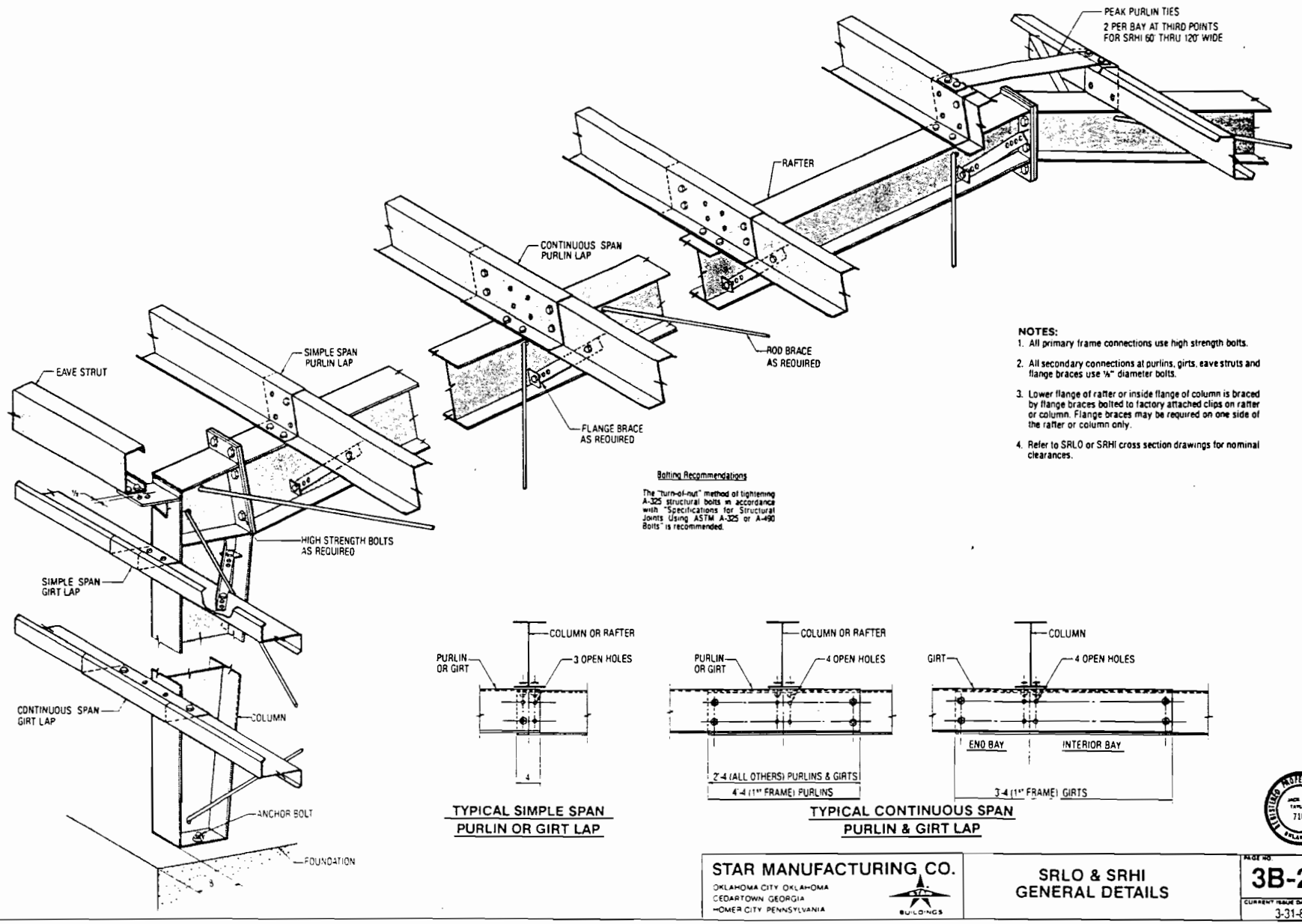
C R O S S S E C T I O N

NOTES:

1. Standard bay lengths are 20 and 25. Other lengths are available upon request.
2. All clearances shown are nominal. If exact clearances are required contact Star's home office.
3. Frames are designed for standard girt spacing. Column lateral stability may be required for non-standard or optional girts.
4. Special frames are required for all 2 bay conditions. Contact Star's home office for clearance information.

C L E A R A N C E S

	LIVE LOAD	EAVE HT.	40' WIDE					50' WIDE					60' WIDE					70' WIDE					80' WIDE					100' WIDE					120' WIDE				
			Ⓐ	Ⓑ	Ⓒ	Ⓓ	COL. BASE	Ⓐ	Ⓑ	Ⓒ	Ⓓ	COL. BASE	Ⓐ	Ⓑ	Ⓒ	Ⓓ	COL. BASE	Ⓐ	Ⓑ	Ⓒ	Ⓓ	COL. BASE	Ⓐ	Ⓑ	Ⓒ	Ⓓ	COL. BASE	Ⓐ	Ⓑ	Ⓒ	Ⓓ	COL. BASE	Ⓐ	Ⓑ	Ⓒ	Ⓓ	COL. BASE
20 FT. BAYS	12 PSF	10'	8'-8	15'-1	36'-2	38'-8	8	8'-4	16'-4	45'-6	48'-8	8	8'-3	17'-10	55'-2	58'-8	8																				
		12'	10'-6	16'-10	35'-10	38'-8	8	10'-3	18'-6	45'-2	48'-8	8	10'-1	19'-10	54'-10	58'-8	8	10'-0	21'-4	54'-6	68'-8	12	9'-11	22'-10	74'-4	68'-8	12										
		14'	12'-4	18'-10	35'-6	38'-8	8	12'-3	20'-6	45'-0	48'-8	8	12'-1	21'-10	54'-8	58'-8	8	12'-0	23'-4	64'-6	68'-8	12	11'-10	24'-10	74'-2	68'-8	12	11'-7	27'-8	93'-6	98'-8	12	11'-5	30'-5	112'-10	118'-8	12
		16'	14'-4	20'-10	36'-6	38'-8	8	14'-3	22'-4	44'-10	48'-8	8	14'-1	23'-10	54'-6	58'-8	8	14'-0	25'-4	64'-5	68'-8	8	13'-10	26'-8	74'-0	68'-8	8	13'-7	29'-8	93'-4	98'-8	12	13'-4	32'-5	112'-8	118'-8	12
		20'	16'-1	25'-0	34'-6	38'-8	12	16'-1	26'-4	44'-6	48'-8	12	17'-11	27'-10	54'-4	58'-8	12	17'-11	29'-4	54'-4	68'-8	12	17'-10	30'-8	73'-10	68'-8	12	17'-6	33'-6	93'-2	98'-8	12	17'-3	36'-5	112'-4	118'-8	12
		24'	21'-10	29'-0	34'-2	38'-8	12	21'-10	30'-5	44'-0	48'-8	12	21'-8	32'-0	53'-6	58'-8	12	21'-8	33'-4	63'-8	68'-8	12	21'-7	34'-8	73'-6	68'-8	12	21'-5	37'-6	92'-10	98'-8	12	21'-2	40'-5	112'-2	118'-8	12
	20 PSF	10'	8'-4	15'-1	35'-4	38'-8	8	8'-1	16'-4	45'-0	48'-8	8	8'-0	17'-10	54'-6	58'-8	12																				
		12'	10'-3	17'-1	35'-4	38'-8	8	10'-1	18'-6	44'-10	48'-8	8	9'-11	19'-10	54'-4	58'-8	8	9'-10	21'-4	64'-0	68'-8	12	9'-6	22'-10	73'-6	68'-8	12										
		14'	12'-2	18'-10	35'-4	38'-8	8	12'-1	20'-6	44'-8	48'-8	8	11'-11	21'-10	54'-4	58'-8	8	11'-9	23'-4	63'-10	68'-8	12	11'-6	24'-10	73'-6	68'-8	12	11'-3	27'-8	92'-8	98'-8	12	11'-1	30'-5	112'-0	118'-8	12
		16'	14'-4	20'-10	35'-1	38'-8	8	14'-1	22'-4	44'-8	48'-8	8	13'-10	23'-10	54'-2	58'-8	8	13'-8	25'-4	63'-8	68'-8	8	13'-7	26'-10	73'-4	68'-8	12	13'-4	29'-8	92'-4	98'-8	12	13'-0	32'-5	111'-8	118'-8	12
		20'	16'-1	25'-0	34'-6	38'-8	12	16'-1	26'-4	44'-6	48'-8	12	17'-10	27'-10	54'-0	58'-8	12	17'-8	29'-4	53'-8	68'-8	12	17'-6	30'-8	73'-2	68'-8	12	17'-2	33'-6	92'-2	98'-8	12	16'-10	36'-5	111'-4	118'-8	12
		24'	21'-10	29'-0	34'-2	38'-8	12	21'-10	30'-5	44'-0	48'-8	12	21'-8	31'-10	53'-6	58'-8	12	21'-8	33'-3	63'-6	68'-8	12	21'-5	34'-9	73'-0	68'-8	12	21'-1	37'-6	92'-0	98'-8	12	20'-9	40'-5	111'-0	118'-8	12
	30 PSF	10'	8'-2	15'-0	35'-0	38'-8	8	8'-1	16'-4	44'-6	48'-8	12	7'-10	17'-10	54'-0	58'-8	12																				
		12'	10'-1	17'-0	34'-10	38'-8	8	9'-11	18'-5	44'-4	48'-8	8	9'-9	19'-10	53'-10	58'-8	12	9'-7	21'-4	63'-4	68'-8	12	9'-5	22'-9	72'-10	68'-8	12										
		14'	12'-1	19'-0	34'-10	38'-8	8	11'-8	20'-5	44'-2	48'-8	8	11'-6	21'-10	53'-8	58'-8	12	11'-5	23'-4	63'-2	68'-8	12	11'-4	24'-9	72'-8	68'-8	12	11'-0	27'-8	91'-10	98'-8	12	10'-8	30'-5	111'-0	118'-8	16
		16'	14'-1	21'-0	34'-10	38'-8	8	13'-10	22'-5	44'-2	48'-8	8	13'-8	23'-9	53'-8	58'-8	12	13'-5	25'-4	63'-0	68'-8	12	13'-3	26'-9	72'-6	68'-8	12	12'-11	29'-7	91'-6	98'-8	12	12'-6	32'-5	110'-8	118'-8	16
		20'	16'-1	25'-0	34'-8	38'-8	12	16'-1	26'-5	44'-0	48'-8	12	17'-9	27'-8	53'-6	58'-8	12	17'-5	29'-3	62'-10	68'-8	12	17'-3	30'-8	72'-2	68'-8	12	16'-9	33'-6	91'-2	98'-8	12	16'-5	36'-5	110'-2	118'-8	12
		24'	21'-10	29'-0	34'-2	38'-8	12	21'-10	30'-4	44'-0	48'-8	12	21'-8	31'-10	53'-6	58'-8	12	21'-4	33'-2	62'-8	68'-8	12	21'-2	34'-7	72'-0	68'-8	12	20'-9	37'-6	91'-0	98'-8	12	20'-4	40'-5	110'-0	118'-8	12
	40 PSF	10'	8'-1	15'-0	34'-8	38'-8	8	7'-10	16'-5	44'-0	48'-8	12	7'-8	17'-10	53'-6	58'-8	12																				
		12'	10'-0	17'-0	34'-6	38'-8	8	9'-10	18'-5	43'-10	48'-8	12	9'-7	19'-9	53'-4	58'-8	12	9'-5	21'-3	62'-10	68'-8	12	9'-2	22'-8	72'-4	68'-8	12										
		14'	12'-0	19'-0	34'-6	38'-8	8	11'-9	20'-5	43'-10	48'-8	12	11'-6	21'-9	53'-2	58'-8	12	11'-3	23'-2	62'-6	68'-8	12	11'-2	24'-7	72'-0	68'-8	12	10'-8	27'-6	91'-2	98'-8	16	10'-5	30'-6	110'-4	118'-8	20
		16'	14'-1	21'-0	34'-6	38'-8	8	13'-9	22'-4	43'-10	48'-8	12	13'-6	23'-8	53'-2	58'-8	12	13'-3	25'-2	62'-6	68'-8	12	13'-1	26'-8	71'-10	68'-8	12	12'-7	29'-6	90'-10	98'-8	16	12'-3	32'-6	110'-0	118'-8	16
		20'	18'-0	24'-10	34'-4	38'-8	12	17'-8	26'-3	43'-8	48'-8	12	17'-5	27'-7	53'-0	58'-8	12	17'-3	29'-1	62'-1	68'-8	12	17'-0	30'-6	71'-8	68'-8	12	16'-6	33'-6	90'-6	98'-8	12	16'-3	36'-5	109'-8	118'-8	16
		24'	21'-10	28'-9	34'-0	38'-8	12	21'-8	30'-2	43'-8	48'-8	12	21'-5	31'-9	52'-10	58'-8	12	21'-3	33'-0	62'-2	68'-8	12	20'-11	34'-7	71'-6	68'-8	12	20'-5	37'-6	90'-2	98'-8	12	20'-2	40'-5	109'-6	118'-8	16
25 FT. BAYS	12 PSF	10'	8'-7	15'-1	36'-2	38'-8	8	8'-4	16'-4	45'-6	48'-8	8	8'-3	17'-10	55'-2	58'-8	8																				
		12'	10'-6	17'-1	35'-10	38'-8	8	10'-3	18'-6	45'-2	48'-8	8	10'-2	19'-10	55'-0	58'-8	8	10'-0	21'-4	64'-6	68'-8	12	9'-10	22'-10	74'-4	68'-8	12										
		14'	12'-4	19'-1	35'-6	38'-8	8	12'-3	20'-6	45'-0	48'-8	8	12'-2	21'-10	54'-8	58'-8	8	12'-0	23'-4	64'-6	68'-8	12	11'-10	24'-10	74'-2	68'-8	12	11'-6	27'-8	93'-6	98'-8	12	11'-5	30'-5	112'-10	118'-8	12
		16'	14'-4	21'-1	35'-2	38'-8	8	14'-2	22'-6	44'-10	48'-8	8	14'-1	23'-10	54'-6	58'-8	8	13'-11	25'-4	64'-4	68'-8	12	13'-10	26'-10	74'-0	68'-8	12	13'-7	29'-8	93'-4	98'-8	12	13'-4	32'-5	112'-8	118'-8	12
		20'	18'-1	25'-0	34'-6	38'-8	12	18'-1	26'-6	44'-6	48'-8	12	17'-11	27'-10	54'-4	58'-8	12	17'-10	29'-4	64'-0	68'-8	12	17'-8	30'-7	73'-8	68'-8	12	17'-6	33'-6	93'-2	98'-8	12	17'-3	36'-5	112'-4	118'-8	12
		24'	21'-10	29'-0	34'-2	38'-8	12	21'-10	30'-5	44'-0	48'-8	12	21'-8	32'-0	53'-6	58'-8	12	21'-8	33'-4	63'-8	68'-8	12	21'-7	34'-10	73'-6	68'-8	12	21'-5	37'-8	92'-10	98'-8	12	21'-2	40'-5	112'-2	118'-8	12
	20 PSF	10'	8'-3	15'-1	35'-4	38'-8	8	8'-1	16'-6	45'-0	48'-8	8	8'-0	17'-10	54'-6	58'-8	12																				
		12'	10'-3	17'-1	35'-4	38'-8	8	10'-1	18'-6	44'-10	48'-8	8	9'-11	19'-10	54'-4	58'-8	8	9'-10	21'-4	64'-0	68'-8	12	9'-8	22'-10	73'-6	68'-8	12										
		14'	12'-3	19'-1	35'-4	38'-8	8	12'-1	20'-6	44'-8	48'-8	8	11'-11	21'-10	54'-4	58'-8	8	11'-9	23'-4	63'-10	68'-8	12	11'-6	24'-10	73'-6	68'-8	12	11'-3	27'-8	92'-8	98'-8	12	11'-1	30'-5	112'-0	118'-8	12
		16'	14'-4	21'-1	35'-2	38'-8	8	14'-1	22'-6	44'-8	48'-8	8	13'-10	23'-10	54'-2	58'-8	8	13'-8	25'-4	63'-8	68'-8	12	13'-6	26'-10	73'-4	68'-8	12	13'-3	29'-8	92'-4	98'-8	12	13'-0	32'-5	111'-8	118'-8	12
		20'	18'-1	25'-0	34'-10	38'-8	12	18'-1	26'-6	44'-8	48'-8	8	17'-11	27'-10	54'-0	58'-8	12	17'-8	29'-4	63'-8	68'-8	12	17'-6	30'-10	73'-2	68'-8	12	17'-2	33'-8	92'-2	98'-8	12	16'-10	36'-5	111'-4	118'-8	12
		24'	21'-10	29'-0	34'-2	38'-8	12	21'-10	30'-5	44'-0	48'-8	12	21'-8	31'-10	53'-8	58'-8	12	21'-8	33'-3	63'-6	68'-8	12	21'-5	34'-9	73'-0	68'-8	12	21'-1	37'-8	92'-0	98'-8	12	20'-9	40'-5	111'-0	118'-8	12
	30 PSF	10'	8'-2	15'-0	35'-0	38'-8	8	8'-1	16'-6	44'-6	48'-8	12	7'-10	17'-10	54'-0	58'-8	12																				
		12'	10'-1	17'-0	34'-10	38'-8	8	9'-11	18'-5	44'-4	48'-8	8	9'-9	20'-0	53'-10	58'-8	12	9'-7	21'-4	63'-4	68'-8	12	9'-5	22'-9	72'-10	68'-8	12										
		14'	12'-1	19'-0	34'-10	38'-8	8	11'-8	20'-5	44'-2	48'-8	8	11'-6	21'-10	53'-8	58'-8	12	11'-5	23'-4	63'-2	68'-8	12	11'-4	24'-9	72'-8	68'-8	12	11'-0	27'-8	91'-10	98'-8	12	10'-8	30'-8	111'-0	118'-8	16
		16'	14'-1	21'-0	34'-10	38'-8	8	13'-10	22'-5	44'-2	48'-8	8	13'-8	23'-9	53'-8	58'-8	12	13'-5	25'-4	63'-0	68'-8	12	13'-3	26'-9	72'-6	68'-8	12	12'-11	29'-8	91'-6	98'-8	12	12'-6	32'-8	110'-8	118'-8	16
		20'	18'-2	25'-0	34'-8	38'-8	12	17'-11	26'-5	44'-0	48'-8	12	17'-9	27'-8	53'-6	58'-8	12	17'-5	29'-3	62'-10	68'-8	12	17'-3	30'-8	72'-2	68'-8	12	16'-9	33'-8	91'-2	98'-8	12	16'-5	36'-5	110'-2	118'-8	12
		24'	21'-10	28'-10	34'-2	38'-8	12	21'-10	30'-4	44'-0	48'-8	12	21'-7	31'-10	53'-6	58'-8	12	21'-4	33'-2	62'-8	68'-8	12	21'-2	34'-7	72'-0	68'-8	12	20'-9	37'-6	91'-0	98'-8	12	20'-3	40'-5	110'-0	118'-8	12



NOTES:

1. All primary frame connections use high strength bolts.
2. All secondary connections at purlins, girts, eave struts and flange braces use ⅛" diameter bolts.
3. Lower flange of rafter or inside flange of column is braced by flange braces bolted to factory attached clips on rafter or column. Flange braces may be required on one side of the rafter or column only.
4. Refer to SRLO or SRHI cross section drawings for nominal clearances.

Bolting Recommendations

The "turn-of-nut" method of tightening A-325 structural bolts in accordance with "Specifications for Structural Joints Using ASTM A-325 or A-490 Bolts" is recommended.

TYPICAL SIMPLE SPAN
PURLIN OR GIRT LAP

TYPICAL CONTINUOUS SPAN
PURLIN & GIRT LAP

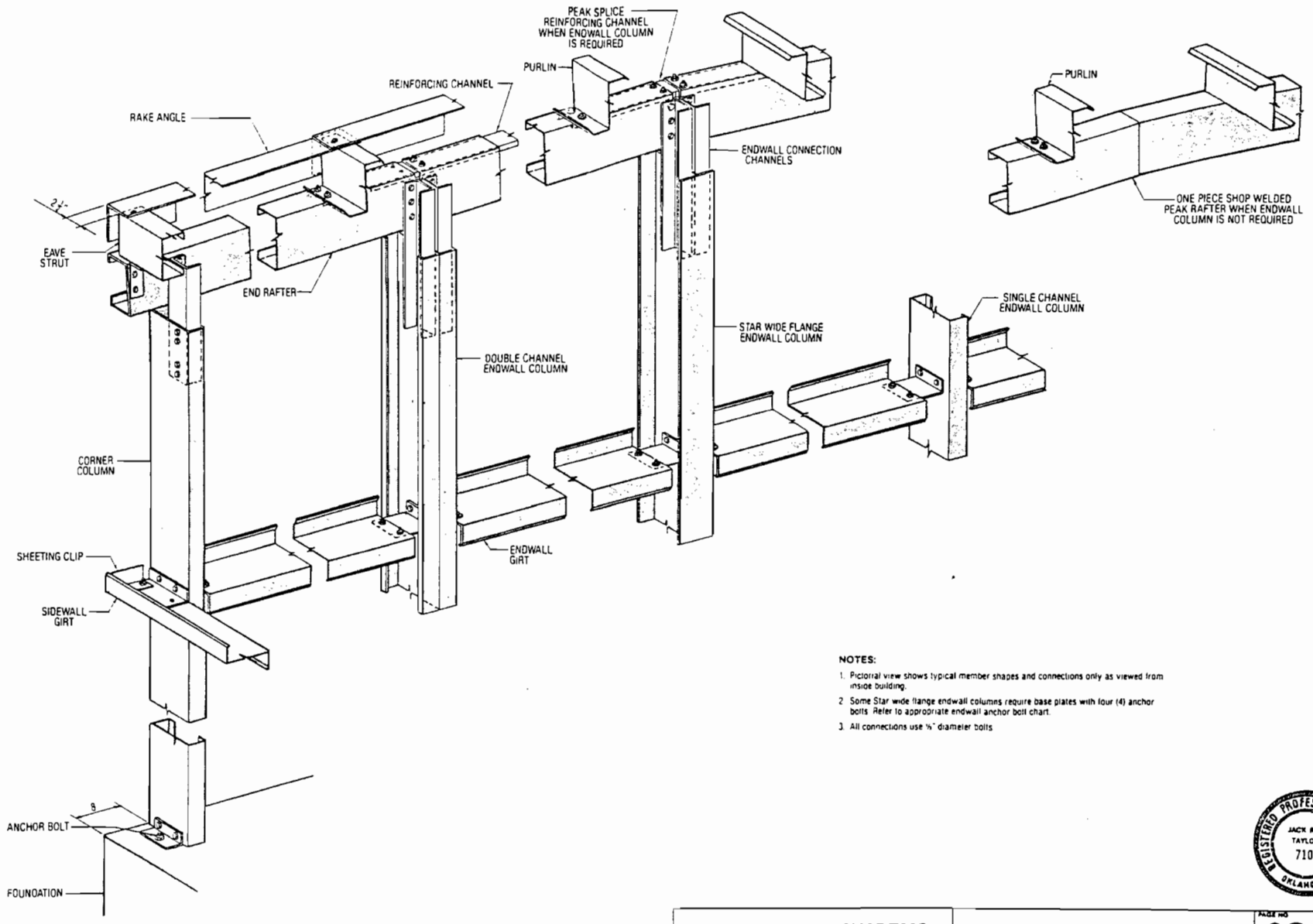
REGISTERED PROFESSIONAL ENGINEER
NICK RAE TAYLOR
7106
OKLAHOMA

STAR MANUFACTURING CO.
OKLAHOMA CITY OKLAHOMA
CEDARTOWN GEORGIA
HOMER CITY PENNSYLVANIA
BUILDINGS

SRLO & SRHI
GENERAL DETAILS

PAGE NO.
3B-20

CURRENT ISSUE DATE
3-31-85



NOTES:

1. Pictorial view shows typical member shapes and connections only as viewed from inside building.
2. Some Star wide flange endwall columns require base plates with four (4) anchor bolts. Refer to appropriate endwall anchor bolt chart.
3. All connections use ½" diameter bolts

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7106
OKLAHOMA

STAR BUILDING SYSTEMS Division of H. H. Robertson	POST AND BEAM ENDWALL GENERAL DETAILS	PAGE NO 3C-1 CURRENT ISSUE DATE 12-21-90

4.0 STRUCTURAL DESIGN ANALYSIS

4.1 GENERAL PARAMETERS

1. The groundwater treatment plant building will be approximately 5,900 square feet on the ground and 377 square feet of platforms. The volume of the building will be approximately 150,000 cubic feet. The pre-engineered metal building frame and foundations will be designed by the building manufacture, in accordance with Corps of Engineer design guidance for pre-engineered metal buildings. The structure will be an original design.

2. Design References:

   - TM 5-809-1 - Load assumptions for buildings.
   - TM 5-809-2 - Concrete and Structural design for buildings.
   - TM 5-809-4 - Structural steel and cold formed steel for buildings.
   - TM 5-809-12 - Concrete floor slabs on grade subjected to heavy loads.
   - "Manual of Steel Construction," 9th Edition, American Institute of Steel Construction.
   - "Building Code Requirement for Reinforced Concrete," (ACI 318-89) American Concrete Institute.
   - Codes, Rules, and Regulations of the State of New York, Volume 9 executive (B) 803, "Design Loads."
   - "Minimum Design Loads for Buildings and Other Structures," (ASCE 7-88) American Society of Civil Engineer.

4.2 FUNCTIONAL AND TECHNICAL REQUIREMENTS

1. Structural Design Loads and Conditions:

   a. Roof Live Load:

Roof Snow Load =	30 psf
Mechanical Equipment =	5 psf
Total Roof Live Load =	35 psf

   b. Floor Live Load:

   Equipment platforms live load will be 100 psf. Slab on grade live load shall consist of forklift axle load of 10 kips.

c. Equipment Live Loads: (*to be determined as the design proceeds).

Item	Base Area	Weights
Compressor Package	*	*
Hydrochloric Acid Feed		
Carbon Adsorber Feed Tanks		
Air Stripper Feed Tanks		
Liquid Phase Carbon Adsorbers		
Sand Filters		
Recycle Pumping System		
Sludge Press		
Polymer Feed		
Clarifiers		
Sludge Storage Tanks		
Reaction Tanks		
Potassium Permanganate Feed		
Sodium Hydroxide Feed		
Injection Pumping System		
Influent Pumping System		
Air Strippers		
Influent Storage Tank		

d. Wind Design Parameters:

Basic Wind Speed	85 mph
Exposure	C
Maximum Height	30 feet
Importance Factor (I)	1.05

e. Seismic Design Parameters:

Seismic Zone	2
Importance Factor (I)	1
Horizontal Force Factor (K)	1
C*S	0.14

f. Foundation Design Criteria:

Design Depth for Footing	3 feet-4 inches
Assumed Allowable Soil Bearing Pressure	2,000 psf
Assumed Modulus of Subgrade Reaction	100 pci
Equivalent Soil Fluid Pressure	60 pcf
Retaining Wall Surcharge	300 psf

4. Structural Materials:

a. Structural Steel:

Steel Shapes	ASTM A-36
Steel Tubes	ASTM A501, Grade B
Bolts	ASTM A325
Light-Gauge Structural Steel Framing	ASTM A446-72, Grade B

b. Concrete:

Compressive Strength	fc' = 4000 psi @ 28 days
Reinforcing Steel	ASTM 615, Grade 60

5. Description of the Structural System:

a. A pre-engineered metal building on spread concrete footings will be used. Rigid steel frames will span 60 feet in the north-south direction. The spacing of the frames will be about 24 feet on center. The clear height under the building frames will be 27 feet-0 inches as required by equipment size and required clearance.

b. Roof framing will consist of approximately 12-inch deep cold-rolled steel purlins spanning between rigid frames. Spacing of purlins will be approximately 5 feet-0 inches. A single, center peaked roof will have a pitch of 4:12. Roof deck will be cold rolled steel.

c. Wall framing will consist of cold rolled steel girts approximately 8 inches deep spanning between rigid frames. The girt spacing will be approximately 6 feet.

d. Foundation system will be reinforced concrete placed below elevation of frost penetration. The assumed allowable soil bearing pressure is 2,000 psf. It is expected that the top few feet of soil will be contaminated and will be removed and treated to remove contaminants. After treatment the soils will be used as structural fill beneath the structure.

e. Foundations for equipment inside of the building will generally be concrete pads approximately 6 inches thick on top of the concrete floor slab on grade. The concrete floor slab on grade will be thickened as required in areas under the heaviest equipment.

f. Slab on grade construction will consist of a 6-inch thick concrete slab reinforced with minimum temperature and shrinkage steel. Crack control joints will be spaced at approximately 24 feet. The floor slab will act as a containment area in case of spills, no waterstops will be provided.

g. The following systems will require independent containment areas:

Polymer
Hydrochloric Acid Feed
Potassium Permanganate Feed

Fiberglass grating system will be provided at all containment areas. No waterstops will be provided in concrete for containment areas.

h. The platforms will be constructed of painted steel with galvanized grating and painted steel handrails.

i. Control room will be constructed of light-gauge structural steel framing with drywall walls and a metal deck roof. The light-gauge structural steel framing will be designed by the manufacturer. Roof live load 30 psf (no storage allowed, equipment access only).

j. Alternate Structural Systems:

- Pre-engineered metal building.
- Reinforced concrete block walls with steel joist and metal decking.

6. Miscellaneous Design Features:

a. Moment resisting steel rigid frames will resist seismic and wind forces in the north-south direction. In the east-west direction, these fences will be resisted by the steel cross bracing.

b. The steel roof will not be designed as a diaphragm. All horizontal loading will be transferred to the vertical frames and vertical cross bracing by steel cross bracing in the roof plane.

RP/CPC65RDN/AC2

5.0 HEATING, VENTILATING DESIGN ANALYSIS

5.1 GENERAL PARAMETERS

1. The HVAC systems shall be designed in conformance with the following manuals and codes:

   - TM 5-810-1, Mechanical Design for Heating, Ventilating and Air Conditioning.
   - American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) Handbooks.
   - State of New York Codes, Title 9, Subtitle S, Chapter I - State Uniform Fire Prevention and Building Code.

5.2 DESIGN OBJECTIVES AND PROVISIONS

1. The process area of the building encloses a volume of 168,750 cubic feet. For municipal wastewater treatment facilities, dealing with biological processes, accepted standards suggest an outside air ventilation rate of 12 air changes per hour, which would equal 33,750 cubic feet per minute for this building. Since the chemical sludges produced in this process should be less odorous than a municipal facility, and the building may be unoccupied much of the time, we have designed the process air handling system to provide for adjustable outside air rates.

2. Air supply will be provided by a 34,000 cfm indirect-fired makeup air unit suspended over the top of the control room. The unit will be fired by natural gas, with a modulating burner and an inlet mixing box to control the percentage of outside air. During summer conditions, the gas burner will be locked out and the unit will draw in 100 percent outside air. When the operator selects the "winter-occupied" control mode, the mixing box will modulate to provide 50 percent outside air and 50 percent return air, with the gas burner modulating to maintain a supply air discharge temperature of 60 degrees Fahrenheit. At design conditions of 10 degrees F. outside, this will provide an interior design temperature of 55 degrees F. When the system is in the "winter-unoccupied" mode, as controlled by a seven-day timeclock, the outside air will reduce to 20 percent for energy conservation. The time clock would be set to go into the "winter-occupied" mode about 1/2 hour before the arrival of the operator to flush out any possible hazardous airborn contaminants. Supply air from the makeup air unit would be distributed by ceiling mounted ductwork throughout the length of the building, with a center run of supply diffusers located to provide fresh air along the elevated platform between the process units.

3. Exhaust air would be drawn from near the floor at the east end of the building by a two speed exhaust fan. The fan would be interlocked to run at high speed (34,000 cfm) to match the "summer" mode of the makeup air unit, and to run at low speed (17,000 cfm) to match the "winter-occupied" mode. During the "winter-unoccupied" mode, the exhaust fan would be off and the minimal amount of outside air intake would be relieved through building exfiltration.

4. The control room would have a separate small air handling unit, with an electric heating coil and a cooling coil to provide air conditioning. The compressor-condensor unit would be mounted outside on a pad, similar to a small residential system. Minimal outside air would be provided to pressurize the control room, with respect to the process areas, and exhaust air would be drawn from the adjacent toilet room.

5. The thermal performance of the building envelope will be in compliance with the State of New York energy codes and requirements.

5.3 PRODUCT INFORMATION AND CALCULATIONS

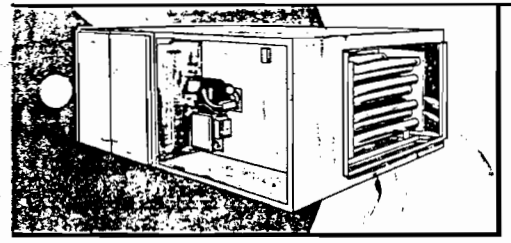
1. See Appendix A for information on the equipment proposed for the facilities.

2. See Appendix B for calculations used for preliminary sizing and selection of HVAC equipment.

RP/CPC65RDN/AC5

APPENDIX A

MAU-1



FORM ID T4 391

Weather-Rite®

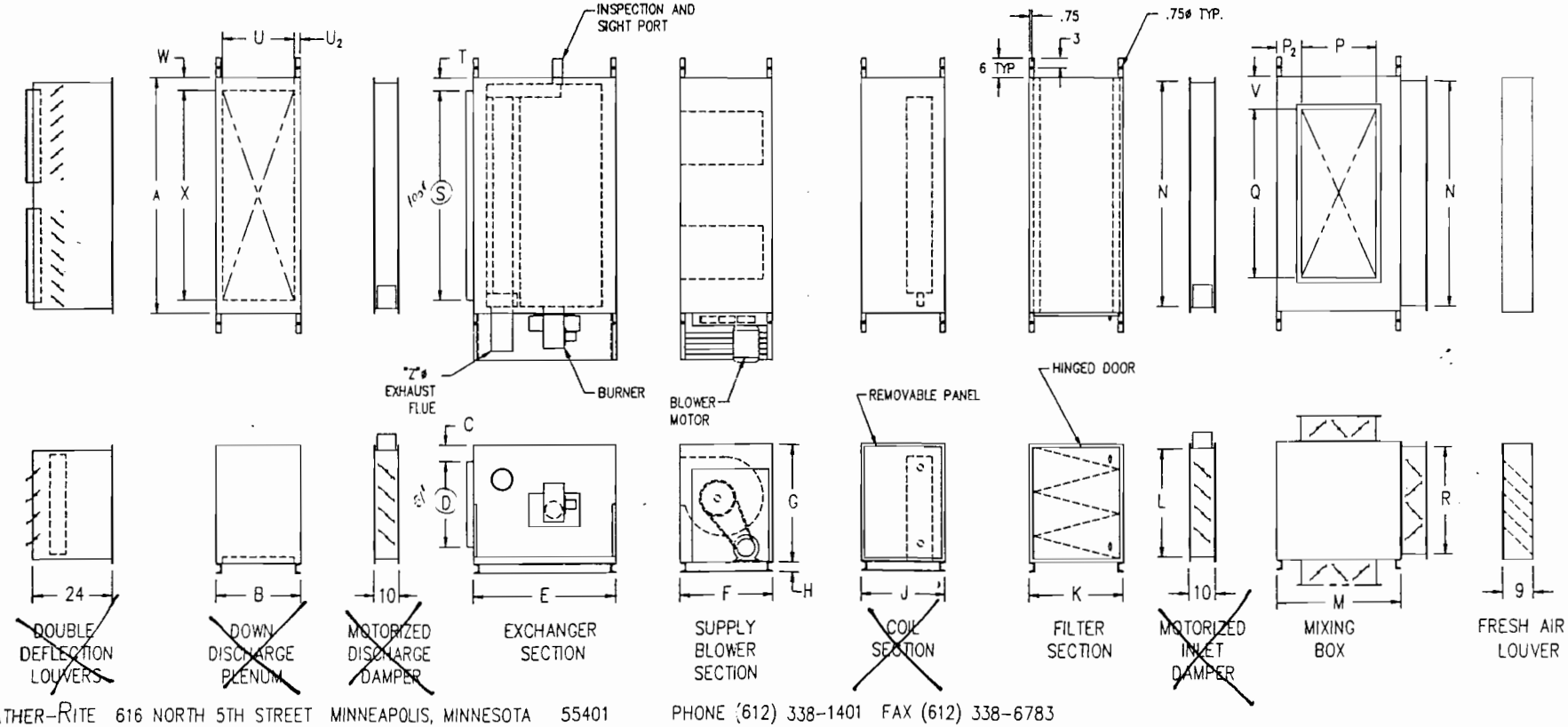
Modular Indirect-Fired Systems

SUBMITTAL INFORMATION

NOTE:
1. DRAWING IS NOT TO SCALE. DIMENSIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE.
2. SUGGESTED MOUNTING HEIGHT OF OUTDOOR UNIT IS 24" MINIMUM FROM ROOF SURFACE TO BOTTOM OF UNIT.
3. ON OUTDOOR UNITS A LOUVERED VESTIBULE IS ADDED TO THE BURNER AREA. ALL OTHER COMPONENTS HAVE A WEATHERIZED ENCLOSURE.
4. FLUE VENT, CHIMNEY, AND CAP REQUIRED ON ALL UNITS. (SUPPLIED BY OTHERS)

HORIZONTAL DIMENSIONS FOR INDIRECT FIRED MODELS 125, 150, 175, 200, 250, 275, 300, 350, 400

MODEL	A	B	C	D	E	F	G	H	J	K	L	M	N	P	P_2	Q	R	S	T	U	U_2	V	W	X	Z	FILTERS
ID125/150/175	100	36	8.5	38	72	42	55	3	43	26	51	36	96	26	5	90	51	90	5	26	5	5	5	90	12	(20) 2x20x25
ID200/250/275	116	43	4.5	51	90	42	60	4	43	26	55	43	111	36	2.5	96	55	100	8	36	2.5	10	10	96	14	(10) 2x20x20 (15) 2x20x25
ID300/350/400	160	43	8	56	102	55	72	4	43	26	67	43	155	36	2.5	140	67	150	5	36	2.5	10	10	140	16	(40) 2x20x20



WEATHER-RITE 616 NORTH 5TH STREET MINNEAPOLIS, MINNESOTA 55401 PHONE (612) 338-1401 FAX (612) 338-6783

AHU-1

GENERAL DATA FOR CASSETTE TYPE HEAT PUMPS

Model		RCI-24HQN + RAS-24HQ		RCI-38HQN1 + RAS-38HQ1		RCI-48HQN1 + RAS-48HQ1	
PERFORMANCE AND ELECTRICAL RATING							
Cooling Capacity	BTU/h	26,000		40,000		45,000	
SEER	BTU/W.h	10.0		10.0		10.0	
Heating Capacity	BTU/h	27,800		44,000		48,000	
(with Heater)	(BTU/h)	(35,000)		(54,600)		(58,600)	
COP	–	3.0		3.0		2.9	
Air Flow at High Speed	CFM	850		1,100		1,100	
Voltage Rating	V	230		230		230	
Minimum Circuit Ampacity							
Indoor Unit (with Heater)	A	15		20		20	
Outdoor Unit		20		35		35	
Maximum Fuse Size (Time Delay)							
Indoor Unit (with Heater)	A	15		20		20	
Outdoor Unit		30		50		50	
FEATURES							
Controls	–	Micro-Computer					
Indoor Fan Speeds	–	3					
ON/OFF Timer	–	ON/OFF 24 hours					
Air Deflector (Vertical)	–	Auto-Swing at 4 Outlets					
Air Filter	–	Washable					
Operating Sound of Indoor Unit	dB-A	45		48			
Type of Refrigerant	–	R-22					
Refrigerant Tube Connection							
Size Liquid	in.	Flare-Nut 3/8		Flare-Nut 3/8			
Gas	in.	Flare-Nut 3/4		Brazing 7/8			
Maximum Height							
Indoor Unit above Outdoor Unit	ft.	49					
Indoor Unit below Outdoor Unit	ft.	80					
Maximum Tube Length	ft.	115					
DIMENSIONS & WEIGHT		Indoor	Outdoor	Indoor	Outdoor	Indoor	Outdoor
Height	in.	13-11/16	34-7/8	13-11/16	44-11/16	13-11/16	44-11/16
Width	in.	44-7/8	35-1/16	44-7/8	41-3/4	44-7/8	41-3/4
Depth	in.	32-5/16	11-1/4	32-5/16	17-15/16	32-5/16	17-15/16
NET Weight (with Heater)	lbs.	101	154	104	242	104	245
Cabinet Color (MUNSELL No.)	–	–	Beige 2.5Y 8/2	–	Beige 2.5Y 8/2	–	Beige 2.5Y 8/2
Air Panel Color	–	Silky White					
MUNSELL Code	–	2.5Y 8.9/1					
Outer Dimensions							
Height	in.	13/16		13/16		13/16	
Width	in.	49-3/16	–	49-3/16	–	49-3/16	–
Depth	in.	36-5/8		36-5/8		36-5/8	
NET Weight	lbs.	22		22		22	
Standard Accessories	–	Mounting Bracket and Remote Control Panel Attached with Indoor Unit					
Approval	–	ETL					

(Model Name)

i) INDOOR UNIT
Cassette type: RCI-□□HQN*/AQ
□□HQN*1/AQ1
Ceiling type: RPC-□□HQN*/AQ
□□HQN*1/AQ1

* "HQN" type models are equipped with an auxiliary electric heater.

ii) OUTDOOR UNIT: RAS-□□HQ/AQ
□□HQ1/AQ1

NOTES:

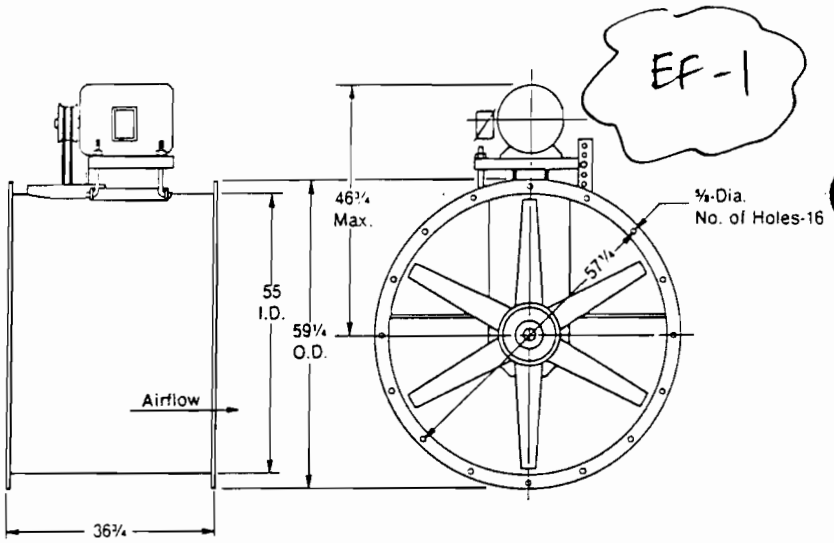
1. The nominal cooling capacity and heating capacity are the combined capacity of the HITACHI standard split system, and are based on the following conditions:
   - *Cooling Capacity
     - Indoor Air Inlet Temperature: 80°F DB, 67°F WB
     - Outdoor Air Inlet Temperature: 95°F DB, 75°F WB
   - *Heating Capacity
     - Indoor Air Inlet Temperature: 70°F DB, 60°F WB
     - Outdoor Air Inlet Temperature: 47°F DB, 43°F WB
   - *Actual Refrigerant Piping Length: 25 Feet
   - *Indoor Unit Fan speed: High Speed Position
   - *Standard rating is based on ARI Standard 240-89.
2. Power Supply: 230V, Single Phase, 60Hz
3. Refrigerant is factory-charged for the actual piping length of 49 feet and no additional charge is required when the piping length is shorter than 49 feet.
4. The operating sound level is based on the following conditions:
   For Cassette Units: 4.9 Feet Beneath The Unit (High Speed)
   For Ceiling Units: 3.3 Feet Beneath The Unit and 3.3 Feet From Discharge Grille (High Speed).
   The above data was measured in an anechoic chamber so that reflected sound should be taken into consideration when installing the unit.
5. The control system has Auto-Restart function and Self-Diagnostic function.
6. Knock-out hole(s) is provided for fresh air intake.

Performance Data

EF-1

TAB 54

Max RPM - 1140
Max Motor Frame Size - 256T
Shaft Dia. - 1¾
Fan Tube Gauge - 10
Approx. Weight (lbs.) - 820

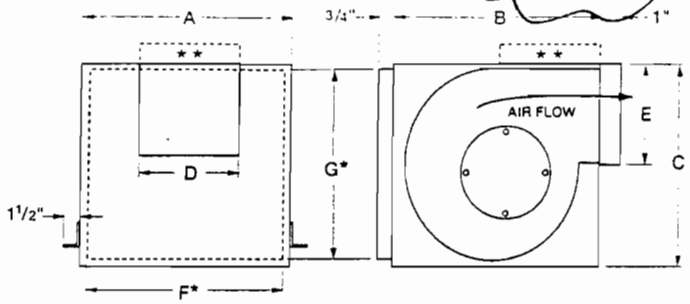


HP	RPM	TS		STATIC PRESSURE/CAPACITY							
				0.125	0.250	0.375	0.500	0.750	1.000	1.250	1.500
2	550	7775	CFM	24519	19338						
			BHP	1.74	1.67						
2	585	8270	CFM	26632	21966						
			BHP	2.09	2.04						
3	605	8552	CFM	27826	23403	17137					
			BHP	2.31	2.27	2.01					
3	635	8977	CFM	29590	25520	20545					
			BHP	2.67	2.65	2.48					
3	665	9401	CFM	31336	27594	22994					
			BHP	3.06	3.06	2.92					
5	690	9754	CFM	32779	29239	24967					
			BHP	3.41	3.43	3.32					
5	715	10108	CFM	34214	30807	26796	21959				
			BHP	3.79	3.82	3.72	3.46				
5	745	10532	CFM	35924	32666	28950	24692				
			BHP	4.28	4.32	4.24	4.04				
5	770	10885	CFM	37342	34199	30716	26722				
			BHP	4.72	4.77	4.71	4.54				
5	795	11239	CFM	38753	35718	32456	28701				
			BHP	5.19	5.25	5.21	5.08				
7½	825	11663	CFM	40438	37525	34516	30897				
			BHP	5.79	5.86	5.86	5.72				
7½	855	12087	CFM	42116	39316	36435	33055	24155			
			BHP	6.44	6.53	6.53	6.41	5.68			
7½	880	12440	CFM	43496	40791	37999	34827	27458			
			BHP	7.02	7.11	7.11	7.02	6.50			
7½	910	12864	CFM	45140	42546	39857	36924	30042			
			BHP	7.75	7.85	7.87	7.81	7.35			
10	935	13218	CFM	46506	44000	41393	38649	32078			
			BHP	8.40	8.50	8.53	8.50	8.10			
10	965	13642	CFM	48141	45735	43220	40668	34480			
			BHP	9.22	9.33	9.38	9.38	9.05			
10	1000	14137	CFM	50043	47747	45333	42870	37084	29585		
			BHP	10.3	10.4	10.4	10.4	10.2	9.3		
15	1030	14561	CFM	51669	49462	47130	44739	39256	32974		
			BHP	11.2	11.3	11.4	11.4	11.2	10.5		
15	1045	14773	CFM	52481	50317	48024	45667	40330	34215		
			BHP	11.7	11.8	11.9	11.9	11.7	11.1		
15	1075	15197	CFM	54102	52020	49796	47512	42458	36665		
			BHP	12.7	12.8	13.0	13.0	12.8	12.3		
15	1100	15550	CFM	55451	53435	51261	49038	44212	38677	30676	
			BHP	13.6	13.8	13.9	13.9	13.8	13.3	12.0	
15	1140	16116	CFM	57605	55688	53591	51461	46983	41746	35901	
			BHP	15.1	15.3	15.4	15.5	15.4	15.0	14.2	

Performance shown is for Model TAB with inlet and outlet ducts.
BHP does not include drive losses.

GREENHECK

EF-2



CSP 108-165

DIMENSIONAL DATA

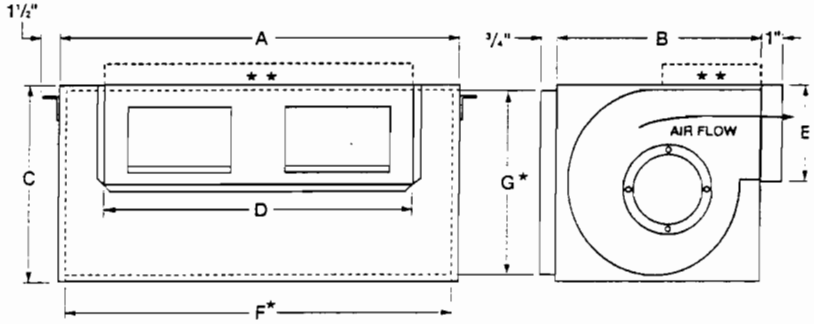
Model	A	B	C	D	E	F	G	WT.
108A	10	9 5/8	9 1/2	6 1/2	5	9	8 1/4	13
115A/117A	13	10 5/8	10 1/2	6 1/2	5	12	9 1/4	16
125A/127A	14	11 7/8	11 1/4	7 1/2	7	12 7/8	10	23
150A/152A 158A	18	14 3/8	14 1/2	7 1/2	7	16 7/8	13 1/4	36
160A/162A 165A	23 3/4	14 3/8	14 1/2	18 1/4	7	22 5/8	13 1/4	59

*Inlet Dimensions
**Optional Discharge Position
For complete dimensional information, see submittal drawings.

PERFORMANCE DATA

Model	RPM	AMPS	Watts	CFM/Static Pressure in inches of W.G.															
					0.000		0.050		0.100		0.125		0.150		0.250		0.375		0.500	
CSP-108A	1550	.67	53	CFM	146		138		125		121		116		100		75			
				Sones	Sones*	2.9	2.4	2.7	2.1	2.6	2.2	2.6	2.2	2.6	2.2	2.6	2.2	2.6	2.3	
CSP-115A	1140	.94	58	CFM	144		125		107		102		93							
				Sones	Sones*	1.1	0.9	1.1	0.8	1.1	0.9	1.1	0.9	1.1	0.9					
CSP-117A	1650	1.08	79	CFM	221		212		202		198		193		175		152			
				Sones	Sones*	3.3	2.4	3.1	2.1	3.0	2.2	3.0	2.2	3.0	2.2	3.0	2.3	2.9	2.4	
CSP-125A	1000	1.06	80	CFM	300		282		265		258		248		207					
				Sones	Sones*	3.0	2.2	2.8	2.1	2.7	2.0	2.7	2.1	2.7	2.1	2.6	2.1			
CSP-127A	1550	3.10	217	CFM	461		444		430		425		420		397		363		329	
				Sones	Sones*	5.6	4.2	5.4	4.0	5.2	3.9	5.1	3.8	5.1	3.8	5.1	3.8	5.2	3.9	5.6	4.3
CSP-150A	1000	1.87	139	CFM	470		454		436		427		415		369		312		245	
				Sones	Sones*	3.7	2.8	3.5	2.5	3.3	2.2	3.3	2.1	3.3	1.9	3.3	1.8	3.3	2.0	3.4	2.1
CSP-152A	1075	3.11	217	CFM	565		545		526		517		507		464		425		364	
				Sones	Sones*	5.1	3.1	4.5	3.0	4.5	3.0	4.5	3.0	4.5	3.0	4.5	3.0	4.4	3.0	4.3	3.1
CSP-158A	1550	3.77	405	CFM	822		809		797		791		785		760		727		687	
				Sones	Sones*	8.4	5.8	8.3	5.8	8.3	5.7	8.2	5.7	8.2	5.7	8.1	5.6	8.0	5.5	7.7	5.4
CSP-160A	900	4.87	328	CFM	908		876		852		840		829		782		714		631	
				Sones	Sones*	4.7	3.7	4.7	3.7	4.8	3.8	4.8	3.8	4.7	3.8	4.7	4.0	4.7	4.0	4.6	4.1
CSP-162A	1085	6.65	455	CFM	1182		1144		1110		1093		1077		1013		922		832	
				Sones	Sones*	7.4	6.3	7.2	6.4	7.0	6.1	6.8	6.0	6.8	5.9	6.4	5.8	6.3	6.0	6.1	6.0
CSP-165A	1610	8.32	830	CFM	1672		1644		1617		1604		1590		1542		1484		1427	
		.70 Max BHP		Sones	Sones*	12.4	8.6	12.3	8.5	12.3	8.5	12.3	8.5	12.1	8.5	12.0	8.4	11.9	8.5	11.8	8.5

* Sones w/ insulated inlet duct



CSP 170/175

DIMENSIONAL DATA

Model	A	B	C	D	E	F*	G*	WT.
170/175	35	14 3/4	14 3/4	27 3/4	6 1/4	32 3/4	13	68

*Inlet Dimensions
**Optional Discharge Position
For complete dimensional information, see submittal drawings.

PERFORMANCE DATA

Model	RPM	AMPS	Watts	CFM/Static Pressure in inches of W.G.							
					0.000	0.100	0.125	0.250	0.375	0.500	0.625	0.750
CSP-170	1130	6.6	550	CFM	1850	1775	1755	1620	1460	1290	1035	775
		.43 MAX BHP		SONES	7.8	8.0	8.1	8.1	8.0	7.9	7.7	7.4
CSP-175	1100	7.8	735	CFM	2340	2230	2200	2055	1900	1700	1420	1030
		.52 MAX BHP		SONES	10.7	10.6	10.5	10.1	9.7	9.2	8.7	8.2

Performance shown is for Model CSP with outlet duct and backdraft damper in place (no grille). In addition, CSP 108-165 were tested with inlet duct and the sone values indicate sound levels in the room 5 feet from the test inlet duct and do not include end reflection or flow absorption corrections. The sound rating for model CSP 170 and CSP 175 are loudness values in fan sones at 5 ft. (1.5m) in a hemispherical free field calculated per AMCA standard 301. Values shown are for installation type B free inlet fan sone levels. RPM shown is nominal and performance is based on actual speed of test. The AMCA Certified Ratings Sound Seal applies to sone ratings only.

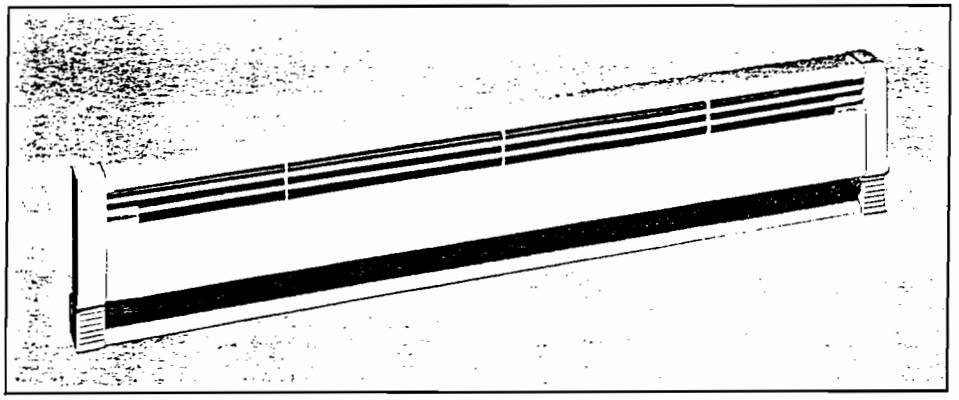
QMARK®
A Division of Marley Electric Heating
(Formerly Chromalox Comfort Heating Products)

EBB-1

TYPE CBD

HEAVY-DUTY COMMERCIAL BASEBOARD HEATERS

- Heavy-duty construction
- 16 gauge front cover
- Built-in wireway
- Large wiring compartment
- U.L. Listed, File #E37116



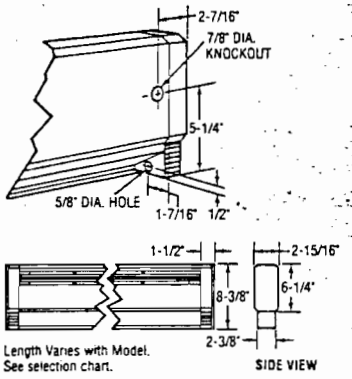
CBD Series heavy-duty baseboard, with its complete line of accessories and controls, can solve the space heating needs of virtually any type commercial structure. Individual room control allows you to heat each room separately for utmost energy savings.

CONSTRUCTION — This heavy-duty baseboard is designed specifically for commercial use. The front cover is made of 16 gauge cold rolled steel. A built-in wireway runs the length of each heater.

ELEMENT — Heating element design combines the durability of a steel tubular heater with the excellent heat transfer characteristics of aluminum fins.

JUNCTION BOXES — Identical prewired junction boxes at each end are large and roomy to work in. Access to the junction box can be made either from the side or the front of the heater. Knockouts are provided in the backside or the bottom of each heater end.

Heavy-duty welded steel louvered grilles discourage insertion of foreign objects and direct heat outward into the room. The junction boxes are made of high-strength Lexan® to resist scratches and wear marks.



SELECTION CHART

CATALOG NO.	HEATER VOLTS	WATTS	BTU/HR	AMPS	LENGTH	SHIP WT. (LBS.)
CBD500	120	500	1706	4.2	28"	8
CBD508	208			2.4		
CBD504	240			2.1		
CBD507	277			1.8		
CBD750	120	750	2560	6.3	34"	10
CBD758	208			3.6		
CBD754	240			3.1		
CBD757	277			2.7		
CBD1000	120	1000	3413	8.3	46"	13
CBD1008	208			4.8		
CBD1004	240			4.2		
CBD1007	277			3.6		
CBD1250	120	1250	4265	10.4	58"	16
CBD1258	208			6.0		
CBD1254	240			5.2		
CBD1257	277			4.5		
CBD1500	120	1500	5120	12.5	70"	20
CBD1508	208			7.2		
CBD1504	240			6.3		
CBD1507	277			5.4		
CBD2008	208	2000	6826	9.6	94"	27
CBD2004	240			8.3		
CBD2007	277			7.2		

ACCESSORIES

CATALOG NO.	DESCRIPTION	SHIP WT. (LBS.)
HBBT1	22A @ 120-240V, 18A @ 277V SPST Thermostat	1
HBBT2	22A @ 120-240V, 18A @ 277V DPST Thermostat	1
HBBT1TP	Same as HBBT1 except tamper proof.	1
HBBT2TP	Same as HBBT2 except tamper proof.	1
HBBAC	Air conditioner outlet section, 20A @ 208-240V	2
HBBDR	Duplex receptacle section, 15a @ 120V	2
HBBLVR0	Low voltage Relay Section, 25A @ 120V	3
HBBLVR8	Low voltage Relay Section, 25A @ 208V	3
HBBLVR4	Low voltage Relay Section, 25A @ 240V	3
HBBLVR7	Low voltage Relay Section, 25A @ 277V	3
CCDS2	2 POLE Disconnect switch section	2
CCIC	Inside corner section	2
CCOC	Outside corner section	2
CBS2	2 FT BLANK SECTION	6
CBS3	3 FT BLANK SECTION	8
CBS4	4 FT BLANK SECTION	11
CBS5	5 FT BLANK SECTION	14
CBS6	6 FT BLANK SECTION	16
CBS8	8 FT BLANK SECTION	22

GREENHECK ESD-401 Drainable Blade Louver

Extruded Aluminum

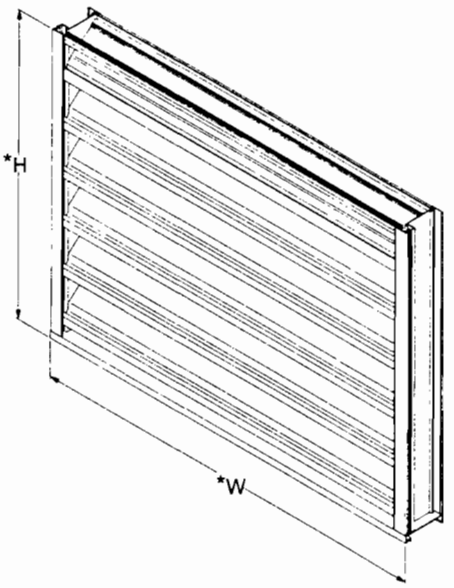
Application and Design

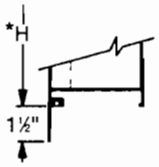
ESD-401 is a weather louver designed to protect air intake and exhaust openings in building exterior walls. Design incorporates drain gutters in horizontal blades to channel water to the louver side frames or jambs where water is further channeled through vertical downspouts and out at the bottom or louver sill. The ESD-401 is an extremely efficient louver with **AMCA LICENSED PERFORMANCE DATA** enabling designers to select and apply with confidence.

amca CERTIFIED RATINGS
WATER PENETRATION
AIR PERFORMANCE
AIR MOVEMENT AND CONTROL ASSOCIATION, INC.

Standard Construction

Frame:	Heavy gauge 6063T5 extruded aluminum, 4" x .081" nominal dimensions
Blades:	Drainable design, 6063T5 extruded aluminum, .081" nominal wall thickness, positioned at 37° and 45° angles on approximately 4" centers
Birdscreen:	3/4" x .051" flattened expanded aluminum in removable frame. Screen is mounted on inside (rear)
Finish:	Mill
Minimum Size:	12"W x 12"H
Maximum Size:	120"W x 120"H (see page 4)





OPTIONAL FLANGE

OPTIONAL EXTENDED SILL

Options (at additional cost)

- Flanged frame
- Extended sill
- A variety of bird and insect screens
- A variety of architectural finishes including:
  - Clear anodize
  - Integral color anodize
  - Baked enamel
  - Kynar

*** W & H Dimensions furnished approximately 1/4" under size.**

Quantity	Size		
	W Width	H Height	

Project	Location
Contractor	Design Specifier

RESIDENTIAL ELECTRIC WATER HEATERS

CENSIBLE TABLE TOP AND MIDGET 510E

5-YEAR TANK WARRANTY

1-YEAR PARTS WARRANTY

FOAM-INSULATED

TABLE TOP—240/208 VOLT

MIDGET—120/240 VOLT

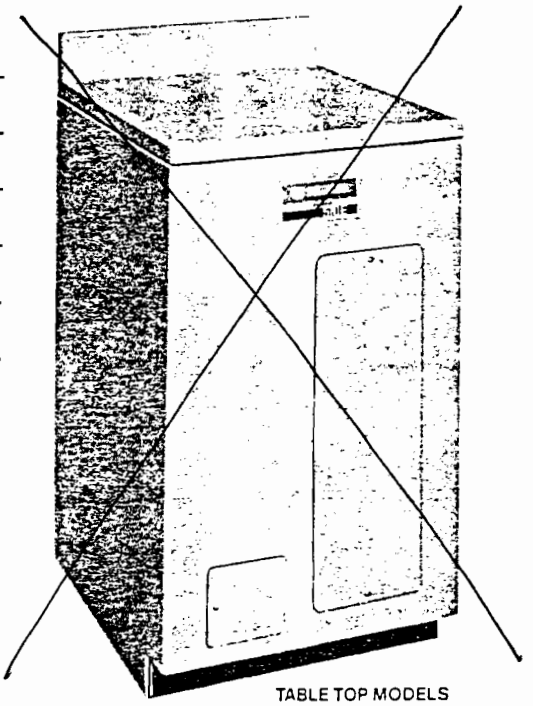


TABLE TOP MODELS

The Censible 510E Table Top and Midget electric water heaters are designed to meet the special space requirements of many installations. The foam-insulated Censible 510E Midget is ideal for under-counter and crawl-space installation. Foam insulated Censible 510E Table Top water heaters provide a convenient 36" high "counter-top" surface, an outstanding feature for kitchen or laundry room installations.

Thick Foamite (polyurethane foam) Insulation.

Direct-Immersion Threaded Heating Elements. Table Top models available in single- or double-element designs. Check reverse side for standard and maximum element wattages. Non-standard element wattages must be specified when ordering.

Double-element models wired so that only one element fires at any time. Double-element models available simultaneous or non-simultaneous with off-peak metering, as demanded by zone requirements.

Factory-Installed Temperature and Pressure (T&P) Relief Valve.

Anode Rod protects against tank corrosion.

U.L. Listed Energy Cut-Off (E.C.O.) safety feature.

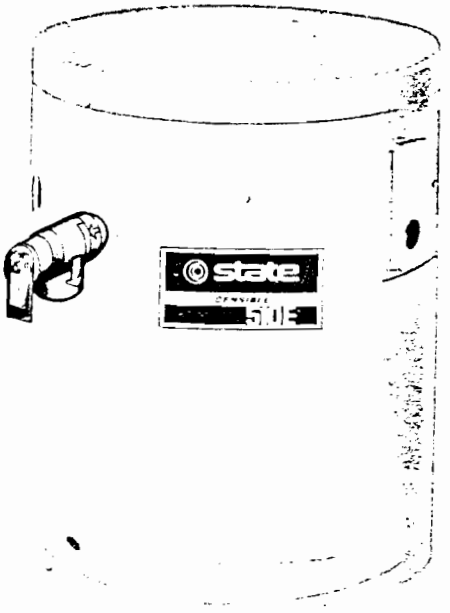
Automatic Thermostat.

Nylon Drain Valve on Table Top models.

Welded Steel Couplings.

Maximum Hydrostatic Working Pressure 150 PSI.

Foam-Insulated models manufactured under U.S. Patent Numbers 4,447,377 and 4,527,543.



MIDGET MODELS

WH-1

APPENDIX B

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Environment & Infrastructure

CALCULATION SHEET

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PROJECT NO. _____

CLIENT COE SUBJECT _____ Prepared By RGE Date 2/4/93

PROJECT CPC, NY _____ Reviewed By _____ Date _____

_____ _____ Approved By _____ Date _____

DESIGN PARAMETERS

WEATHER CONDITIONS

LOCAL: OLD BETHPAGE, NY (LONG ISLAND AREA)

WINTER DESIGN CONDITION: 10(°F) SUMMER DESIGN: 92°DB/74°WB (°F)
(ASHRAE, '85 FUNDAMENTALS - 24.13)

DEGREE HEATING DAYS - ANNUAL - 4909 (ENG. WEATHER DATA 7/78)

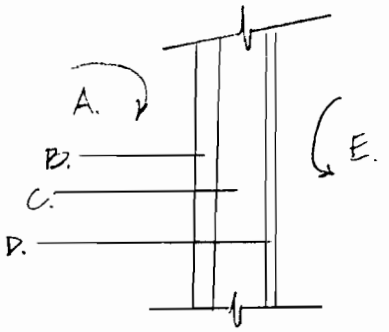
INTERIOR DESIGN CONDITIONS.

- OPEN TREATMENT AREA: 55°F
- CONTROL ROOM: 68°F

BUILDING PARAMETERS – PROCESS AREA (METAL BUILDING CONST.)

"U"-VALUES

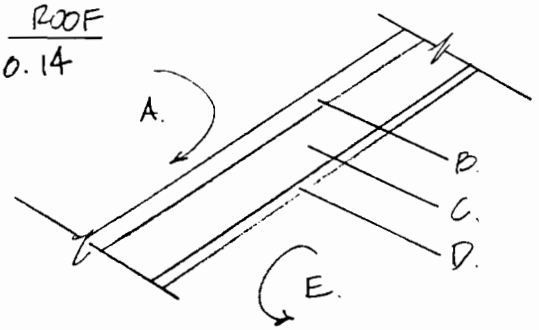
WALL
0.15



	R-VALUE
A. OUTSIDE AIR FILM (15 MPH)	0.17
B. CORRUGATED METAL PANEL C. INSULATION (3" BLANK) D. VAPOR BARRIER	5.73
E. INSIDE AIR FILM (STILL)	0.68
	R_T = 6.63

$U_{WALL} = 1/R_T = 0.15$

ROOF
0.14



	R-VALUE
A. OUTSIDE AIR FILM (15 MPH)	0.17
B. CORRUGATED METAL PANEL C. INSULATION (3" BLANK) D. VAPOR BARRIER	6.37
E. INSIDE AIR FILM (STILL)	0.62
	R_T = 7.15

$U_{ROOF} = 1/R_T = 0.14$

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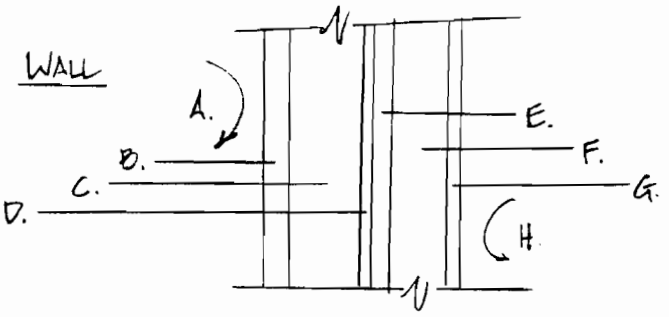
BUILDING PARAMETERS - CONTROL ROOM

"U"-VALUES

WALL

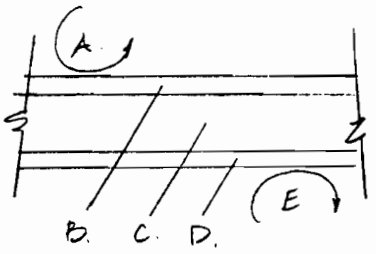


	R-VALUE
A → D METAL BUILDING	6.46
E. 1/2" GYSUM BD	0.45
F. AIR GAP (3 1/2")	1.01
G. 1/2" GYSUM BD	0.45
H INSIDE AIR FILM.	0.68
	R_T = 9.05

$U_{WALL} = 1/R_T = 0.11$

(WALL FROM CONTROL RM TO OUTSIDE)

ROOF



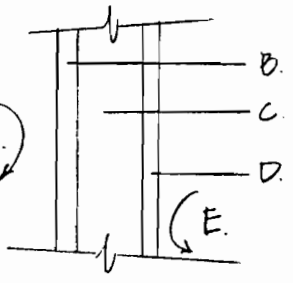
	R-VALUE
A. OUTER AIRFILM (STILL)	0.61
B. 3/4" PLYWOOD	0.93
C. AIR GAP (3 1/2")	0.92
D. 1/2" GYPSUM BD.	0.45
E. INSIDE AIR FILM.	0.61
	R_T = 3.53

(ROOF OF CONTROL RM TO OPEN TREATMENT AREA)

$U_{ROOF} = 1/R_T = 0.28$

WALL

(INTERIOR WALL)



	R-VALUE
A. OPEN TREATMENT AREA - AIRFILM (STILL)	0.68
B. 1/2" GYPSUM BOARD	0.45
C. 3 1/2" AIR GAP	1.01
D. 1/2" GYPSUM BOARD	0.45
E. CONTROL RM - AIR FILM (STILL)	0.68
	R_T = 3.27

$U_{WALL} = 1/R_T = 0.31$

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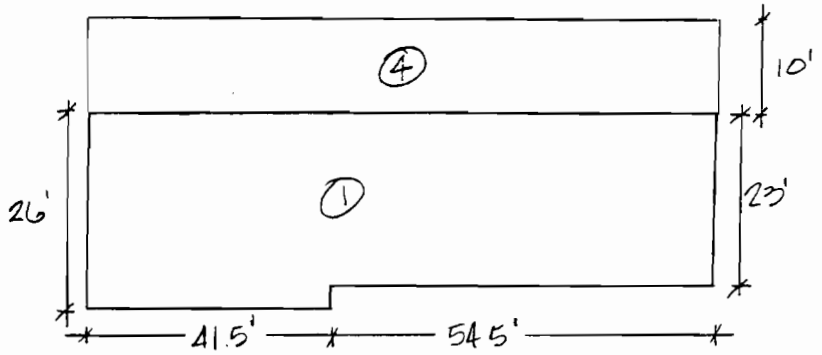
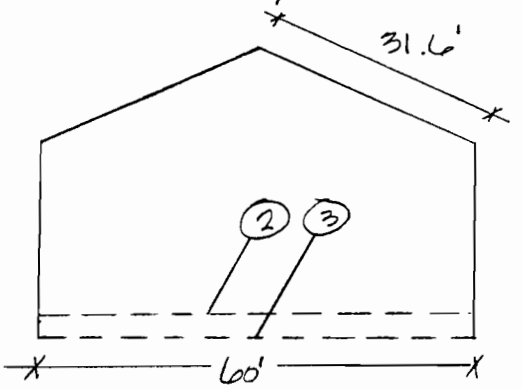
BUILDING AREA CALCS – (PROCESS AREA)

NORTH ELEVATION



EAST / WEST ELEVATION



WALL AREA (1)

$(23' * 54.5') + (26' * 41.5') = 2332.5\ ft^2$ (2a) $2332.5 * 2 = 4665\ ft^2$ (TOTAL)

WALL AREA (2) (23' EVE HT)

$(60' * 23') + (30' * 10') = 1680\ ft^2$

WALL AREA (3) (26' EVE HT)

$(60' * 26') + (30' * 10) = 1860\ ft^2$

ROOF AREA (4)

$(31.6' * 96') = 3033.6\ ft^2$ (2a) $3033.6 * 2 = 6067.2\ ft^2$ (TOTAL)

TOTAL WALL AREA = $4665 + 1680 + 1860 = 8205\ ft^2 - 415\ ft^2 = 7790\ ft^2$

TOTAL ROOF AREA = $6067.2\ ft^2$

CONTROL ROOM WALL AREA

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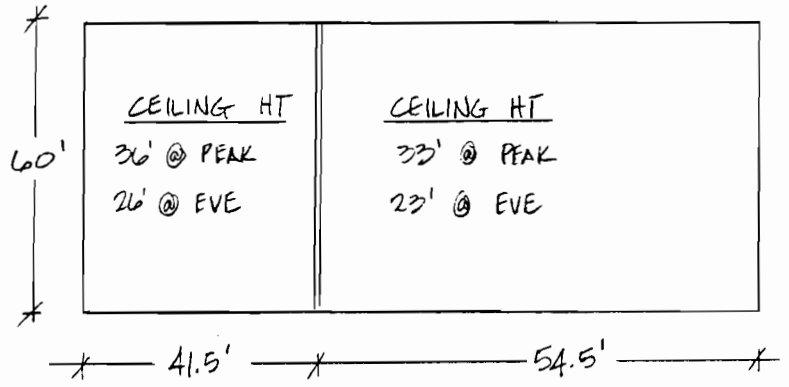
VENTILATION AIR REQUIREMENTS - (PROCESS AREA)

FLOOR AREA

$60' * 96' = \boxed{5760\ ft^2}$



VOLUME

$(60 * 41.5 * 26) + (30 * 41.5 * 10) + (60 * 54.5 * 23) + (30 * 54.5 * 10) =$

$= \boxed{168{,}750\ ft^3}$

WE WILL DESIGN FOR A CONSTANT VOLUME LIMIT FOR 12 AC/HR CFM CAPACITY

$$\frac{168{,}750\ ft^3}{AC} \times \frac{12\ AC}{HR} \times \frac{HR}{60\ MIN} = \boxed{33{,}750\ cfm}$$

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HEATING
VENTILATION REQUIREMENTS – PROCESS & AREA

ASSUMPTIONS: DURING WINTER CONDITIONS, AREA TO BE VENTILATED AT 6 A.C. OUTSIDE AIR + 6 A.C. RECIRC.

$\therefore \frac{33,750 \text{ cfm}}{2} = 16,875 \text{ cfm O.A.} + 16,875 \text{ cfm RECIRC.}$

APPROX. MIXED AIR TEMP – 16,875 cfm @ 10°F
16,875 cfm @ 55°F

$\therefore$ MIXED AIR TEMP = 32.5°F @ 33,750 cfm

Btu/h REQ'MT FOR OUTSIDE AIR = cfm * 1.085 * ΔT

cfm = 33,750
ΔT = 55°F - 32.5°F
= 22.5°F

Btu/h = 33,750 * 1.085 * 22.5 = 823921 Btu/h = **824 MBtH**

BUILDING HEAT LOSS - PROCESS AREA.

	U	A (ft^2)	ΔT (°F)	= Btu/h
WALLS	(0.15)	(7790	45)	52563.
ROOF	(0.14)	(6067.2)	45)	38,223.

TOTAL = 90,806 Btu/h

= 91 MBH

BUILDING EDGE LOSS - PROCESS AREA

TOTAL EDGE (PERIMETER) = 60' + 96' + (96' - 17.5') + (60' - 34.5') = 260 ft

(CONTROL RM)

EQ.: $Q = F_2 P(\Delta T)$ ASHRAE FUNDAMENTALS '85 p. 25.7

$F_2 = 0.52$ — p. 25.9

$\Delta T = 45°F$

$P = 201.5$

EDGE LOSS = 0.52 (260) 45 = 6084 Btu/h = 6.1 MBH

TOTAL HEAT LOSS FOR OPEN TREATMENT AREA = WALLS + ROOF + EDGE LOSS

≅ 97.1 MBH

TOTAL HEATING CAPACITY FOR OPEN TREATMENT AREA =
(HEAT REQ'MTS FOR O.A. VENTILATION + BUILDING LOSSES)

824 MBH + 97 MBH = 921 MBH

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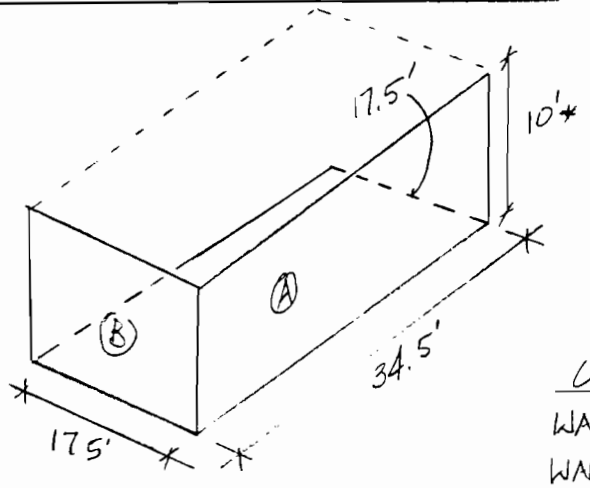
BUILDING AREA CALCS - (CONTROL ROOM)



*10' CEILING (CONSERVATIVE)

CONTROL ROOM

WALL (A) (17.5' * 10') = 175 ft²

WALL (B) (24' * 10') = 240 ft²

TOTAL OUTSIDE WALL AREA FOR C.R = 415 ft²

VOLUME

(34.5' * 17.5' * 10') = 6037.5 ft³

TOTAL INTERIOR WALL AREA = TOTAL OUTSIDE WALL AREA

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BUILDING HEAT LOSS - CONTROL ROOM

	U	A (ft)	ΔT (°F)	=	Btu/h
WALLS (OUTSIDE)	0.11	585	58		3732
WALLS (BETWEEN CONTROL RM & PROCESS AREA)	0.31	(175 + 345)	20		3224.
ROOF (TO CONTROL RM)	0.28	(17.5' * 34.5')	20		3381

TOTAL = 10,337

= 10.4 MBH

EDGE LOSS - CONTROL RM

TOTAL EDGE = 17.5' + 34.5' = 52.0'

F&P.: $Q = F_2 \cdot P \cdot \Delta T$ ASHRAE FUNDAMENTALS '85 pg. 25.7

$F_2 = 0.52$ - pg. 25.9

$\Delta T = 58$ °F

$P = 52'$

EDGE LOSSES = 0.52 (52') 58 = 1569 Btu/h = 1.6 MBH

CONTROL RM

HEATING REQMTS FOR MINIMUM OUTSIDE AIR - FOR PRESSURIZATION PURPOSES

USE 100 CFM - @ DESIGN TEMP = 10°F / INDOOR DESIGN = 68°F

Btu/h = cfm * 1.085 * ΔT = 100 * 1.085 * 58 = 6293 Btu/h 6.3 MBH

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HEATING REQUIREMENT - CONTROL RM

TOTAL HEAT LOSS = SPACIAL HEAT LOSS + EDGE LOSS + O.A.

= 10.4 MBH + 1.6 MBH + 6.3 MBH = **18.3 MBH**

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COOLING LOAD - CONTROL ROOM

SUMMER DESIGN TEMP = 92 DB / 74° WB
INTERIOR TEMP = 78°F DB / 50% RH.

ASSUMPTIONS

- NET GLASS AREA IS NEGLIGIBLE
- PEOPLE LOAD TO SPACE - TOTAL OF 2 PERSONS (AVE.)
- MISCELLANEOUS LABS EQUIPMENT ALLOWANCE OF 4500 WATTS
- SUPPLY 200 CFM OUTSIDE AIR TO PRESSURIZE CONTROL ROOM RELATIVE TO PROCESS AREA. (EVEN WHEN RESTROOM EXHAUST IS OPERATING). ODORS FROM PROCESS WILL NOT ENTER CONTROL AREA

COOLING LOAD - (CONT) CONTROL ROOM

EXTERIOR WALL LOAD

$Q = U \cdot A \cdot \Delta T$

$U = 0.11$

$A = 415\ ft^2$

$\Delta T = (92 - 78) = 14°F$

$Q = 0.11 \cdot 415 \cdot 14 = \underline{639.1\ Btu/h}$

INTERIOR WALLS

$U = 0.31$

$A = 415\ ft^2$

$\Delta T = (92 - 78) = 14°F$

(ASSUMING PROCESS AREA IS VENTILATED TO MAINTAIN 92°F)

$Q = (0.31) \cdot 415 \cdot 14 = \underline{1801.1\ Btu/h}$

INTERIOR ROOF

$U = 0.28$

$A = 17.5 \times 34.5 = 603.75\ ft^2$

$\Delta T = (92 - 78) = 14°F$

$Q = (0.28) \cdot 603.75 \cdot 14 = \underline{2366.7\ Btu/h}$

PEOPLE - STANDING / LIGHT WORK

- 315 Btu/h SENSIBLE * 2 PEOPLE = 630 Btu/h
- 325 Btu/h LATENT * 2 PEOPLE = 650 Btu/h

COOLING LOAD - (CONT) CONTROL ROOM

VENTILATION AIR @ 200 CFM (O.A.)

$Q = CFM * 4.5 * \Delta h$

CFM = 200

$\Delta h = h_o - h_i = 37.7 - 30.0 = 7.7$

$Q = 200 * 4.5 * 7.7 = \underline{6930 \text{ Btu/h}}$

[200 CFM TO PROVIDE POSITIVE PRESSURIZATION TO CONTROL ROOM]

LIGHTING LOAD

$2.2 \frac{\text{WATTS}}{\text{SQ FT}} \times 603.75 \text{ ft}^2 = 1328.25 \text{ WATTS}$

$1328.25 \text{ WATTS} * \frac{3.4 \text{ Btu/h}}{\text{WATTS}} = \underline{4516.1 \text{ Btu/h}}$

LAB EQUIPMENT -

ASSUMPTION - WILL ADD 4500 WATTS FOR MISC. EQUIPMENT UNTIL EXACT LIST HAS BEEN ACQUIRED.

$4500 \text{ W} * \frac{3.4 \text{ Btu/h}}{\text{W}} = \underline{15,300 \text{ Btu/h}}$

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Environment & Infrastructure

CALCULATION SHEET

PROJECT NO. _____

CLIENT COE SUBJECT _____ Prepared By RGE Date 2/10/93

PROJECT CPC, NY _____ Reviewed By _____ Date _____

_____ _____ Approved By _____ Date _____

TOTAL COOLING LOAD

	Btu/h
EXTERIOR WALL LOAD	639.1
INTERIOR WALL LOAD	1801.1
INTERIOR ROOF LOAD	2366.7
PEOPLE — SENSIBLE	6300
— LATENT	650
VENTILATION (OA) LOAD	6930
LIGHTING LOAD	4516.1
LAB EQUIPMENT (MISC.)	15,300.

TOTAL 32833 Btu/h * 1 ton / 12,000 Btu/h = 2.74 tons

REQUIRED AIR FLOW W/SUPPLY = 55°F DB / 55°F WB

$$\frac{(29,368-650-3465)}{1.085*(78-55)} = \frac{[\text{SENSIBLE LOAD ONLY (NO O.A.)}]}{1.085 * \Delta T} = \frac{25253}{1.085*23} =$$

= 1012 cfm

SEC DONOHUE
Environment & Infrastructure

CALCULATION SHEET

PAGE 14 OF 17

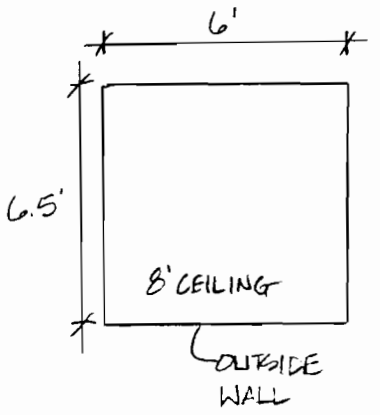
PROJECT NO. _____

CLIENT COE SUBJECT _____ Prepared By RGE Date 2/5/93

PROJECT CPC, NY _____ Reviewed By _____ Date _____

_____ _____ Approved By _____ Date _____

REST ROOM VENTILATION



VOLUME

$(6.5' \times 6.0' * 8.0') = 312\ ft^3$

WHEN OCCUPIED - VENTILATE @ 4 A.C /HR

$\therefore \frac{312\ ft^3}{A.C.} * \frac{4\ A.C.}{HR} * \frac{HR}{60\ min.} = 20.8\ cfm.$ - REQ'D

- VENTILATE @ 2 cfm/ft²

$\therefore 6.5' \times 6.0' = 39\ ft^2 * \frac{2\ cfm}{ft^2} = 78\ cfm$ MINIMUM

SELECTED FAN @ 100 CFM.

SEC DONOHUE
Environment & Infrastructure

CALCULATION SHEET

PAGE 15 OF 17

PROJECT NO. _____

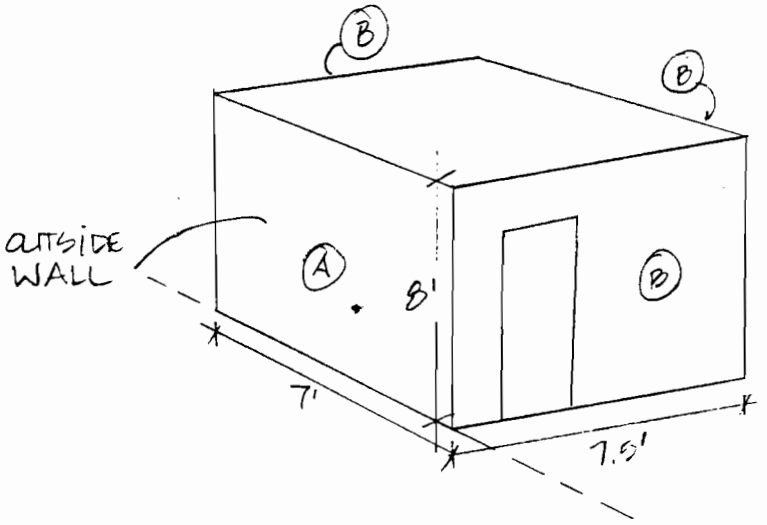
CLIENT COE SUBJECT _____ Prepared By RGE Date 2/5/93

PROJECT CPC, NY _____ Reviewed By _____ Date _____

_____ _____ Approved By _____ Date _____

RESTROOM HEAT LOSS - (BASEBOARD REQ'MTS)

HEAT LOSSES IN GENERAL FOR RESTROOM AREA WILL BE MADE UP FOR BY THE AHU (CEILING MOUNTED) IN CONTROL ROOM. HOWEVER, ADDITIONAL HEAT MAY BE REQ'D IF THE DOOR REMAINS CLOSED FOR A PERIOD OF TIME WHILE UNOCCUPPIED. BASEBOARD HEAT WILL ALSO PROVIDE COMFORT HEAT.
ROOM TEMP = 75°F



U-VALUE - WALLS & ROOF

WALL (A) - 0.11
WALL (B) - 0.31
ROOF - 0.28

WALL OR ROOF	U	A (ft^2)	ΔT(°F) =	Btu/h
WALL (A)	0.11	56	65	400.4
WALL (B)	0.31	(60×2)+56	20	1051.2
ROOF	0.28	52.5	20	294
				1785.6

EDGE LOSS. $Q = F_2 \cdot P \cdot \Delta T$

F_2 = 0.52 - ASHRAE '85 p. 25.9

P = PERIMETER P = 7'

ΔT = 65°F [(75-10)]

$Q = .52\ (7)(65) =$ 236.6 Btu/h

EDGE LOSS TO OPEN TREATMENT AREA ASSUMED NEGLIGIBLE.

TOTAL RESTROOM HEAT LOSS = 1785.6 + 236.6 = **2022.2 Btu/h**

REST ROOM HEAT LOSS - CONT'D

TOTAL LOSSES = 2022 Btu/h

$\therefore 2022 \frac{Btu}{hr} * \frac{hr}{60 min} * \frac{1 \text{ watts}}{0.05688 \text{ Btu/min}} = 592 \text{ Watts}$

BASEBOARD SELECTED @ 750 Watts

SEC DONOHUE
Environment & Infrastructure

CALCULATION SHEET

PROJECT NO. _____

CLIENT COE SUBJECT _____ Prepared By RGE Date 2/9/93

PROJECT CPC, NY _____ Reviewed By _____ Date _____

_____ _____ Approved By _____ Date _____

INTAKE
LOUVER SIZES

FOR PROCESS AREA - CFM REQ'D = 34,000 (MAU-1) (872 MAX FPM THRU GREENHECK LOUVER) ft. of ø water penetration

$\frac{34,000 \text{ cfm}}{872 \text{ fpm}} = 38.99 \text{ ft}^2 \text{ F.A.}$

120" x 90" = 41.60 ft² F.A. ∴ F.A. VELOCITY = $\frac{34,000}{41.6}$ = 817 fpm

FOR CONTROL RM. - CFM REQ'D = 100 (AHU-1)

$\frac{100 \text{ cfm}}{872 \text{ fpm}} = 0.12 \text{ ft}^2 \text{ F.A.}$

12" x 12" = 0.30 ft² FA. ∴ FA VELOCITY = $\frac{100}{0.3}$ = 333 fpm

---

EXHAUST
LOUVER SIZES

FOR PROCESS AREA - CFM REQ'D = 34,000 (EF-1)

SAME SIZE AS INTAKE

120" x 90"

6.0 PLUMBING DESIGN ANALYSIS

6.1 GENERAL PARAMETERS

1. The Plumbing systems shall be designed in conformance with the following manuals and codes:

   - TM 5-810-5, Plumbing.
   - National Standard Plumbing Code.
   - State of New York Codes, Title 9, Subtitle S, Chapter I - State Uniform Fire Prevention and Building Code.

6.2 DESIGN OBJECTIVES AND PROVISIONS

1. A 2-inch potable water service will be brought in from the municipal supply on Winding Road.

2. As the water service enters the building, parallel reduced-pressure-principle backflow preventers will provide a potable water system for the sinks, toilet, hose bibbs and emergency showers, and a process water system for pump seals and chemical mixing. All hose bibbs and service sinks will have additional backflow prevention. The piping for the two water services, potable and process, will be color coded and clearly identified.

3. Sanitary drainage from the toilet and sinks will go directly to the municipal sanitary sewer.

4. Floor drainage from the upper and lower levels of the process area will be carried in grated trench drains to a single sump in the lower level floor. The sump will have a valved outlet leading to the municipal sanitary system. In the event of an accidental chemical spill, the outlet valve could be closed and the spill contained until it could be neutralized or pumped out for disposal.

5. The building plumbing system will include the following fixtures:

Quantity	Tag No.	Description
1	WC-1	Water Closet (tank type)
1	L-1	Lavatory
1	WH-1	Water Heater (10 gal.-electric)
1	S-1	Countertop Sink

1	S-2	Service Sink
3	ES-1	Emergency Shower and Eyewash
1	EW-1	Emergency Eyewash
5	HB-1	Hose Bibbs (interior)
2	HH-1	Wall Hose Hydrants (freeze-proof)

6.3 PRODUCT INFORMATION

1. See Appendix A for information on the plumbing fixtures proposed to be used on the project.

RP/CPC65RDN/AE1

APPENDIX A

HIGHLINE™
WATER-GUARD® TOILET

WC-1

VITREOUS CHINA

- *18" high bowl.*
- *Designed for people with special needs.*
- *Three-bolt quick connect system with factory-installed tank gasket and bolts.*

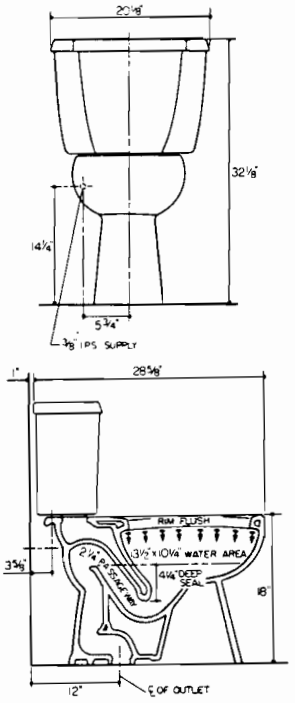
K-3527-EB Highline Water-Guard Toilet, vitreous china, 3.5 gallon flush. Close-coupled design with elongated bowl 18" (457 mm) high, siphon jet flushing, and 52184 bolt caps. Minimum roughing-in is 12" (305 mm).

Bowl/tank combination includes K-4224-ET 18" (457 mm) high bowl, K-4518-A vitreous china tank with Insuliner® lining, 30671 float valve with vacuum breaker, 30676 flush valve, K-4558 tank cover, and K-9404 chrome-plated trip lever.

Recommended Seats and Supply
K-4650 Lustra™ solid plastic seat with open front (K-4652 closed front) and cover. For elongated bowl.
K-4670-C Lustra solid plastic seat (K-4671-C Black Black™) with open front and check hinge. For elongated bowl.
K-7637 ⅜" angle supply with stop.

IMPORTANT—Available with Tank Locks.
Add "T" to product number.

For complete color selection, see Colors section.



Highline Water-Guard Toilet and Lustra seat (K-4652) in Heron™ Blue.

HIGHLINE
WATER-GUARD TOILET

VITREOUS CHINA

- *Integral bedpan lugs.*
- *18" high bowl.*
- *Designed for people with special needs.*
- *Three-bolt quick connect system with factory-installed tank gasket and bolts.*

K-3527-EBL Highline Water-Guard Toilet, same as K-3527-EB except with integral bedpan lugs.

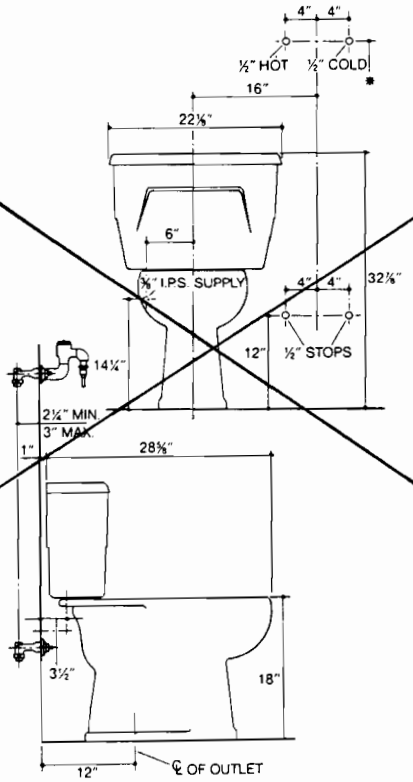
Bowl/tank combination includes K-4224-ETL 18" (457 mm) high bowl, K-4518-A vitreous china tank with Insuliner lining, 30671 float valve with vacuum breaker, 30676 flush valve, K-4558 tank cover, and K-9404 chrome-plated trip lever.

Hardware Recommended
K-13938-2A Built-in bedpan washer with Valvet® valve units, screwdriver check stops, vacuum breaker, flexible hose, self-closing lever control spray and hook.

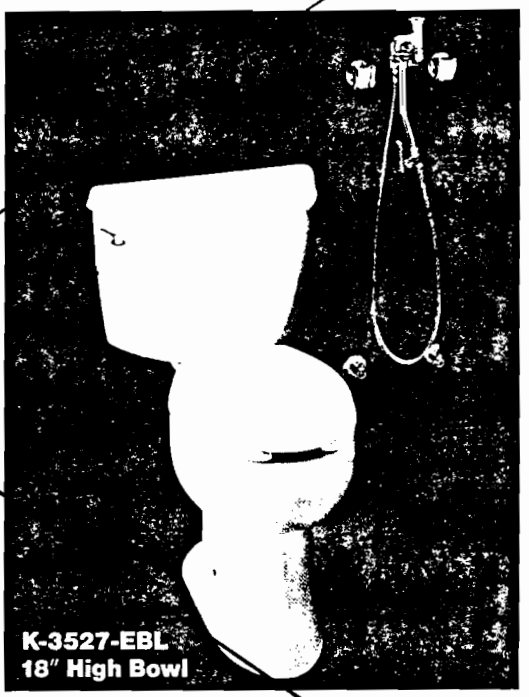
Recommended Seats and Supply
K-4650 Lustra solid plastic seat with open front (K-4652 closed front) and cover.
K-4670-C Lustra solid plastic seat (K-4671-C Black Black) with open front and check hinge.
K-7637 ⅜" angle supply with annealed vertical tube and stop.

IMPORTANT—Available with Tank Locks.
Add "T" to product number.

For complete color selection, see Colors section.



*Consult local codes for vacuum breaker height.

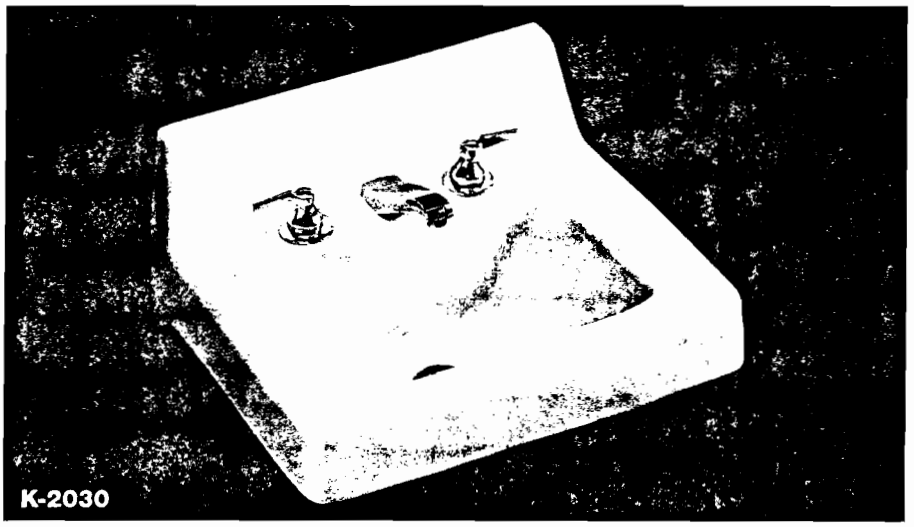


Highline Water-Guard Toilet with Lustra seat (K-4650) in White and bedpan washer (K-13938-2A) in polished chrome.

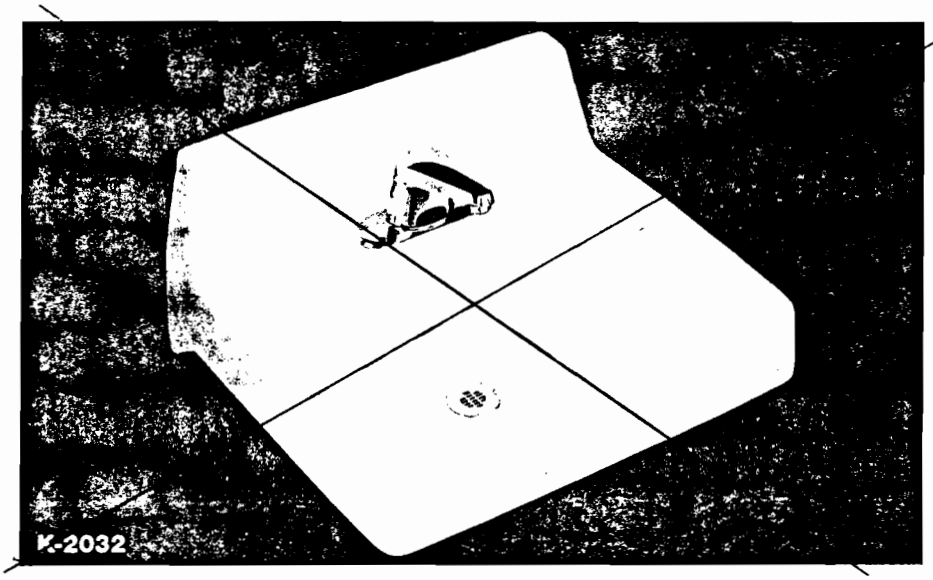
KOHLER®

L-1

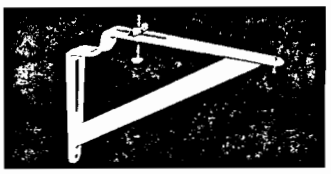
GREENWICH™
WALL-MOUNT



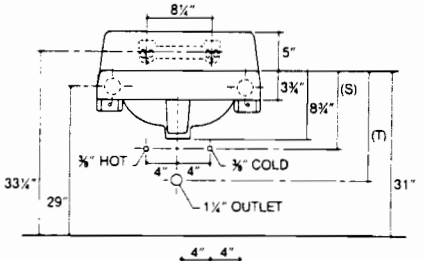
Greenwich Wall-Mount Lavatory in Heron™ Blue with Triton™ faucet (K-7443-4A) in polished chrome.

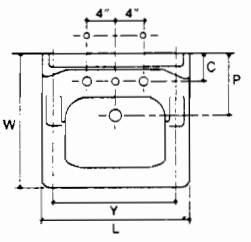


Greenwich Wall-Mount Lavatory in Almond with Touchless™ faucet (K-13662) in polished chrome with vandal-proof aerator.



Lavatory bracket with toggle bolt and adjusting screw.
K-1808 12″ (305 mm) for Greenwich Lavatories K-2023, K-2030, K-2027, K-2032, K-2034, K-2036 and K-2041.
K-1810 14″ (356 mm) for Greenwich Lavatories K-2038, K-2040 and K-2042.





(S) K-2023, K-2030, K-2038 (14″) **K-2027, K-2032, K-2040, K-2036, K-2041, K-2042** (10″) based on the use of a 12″ supply riser which may require cutting.
(T) Pop-up drain typically 14⅜″. Drain typically 13½″.

Sizes	L	W	C	P	Y
K-2023/K-2027	18¼″	15⅜″	3⅜″	7¼″	15¼″
K-2030/K-2032/K-2034/K-2036	20¾″	18″	3¼″	8⅜″	17¼″
K-2038/K-2040/K-2042	24″	20″	4″	8⅝″	19″

- *Three sizes—18″ x 15″, 20″ x 18″ and 24″ x 20″.*
- *4″ and 8″ faucet centers.*

K-2023 Greenwich Wall-Mount Lavatory, vitreous china, 18″ x 15″ (457 x 381 mm), with 8″ (204 mm) faucet centers.

K-2030 Greenwich Wall-Mount Lavatory, 20″ x 18″ (508 x 457 mm), with 8″ (204 mm) faucet centers.

K-2038 Greenwich Wall-Mount Lavatory, 24″ x 20″ (610 x 508 mm), with 8″ (204 mm) faucet centers.

K-2027 Greenwich Wall-Mount Lavatory, 18″ x 15″ (457 x 381 mm), with 4″ (102 mm) faucet centers.

K-2032 Greenwich Wall-Mount Lavatory, 20″ x 18″ (508 x 457 mm), with 4″ (102 mm) faucet centers.

K-2034 Greenwich Wall-Mount Lavatory, 20″ x 18″ (508 x 457 mm), with 8″ (204 mm) faucet centers with soap dispenser drilling at right.

K-2040 Greenwich Wall-Mount Lavatory, 24″ x 20″ (610 x 508 mm), with 4″ (102 mm) faucet centers.

K-2036 Greenwich Wall-Mount Lavatory, 20″ x 18″ (508 x 457 mm), with 4″ (102 mm) faucet centers and soap dispenser drilling at right.

K-2041 Greenwich Wall-Mount Lavatory, 18″ x 15″ (457 x 381 mm), with 4″ (102 mm) faucet centers and soap dispenser drilling at right.

K-2042 Greenwich Wall-Mount Lavatory, 24″ x 20″ (610 x 508 mm), with 4″ (102 mm) faucet centers and soap dispenser drilling at right.

NOTE—All Greenwich Wall-Mount Lavatories are drilled for concealed arm carrier with wall bracket furnished.

Hardware Recommended
K-7605 ⅜″ angle supplies with stops.
K-8998 1¼″ cast brass "P" trap.

Optional Accessories
K-7715 Drain with perforated strainer with 1¼″ tailpiece.
K-7717 Drain with perforated strainer with 1½″ x 8½″ (38 x 216 mm) tailpiece.

For complete faucet selection, see Faucet sections. For complete color selection, see Colors section.

	Basin	Back
K-2023/K-2027	13″ x 8¼″ (331 x 210 mm)	5″ (127 mm)
K-2030/K-2032/K-2034/ K-2036	14″ x 10″ (356 x 254 mm)	5″ (127 mm)
K-2038/K-2040/K-2042	16″ x 12″ (407 x 308 mm)	5″ (127 mm)

KOHLER®

BANNON™
SERVICE SINK

S-2

KOHLER CAST IRON

K-6714 Bannon Service Sink, enameled cast iron, 22¼" x 18¼" (565 x 464 mm) with K-8936 stainless steel rim guard and wall hanger supports.

K-6716 Bannon Service Sink, same as K-6714 except 24¼" x 20¼" (615 x 514 mm) with K-8937 stainless steel rim guard and wall hanger supports.

K-6718 Bannon Service Sink, enameled cast iron, 22¼" x 18¼" (565 x 464 mm) with blank back, K-8936 stainless steel rim guard and wall hanger supports.

K-6719 Bannon Service Sink, same as K-6718 except 24¼" x 20¼" (615 x 514 mm) with K-8937 stainless steel rim guard and wall hanger supports.

For complete faucet selection, see Commercial/ Institutional Faucets section.

	K-6714/K-6718	K-6716/K-6719
Size	22¼" x 18¼"	24¼" x 20¼"
Depth	12"	12"
Back	10"	19"

IMPORTANT—Bannon service sinks and traps are enameled inside only. Bannon under-surfaces have glazed dark finish.

Bannon Service Sinks available exclusively in White.

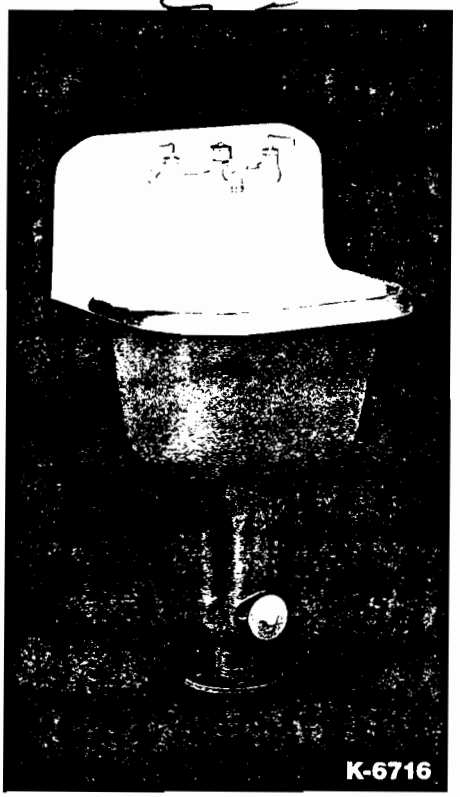
Traps for Vitreous and Cast Iron Service Sinks

K-6670 3" (76 mm) trap for lead pipe connection, with clean-out plug and strainer.

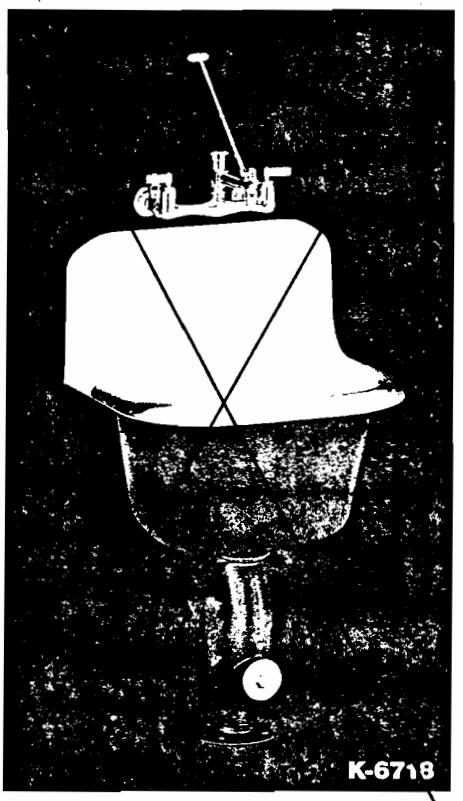
K-6671 Same as K-6670 except with spigot end for 3" (76 mm) soil pipe.

K-6672 2" (51 mm) trap for iron pipe connection, with clean-out plug and strainer.

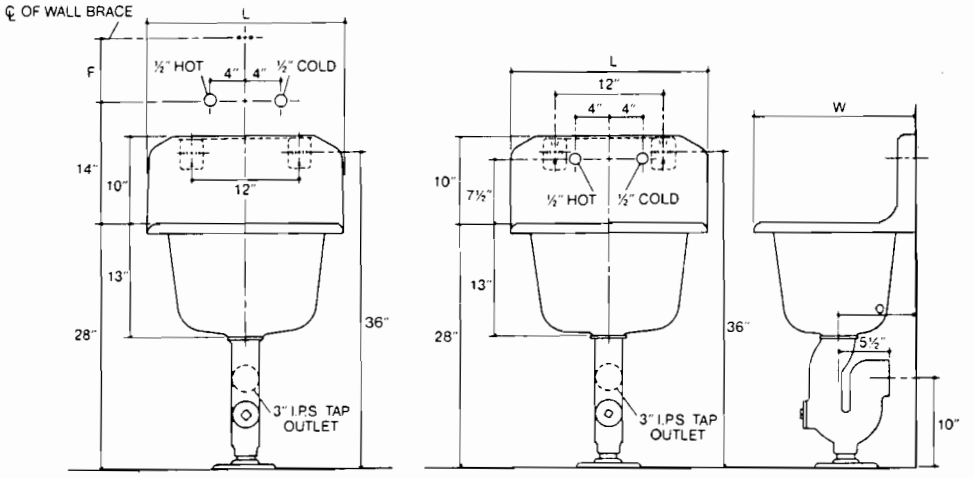
K-6673 3" (76 mm) trap for iron pipe connection, with clean-out plug and strainer.



Bannon Service Sink with Knoxford™ rough-plated faucet (K-8905) and enameled inside trap standard (K-6673).



Bannon Service Sink with polished chrome faucet (K-8904) and enameled inside trap standard (K-6673).



	F		L	W	O
K-8904	10⅜"	**K-6714/K-6718**	22¼"	18¼"	8½"
		K-6716/K-6719	24¼"	20¼"	9½"

Roughing-in for trap standards **K-6672** and **K-6673** shown. For **K-6670** and **K-6671** see roughing-in manual.

KOHLER.

Shower/Eye-Wash Emergency Station

Model 8320

8300 Series

This unit provides a complete emergency station for immediate first-aid. Model is supplied with 10" diameter deluge shower head and twin Feather-Flo* eye-face sprays. Unit has a hand and foot operated eye-wash and is equipped with emergency sign.

Model 8320 (Stay Open Ball Valve)

Shower head: ABS plastic in "first-aid" green, Model 8129.

Valve: instant-action stay-open rough chrome plated brass ball valve, operated by easily located rigid pull rod with triangular handle.

Standard: 1¼" galvanized pipe with 9" floor flange.

Eye-Wash: corrosion-resistant ABS plastic bowl with twin plastic patented Soft Flo* anti-surge heads. Eye-wash activated by hand or foot treadle controls.

Supply: 1¼" IPS.

Waste: 1¼" IPS.

Shipping weight: approx. 48 lbs.

Options:

☐ **Shower head:** Model 8127, stainless steel, at additional cost.

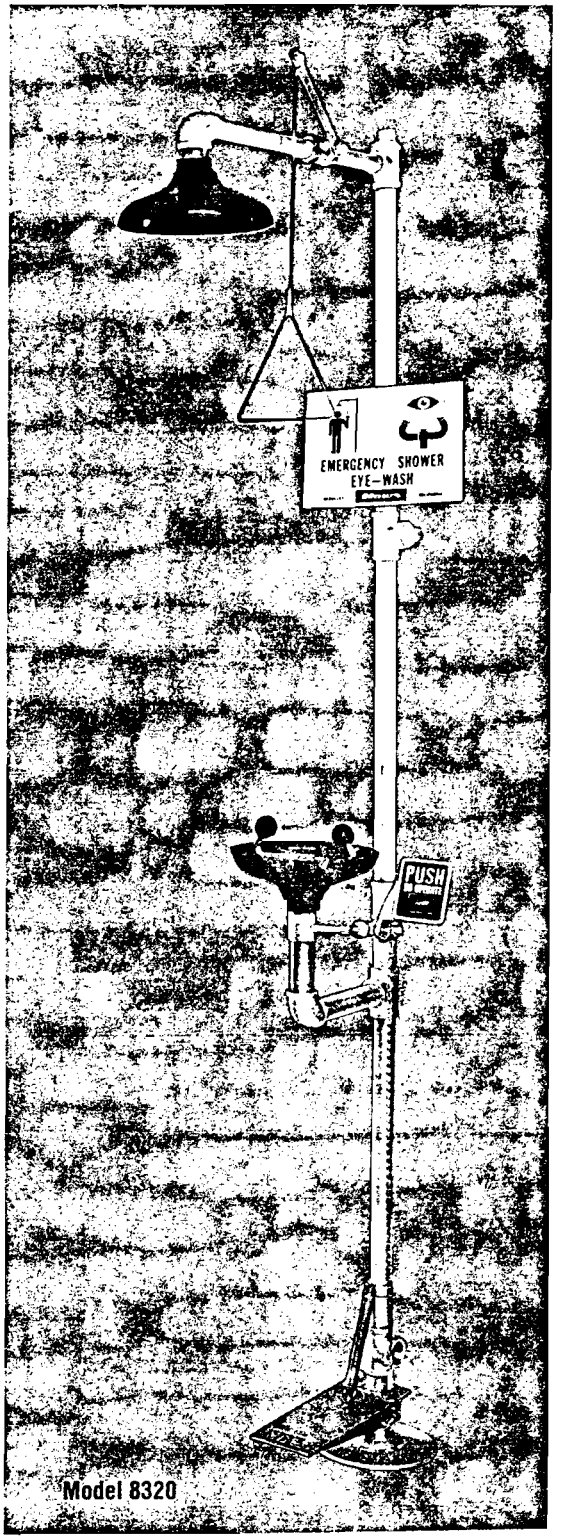
☐ **CRP Green Coating:** For protection against corrosive atmospheres, at additional cost.

ALL EMERGENCY EQUIPMENT SHOULD BE TESTED WEEKLY.

Specifications subject to change without notice.

*Patent No. 3,809,315

ES-1



Model 8320

August, 1982

HAWS DRINKING FAUCET COMPANY
GENERAL OFFICES: Fourth and Page Sts.
P.O. Box 1999, Berkeley, CA 94701
Telephone 415/525-5801
CABLE: "HAWSCO" Berkeley, California, USA • TELEX 33-6358

Haws EMERGENCY EQUIPMENT

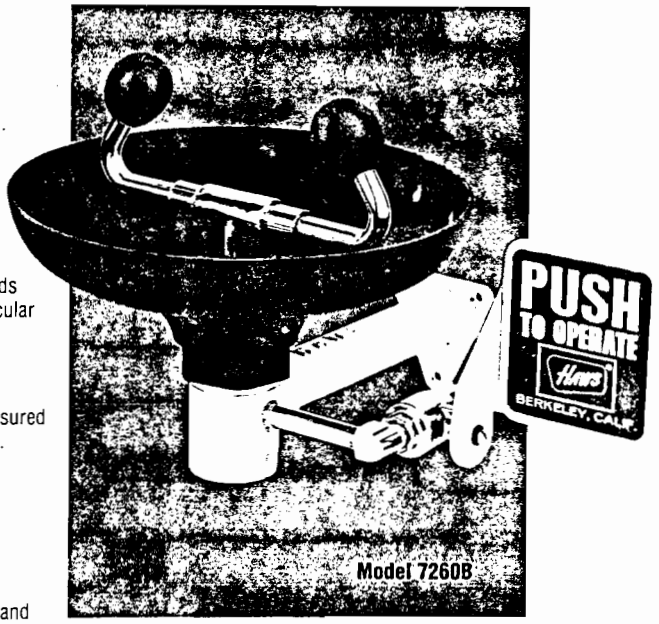
Eye-Wash Fountain with ABS Plastic Bowl

Models 7260 • 7260B • 7260BT

EW-1

7200 Series

Units feature twin eye-wash heads mounted in ABS plastic receptor which is impervious to damage from alkalies, salt solutions, oils and most acids. All functional parts are constructed of red brass for additional protection against corrosion. Emergency sign is included with each unit.



Model 7260B

Model 7260 (Unmounted)

Receptor: ABS plastic, "First-Aid" green color.

Heads: Buna N covered ABS plastic patented Soft-Flo* anti-surge heads angled to direct generous yet gentle streams of water into eyes and ocular area of face.

Valve: instant-action, push-type brass ball valve that stays open until manually closed.

Stream control: safe, steady water flow under varying pressures is assured with Haws dependable dual automatic pressure compensation devices.

Supply: ½" IPS.

Waste: 1¼" IPS.

Shipping weight: approx. 6 lbs.

Model 7260B (Wall Mounted)

Same as Model 7260, except furnished with bracket for all mounting, and 1¼" O.D. tailpiece.

Shipping weight: approx. 6 lbs.

Model 7260BT (Wall Mounted with Bracket and Trap)

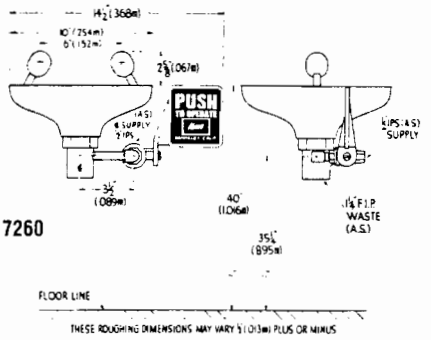
Same as Model 7260B, except furnished with 1½" IPS satin chrome plated trap.

Shipping weight: approx. 8 lbs.

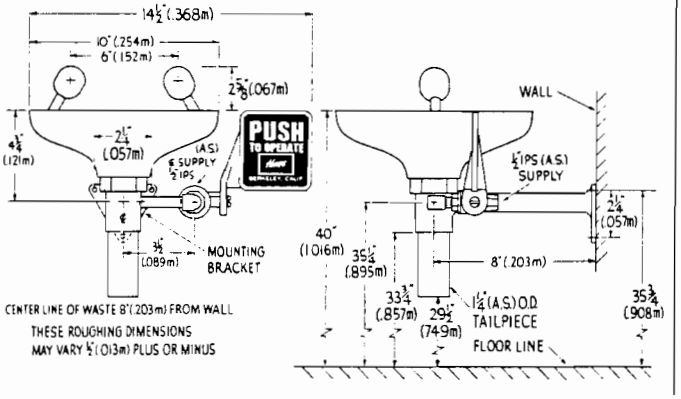
ALL EMERGENCY EQUIPMENT SHOULD BE TESTED WEEKLY.

Specifications subject to change without notice.

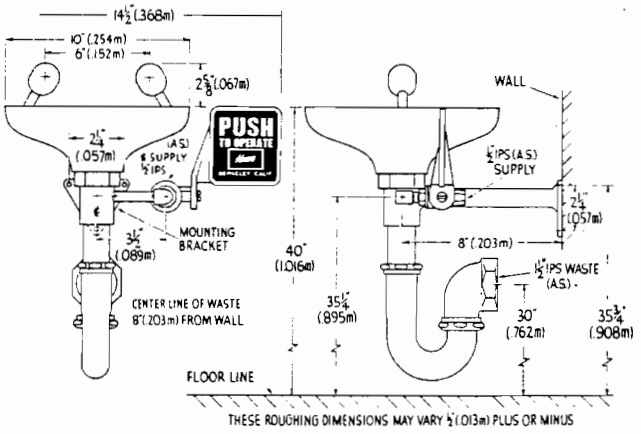
*Pat. No. 3,809,315 Canadian Pat. No. 990902



Model 7260



Model 7260B



Model 7260BT

August, 1982

HAWS DRINKING FAUCET COMPANY
GENERAL OFFICES: Fourth and Page Sts.
P.O. Box 1999, Berkeley, CA 94701
Telephone 415/525-5801
CABLE: "HAWSCO" Berkeley, California, USA • TELEX 33-6358

Haws EMERGENCY EQUIPMENT

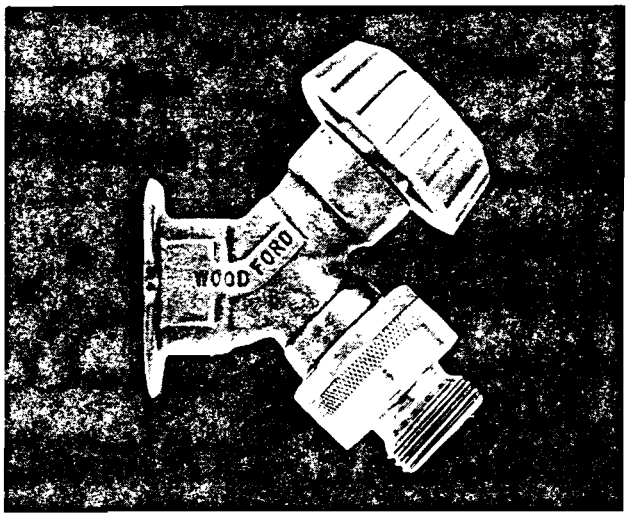
FOR NON-FREEZING AREAS ONLY

WOODFORD

HB-1

Anti-Contamination Wall and Lawn Faucets

WALL FAUCET MODEL 24

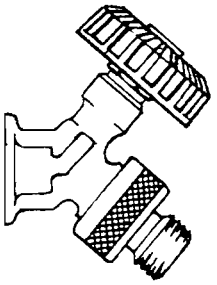


24P - ½

INLET - ½" FPT

INLET - ¾" FPT

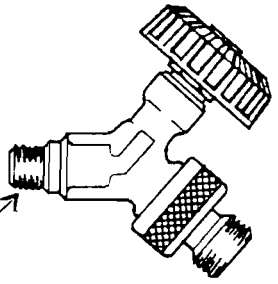
24P - ¾



24CP

INLET - ½" COPPER TUBE INSIDE

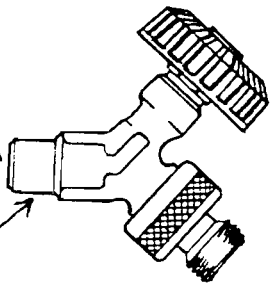
½" MPT OUTSIDE



24C

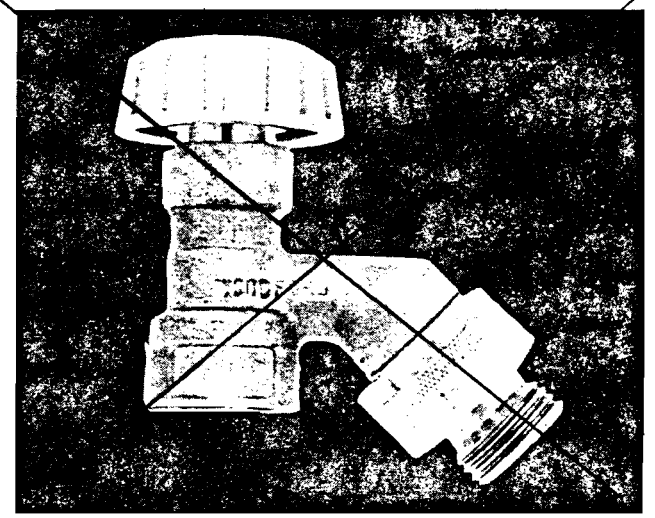
INLET - ½" COPPER TUBE INSIDE

¾" COPPER COUPLING OUTSIDE



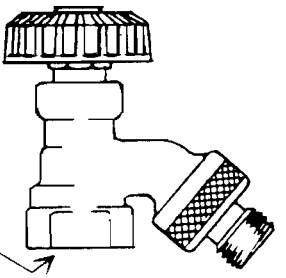
Model 24 is a vacuum breaker-backflow protected wall faucet for use in mild climate areas on homes, service stations, churches, motels, drive-in restaurants, etc.

LAWN FAUCET MODEL Y24



Y24

INLET - ¾" NPT FEMALE THREAD



Model Y24 is a vacuum breaker-backflow protected lawn faucet for use in garden, lawn and other water systems in mild climate areas.

SPECIFICATIONS: 24P-½, 24P-¾, 24CP, 24C and Y24

VACUUM BREAKER-BACKFLOW PREVENTER—NIDEL® Model 34HF with ¾ inch male hose thread, approved under ASSE Standard 1011, by City of Los Angeles, Canadian Standards Association, listed by IAPMO® and accepted by U.S. Department of Health.

EXTERIOR FINISH — Brass. Optional polished chrome, polished brass or chrome plated casting with chrome plated vacuum breaker.

OPERATING HANDLE — Wheel Handle. Polycarbonate. Optional loose tee key. Polish chrome standard loose tee key. Optional wheel handle.

BRASS CONSTRUCTION — Adjustable packing nut with deep stem guard, Teflon impregnated packing and standard "O" size washer.

SHIPPING WEIGHT — 10 lbs. (approximate weight per master carton of 10 units).

When ordering specify model number, inlet and finish.

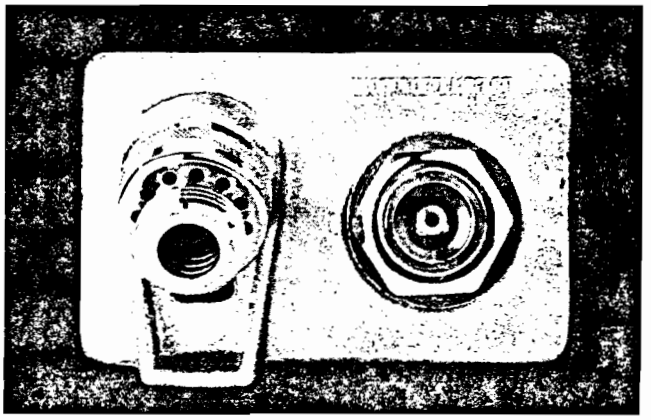
WOODFORD MFG. CO. 1/89 15P VALVES

HH-1

WOODFORD

Sanitary Automatic Draining Freezeless Wall Hydrants Model 65 Series

The Model 65 is an automatic draining, freezeless wall hydrant with vacuum breaker-backflow preventer. It is designed to blend with modern architecture for installation on restaurants, schools, office buildings, churches, apartments, motels, stores, shopping centers and industrial buildings.



SPECIFICATIONS:

MODEL 65 — Approved under ASSE Standard 1019 and listed by IAPMO®.

VACUUM BREAKER-BACKFLOW PREVENTER—NIDEL® Model 34HA with ¾ inch male hose thread, approved under ASSE Standard 1011, by City of Los Angeles, Canadian Standards Association, listed by IAPMO® and accepted by U.S. Department of Health.

MODULAR INSTALLATION — Fits one standard modular brick course.

VALVE SEAT — Permanent type brass valve body with hemispherical seating surface.

VALVE — One piece valve plunger accurately controls both flow and drainage with a minimum number of turns and without need for adjustments.

DRAIN — Under nozzle away from hands of operator and with a lip to divert water away from building.

CASING — Copper tubes.

NO LEAD SOLDER — All solder joints.

STEM — Hardened stainless steel stem resists damage.

TEE KEY — Loose key operates hydrant.

OPERATING ROD — ⅜" solid brass operating rod.

EXTERIOR FINISH — Chrome finish on brass casting. Optional — Polished brass finish.

INLETS — As shown. Special Inlets can be furnished.

WALL CLAMP — Furnished on all 65 series except closed coupled.

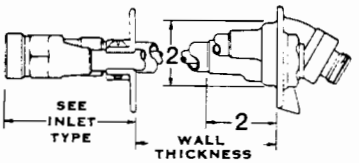
Model 60 series is available with no vacuum breaker.

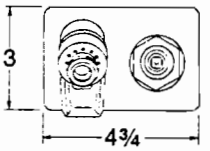
Wall Thickness (inches)	CC†	4	6	8	10	12	14	18	24
Approx. Shipping Weight (lbs.)	3.8	4.4	4.8	5.2	5.6	6.0	6.4	7.2	8.4

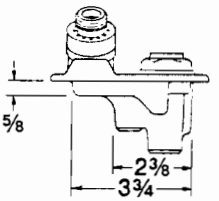
†Close coupled Model 65 is not recommended for use in freezing climates and cannot use wall clamp. C and P inlets are 5" from flange to end of inlet and EP inlet is 6¾".

Specify as follows:

Wall hydrant shall be exposed type Woodford automatic draining Model 65 with vacuum breaker-backflow preventer, ¾ inch hose thread nozzle, one piece valve plunger to control both flow and drain functions, hardened stainless steel operating stem, chrome or polished brass finish on brass castings. Loose tee key to be furnished with each hydrant. Wall thickness to be _____ inches.



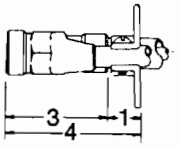




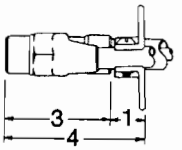
Roughing-In Dimensions

Inlet Descriptions

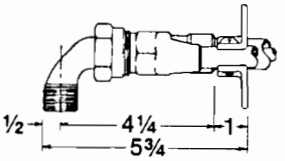
WALL CLAMP OPTIONAL ON REQUEST



MODEL 65P
¾" FEMALE PIPE THREAD INLET



MODEL 65C
¾" COPPER WATER TUBE INLET

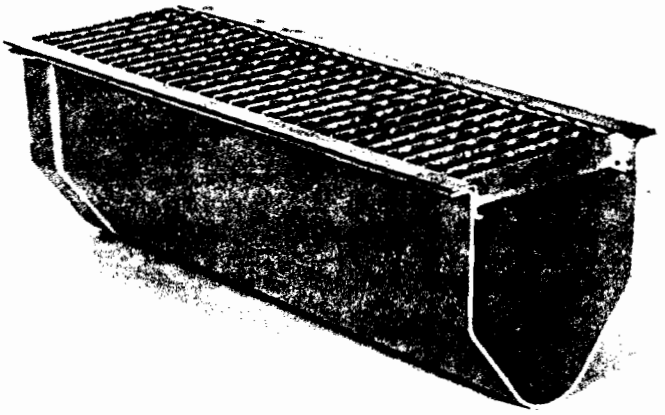


MODEL 65EP
UNION ELBOW WITH ¾" MALE PIPE THREAD INLET

When ordering specify model number, inlet, and wall thickness.

REV 1/91 FORM NO 83 108

WOODFORD MFG. CO. 1/91 15P VALVES



Smooth surface guarantees high velocity and rapid evacuation of large volumes of liquids.

ACO Polymer Products, Inc. offers a wide range of engineered grate options for the ACO FG200 System.

Ductile iron grating is recommended for extra heavy duty applications. These 18 inch grates are securely locked to the sturdy framework with two 18 - 8 stainless steel 1/2" bolts.

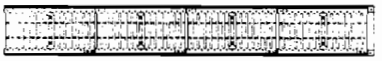
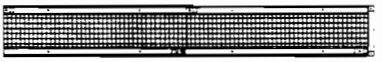
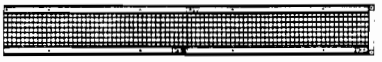
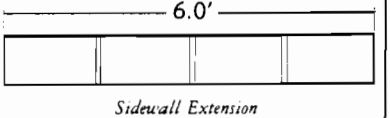
For lighter duty applications, ACO provides galvanized or stainless steel mesh grating based on mechanical or chemical requirements. These three foot mesh grates are locked down to the frame with four counter sunk bolts per grate.

For extreme chemical conditions, vinylester bar grating with frame is available in three foot lengths.

This wide range of grating for the ACO FG200 System provides a grating option for virtually every requirement. In addition, the line of inlet/outlet components provides a high degree of flexibility when designing an ACO FG200 System.

The FG200 Catch Basins come with cast iron grates as standard. These basins may be used with any channel to serve as an outlet point for the trench system. Knock-outs to accept trench, inlets and outlets are easily fabricated in the catch basin walls on the job site.

The twelve inch sidewall extensions added to the channel system provide 192 feet of continuous slope and increase overall flow capacity.

		Weight: 6 foot unit	Part Number: Channel/Group No.
Group 1 Ductile Iron Six foot fiberglass channel with frames, 4 ductile iron grates, 6 stainless steel locking bolts (2 per grate).		140 - 155 lbs	8011 - 8161
Group 2 Cast Iron Six foot fiberglass channel with frames, 4 cast iron grates, 6 stainless steel locking bolts (2 per grate).		140 - 155 lbs.	8012 - 8162
Group 3 Galvanized Mesh Six foot fiberglass channel with frames, 2 galvanized mesh grates and 8 stainless steel bolts (4 per grate).		105 - 120 lbs.	8013 - 8163
Group 4 Stainless Steel Mesh Six foot fiberglass channel with frames, 2 stainless steel mesh grates and 8 steel bolts (4 per grate).		105 - 120 lbs.	8014 - 8164
Group 5 Vinylester Fiberglass Six foot fiberglass channel with frame and 2 vinylester fiberglass bar grates.		100 - 115 lbs.	8015 - 8015
Group 6 Accessories Universal End Cap Universal End Cap w/6" outlet 6" Flumed Bottom Outlet Catch Basin Sidewall Extension	 *Sidewall Extension*	 3 lbs. 2.5 lbs. 6 lbs. 55 lbs. 7.25 lbs. ea.	 8606 8706 8756 8806 8506

7.0 ELECTRICAL DESIGN ANALYSIS

7.1 GENERAL PARAMETERS

1. The groundwater treatment facility will be fed from a new 400 amp, 480 volt, three-phase, four-wire underground electric service from the electric utility. An electric utility owned padmount transformer located near the control room will supply the new facility with power. The new facility will also be provided with a new telephone service.

2. The control room will serve as the distribution point for the facility, with service entrance equipment UL labeled "suitable for service entrance." The distribution equipment consists of a motor control center (MCC) with a main circuit breaker and a lighting panel with a step-down transformer. Thermal magnetic circuit breakers and combination motor starters with motor circuit protectors (MCP) will be located in the motor control center. The MCC will feed equipment and motors requiring 480 volts. The lighting panel will be 120/208 volt, three-phase, four-wire, and be fed from a transformer powered from the motor control center. Thermal magnetic circuit breakers located in the lighting panel will power lighting and equipment requiring 120 or 208 volts. Refer to Appendix A for load tabulation.

7.2 FUNCTIONAL AND TECHNICAL CONSIDERATIONS

1. Interior Electrical Distribution System

   a. The building wiring system will be a minimum of 3/4-inch galvanized rigid steel conduit or flexible conduit for general wiring. A minimum 1/2-inch electrical metallic tubing can be used where conduit is concealed in hollow spaces in walls and above lay-in ceilings. Conduit under floor slabs or in contact with earth will be PVC coated galvanized rigid steel conduit.

   b. The lighting system will be designed in accordance with the illuminance category charts of the Illuminating Engineering Society (I.E.S). The interior lighting system will consist of fluorescent fixtures in the control room. High Pressure Sodium fixtures and enclosed gasketed fluorescent fixtures will be used in the process area. Exit signs will be provided over exterior exit doors. Refer to Appendix B for lighting calculations and fixture schedule.

   c. All conductors will be copper and minimum conductor size will be No. 12 AWG, type THWN solid for single conductors up to No. 8 AWG. Type XHHW stranded single conductors will be used for No. 8 AWG and larger, and type TW stranded single conductors for green equipment ground. Refer to Appendix C for voltage drop calculations.

d. The new phone service will be terminated in the control room, with phone jacks being provided in the control room near the door and desk.

2. Exterior Electrical Distribution System

a. Site lighting will consist of high pressure sodium fixtures mounted to the building to illuminate building entrances and exterior equipment.

b. Site electrical distribution will consist of direct buried PVC coated galvanized rigid steel conduit routed to exterior equipment and the extraction and injection wells.

RP/CPC65RDN/AC3

APPENDIX A

LOAD TABULATION

10MCC-1

CLIENT CPC WMNA
PROJECT CPC
PROJECT # 18422

DATE 2-5-93
BY JAB
CHK BY DRT

TAG #	DESCRIPTION	CONNECTED LOAD		DIVERSITY	DEMAND LOAD		REMARKS
		HP/AMPS	KVA		HP/AMPS	KVA	
-	EQUALIZATION PUMP	3 HP	4	1	-	4	-
-	EQUALIZATION PUMP	3 HP	4	1	-	4	-
-	EQUALIZATION PUMP	3 HP	4	0	-	0	BACK UP
-	EQUALIZATION MIXER	3 HP	4	1	-	4	-
-	REACTION TANK MIXER	1 HP	1.5	1	-	1.5	-
-	REACTION TANK MIXER	1 HP	1.5	1	-	1.5	-
-	SODIUM HYDROX. MIXER	1/2 HP	0.83	1	-	0.83	-
-	POTASSIUM PER. MIXER	1/2 HP	0.83	1	-	0.83	-
-	POLYMER MIXER	1 HP	1.5	1	-	1.5	-
-	POLYMER MIXER	1 HP	1.5	1	-	1.5	-
-	RECYCLE PUMP	1.5 HP	2.2	1	-	2.2	-
-	RECYCLE PUMP	1.5 HP	2.2	0	-	0	BACK UP
-	AIR STRIP. FEED PUMP	5 HP	6.3	1	-	6.3	-
-	AIR STRIP. FEED PUMP	5 HP	6.3	1	-	6.3	-
-	AIR STRIP. FEED PUMP	5 HP	6.3	0	-	0	BACK UP
-	CARBON ABSORB. PUMP	5 HP	6.3	1	-	6.3	-
-	CARBON ABSORB. PUMP	5 HP	6.3	1	-	6.3	-
-	CARBON ABSORB. PUMP	5 HP	6.3	0	-	0	BACK UP
-	AIR STRIPPER BLOWER	10 HP	11.6	1	-	11.6	-
-	AIR STRIPPER BLOWER	10 HP	11.6	1	-	11.6	-
-	INJECTION WELL PUMP	15 HP	17.4	1	-	17.4	-
-	INJECTION WELL PUMP	15 HP	17.4	1	-	17.4	-
-	EXTRACTION WELL PUMP	10 HP	11.6	1	-	11.6	-
-	EXTRACTION WELL PUMP	10 HP	11.6	1	-	11.6	-
-	EXTRACTION WELL PUMP	10 HP	11.6	1	-	11.6	-
-	MAKE UP AIR UNIT	20 HP	22.4	0.8	-	18	-
-	EXHAUST FAN	5 HP	6.3	0.8	-	5	-
-	LTG. TRANSFORMER	-	30 KVA	0.8	-	24	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
TOTAL			217.4			186.9 = 225 AMPS (DEMAND)	

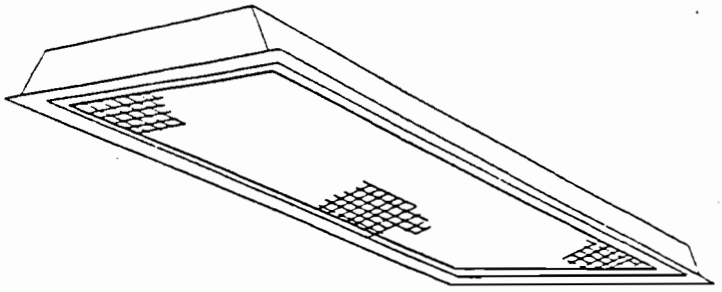
APPENDIX B

********** LUMINAIRE REQUIREMENTS REPORT **********

ROOM NO. AND DESCR LUM. DESCRIPTION LUM. FILENAME, NUM LUM. MANUF AND CAT.#	#TIMES LENGTH WIDTH AREA	HCC CCR PC PCC	HRC RCR PW PFC	HFC FCR PF PFM	LLD LDD TBF LLF	ORIENT #L/ROW # ROWS COEF.U	LUMEN #LAMP WATTS W/SF.	D-FC. I-FC. D-LUM I-LUM
1.CONTROL ROOM	1	0.00	5.50	2.50	95	LENGTH	9600	50.00
Recessed 2'x4' Trof	33.00	0.00	2.55	1.16	85	2	3	52.45
ELITE, 46	16.00	50.00	30.00	20.00	75	4.00	1200	7.63
DAYBRITE FGS243-SRA12	528.00	50.00	16.45	0.990	61	59.54	2.27	8.00
2.REST ROOM	1	0.00	5.50	2.50	95	LENGTH	9600	30.00
Recessed 2'x4' Trof	6.50	0.00	8.81	4.01	85	1	3	40.99
ELITE, 46	6.00	50.00	30.00	20.00	75	1.00	150	0.73
DAYBRITE FGS243-SRA12	39.00	50.00	11.47	0.991	61	27.50	3.85	1.00
3.PROCESS AREA	1	3.00	22.50	2.50	95	LENGTH	27500	30.00
Surface	96.00	0.41	3.05	0.34	85	4	1	31.79
ELITE, 56	60.00	50.00	30.00	20.00	75	5.00	6000	18.87
Daybrite LB25HSMTBRAC	5760.00	45.03	18.82	0.997	61	54.98	1.04	20.00

LIGHTING FIXTURE SCHEDULE

FIX. DES.	LAMPS NO.	LAMPS ORD. ABB.	DESCRIPTION/CATALOG NO.	FINISH	LENS	MOUNTING	CORP FIXTURE TYPE NUMBER
A	3	F40 RS	2X4 RECESSED LAY-IN TROFFER FLUORSCENT FIXTURE DAY BRITE CAT NO. SG243-SRA12D OR EQUAL	BAKED WHITE ENAMEL	ACRYLIC	CEILING GRID MOUNTED –	206-B-1
B	2	F40 RS	1X4 ENCLOSED GASKETED VAPOR-TIGHT FLUORSCENT FIXTURE METALUX CAT NO. AUT-240-DR-DL OR EQUAL	THERMOPLASTIC BODY	ACRYLIC	AS INDICATED ON FLOOR PLAN –	232
C	1	250LU	250 WATT HIGH PRESSURE SODIUM LOW BAY DAY BRITE CAT NO. LB-25-HS-MT-BRA-CF OR EQUAL	DIE CAST ALUMINUM	GLASS	MOUNTED 25' AFF – –	302-B
D	1	70LU	70 WATT HIGH PRESSURE SODIUM WALL PACK W/PHOTOCELL DAY BRITE CAT NO. OWW-70-HS-12-PE-TP-WGWLL OR EQUAL	BRONZE	GLASS	MOUNTED 8'6" AFG	502-B
	2	WITH UNIT	EMERGENCY BATTERY PACK WITH 2 UNIT MOUNTED LAMP HEADS DUAL LITE CAT NO. ML-2E OR EQUAL	–	–	MOUNTED 8'6" AFF	603
	1	WITH UNIT	EXIT SIGN WITH FLUORESCENT LAMP DUAL LITE CAT NO. FLXI-RW OR EQUAL	THERMOPLASTIC BODY	RED STENCIL LETTER	MOUNTED ABOVE DOORS	605-A-2



TYPE 206
Static Troffer

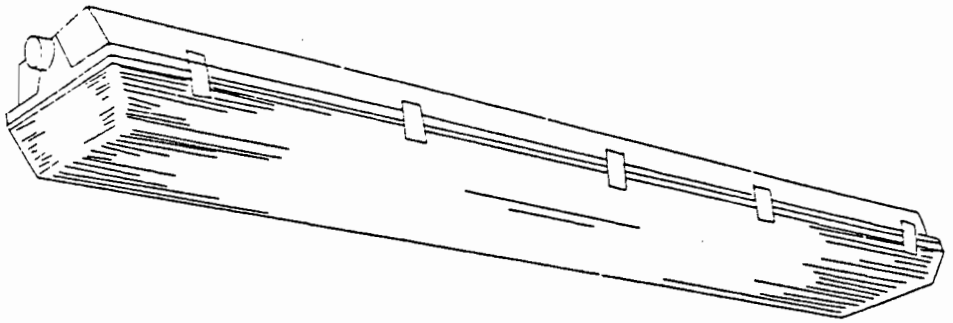
TYPE 207
Air Handling Troffer

Recessed Fluorescent Fixture, 2-foot by 4-foot

First Suffix	Second Suffix	Third Suffix	Description
A			Two lamps
B			Three lamps
C			Four lamps
	1		Prismatic acrylic lens
	2		1/2- by 1/2- by 1/2-inch cube louver
	3		1/2- by 1/2- by 1/2-inch polystyrene cube louver
		A	Type 200 emergency unit

Fixture shall conform to UL 1570. Housing shall be complete with integral side trim flanges and shall be suitable for mounting in continuous rows. Housing and trim flanges shall be cold-rolled steel. The lens or louver shall be installed in a manner that will prevent it from coming loose due to vibration. The ballasts and wiring shall be enclosed in a wireway that is continuous throughout the length of the fixture and which forms a wireway for circuits through the fixture. All metal parts shall receive a rust inhibitive coating before application of the finish coat. The finish coat shall be baked enamel. Lenses and acrylic cube louvers shall be 100 percent virgin acrylic plastic. The lens or louver shall be four feet in length. Acrylic lens shall be flat, 0.125 inch nominal thickness, low brightness, with smooth top surface and a lower surface having a regular array of prismatic elements. Two-lamp ballasts shall be used for individually mounted two-lamp fixtures. Standard ballast(s) shall be the Class P, high power factor type which has been approved for the application by the Certified Ballast Manufacturers. Fixture shall be prewired.

Fixture types indicated on this sheet shall also conform to requirements specified and indicated in the contract documents.



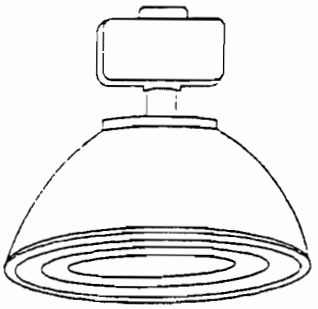
TYPE 232
4-Foot Fixture Length

TYPE 233
8-Foot Fixture Length

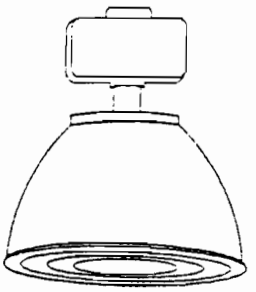
Enclosed and Gasketed, Vapor-Tight Fluorescent Fixture
For Surface or Pendant Mounting

Fixture shall conform to UL 1570 and shall be vapor-tight and suitable for use in wet locations. Fixture shall have one-piece housing of molded high-impact plastic or reinforced fiberglass. Housing body shall have an internal, die-formed, cold-rolled steel channel with cover to provide fixture rigidity and to contain electric components. The metal channel and cover shall receive a rust inhibitive coating before application of the finish coat, which shall consist of baked white enamel or porcelain enamel. The lens shall be one piece, of high-impact-resistant acrylic, and shall have smooth exterior surface and stippled or pebbled interior surface. The lens shall be secured to the housing with captive molded plastic or stainless steel spring latches. A continuous gasket shall be provided to form a vapor seal between the lens and the fixture body. All openings in the housing for mounting, conduit, etc., shall be capable of forming a vapor-tight seal. Ballast(s) shall be cold weather type for starting temperatures down to minus 20 degrees F. Standard ballast(s) shall be the Class P, high power factor type approved for the application by the Certified Ballast Manufacturers. Fixture shall be prewired, and provided with lamps that are properly mated to the ballast operating characteristics.

Fixture types indicated on this sheet shall also conform to requirements specified and indicated in the contract documents.



TYPE 301
High Bay



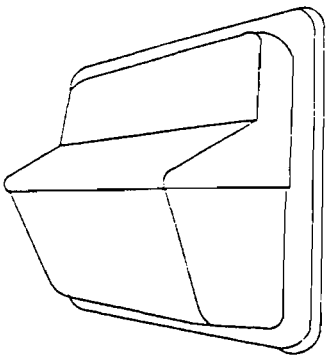
TYPE 302
Low Bay

Enclosed, Pendant, Integrally Ballasted, Industrial,
High Intensity Discharge Fixture

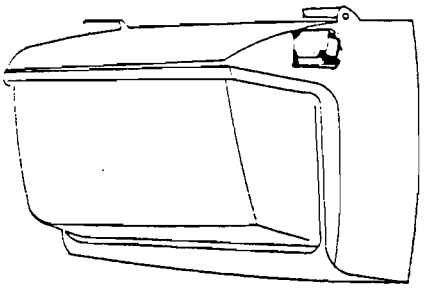
First Suffix	Second Suffix	Description
A		Rated for metal halide lamp
B		Rated for high pressure sodium lamp
	1	Type 300 emergency quartz standby

Fixture shall conform to UL 1572. The ballast housing and structural parts, including the mounting devices, shall be of cast aluminum. The optical assembly shall be enclosed, gasketed, and locked to the ballast housing by a positive vibration-proof means. An optical assembly filter to permit the passage of air during heating and cooling cycles shall be provided. All exposed cast aluminum parts shall have a baked enamel paint finish. The lens shall be heat and impact resistant glass mounted in a gasketed, hinged aluminum door frame. Ballast shall be of the high power factor type. Fixture shall be prewired. Ballast shall start and operate the lamp in an ambient temperature range of minus 20 degrees F to 105 degrees F. Metal halide fixture shall use a lead-peaked autotransformer ballast. High pressure sodium fixture shall use a regulated type ballast. Reflector shall be constructed of aluminum and contoured or formed to provide high lighting efficiency. The exterior of the reflector shall have a clear acrylic lacquer protective coating. The interior of the reflector shall be the manufacturer's standard commercial product finish suitable for light source provided. The fixture shall have a mogul base glazed porcelain lampholder, adjustable for varying the spacing-to-mounting-height ratio in the field. The fixture shall have separate, removable mounting components that can be easily removed and assembled to the structural or mounting hardware before mounting the remainder of the fixture.

Fixture types indicated on this sheet shall also conform to requirements specified and indicated in the contract documents.



TYPE 501



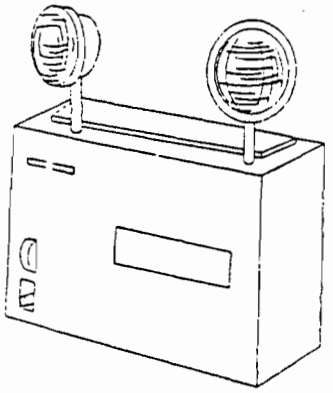
TYPE 502

High Intensity Discharge Fixture for Exterior Wall Mounting, Medium Output

Suffix	Description
	Rated for:
A	50 watt high pressure sodium lamp
B	70 watt high pressure sodium lamp
C	100 watt high pressure sodium lamp
D	150 watt high pressure sodium lamp
E	175 watt metal halide lamp

Fixture shall conform to UL 1572 and shall be rated for use in wet locations. The fixture housing, door assembly, and backplate shall be die-cast aluminum. The door assembly shall have integral cast aluminum hinges. The door assembly shall be held securely to the fixture housing with a stainless steel safety strap when the door is in the open position. The door assembly shall be held firmly against a sealing gasket between the fixture door and housing by stainless steel latches or with stainless steel or brass captive screws when the fixture door is closed. The refractor shall be prismatic borosilicate glass or polycarbonate resin. The refractor shall be gasketed and securely held in the door frame, but shall be easily removed for replacement with a common tool. The reflector shall be aluminum with the manufacturer's standard commercial product finish suitable for the type and rating of the lamp. The fixture shall have manufacturers standard protective coating. Cast knockouts shall be provided in the backplate for recessed outlet box mounting. Ballast shall be of the high power factor type. Ballast shall be of the lead-peak autotransformer type metal halide for lamps and the regulating type for high pressure sodium lamps. Ballast shall be capable of starting and operating the lamp at ambient temperatures from minus 20 degrees F to 105 degrees F. The fixture shall be prewired, and shall have a field adjustable, mogul base glazed porcelain lampholder.

Fixture types indicated on this sheet shall also conform to requirements specified and indicated in the contract documents.



TYPE 603

6-Volt Emergency Battery Pack Unit with Two Floodlights

Unit shall conform to UL 924, and shall meet or exceed the NFPA 70 time and voltage requirements. The unit shall be dual-rated for use on either 120-Volt or 277-Volt alternating current power supplies. Following sustained loss of the normal power supply, the unit shall be capable of automatically and instantaneously illuminating the two 6-Volt lighting fixtures for a period of not less than 90 minutes at a battery voltage in excess of 87.5 percent of the nominal voltage rating. The battery shall be the nickel-cadmium, pocket plate type designed to be maintenance free during the expected battery life, and shall be warranted for not less than 3 years from the date of the purchase of the unit, and shall be field replaceable without requiring removal of other components. The battery charger shall be the solid-state type and shall provide a continuous, variable, current limited, filtered and regulated charge rate. The battery and charger shall be contained in a steel cabinet not less than 18 gauge thickness with an enamel finish, unless otherwise approved, which shall be equipped with a push-to-test switch and a meter to indicate battery voltage when the switch is closed. Mounting brackets or shelf shall be provided, complete with all mounting hardware, all with a finish to match the finish or color of the cabinet. The unit shall be prewired and equipped with two 6-volt, 5-8 watt floodlights as indicated.

Fixture type indicated on this sheet shall also conform to requirements specified and indicated in the contract documents.

TYPE 605
Exit Light, Stencil Face

First Suffix	Second Suffix	Third Suffix	Description
A			Single face
B			Double face
	1		Incandescent
	2		Fluorescent
		A	End mounted
		B	Top mounted
		C	Back mounted
		D	Stem mounted

Incandescent fixtures shall conform to UL 924, UL 1571, and NFPA 101. Fluorescent fixture shall conform to UL 924, UL 1570, and NFPA 101. Unit shall conform to UL 924, and shall meet or exceed the NFPA 70 time and voltage requirements. The unit shall be dual-rated for use on either 120-Volt or 277-Volt alternating current power supplies. Following sustained loss of the normal power supply, the unit shall be capable of automatically and instantaneously illuminating the two 6-Volt lighting fixtures for a period of not less than 90 minutes at a battery voltage in excess of 87.5 percent of the nominal voltage rating. The battery shall be the nickel-cadmium, pocket plate type designed to be maintenance free during the expected battery life, and shall be warranted for not less than 3 years from the date of the purchase of the unit, and shall be field replaceable without requiring removal of other components. The battery charger shall be the solid-state type and shall provide a continuous, variable, current limited, filtered and regulated charge rate. The battery and charger shall be contained in a steel cabinet not less than 18 gauge thickness with an enamel finish, unless otherwise approved, which shall be equipped with a push-to-test switch and a meter to indicate battery voltage when the switch is closed. Mounting brackets or shelf shall be provided, complete with all mounting hardware, all with a finish to match the finish or color of the cabinet. Fixture shall be prewired, with wiring concealed in the illuminated portion of the fixture housing.

Fixture type indicated on this sheet shall also conform to requirements specified and indicated in the contract documents.

APPENDIX C

VOLTAGE DROP ANALYSIS

EDSA Micro Corp. - (C) Copyright 1990 Dist. Load Flow Analysis
Base KVA: 10000 Cyc/Sec: 60 Date: 02/11/93 Time: 10:12:59am Page 1
CPC Treatment Facility
Designer: J. Berktold
PM: D. Froh

Project Number :

Node ID	Node Label	System or Nom. Voltage	Cod	KW	KVAR	Dem. Fact. (%)	Demanded KVA	Reactive Power KVAR
10	MCC-1	480						
100	Reaction mixer	480	L	0.857471	0.531413	100.0	1.008790	0
110	Sodium hyd. mix	480	L	0.428736	0.265706	100.0	0.504395	0
120	Potassium mixer	480	L	0.428736	0.265706	100.0	0.504395	0
130	Polymer mixer	480	L	0.857471	0.531413	100.0	1.008790	0
140	Polymer mixer	480	L	0.857471	0.531413	100.0	1.008790	0
150	Recycle pump	480	L	1.286207	0.797119	100.0	1.513184	0
160	Recycle pump	480	L	1.286207	0.797119	0	0	0
170	Air strip. feed	480	L	4.287356	2.657064	100.0	5.043949	0
180	Air strip. feed	480	L	4.287356	2.657064	100.0	5.043949	0
190	Air strip. feed	480	L	4.287356	2.657064	0	0	0
20	Ext Well No. X	480	L	8.574713	5.314129	100.0	10.08790	0
200	Carbon absorber	480	L	4.287356	2.657064	100.0	5.043949	0
210	Carbon absorber	480	L	4.287356	2.657064	100.0	5.043949	0
220	Carbon absorber	480	L	4.287356	2.657064	0	0	0
230	Air strip blower	480	L	8.574713	5.314129	100.0	10.08790	0
240	Air strip blower	480	L	8.574713	5.314129	100.0	10.08790	0
250	Injection pump	480	L	12.86207	7.971193	100.0	15.13185	0
260	Injection pump	480	L	12.86207	7.971193	100.0	15.13185	0
270	Make-up air unit	480	L	17.14943	10.62826	80.0	16.14063	0
280	Exhaust fan	480	L	4.287356	2.657064	80.0	4.035159	0
290	Lighting panel	208	L	25.50000	15.80348	80.0	24.00000	0
30	Ext Well No. Y	480	L	8.574713	5.314129	100.0	10.08790	0
40	Ext Well No. Z	480	L	8.574713	5.314129	100.0	10.08790	0
5	utility	480	S					
	Actual V.->	480						
50	Equal. pump	480	L	2.572414	1.594239	100.0	3.026369	0
60	Equal. pump	480	L	2.572414	1.594239	100.0	3.026369	0
70	Equal. pump	480	L	2.572414	1.594239	0	0	0
80	Equal. mixer	480	L	2.572414	1.594239	100.0	3.026369	0
90	Reaction mixer	480	L	0.857471	0.531413	100.0	1.008790	0

CPC Treatment Facility
Designer: J. Berktold
PM: D. Froh

Project Number :

FromNode	ToNode	Cd	# C	Codename or or Label	KVA or Leng.-Ft	R or R% (T,W)	X or X% (T,W)	TrnRt & Coup.F.
10	100			12	75.0000	1.6848(+)/K	0.0473(+)/K	
10	110			12	80.0000	1.6848(+)/K	0.0473(+)/K	
10	120			12	80.0000	1.6848(+)/K	0.0473(+)/K	
10	130			12	80.0000	1.6848(+)/K	0.0473(+)/K	
10	140			12	80.0000	1.6848(+)/K	0.0473(+)/K	
10	150			12	100.0000	1.6848(+)/K	0.0473(+)/K	
10	160			12	100.0000	1.6848(+)/K	0.0473(+)/K	
10	170			12	150.0000	1.6848(+)/K	0.0473(+)/K	
10	180			12	150.0000	1.6848(+)/K	0.0473(+)/K	
10	190			12	150.0000	1.6848(+)/K	0.0473(+)/K	
10	20			8	450.000	0.6791(+)/K	0.0446(+)/K	
10	200			12	150.0000	1.6848(+)/K	0.0473(+)/K	
10	210			12	150.0000	1.6848(+)/K	0.0473(+)/K	
10	220			12	150.0000	1.6848(+)/K	0.0473(+)/K	
10	230			12	200.0000	1.6848(+)/K	0.0473(+)/K	
10	240			12	200.0000	1.6848(+)/K	0.0473(+)/K	
10	250			10	60.0000	1.0587(+)/K	0.0440(+)/K	
10	260			10	60.0000	1.0587(+)/K	0.0440(+)/K	
10	270			8	60.0000	0.6791(+)/K	0.0446(+)/K	
10	280			12	150.0000	1.6848(+)/K	0.0473(+)/K	
10	290	T		30-3-D	30.00000	3.1000(+)	2.3000(+)	1.00000
10	30			8	300.0000	0.6791(+)/K	0.0446(+)/K	
10	40			8	425.000	0.6791(+)/K	0.0446(+)/K	
10	50			12	50.0000	1.6848(+)/K	0.0473(+)/K	
10	60			12	50.0000	1.6848(+)/K	0.0473(+)/K	
10	70			12	50.0000	1.6848(+)/K	0.0473(+)/K	
10	80			12	50.0000	1.6848(+)/K	0.0473(+)/K	
10	90			12	75.0000	1.6848(+)/K	0.0473(+)/K	
5	10			500	100.0000	0.0229(+)/K	0.0318(+)/K	

CPC Treatment Facility
Designer: J. Berktold
PM: D. Froh

Project Number :

Branch Calculations

From Node	To Node		---Power Flow--- KW	KVAR	FrNod Amps	Branch Loss KW	Volt Drop Per Cent	Total KVA On XFMR
5	10		151.0	93.3	214	0.31	0.3	
10	100		0.9	0.5	1	0.00	0.0	
10	110		0.4	0.3	1	0.00	0.0	
10	120		0.4	0.3	1	0.00	0.0	
10	130		0.9	0.5	1	0.00	0.1	
10	140		0.9	0.5	1	0.00	0.1	
10	150		1.3	0.8	2	0.00	0.1	
10	160		1.3	0.8	2	0.00	0.1	
10	170		4.3	2.7	6	0.03	0.5	
10	180		4.3	2.7	6	0.03	0.5	
10	190		4.3	2.7	6	0.03	0.5	
10	20		8.7	5.3	12	0.14	1.2	
10	200		4.3	2.7	6	0.03	0.5	
10	210		4.3	2.7	6	0.03	0.5	
10	220		4.3	2.7	6	0.03	0.5	
10	230		8.7	5.3	12	0.15	1.3	
10	240		8.7	5.3	12	0.15	1.3	
10	250		12.9	8.0	18	0.06	0.4	
10	260		12.9	8.0	18	0.06	0.4	
10	270		13.8	8.5	20	0.05	0.3	
10	280		3.4	2.1	5	0.02	0.4	
10	290	T	21.0	13.1	30	0.64	3.2	24.8
10	30		8.7	5.3	12	0.09	0.8	
10	40		8.7	5.3	12	0.13	1.1	
10	50		2.6	1.6	4	0.00	0.1	
10	60		2.6	1.6	4	0.00	0.1	
10	70		2.6	1.6	4	0.00	0.1	
10	80		2.6	1.6	4	0.00	0.1	
10	90		0.9	0.5	1	0.00	0.0	

CPC Treatment Facility
Designer: J. Berktold
PM: D. Froh

Project Number :

Node Calculations

Node Ident		--Cumulative-- Voltage Drop %	% Cum.V.Drop From T-Sec	% Power Factor	Node Voltage
5					480
10		0.3	0.3	85	479
100	L	0.3	0.3	85	478
110	L	0.3	0.3	85	479
120	L	0.3	0.3	85	479
130	L	0.3	0.3	85	478
140	L	0.3	0.3	85	478
150	L	0.4	0.4	85	478
160	L	0.4	0.4	85	478
170	L	0.8	0.8	85	476
180	L	0.8	0.8	85	476
190	L	0.8	0.8	85	476
20	L	1.5	1.5	85	473
200	L	0.8	0.8	85	476
210	L	0.8	0.8	85	476
220	L	0.8	0.8	85	476
230	L	1.6	1.6	85	472
240	L	1.6	1.6	85	472
250	L	0.6	0.6	85	477
260	L	0.6	0.6	85	477
270	L	0.5	0.5	85	477
280	L	0.7	0.7	85	477
290	L	3.5	T-SEC	85	201
30	L	1.1	1.1	85	475
40	L	1.4	1.4	85	473
50	L	0.4	0.4	85	478
60	L	0.4	0.4	85	478
70	L	0.4	0.4	85	478
80	L	0.4	0.4	85	478
90	L	0.3	0.3	85	478

CPC Treatment Facility
Designer: J. Berktold
PM: D. Froh

Project Number :

Transformer Loading

From Node	To Node	Codename or Label	Xformer KVA	Loading KVA	Loading Per Cent
10	290	T 30-3-D	30.0	24.8	82.64

CPC Treatment Facility
Designer: J. Berktold
PM: D. Froh

Project Number :

* System Summary *

Line Losses :	1.36	KW
Line Losses :	0.90	% Of Total Load
Transformer Losses :	0.64	KW
Transformer Losses :	0.42	% Of Total Load
Total System Losses :	2.00	KW
Total System Losses :	1.33	% Of Total Load

SHORT CIRCUIT ANALYSIS

CPC Treatment Facility
Designer: J. Berktold
PM: D. Froh

Project Number :

Node ID	Node Label	System or Nom. Voltage	Cod	SCKVA(P) KVA(G,H) Amp(SIT)	Dem Fac %	X/R %X	Multiply Factor	Ground Type & Value
10	MCC-1	480						
100	Reaction mixer	480	T	1.213386	100	6.6(0)X"R		
	Motor V.->	480				6.6(+)X"R		
						25(0)X"	4.00(0)"	
						25(+)X"	4.00(+)"	
110	Sodium hyd. mix	480	T	0.606693	100	6.6(0)X"R		
	Motor V.->	480				6.6(+)X"R		
						25(0)X"	4.00(0)"	
						25(+)X"	4.00(+)"	
120	Potassium mixer	480	T	0.606693	100	6.6(0)X"R		
	Motor V.->	480				6.6(+)X"R		
						25(0)X"	4.00(0)"	
						25(+)X"	4.00(+)"	
130	Polymer mixer	480	T	1.213386	100	6.6(0)X"R		
	Motor V.->	480				6.6(+)X"R		
						25(0)X"	4.00(0)"	
						25(+)X"	4.00(+)"	
140	Polymer mixer	480	T	1.213386	100	6.6(0)X"R		
	Motor V.->	480				6.6(+)X"R		
						25(0)X"	4.00(0)"	
						25(+)X"	4.00(+)"	
150	Recycle pump	480	T	1.820078	100	6.6(0)X"R		
	Motor V.->	480				6.6(+)X"R		
						25(0)X"	4.00(0)"	
						25(+)X"	4.00(+)"	
160	Recycle pump	480	T	1.820078	100	6.6(0)X"R		
	Motor V.->	480				6.6(+)X"R		
						25(0)X"	4.00(0)"	
						25(+)X"	4.00(+)"	
170	Air strip. feed	480	T	6.066927	100	6.6(0)X"R		
	Motor V.->	480				6.6(+)X"R		
						25(0)X"	4.00(0)"	
						25(+)X"	4.00(+)"	
180	Air strip. feed	480	T	6.066927	100	6.6(0)X"R		
	Motor V.->	480				6.6(+)X"R		
						25(0)X"	4.00(0)"	
						25(+)X"	4.00(+)"	

CPC Treatment Facility
Designer: J. Berktold
PM: D. Froh

Project Number :

Node ID	Node Label	System or Nom. Voltage	Cod	SCKVA(P) KVA(G,H) Amp(SIT)	Dem Fac %	X/R %X	Multiply Factor	Ground Type & Value
190	Air strip. feed	480	T	6.066927	100	6.6(0)X"R		
	Motor V.->	480				6.6(+)X"R		
						25(0)X"	4.00(0)"	
						25(+)X"	4.00(+)"	
20	Ext Well No. X	480	T	12.13385	100	6.6(0)X"R		
	Motor V.->	480				6.6(+)X"R		
						25(0)X"	4.00(0)"	
						25(+)X"	4.00(+)"	
200	Carbon absorber	480	T	6.066927	100	6.6(0)X"R		
	Motor V.->	480				6.6(+)X"R		
						25(0)X"	4.00(0)"	
						25(+)X"	4.00(+)"	
210	Carbon absorber	480	T	6.066927	100	6.6(0)X"R		
	Motor V.->	480				6.6(+)X"R		
						25(0)X"	4.00(0)"	
						25(+)X"	4.00(+)"	
220	Carbon absorber	480	T	6.066927	100	6.6(0)X"R		
	Motor V.->	480				6.6(+)X"R		
						25(0)X"	4.00(0)"	
						25(+)X"	4.00(+)"	
230	Air strip blower	480	T	12.13385	100	6.6(0)X"R		
	Motor V.->	480				6.6(+)X"R		
						25(0)X"	4.00(0)"	
						25(+)X"	4.00(+)"	
240	Air strip blower	480	T	12.13385	100	6.6(0)X"R		
	Motor V.->	480				6.6(+)X"R		
						25(0)X"	4.00(0)"	
						25(+)X"	4.00(+)"	
250	Injection pump	480	T	18.20078	100	6.6(0)X"R		
	Motor V.->	480				6.6(+)X"R		
						25(0)X"	4.00(0)"	
						25(+)X"	4.00(+)"	
260	Injection pump	480	T	18.20078	100	6.6(0)X"R		
	Motor V.->	480				6.6(+)X"R		
						25(0)X"	4.00(0)"	
						25(+)X"	4.00(+)"	

CPC Treatment Facility
Designer: J. Berktold
PM: D. Froh

Project Number :

Node ID	Node Label	System or Nom. Voltage	Co d	SCKVA(P) KVA(G,H) Amp(SIT)	Dem Fac %	X/R %X	Multiply Factor	Ground Type & Value
270	Make-up air unit	480	T	24.26771	100	6.6(0)X"R		
	Motor V.->	480				6.6(+)X"R		
						25(0)X"	4.00(0)"	
						25(+)X"	4.00(+)"	
280	Exhaust fan	480	T	6.066927	100	6.6(0)X"R		
	Motor V.->	480				6.6(+)X"R		
						25(0)X"	4.00(0)"	
						25(+)X"	4.00(+)"	
290	Lighting panel	208						
30	Ext Well No. Y	480	T	12.13385	100	6.6(0)X"R		
	Motor V.->	480				6.6(+)X"R		
						25(0)X"	4.00(0)"	
						25(+)X"	4.00(+)"	
40	Ext Well No. Z	480	T	12.13385	100	6.6(0)X"R		
	Motor V.->	480				6.6(+)X"R		
						25(0)X"	4.00(0)"	
						25(+)X"	4.00(+)"	
5	utility	480	P	1934-LG		12(0)X/R		
	Actual V.->	480		17408-3P		6.0(+)X/R		
50	Equal. pump	480	T	3.640156	100	6.6(0)X"R		
	Motor V.->	480				6.6(+)X"R		
						25(0)X"	4.00(0)"	
						25(+)X"	4.00(+)"	
60	Equal. pump	480	T	3.640156	100	6.6(0)X"R		
	Motor V.->	480				6.6(+)X"R		
						25(0)X"	4.00(0)"	
						25(+)X"	4.00(+)"	
70	Equal. pump	480	T	3.640156	100	6.6(0)X"R		
	Motor V.->	480				6.6(+)X"R		
						25(0)X"	4.00(0)"	
						25(+)X"	4.00(+)"	
80	Equal. mixer	480	T	3.640156	100	6.6(0)X"R		
	Motor V.->	480				6.6(+)X"R		
						25(0)X"	4.00(0)"	
						25(+)X"	4.00(+)"	

CPC Treatment Facility
Designer: J. Berktold
PM: D. Froh

Project Number :

Node ID	Node Label	System or Nom. Voltage	C o d	SCKVA(P) KVA(G,H) Amp(SIT)	Dem Fac %	X/R %X	Multiply Factor	Ground Type & Value
90	Reaction mixer	480	T	1.213386	100	6.6(0)X"R		
	Motor V.->	480				6.6(+)X"R		
						25(0)X"	4.00(0)"	
						25(+)X"	4.00(+)"	

CPC Treatment Facility
Designer: J. Berktold
PM: D. Froh

Project Number :

FromNode	ToNode	Cd	# C	Codename or or Label	KVA or Leng.-Ft	R or R% (T,W)	X or X% (T,W)	Grnd or Coup.F.
10	100		12		75.0000	1.7411(0)/K 1.6848(+)/K	0.2008(0)/K 0.0473(+)/K	
10	110		12		80.0000	1.7411(0)/K 1.6848(+)/K	0.2008(0)/K 0.0473(+)/K	
10	120		12		80.0000	1.7411(0)/K 1.6848(+)/K	0.2008(0)/K 0.0473(+)/K	
10	130		12		80.0000	1.7411(0)/K 1.6848(+)/K	0.2008(0)/K 0.0473(+)/K	
10	140		12		80.0000	1.7411(0)/K 1.6848(+)/K	0.2008(0)/K 0.0473(+)/K	
10	150		12		100.0000	1.7411(0)/K 1.6848(+)/K	0.2008(0)/K 0.0473(+)/K	
10	160		12		100.0000	1.7411(0)/K 1.6848(+)/K	0.2008(0)/K 0.0473(+)/K	
10	170		12		150.0000	1.7411(0)/K 1.6848(+)/K	0.2008(0)/K 0.0473(+)/K	
10	180		12		150.0000	1.7411(0)/K 1.6848(+)/K	0.2008(0)/K 0.0473(+)/K	
10	190		12		150.0000	1.7411(0)/K 1.6848(+)/K	0.2008(0)/K 0.0473(+)/K	
10	20		8		450.000	0.7355(0)/K 0.6791(+)/K	0.1642(0)/K 0.0446(+)/K	
10	200		12		150.0000	1.7411(0)/K 1.6848(+)/K	0.2008(0)/K 0.0473(+)/K	
10	210		12		150.0000	1.7411(0)/K 1.6848(+)/K	0.2008(0)/K 0.0473(+)/K	
10	220		12		150.0000	1.7411(0)/K 1.6848(+)/K	0.2008(0)/K 0.0473(+)/K	
10	230		12		200.0000	1.7411(0)/K 1.6848(+)/K	0.2008(0)/K 0.0473(+)/K	
10	240		12		200.0000	1.7411(0)/K 1.6848(+)/K	0.2008(0)/K 0.0473(+)/K	
10	250		10		60.0000	1.1150(0)/K 1.0587(+)/K	0.1874(0)/K 0.0440(+)/K	
10	260		10		60.0000	1.1150(0)/K 1.0587(+)/K	0.1874(0)/K 0.0440(+)/K	
10	270		8		60.0000	0.7355(0)/K 0.6791(+)/K	0.1642(0)/K 0.0446(+)/K	

CPC Treatment Facility
Designer: J. Berktold
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Project Number :

FromNode	ToNode	Cd	# C	Codename or or Label	KVA or Leng.-Ft	R or R% (T,W)	X or X% (T,W)	Grnd or Coup.F.
10	280			12	150.0000	1.7411(0)/K 1.6848(+)/K	0.2008(0)/K 0.0473(+)/K	
10	290	T		30-3-D	30.00000	3.1000(0) 3.1000(+)	2.3000(0) 2.3000(+)	Delta Y-Solid
10	30			8	300.0000	0.7355(0)/K 0.6791(+)/K	0.1642(0)/K 0.0446(+)/K	
10	40			8	425.000	0.7355(0)/K 0.6791(+)/K	0.1642(0)/K 0.0446(+)/K	
10	50			12	50.0000	1.7411(0)/K 1.6848(+)/K	0.2008(0)/K 0.0473(+)/K	
10	60			12	50.0000	1.7411(0)/K 1.6848(+)/K	0.2008(0)/K 0.0473(+)/K	
10	70			12	50.0000	1.7411(0)/K 1.6848(+)/K	0.2008(0)/K 0.0473(+)/K	
10	80			12	50.0000	1.7411(0)/K 1.6848(+)/K	0.2008(0)/K 0.0473(+)/K	
10	90			12	75.0000	1.7411(0)/K 1.6848(+)/K	0.2008(0)/K 0.0473(+)/K	
5	10			500	100.0000	0.0793(0)/K 0.0229(+)/K	0.0637(0)/K 0.0318(+)/K	

CPC Treatment Facility
Designer: J. Berktold
PM: D. Froh

Project Number :

Three Phase Bolted Fault

Node Ident	Pre-Flt Voltage	X/R Ratio	SC Current (Amps) at the following Times 1/2-Cyc AC-Comp	1/2-Cyc Asym.	8-Cycl	Steady State
10	480	3.69	17204	20101	17204	16459
100	480	0.15	2102	2102	2102	2095
110	480	0.14	1975	1975	1975	1970
120	480	0.14	1976	1976	1976	1970
130	480	0.14	1976	1976	1976	1970
140	480	0.14	1976	1976	1976	1970
150	480	0.12	1596	1596	1596	1591
160	480	0.12	1596	1596	1596	1591
170	480	0.11	1080	1080	1080	1073
180	480	0.11	1080	1080	1080	1073
190	480	0.11	1080	1080	1080	1073
20	480	0.17	903	903	903	888
200	480	0.11	1080	1080	1080	1073
210	480	0.11	1080	1080	1080	1073
220	480	0.11	1080	1080	1080	1073
230	480	0.13	822	822	822	809
240	480	0.13	822	822	822	809
250	480	0.29	3979	3979	3979	3928
260	480	0.29	3979	3979	3979	3928
270	480	0.42	5756	5756	5756	5655
280	480	0.11	1080	1080	1080	1073
290	208	0.79	2068	2069	2068	2064
30	480	0.18	1334	1334	1334	1318
40	480	0.17	954	954	954	939
5	480	5.98	21680	28261	21680	20939
50	480	0.21	3076	3076	3076	3058
60	480	0.21	3076	3076	3076	3058
70	480	0.21	3076	3076	3076	3058
80	480	0.21	3076	3076	3076	3058
90	480	0.15	2102	2102	2102	2095

CPC Treatment Facility
Designer: J. Berktold
PM: D. Froh

Project Number :

Line to Line Fault

Node Ident	Pre-Flt Voltage	X/R Ratio	SC Current (Amps) at the following Times 1/2-Cyc AC-Comp	1/2-Cyc Asym.	8-Cycl	Steady State
10	480	3.69	14899	17408	14899	14254
100	480	0.15	1820	1820	1820	1814
110	480	0.14	1711	1711	1711	1706
120	480	0.14	1711	1711	1711	1706
130	480	0.14	1711	1711	1711	1706
140	480	0.14	1711	1711	1711	1706
150	480	0.12	1382	1382	1382	1378
160	480	0.12	1382	1382	1382	1378
170	480	0.11	936	936	936	929
180	480	0.11	936	936	936	929
190	480	0.11	936	936	936	929
20	480	0.17	782	782	782	769
200	480	0.11	936	936	936	929
210	480	0.11	936	936	936	929
220	480	0.11	936	936	936	929
230	480	0.13	712	712	712	701
240	480	0.13	712	712	712	701
250	480	0.29	3446	3446	3446	3401
260	480	0.29	3446	3446	3446	3401
270	480	0.42	4985	4985	4985	4897
280	480	0.11	936	936	936	929
290	208	0.79	1791	1792	1791	1787
30	480	0.18	1156	1156	1156	1141
40	480	0.17	826	826	826	813
5	480	5.98	18775	24475	18775	18134
50	480	0.21	2664	2664	2664	2648
60	480	0.21	2664	2664	2664	2648
70	480	0.21	2664	2664	2664	2648
80	480	0.21	2664	2664	2664	2648
90	480	0.15	1820	1820	1820	1814

CPC Treatment Facility
Designer: J. Berktold
PM: D. Froh

Project Number :

Line to Ground Fault

Node Ident	Pre-Flt Voltage	X/R Ratio	SC Current (Amps) at the following Times AC-Comp	1/2-Cyc Asym.	8-Cycl	Steady State
10	480	5.17	7496	9461	7496	6227
100	480	0.33	1958	1958	1958	1908
110	480	0.31	1849	1849	1849	1806
120	480	0.31	1849	1849	1849	1806
130	480	0.31	1850	1850	1850	1806
140	480	0.31	1850	1850	1850	1806
150	480	0.26	1515	1515	1515	1487
160	480	0.26	1515	1515	1515	1487
170	480	0.22	1044	1044	1044	1026
180	480	0.22	1044	1044	1044	1026
190	480	0.22	1044	1044	1044	1026
20	480	0.29	860	860	860	834
200	480	0.22	1044	1044	1044	1026
210	480	0.22	1044	1044	1044	1026
220	480	0.22	1044	1044	1044	1026
230	480	0.22	803	803	803	781
240	480	0.22	803	803	803	781
250	480	0.61	3379	3379	3379	3152
260	480	0.61	3379	3379	3379	3152
270	480	0.88	4380	4383	4380	3963
280	480	0.22	1044	1044	1044	1026
290	208	0.78	2097	2098	2097	2094
30	480	0.32	1253	1253	1253	1214
40	480	0.29	908	908	908	880
5	480	8.25	8303	11548	8303	6979
50	480	0.45	2751	2751	2751	2632
60	480	0.45	2751	2751	2751	2632
70	480	0.45	2751	2751	2751	2632
80	480	0.45	2751	2751	2751	2632
90	480	0.33	1958	1958	1958	1908

CPC Treatment Facility
Designer: J. Berktold
PM: D. Froh

Project Number :

Branch Currents (AC RMS Component) for Three Phase Bolted Fault in Amps

Branch From	To	Fault at 10	Fault at 100	Fault at 110	Fault at 120	Fault at 130	Fault at 140	Fault at 150
5	10	16459	2010	1890	1890	1890	1890	1525
10	100	-5	2100	-1	-1	-1	-1	0
10	110	-2	0	1975	0	0	0	0
10	120	-2	0	0	1975	0	0	0
10	130	-5	-1	-1	-1	1975	-1	0
10	140	-5	-1	-1	-1	-1	1975	0
10	150	-7	-1	-1	-1	-1	-1	1594
10	160	-7	-1	-1	-1	-1	-1	-1
10	170	-24	-3	-3	-3	-3	-3	-2
10	180	-24	-3	-3	-3	-3	-3	-2
10	190	-24	-3	-3	-3	-3	-3	-2
10	20	-48	-6	-6	-6	-6	-6	-4
10	200	-24	-3	-3	-3	-3	-3	-2
10	210	-24	-3	-3	-3	-3	-3	-2
10	220	-24	-3	-3	-3	-3	-3	-2
10	230	-48	-6	-6	-6	-6	-6	-4
10	240	-48	-6	-6	-6	-6	-6	-4
10	250	-73	-9	-8	-8	-8	-8	-7
10	260	-73	-9	-8	-8	-8	-8	-7
10	270	-97	-12	-11	-11	-11	-11	-9
10	280	-24	-3	-3	-3	-3	-3	-2
10	30	-48	-6	-6	-6	-6	-6	-4
10	40	-48	-6	-6	-6	-6	-6	-4
10	50	-15	-2	-2	-2	-2	-2	-1
10	60	-15	-2	-2	-2	-2	-2	-1
10	70	-15	-2	-2	-2	-2	-2	-1
10	80	-15	-2	-2	-2	-2	-2	-1
10	90	-5	-1	-1	-1	-1	-1	0

CPC Treatment Facility
Designer: J. Berktold
PM: D. Froh

Project Number :

Branch Currents (AC RMS Component) for Three Phase Bolted Fault in Amps

Branch From	To	Fault at 160	Fault at 170	Fault at 180	Fault at 190	Fault at 20	Fault at 200	Fault at 210
5	10	1525	1029	1029	1029	852	1029	1029
10	100	0	0	0	0	0	0	0
10	110	0	0	0	0	0	0	0
10	120	0	0	0	0	0	0	0
10	130	0	0	0	0	0	0	0
10	140	0	0	0	0	0	0	0
10	150	-1	0	0	0	0	0	0
10	160	1594	0	0	0	0	0	0
10	170	-2	1074	-2	-2	-1	-2	-2
10	180	-2	-2	1074	-2	-1	-2	-2
10	190	-2	-2	-2	1074	-1	-2	-2
10	20	-4	-3	-3	-3	889	-3	-3
10	200	-2	-2	-2	-2	-1	1074	-2
10	210	-2	-2	-2	-2	-1	-2	1074
10	220	-2	-2	-2	-2	-1	-2	-2
10	230	-4	-3	-3	-3	-2	-3	-3
10	240	-4	-3	-3	-3	-2	-3	-3
10	250	-7	-5	-5	-5	-4	-5	-5
10	260	-7	-5	-5	-5	-4	-5	-5
10	270	-9	-6	-6	-6	-5	-6	-6
10	280	-2	-2	-2	-2	-1	-2	-2
10	30	-4	-3	-3	-3	-2	-3	-3
10	40	-4	-3	-3	-3	-2	-3	-3
10	50	-1	-1	-1	-1	-1	-1	-1
10	60	-1	-1	-1	-1	-1	-1	-1
10	70	-1	-1	-1	-1	-1	-1	-1
10	80	-1	-1	-1	-1	-1	-1	-1
10	90	0	0	0	0	0	0	0

CPC Treatment Facility
Designer: J. Berktold
PM: D. Froh

Project Number :

Branch Currents (AC RMS Component) for Three Phase Bolted Fault in Amps

Branch From	To	Fault at 220	Fault at 230	Fault at 240	Fault at 250	Fault at 260	Fault at 270	Fault at 280
5	10	1029	777	777	3794	3794	5489	1029
10	100	0	0	0	-1	-1	-2	0
10	110	0	0	0	-1	-1	-1	0
10	120	0	0	0	-1	-1	-1	0
10	130	0	0	0	-1	-1	-2	0
10	140	0	0	0	-1	-1	-2	0
10	150	0	0	0	-2	-2	-2	0
10	160	0	0	0	-2	-2	-2	0
10	170	-2	-1	-1	-6	-6	-8	-2
10	180	-2	-1	-1	-6	-6	-8	-2
10	190	-2	-1	-1	-6	-6	-8	-2
10	20	-3	-2	-2	-11	-11	-16	-3
10	200	-2	-1	-1	-6	-6	-8	-2
10	210	-2	-1	-1	-6	-6	-8	-2
10	220	1074	-1	-1	-6	-6	-8	-2
10	230	-3	810	-2	-11	-11	-16	-3
10	240	-3	-2	810	-11	-11	-16	-3
10	250	-5	-3	-3	3949	-17	-24	-5
10	260	-5	-3	-3	-17	3949	-24	-5
10	270	-6	-5	-5	-22	-22	5706	-6
10	280	-2	-1	-1	-6	-6	-8	1074
10	30	-3	-2	-2	-11	-11	-16	-3
10	40	-3	-2	-2	-11	-11	-16	-3
10	50	-1	-1	-1	-3	-3	-5	-1
10	60	-1	-1	-1	-3	-3	-5	-1
10	70	-1	-1	-1	-3	-3	-5	-1
10	80	-1	-1	-1	-3	-3	-5	-1
10	90	0	0	0	-1	-1	-2	0

CPC Treatment Facility
Designer: J. Berktold
PM: D. Froh

Project Number :

Branch Currents (AC RMS Component) for Three Phase Bolted Fault in Amps

Branch From	To	Fault at 290	Fault at 30	Fault at 40	Fault at 5	Fault at 50	Fault at 60	Fault at 70
5	10	857	1266	902	-741	2940	2940	2940
10	100	0	0	0	-5	-1	-1	-1
10	110	0	0	0	-2	0	0	0
10	120	0	0	0	-2	0	0	0
10	130	0	0	0	-5	-1	-1	-1
10	140	0	0	0	-5	-1	-1	-1
10	150	0	-1	0	-7	-1	-1	-1
10	160	0	-1	0	-7	-1	-1	-1
10	170	-1	-2	-1	-24	-4	-4	-4
10	180	-1	-2	-1	-24	-4	-4	-4
10	190	-1	-2	-1	-24	-4	-4	-4
10	20	-2	-4	-3	-47	-9	-9	-9
10	200	-1	-2	-1	-24	-4	-4	-4
10	210	-1	-2	-1	-24	-4	-4	-4
10	220	-1	-2	-1	-24	-4	-4	-4
10	230	-2	-4	-3	-47	-9	-9	-9
10	240	-2	-4	-3	-47	-9	-9	-9
10	250	-4	-6	-4	-72	-13	-13	-13
10	260	-4	-6	-4	-72	-13	-13	-13
10	270	-5	-7	-5	-96	-17	-17	-17
10	280	-1	-2	-1	-24	-4	-4	-4
10	290	896	*******	*******	*******	*******	*******	*******
10	290	2068	*******	*******	*******	*******	*******	*******
10	30	-3	1320	-3	-48	-9	-9	-9
10	40	-2	-4	940	-48	-9	-9	-9
10	50	-1	-1	-1	-14	3071	-3	-3
10	60	-1	-1	-1	-14	-3	3071	-3
10	70	-1	-1	-1	-14	-3	-3	3071
10	80	-1	-1	-1	-14	-3	-3	-3
10	90	0	0	0	-5	-1	-1	-1

CPC Treatment Facility
Designer: J. Berktold
PM: D. Froh

Project Number :

Branch Currents (AC RMS Component) for Three Phase Bolted Fault in Amps

Branch From	To	Fault at 80	Fault at 90
5	10	2940	2010
10	100	-1	-1
10	110	0	0
10	120	0	0
10	130	-1	-1
10	140	-1	-1
10	150	-1	-1
10	160	-1	-1
10	170	-4	-3
10	180	-4	-3
10	190	-4	-3
10	20	-9	-6
10	200	-4	-3
10	210	-4	-3
10	220	-4	-3
10	230	-9	-6
10	240	-9	-6
10	250	-13	-9
10	260	-13	-9
10	270	-17	-12
10	280	-4	-3
10	30	-9	-6
10	40	-9	-6
10	50	-3	-2
10	60	-3	-2
10	70	-3	-2
10	80	3071	-2
10	90	-1	2100

8.0 PROCESS DESIGN ANALYSIS

8.1 GENERAL PARAMETERS

1. The design parameters and plant components are described in the attached "Design Memorandum," (refer to Appendix A). The Design Memorandum was revised to include the latest design information.

2. This process design analysis includes the process design support documentation including pertinent confirmation notices, design calculations, design information, and manufacturers' literature.

8.2 FUNCTIONAL AND TECHNICAL REQUIREMENTS

1. Operating flexibility in the processes has been incorporated.

2. Space has been provided on the proposed remediation treatment facility site for the future addition of additional remediation facilities if they are ever required.

3. Design standards for designing process piping and equipment in seismic Zone 2 areas are being followed during this design phase of the project.

4. Standby pumps and other pieces of equipment are provided for critical operations.

5. A portable flow paced sampler will be provided for periodic sampling of plant influent and remediated groundwater. Sample taps will be provided throughout the plant to allow monitoring of the level of treatment through individual processes.

6. The dewatered sludge must pass the paint filter test before it can be accepted by a landfill for disposal.

7. A copy of a memo relative to a telephone conversation with the State of New York regarding the groundwater reinjection quality requirements for the remediation treatment facility is included as Appendix B. Proposed contaminant limits are also presented in the design memorandum.

8.3 DESIGN OBJECTIVES AND PROVISIONS

1. General - The groundwater treatment facility will provide treatment of contaminated groundwater extracted from a contamination plume containing volatile organics and iron and manganese.

2. Extraction Wells - Contaminated groundwater will be pumped from three extraction wells. Flow from each well will be metered and the flow will be discharged into an equalization tank. The well pumps will be designed to pump a flow of 130 gpm, each, continuously from each of the extraction wells.

3. Equalization Tank - There will be one equalization tank with a capacity of approximately 60,000 gallons. This provides about 1.0 hour of detention time when operated half full. Recycles from filtration, sludge overflow or decanting, and dewatering are returned to the equalization tank to be mixed with contaminated groundwater. The equalization tank also allows water extracted from the three wells to be mixed to provide a uniform quality water for treatment. A mixer keeps some of the recycle solids in suspension.

4. Treatment Facility Feed Pumps - Three pumps will be provided to pump flow from the equalization tank to the reaction tanks. Two pumps will normally operate while the third pump is a standby. The control for the pumping system uses two flow meters and flow control valves along with a level element in the equalization tank to regulate the flow. A setpoint with delayed response provides for control on the equalization tank water level. The flow meters are used with the flow control valves to equalize flow between the two reaction tanks. Each pump will be capable of pumping 100 to 250 gpm.

5. Reaction Tanks - Two parallel reaction tanks provide for sodium hydroxide and potassium permanganate addition to raise the pH and assist in coagulation and precipitation of iron and manganese. Mixers in each tank assure that the chemicals are distributed to give time for reactions to occur. Approximately 30 minutes reaction time is provided in each tank.

6. Package Clarifier - The package clarifier units include a rapid mix zone where polymer is mixed with the reaction tank effluent. After rapid mix, the water flows to a flocculation zone where particles are agglomerated to improve settling in the inclined plate clarifier. After settling water flows by gravity to two upflow filters.

7. Upflow Filters - Clarified water flows to two upflow filters to remove solids which did not settle in the clarifiers. Water is introduced to the filters at the bottom and filtered water exits the filters at the top. A continuous air lift mechanism draws dirty sand up to the top of the filter where cleaned sand is returned to the top of the filter and backwash water is returned to the equalization tank via the recycle pump. The continuous backwash minimizes the treatment facility influent quality variation, and thus minimizes adjustments to chemical feed. Effluent from the filters flows to the air stripper feed tank through a static mixer where acid can be added to neutralize the flow.

8. Air Stripper - Three pumps will be provided to pump flow from the air stripper feed tanks to the two air strippers. Two pumps will normally operate while the third pump is a standby. Level control in the stripper tank enables the strippers to be fed a continuous flow under most operating conditions. The air strippers remove the volatile organic contaminants from the flow stream. Blowers move air through the air strippers to strip the contaminants from the waters. Water is discharged to carbon adsorber feed tanks.

9. Vapor Phase Carbon Adsorbers - Off gas from the air strippers will be ducted to vapor phase carbon adsorbers to remove the volatile organics from the air flow before it is vented to the atmosphere.

10. Liquid Phase Carbon Adsorbers - Three pumps will be provided to pump flow from the carbon adsorber feed tanks to the two liquid phase carbon adsorbers. Two pumps will normally operate while the third pump is a standby. The carbon adsorbers will remove the volatile organic contaminants, if any remaining after the air strippers. The control for feeding the flow to the carbon adsorbers will be by level in the carbon adsorber feed tanks with flow control valves on the pump discharge to keep the flow through the carbon adsorbers relatively uniform. The flow to the carbon adsorbers is pumped with adequate pressure for the flow to continue to the treated water storage tanks.

11. Reinjection Wells - Treated groundwater will be temporarily stored in one of two 30,000-gallon storage tanks. Two pumps are provided to pump the treated water to four injection wells. Four flow meters with throttling valves in the treatment building will allow the operator to adjust the flow rates to the tops of the injection wells. Injection pumps will be turned on and off by level controls in the storage tanks. The operator will be able to manually operate valves and pumps to return the flow for retreatment should there be reason to believe that the treatment has not removed all of the contaminants.

12. Sludge Handling - Sludge is recycled within the chemical contact/settling units to enhance treatment. Excess sludge is pumped to a sludge thickening tank. Decant overflows the tank for recycling. Sludge is drawn off the bottom to a sludge press where it is dewatered prior to disposal. Filtrate is recycled to the equalization tank through the recycle pumping system.

13. Chemical Feed Systems - Sodium hydroxide and potassium permanganate are used for iron and manganese removal. The sodium hydroxide solution will be diluted to provide an appropriate strength to feed to the extracted groundwater. Dry potassium permanganate is dissolved in water to be fed with the sodium hydroxide to the reaction tank to form a precipitate.

Dry polymer is dissolved in water and fed to the flow in the rapid mix tank to assist in flocculation and settling of iron and manganese.

Concentrated hydrochloric acid is diluted and added to the filtered effluent to bring the pH back to neutral. Minor amounts of acid are anticipated to be required.

14. Laboratory - Analyses that assist in the control of the treatment plant operation are anticipated to be the primary laboratory tests performed. Sample colormetric tests for iron and manganese and of course pH testing will also be done. Samples for the various volatile organics as required will be sent out for analysis.

15. Process Piping - Process piping will generally be ductile i ron pipe, PVC or FRP. Chemical piping except polymer will be polypropylene. Where piping passes overhead, chemical piping will go through a larger plastic pipe to direct any leakage away from operators. Polymer piping will be PVC.

16. Process Design Documentation - The process design documentation is included as Appendix C, and contains design calculations, catalog cuts, and chemical requirements.

RP/CPC65RDN/AC4

APPENDIX A

CLAREMONT POLYCHEMICAL CORPORATION

65 PERCENT DESIGN MEMORANDUM

Extraction Well System

No. of Units	3
Type	Submersible
Capacity (GPM)	130
Horsepower	10

Design Flow (GPM)	Average	Maximum
Extraction Well Flow	390	390
Recycle Flows		
Filter Recycle	39	39
Sludge Thickening Overflow	25	25
Filter Press	<1	10
Manual Decant	-	15
Total Flow	455	479

Equalization Tank

No. of Units	1
Volume (Gallons)	60,000
Detention Time @ Design Flow (Hours)	2.5
Detention Time @ Peak Flow (Hours)	2.1
Type of Construction	Epoxy-Coated Welded Steel
Physical Dimensions (Feet)	22' Dia. x 21' SWD
Baffles	4
Mixing	3 HP

Influent Feed Pumps

No. of Units	3
Type	Centrifugal
Drive	Constant Speed
Capacity (GPM)	100 to 250
Horsepower	3
Control	Pneumatically Operated Flow Control Valves Level Controller via PLC

Reaction Tanks

No. of Units	2
Type of Construction	Epoxy-Coated Welded Steel
Detention Time @ Design Flow	30 Minutes
Mixing	1 HP
Volume (Gallons)	7,500
Physical Dimensions (Feet)	9' Dia. x 16' 9"

Clarification

No. of Units	2
Type	Lamella
Surface Loading Rate @ Ave. Flow	0.5 GPM/ft.^{2}
Flash Mix	Yes
Flocculation Time	2 Minutes

Sodium Hydroxide Feed System

As Received	55 Gal. Drums 30% or 50%
Feed Tank Size (Gallons)	300
Feed Handling Concentration	1 - 50%
Mixer	1/3 HP
Pump Type	Electric Solenoid Operated Diaphragm
No. of Pumps	2
Capacity (GPH)	0 - 1.6

Potassium Permanganate Feed System

As Received	Dry In 110 or 330 lb. Drums
Feed Tank Size (Gal)	300
Handling	Hand Cart, Manually Added to Dilution Tank
Feed Concentration	1 - 8 oz/gal.
Mixer	1/3 HP
Pump Type	Electric Solenoid Operated Diaphragm
No. of Pumps	2
Capacity (GPH)	0 - 1.6

Polymer Feed System

As Received	55 lb. Bags
No. of Feed Tanks	2
Feed Tank Size (Gal)	600
Handling	Manual; Manually Feed to Educator or Top Hatch of Tank
Feed Concentration	0.1 - 0.5%
Mixer	1/3 HP
Pump Type	Reciprocating Piston Diaphragm Pump
No. of Pumps	3
CAPACITY (GPH)	9-12

Upflow Filters

No. of Units	2
Feed Rate (GPM/SF)	2
Surface Area Per Unit (SF)	100
Reject Rate (GPM)	18

Acid Feed System

As Received	55 Gallon Drums 37% Hydrochloric Acid (FDA)
No. of Feed Tanks	1
Feed Tank Size (Gal)	300
Handling	Drum Dolley, Drum Pump
Feed Concentration	0.1 - 10%
Mixer	1/3 HP
Pump Type	Electric Solenoid Operated Diaphragm
No. of Pumps	2
Capacity (GPH)	0 - 1.6

Air Stripper Feed System

Feed Tanks Size (Gal)	700 Per Unit Number of Tanks (2)
No. of Pumps	3
Type	Constant Speed Centrifugal
Capacity (GPM)	100 - 250
Horsepower	5
Control	Level Controller/Pneumatically Operated Plug Valve

Air Strippers

No. of Units	2
Type of Packing Media	2-inch Jaeger Tri-Pack
Air-To-Water Ratio	60
Tower Diameter (Feet)	3.0
Packing Height	40
Airflow Rate (cfm)	2,000
Contaminant Removal Rates (%)	
1,2-DCE (@ 1,047 ug/L)	99.3
PCE (@ 1,345 ug/L)	99.8
TCE (@ 2,078 ug/L)	99.7
Vapor Phase Carbon Adsorbers	
No. of Units	2
Carbon Capacity (lbs per unit)	5,000

Carbon Adsorber Feed System

Feed Tank Size (Gal.)	700
No. of Tanks	2
No. of Pumps	3
Type	Centrifugal
Drive	Constant
Capacity	100 - 250
Horsepower	7.5
Control	Level Controller/Pneumatically Operated Plug Valve

Liquid Phase Carbon Adsorbers

No. of Units	2
Carbon Capacity (lbs per unit)	10,000
Diameter (Feet)	8
Height (Feet)	10

Treated Water Storage Tank

No. of Units	2
Volume (Gallons) Each	30,000
Physical Dimensions (Feet)	18' Dia. x 15' SWD
Type of Construction	Bolted Steel

Injection Well Pump System

No. of Pumps	2
Pump Capacity (GPM)	475
Type	Centrifugal
Drive	Constant
Horsepower	15

Sludge Transfer Pumps

No. of Units	2
Type	Double Diaphragm
Drive	Air Operated
Capacity (gpm)	30

Sludge Holding/Thickening Tank

No. of Units	1
Volume (Gallons)	4,300
Diameter (Feet)	8
Height SWD (Feet) Above Cone	11' 6"

Filter Press Feed Pump

No. of Units	1
Type	Double Diaphragm
Drive	Air Operated
Capacity (GPM)	30

Filter Press

No. of Units	1
Type	Recessed Chamber
Filter Cake Capacity (cf)	6
Pressure (psi)	100

Recycle Pump System

No. of Pumps	2
Tank Size (Gallons)	700
Pump Capacity (GPM)	100
Type	Centrifugal
Drive	Constant
Horsepower	1.5

RP/CPC35RDN/AD1

APPENDIX B

MEMORANDUM

DATE: February 4, 1993

TO: Files

CC: Mark Mobley
Dave Shultz
Dave Froh

FROM: Dennis Saari

SUBJECT: NYDEC Requirements for Extraction and Injection Wells
CPC
Project No. 18422.317

Telephone conversation with Bill Spitz at NYDEC Region 1 in New York.

There are no Code requirements governing extraction and injection wells for remediation projects. Do not need to go through the permitting process. He suggested that I contact Tony Candela at NYDEC to discuss procedures.

They prefer that the treated water be dishcarged to the aquifer. The water must be treated to drinking water standards. There are no requirements to store the treated water until the laboratory analyses are received verifying compliance, assuming that the treatment plant has been designed to meet the standards.

We discussed the injection wells. He indicated that there have been maintenance problems with plugging of injection wells on Long Island. Plugging is usually due to iron precipitation. I indicated that the plant will be removing iron. We discussed fouling with iron bacteria. He indicated that fouling with iron bacteria has been a problem but usually only on the extraction wells, and then only when the well has been shut down for a long period of time.

He indicated that ~~the~~ some other remediation projects on Long Island are using underground leaching pools to reinject the groundwater. The advantage to using the leaching pools is that they can be readily serviced if they become plugged.

APPENDIX C

SEC DONOHUE
Environment & Infrastructure

CALCULATION SHEET

PAGE 1 OF 45

PROJECT NO. 18422.304

CLIENT COE SUBJECT

PROJECT CPC

Prepared By LUK Date 1-4-93

Reviewed By [illegible] Date 2-10-93

Approved By Date

EQUALIZATION TANK

ASSUME 60,000 GAL TANK NORMALLY OPERATE HALF FULL ENABLING 30,000 GAL OF WATER FROM TREATED STORAGE TANK TO BE PUMPED BACK TO EQUALIZATION. ALSO SINCE TANK WILL CONTAIN MIXER PROVIDE TANK WITH DIMENSIONS THAT WILL PROMOTE GOOD MIXING — 1:1 DIA: HT AND 4 BAFFLES.

60,000 gal @ 1:1 DIAMETER : HEIGHT

$$(60{,}000\ gal)\left(\frac{ft^3}{7.4805\ gal}\right) = 8021\ ft^3$$

$$\pi r^2 h = 8021\ ft^3$$

with $D = h$

$$\pi\left(\frac{D}{2}\right)^2 h = 8021\ ft^3$$

$$\pi\frac{D^3}{4} = 8021\ ft^3$$

$$D = 21.7'$$

USE 22' DIA X 21' SWD

REACTION TANK

ASSUME SHOP FABRICATED TANK AND FOR SHIPPING KEEP TANK < 10' DIA WITH NOZZLES
USE 9' DIA MAX
RESIDENCE TIME FOR pH CONTROL 20-30 MIN

FLOWS TO REACTION TANK

		AVE	MAX	
WELL PUMPS	3 x 130 =	390	390	
FILTER RECYCLE	2 x 0.05 x 390 =	39	39	RECYCLE PUMPING
SLUDGE THICKENING OVERFLOW		25	25	RECYCLE PUMPING
FILTER PRESS		< 1	10	RECYCLE PUMPING
MANUAL DECANT		—	15	RECYCLE PUMPING
		455	479	

AT 250 GPM x 30 MIN = 7500 GAL MIN.

AT 455/2 x 30 MIN = 6825 GAL MIN. ~ 15'H

CHECK HYDRAULICS FOR GRAVITY FLOW INTO FLASH, FLOC, CLARIFIER, FILTER

CLARIFICATION

TYPICAL LOADING RATES FOR METAL HYDROXIDE (IRON HYDROXIDE) SETTLING up to ~ 0.5 GPM/ft^2
THE LOW SOLIDS LOADING 10-15 mg/l WILL REQUIRE SLUDGE RECYCLE AND SHOULD BE DESIGNED AT HIGH RATE AND HAVE FILTER PERFORM POLISHING

EQUIPMENT MANUFACTURERS RECOMMENDATIONS:

PARKSON 570 ft^2

GRAVER 452 ft^2

SEC DONOHUE
Environment & Infrastructure

CALCULATION SHEET

PAGE 4 OF 45

PROJECT NO. _____

CLIENT COE SUBJECT _____ Prepared By LVK Date 1-12-93

PROJECT CPC _____ Reviewed By [illegible] Date 2-5-93

_____ _____ Approved By _____ Date _____

SODIUM HYDROXIDE PUMP

ASSUME $[OH^-]$ NEEDED WILL BE THE RESULT OF MAX 20 mg/l Fe (4 reactions)

$$Fe^{+3} + 3OH^- \rightarrow Fe(OH)_3$$

@ Fe 20 mg/l 560,000 GPD

$$(.56\ MGD)(20\ mg/l)(8.34) = 93\ lb\ Fe/day$$

Fe 56 lb/mol

(OH) 17 lb/mol x3 51

$$\left(\frac{51\ OH}{56\ Fe}\right)\left(93\ lb\ Fe/day\right) = 85\ lb\ OH^-$$

50% NaOH ~ 12.6 lb/gal → 6.3 lb NaOH/gal

$$\frac{17\ lb\ OH}{40\ lb\ NaOH} \qquad \left(85\ lb\ OH^-\right)\left(\frac{40\ lb\ NaOH}{17\ lb\ OH^-}\right)$$

200 lb NaOH

$$200\ lb\ NaOH / 6.3\ lb\ NaOH/gal = 32\ gal/day$$

USE 2X SAFTEY FACTOR

64 Gal/day or 32 gal/day/train

SEC DONOHUE
Environment & Infrastructure

CALCULATION SHEET

PAGE 5 OF 45

PROJECT NO. _____

CLIENT COE SUBJECT _____ Prepared By LVK Date 1-12-93

PROJECT CPC _____ Reviewed By _____ Date 2-5-93

_____ _____ Approved By _____ Date _____

HYDROCHLORIC ACID FEED SYSTEM

ASSUMPTION – VERY LITTLE ACID WILL BE USED IF SYSTEM IS OPERATED AT 7-8 pH MAX USAGE FOR DESIGN WOULD BE TO NEUTRALIZE ALL NaOH added (ASSUMING NO Buffering from water)

$$NaOH + HCl \rightarrow NaCl + H_2O$$

MW 40 36

MAX DESIGN (200 lb NaOH/DAY)(2 Safety factor) = 400

HCl needed → $\left(\frac{36\ lb\ HCl}{40\ lb\ NaOH}\right)$ (400 lb NaOH/DAY) = 360 lb HCl/DAY

37% ≈ 10 lb HCl/gal

(360 lb HCl/day) / (10 lb HCl/gal) = 36 gal 37% HCl/Day

36 gal 37% HCl/day / 2 systems = 18 gal/day

MAX for pumping 18 gal/day/pump

USE TANK FOR DILUTING AND PUMP CAPABLE OF OPERATING AT ~ 60% output to deliver 33 gal/day

SEC DONOHUE
Environment & Infrastructure

CALCULATION SHEET

PAGE 6 OF 45

PROJECT NO. _____

CLIENT COE SUBJECT _____ Prepared By LVK Date 1-5-93

PROJECT CPC _____ Reviewed By _____ Date 2-5-93

_____ _____ Approved By _____ Date _____

POTASSIUM PERMANGANATE SYSTEM

THEORETICAL K_2MnO_4 CONSUMPTION

~ 1 mg/l K_2MnO_4 / mg/l Fe^{++}

~ 1 mg/l K_2MnO_4 / 0.5 mg/l Mn^{++}

DESIGN

Fe^{++} ~ 4 mg/l

Mn ~ 0.6 mg/l

	$KMnO_4$ Demand
Fe^{++}	4
Mn^{++}	~1.1
	5.1 mg/l $KMnO_4$

$(.56 MGD)(5.1 mg/l)(8.34 lb/mg/l \cdot MG) = 23.8 lb/day$

@ 50 lb/200 gal Typical ~ 100 gal/day

@ 100 lb/200 gal MAX ~ 50 gal/day

SEC DONOHUE Environment & Infrastructure

CALCULATION SHEET

PAGE 7 OF 45

PROJECT NO. _____

CLIENT COE SUBJECT _____ Prepared By LVK Date 1-27-93.

PROJECT CPC _____ Reviewed By _____ Date 2-1-93

_____ _____ Approved By _____ Date _____

FILTER PRESS

ASSUME 4.0 mg/l Fe AVE INFLUENT
1.0 mg/l MN

$Fe^{++} \rightarrow Fe^{+3}$

$Fe(OH)_3$ precipitates
MnO_2

MAX DAILY FLOW 561,000 Gal

$(0.56\ MGD)(4\ mg/l\ Fe)(8.34\ lb/MGD \cdot mg/l) = 18.7\ lb\ Fe/day$

$(0.56\ MGD)(1.0\ mg/l\ Mn)(8.34\ lb/MGD \cdot mg/l) = 4.7\ lb\ Mn/day$

Fe 56
$(OH)_3$ 51
107

$\left(\frac{107\ lb\ Fe(OH)_3}{56\ lb\ Fe}\right)(18.7\ lb\ Fe/day) = 35.7\ lb\ Fe(OH)_3/day$

Mn 55
O_2 32
87

$\left(\frac{87\ lb\ MnO_2}{32\ lb\ Mn}\right)(4.7\ lb\ Mn/day) = 12.8\ lb\ MnO_2/day$

$\frac{12.8\ lb\ MnO_2/day}{48.5\ lb\ dry\ solids/day}$

ASSUME 30% SOLIDS FROM FILTER PRESS AND 80 lb/ft³ CAKE DENSITY

$(48.5\ lb\ dry\ solids)\left(\frac{lb\ wet\ solids}{0.30\ lb\ dry\ solids}\right)\left(\frac{ft^3}{80\ lb}\right) = 2\ ft^3/day$

USE 6 ft³ FILTER PRESS

SEC DONOHUE
Environment & Infrastructure

CALCULATION SHEET

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PROJECT NO. _____

CLIENT COE SUBJECT _____ Prepared By LUK Date 1-13-92

PROJECT CCC _____ Reviewed By _____ Date _____

_____ _____ Approved By _____ Date _____

POLYMER FEED SYSTEM

ASSUME 0.2 - 4.0 mg/l Polymer needed (0.2 - 1.0 mg/l Magnifloc 8X5A recommended by Am. Cy. AND 1.0 mg/l MAX BY NSF, EPA for potable water)

USE 0.1 - 0.5% SOLUTIONS

MAX AND MIN REQUIRED

		Feed	STOCK	PUMP/HR/DAY (GAL)
MAX	250 GPM/CLARIFIER	4 mg/l	0.5%	12/288
MIN	150 " / "	0.2 mg/l	0.1%	3/72

MAX DAY 576 GAL POLYMER

SIZE POLYMER TANKS FOR 600 GAL MAX LIQ. LEVEL

SEC DONOHUE Environment & Infrastructure

CALCULATION SHEET

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PROJECT NO. 18422.304

CLIENT COE
PROJECT CPC

SUBJECT FILTERS

Prepared By [illegible] Date 1-4-95
Reviewed By ____ Date ____
Approved By ____ Date ____

	Extraction Wells	w/Recycles
Design flow	390 gpm	430
Peak flow	468 gpm	520

Design Feed Rate @ 390 gpm 2 gpm/sf.

Surface Area Req'd $\frac{390}{2} = 195$ sf

With 2 Filters $\frac{195}{2} = 97.5$ sf/filter

Use Standard 100 sf Filter

At Peak Flow $\frac{520 \text{ gpm}}{200 \text{ sf}} = 2.6$ gpm/sf

USE UPFLOW TYPE FOR CONTINUOUS BACKWASH AND UNIFORM RECYCLE

NEED 4-8 cfm AIR FOR AIRLIFT FOR EACH FILTER

THE COMPOUND IS cis-DCE
HENRY"S COEF., CU.M WATER/CU.M AIR = 0.06700

TOTAL DESIGN FLOW, GPM	=	234.00	(0.01476 CU.M/SEC)
TOTAL AVG FLOW, GPM	=	195.00	(0.01230 CU.M/SEC)
INFLUENT CONC., ug/L	=	1047.000	
EFFLUENT CONC., ug/L	=	5.000	
EQUILIBRIUM CONC., ug/L	=	311.045	
WATER TEMPERATURE, deg-K	=	285.0	
ATMOSPHERIC PRESSURE, ATM	=	1.00	
TYPE OF PACKING MEDIA:	=	2 INCH-SADDLES	
PRESS DROP: MEDIA, N/SQ.M/M	=	70.0	
AIR-TO-WATER RATIO	=	50.0	
MINIMUM A/W RATIO	=	14.85	
DESIGN AIRFLOW RATE, CFM	=	1564.17	(0.74 CU.M/SEC)
STRIPPING FACTOR	=	3.35	
KLa MASS-TRANS COEFF, 1/SEC	=	0.009243	
LIQUID LOADING, GPM/SQ.FT	=	25.10	
TOWER DIAMETER, FT	=	3.45	(1.05 M)
TOTAL TOWER X-SECT AREA, SQ.FT	=	9.3	(0.9 SQ.M)
PACKING HEIGHT, FT	=	43.05	(13.12 M)
TOTAL PACKING VOLUME, CU.FT	=	401.4	(11.4 CU.M)
NUMBER OF TOWERS	=	1.0	
REMOVAL EFFICIENCY, %	=	99.52	
DESIGN POWER FOR BLOWERS, KW/HOUR	=	4.26	
DESIGN POWER FOR PUMPS, KW/HOUR	=	4.10	

PRELIMINARY COST ESTIMATES FOR SYSTEM:

PTA CONSTRUCTION COST ($)	=	102221.	
INDIRECT CONSTRUCTION ($)	=	24533.	
TOTAL PTA CONSTRUCTION ($)	=	126754.	
PTA AMORTIZED CAPITAL ($/YR)	=	14888.	(14.5 CENTS/1000 GAL)
TOWER PUMPING POWER ($/YR)	=	2394.	
BLOWER ELECTRIC ($/YR)	=	2983.	
FIN-WATER PUMP POWER ($/YR)	=	1123.	
MAINTENANCE MATERIAL ($/YR)	=	218.	
PTA O&M LABOR ($/YR)	=	4288.	
SUM PTA O&M COST ($/YR)	=	11006.	(10.7 CENTS/1000 GAL)
TOTAL PTA SYSTEM COST ($/YR)	=	25894.	(25.3 CENTS/1000 GAL)

NEW STRIPPER DESIGN FOLLOWS:

THE COMPOUND IS cis-DCE
HENRY"S COEF., CU.M WATER/CU.M AIR = 0.06700

TOTAL DESIGN FLOW, GPM	=	234.00	(0.01476 CU.M/SEC)
TOTAL AVG FLOW, GPM	=	195.00	(0.01230 CU.M/SEC)
INFLUENT CONC., ug/L	=	1047.000	
EFFLUENT CONC., ug/L	=	6.889	

EQUILIBRIUM CONC., ug/L	=	310.481	
WATER TEMPERATURE, deg-K	=	285.0	
ATMOSPHERIC PRESSURE, ATM	=	1.00	
TYPE OF PACKING MEDIA:	=	2 INCH-SADDLES	
PRESS DROP: MEDIA, N/SQ.M/M	=	66.3	
AIR-TO-WATER RATIO	=	50.0	
MINIMUM A/W RATIO	=	14.83	
DESIGN AIRFLOW RATE, CFM	=	1564.17	(0.74 CU.M/SEC)
STRIPPING FACTOR	=	3.35	
KLa MASS-TRANS COEFF, 1/SEC	=	0.009023	
LIQUID LOADING, GPM/SQ.FT	=	24.34	
TOWER DIAMETER, FT	=	3.50	(1.07 M)
TOTAL TOWER X-SECT AREA, SQ.FT	=	9.6	(0.9 SQ.M)
PACKING HEIGHT, FT	=	40.03	(12.20 M)
TOTAL PACKING VOLUME, CU.FT	=	384.9	(10.9 CU.M)
NUMBER OF TOWERS	=	1.0	
REMOVAL EFFICIENCY, %	=	99.34	
DESIGN POWER FOR BLOWERS, KW/HOUR	=	3.94	
DESIGN POWER FOR PUMPS, KW/HOUR	=	3.89	

PRELIMINARY COST ESTIMATES FOR SYSTEM:

PTA CONSTRUCTION COST ($)	=	99441.	
INDIRECT CONSTRUCTION ($)	=	23866.	
TOTAL PTA CONSTRUCTION ($)	=	123307.	
PTA AMORTIZED CAPITAL ($/YR)	=	14484.	(14.1 CENTS/1000 GAL)
TOWER PUMPING POWER ($/YR)	=	2272.	
BLOWER ELECTRIC ($/YR)	=	2761.	
FIN-WATER PUMP POWER ($/YR)	=	1123.	
MAINTENANCE MATERIAL ($/YR)	=	215.	
PTA O&M LABOR ($/YR)	=	4260.	
SUM PTA O&M COST ($/YR)	=	10631.	(10.4 CENTS/1000 GAL)
TOTAL PTA SYSTEM COST ($/YR)	=	25114.	(24.5 CENTS/1000 GAL)

DESIGN AND COSTS FOR TOWER OFF-GAS CONTROL BY GAC:

GAC BED DEPTH, FT	=	6.00	
GAS VELOCITY, FT/MIN	=	50.0	
GAC EBCT FOR GAS-PHASE, SEC	=	7.20	
TOTAL GAC X-SECT AREA, SQ.FT	=	31.28	
TOTAL EFFECTIVE GAC VOLUME, CU.FT	=	187.70	
TOTAL GAC REQD FOR ADSORBERS, LBS	=	6194.1	
GAS-PHASE CONCENTRATION, ug/L-AIR	=	20.80	
PART PRESS/VAPOR PRESS RATIO	=	0.00014	
GAC GAS-PHASE CAPACITY, ug/g-GAC	=	173252.5	
GAC USE RATE-GAS ADSRP, mg/L-WATER	=	6.0034	
GAC USE RATE, LBS/1000 GAL-WATER	=	0.0501	
GAC USE RATE, mg-GAC/L-AIR	=	0.1201	
SPENT GAC QUANTITY, LBS/YEAR	=	5135.0	
GAC BED LIFE, DAYS	=	440.3	
OFF-GAS BLOWER, KW per HOUR	=	3.3	
OFF-GAS HEATER, KW per HOUR	=	15.6	
GAC CONSTRUCTION COST ($)	=	110504.	
INDIRECT CONSTR COST ($)	=	26521.	
TOTAL GAC CONSTR COST ($)	=	137025.	
GAC AMORTIZED CAPITAL ($/YR)	=	16095.	(15.7 CENTS/1000 GAL)
OFF-GAS BLOWER POWER ($/YR)	=	1904.	
OFF-GAS HEATER POWER ($/YR)	=	9135.	
MAINT MATERIAL ($/YR)	=	932.	
O&M LABOR ($/YR)	=	6344.	
ON-SITE STEAM REGEN ($/YR)	=	1551.	
GAC REPLACE ($/YR)	=	2769.	
SUM GAC O&M COST ($/YR)	=	22636.	(22.1 CENTS/1000 GAL)
TOTAL GAC GAS-ADSORP ($/YR)	=	38730.	(37.8 CENTS/1000 GAL)

OVERALL SYSTEM COSTS:

TOTAL SYSTEM CONSTR COST ($)	=	260332.	
TOTAL SYSTEM CAPITAL ($/YR)	=	30579.	(29.8 CENTS/1000 GAL)
TOTAL SYSTEM O&M COST ($/YR)	=	33266.	(32.5 CENTS/1000 GAL)
OVERALL SYSTEM COST ($/YR)	=	63845.	(62.3 CENTS/1000 GAL)

THE COMPOUND IS TETRACHLOROETHYLENE
HENRY"S COEF., CU.M WATER/CU.M AIR = 0.22000

TOTAL DESIGN FLOW, GPM	=	234.00	(0.01476 CU.M/SEC)
TOTAL AVG FLOW, GPM	=	195.00	(0.01230 CU.M/SEC)
INFLUENT CONC., ug/L	=	1395.000	
EFFLUENT CONC., ug/L	=	5.000	
EQUILIBRIUM CONC., ug/L	=	126.364	
WATER TEMPERATURE, deg-K	=	285.0	
ATMOSPHERIC PRESSURE, ATM	=	1.00	
TYPE OF PACKING MEDIA:	=	2 INCH-SADDLES	
PRESS DROP: MEDIA, N/SQ.M/M	=	70.0	
AIR-TO-WATER RATIO	=	50.0	
MINIMUM A/W RATIO	=	4.53	
DESIGN AIRFLOW RATE, CFM	=	1564.17	(0.74 CU.M/SEC)
STRIPPING FACTOR	=	11.00	
KLa MASS-TRANS COEFF, 1/SEC	=	0.009254	
LIQUID LOADING, GPM/SQ.FT	=	25.10	
TOWER DIAMETER, FT	=	3.45	(1.05 M)
TOTAL TOWER X-SECT AREA, SQ.FT	=	9.3	(0.9 SQ.M)
PACKING HEIGHT, FT	=	36.80	(11.22 M)
TOTAL PACKING VOLUME, CU.FT	=	343.1	(9.7 CU.M)
NUMBER OF TOWERS	=	1.0	
REMOVAL EFFICIENCY, %	=	99.64	
DESIGN POWER FOR BLOWERS, KW/HOUR	=	3.91	
DESIGN POWER FOR PUMPS, KW/HOUR	=	3.67	

PRELIMINARY COST ESTIMATES FOR SYSTEM:

PTA CONSTRUCTION COST ($)	=	92259.	
INDIRECT CONSTRUCTION ($)	=	22142.	
TOTAL PTA CONSTRUCTION ($)	=	114401.	
PTA AMORTIZED CAPITAL ($/YR)	=	13438.	(13.1 CENTS/1000 GAL)
TOWER PUMPING POWER ($/YR)	=	2142.	
BLOWER ELECTRIC ($/YR)	=	2739.	
FIN-WATER PUMP POWER ($/YR)	=	1123.	
MAINTENANCE MATERIAL ($/YR)	=	207.	
PTA O&M LABOR ($/YR)	=	4184.	
SUM PTA O&M COST ($/YR)	=	10395.	(10.1 CENTS/1000 GAL)
TOTAL PTA SYSTEM COST ($/YR)	=	23833.	(23.3 CENTS/1000 GAL)

NEW STRIPPER DESIGN FOLLOWS:

THE COMPOUND IS TETRACHLOROETHYLENE
HENRY"S COEF., CU.M WATER/CU.M AIR = 0.22000

TOTAL DESIGN FLOW, GPM	=	234.00	(0.01476 CU.M/SEC)
TOTAL AVG FLOW, GPM	=	195.00	(0.01230 CU.M/SEC)
INFLUENT CONC., ug/L	=	1395.000	
EFFLUENT CONC., ug/L	=	2.944	
EQUILIBRIUM CONC., ug/L	=	126.551	
WATER TEMPERATURE, deg-K	=	285.0	
ATMOSPHERIC PRESSURE, ATM	=	1.00	
TYPE OF PACKING MEDIA:	=	2 INCH-SADDLES	
PRESS DROP: MEDIA, N/SQ.M/M	=	66.3	
AIR-TO-WATER RATIO	=	50.0	
MINIMUM A/W RATIO	=	4.54	
DESIGN AIRFLOW RATE, CFM	=	1564.17	(0.74 CU.M/SEC)
STRIPPING FACTOR	=	11.00	
KLa MASS-TRANS COEFF, 1/SEC	=	0.009040	
LIQUID LOADING, GPM/SQ.FT	=	24.34	
TOWER DIAMETER, FT	=	3.50	(1.07 M)
TOTAL TOWER X-SECT AREA, SQ.FT	=	9.6	(0.9 SQ.M)
PACKING HEIGHT, FT	=	40.03	(12.20 M)
TOTAL PACKING VOLUME, CU.FT	=	384.9	(10.9 CU.M)
NUMBER OF TOWERS	=	1.0	
REMOVAL EFFICIENCY, %	=	99.79	
DESIGN POWER FOR BLOWERS, KW/HOUR	=	3.94	
DESIGN POWER FOR PUMPS, KW/HOUR	=	3.89	

PRELIMINARY COST ESTIMATES FOR SYSTEM:

PTA CONSTRUCTION COST ($)	=	99441.	
INDIRECT CONSTRUCTION ($)	=	23866.	
TOTAL PTA CONSTRUCTION ($)	=	123307.	

DESIGN POWER FOR PUMPS, KW/HOUR = 3.89

PRELIMINARY COST ESTIMATES FOR SYSTEM:

PTA CONSTRUCTION COST ($)	=	99441.	
INDIRECT CONSTRUCTION ($)	=	23866.	
TOTAL PTA CONSTRUCTION ($)	=	123307.	
PTA AMORTIZED CAPITAL ($/YR)	=	14484.	(14.1 CENTS/1000 GAL)
TOWER PUMPING POWER ($/YR)	=	2272.	
BLOWER ELECTRIC ($/YR)	=	2761.	
FIN-WATER PUMP POWER ($/YR)	=	1123.	
MAINTENANCE MATERIAL ($/YR)	=	215.	
PTA O&M LABOR ($/YR)	=	4260.	
SUM PTA O&M COST ($/YR)	=	10631.	(10.4 CENTS/1000 GAL)
TOTAL PTA SYSTEM COST ($/YR)	=	25114.	(24.5 CENTS/1000 GAL)

DESIGN AND COSTS FOR TOWER OFF-GAS CONTROL BY GAC:

GAC BED DEPTH, FT	=	6.00	
GAS VELOCITY, FT/MIN	=	50.0	
GAC EBCT FOR GAS-PHASE, SEC	=	7.20	
TOTAL GAC X-SECT AREA, SQ.FT	=	31.28	
TOTAL EFFECTIVE GAC VOLUME, CU.FT	=	187.70	
TOTAL GAC REQD FOR ADSORBERS, LBS	=	6194.1	
GAS-PHASE CONCENTRATION, ug/L-AIR	=	27.84	
PART PRESS/VAPOR PRESS RATIO	=	0.00011	
GAC GAS-PHASE CAPACITY, ug/g-GAC	=	295185.0	
GAC USE RATE-GAS ADSRP, mg/L-WATER	=	4.7159	
GAC USE RATE, LBS/1000 GAL-WATER	=	0.0394	
GAC USE RATE, mg-GAC/L-AIR	=	0.0943	
SPENT GAC QUANTITY, LBS/YEAR	=	4033.7	
GAC BED LIFE, DAYS	=	560.5	
OFF-GAS BLOWER, KW per HOUR	=	3.3	
OFF-GAS HEATER, KW per HOUR	=	15.6	
GAC CONSTRUCTION COST ($)	=	110504.	
INDIRECT CONSTR COST ($)	=	26521.	
TOTAL GAC CONSTR COST ($)	=	137025.	
GAC AMORTIZED CAPITAL ($/YR)	=	16095.	(15.7 CENTS/1000 GAL)
OFF-GAS BLOWER POWER ($/YR)	=	1904.	
OFF-GAS HEATER POWER ($/YR)	=	9135.	
MAINT MATERIAL ($/YR)	=	932.	
O&M LABOR ($/YR)	=	6344.	
ON-SITE STEAM REGEN ($/YR)	=	1219.	
GAC REPLACE ($/YR)	=	2769.	
SUM GAC O&M COST ($/YR)	=	22303.	(21.8 CENTS/1000 GAL)
TOTAL GAC GAS-ADSORP ($/YR)	=	38398.	(37.5 CENTS/1000 GAL)

OVERALL SYSTEM COSTS:

TOTAL SYSTEM CONSTR COST ($)	=	260332.	
TOTAL SYSTEM CAPITAL ($/YR)	=	30579.	(29.8 CENTS/1000 GAL)
TOTAL SYSTEM O&M COST ($/YR)	=	32933.	(32.1 CENTS/1000 GAL)
OVERALL SYSTEM COST ($/YR)	=	63512.	(62.0 CENTS/1000 GAL)

THE COMPOUND IS TRICHLOROETHYLENE
HENRY"S COEF., CU.M WATER/CU.M AIR = 0.11600

TOTAL DESIGN FLOW, GPM	=	234.00	(0.01476 CU.M/SEC)
TOTAL AVG FLOW, GPM	=	195.00	(0.01230 CU.M/SEC)
INFLUENT CONC., ug/L	=	2078.000	
EFFLUENT CONC., ug/L	=	5.000	
EQUILIBRIUM CONC., ug/L	=	357.414	
WATER TEMPERATURE, deg-K	=	285.0	
ATMOSPHERIC PRESSURE, ATM	=	1.00	
TYPE OF PACKING MEDIA:	=	2 INCH-SADDLES	
PRESS DROP: MEDIA, N/SQ.M/M	=	70.0	
AIR-TO-WATER RATIO	=	50.0	
MINIMUM A/W RATIO	=	8.60	
DESIGN AIRFLOW RATE, CFM	=	1564.17	(0.74 CU.M/SEC)
STRIPPING FACTOR	=	5.80	
KLa MASS-TRANS COEFF, 1/SEC	=	0.009288	
LIQUID LOADING, GPM/SQ.FT	=	25.10	
TOWER DIAMETER, FT	=	3.45	(1.05 M)
TOTAL TOWER X-SECT AREA, SQ.FT	=	9.3	(0.9 SQ.M)
PACKING HEIGHT, FT	=	42.49	(12.95 M)
TOTAL PACKING VOLUME, CU.FT	=	396.2	(11.2 CU.M)
NUMBER OF TOWERS	=	1.0	
REMOVAL EFFICIENCY, %	=	99.76	
DESIGN POWER FOR BLOWERS, KW/HOUR	=	4.22	
DESIGN POWER FOR PUMPS, KW/HOUR	=	4.06	

PRELIMINARY COST ESTIMATES FOR SYSTEM:

PTA CONSTRUCTION COST ($)	=	101347.	
INDIRECT CONSTRUCTION ($)	=	24323.	
TOTAL PTA CONSTRUCTION ($)	=	125670.	
PTA AMORTIZED CAPITAL ($/YR)	=	14761.	(14.4 CENTS/1000 GAL)
TOWER PUMPING POWER ($/YR)	=	2371.	
BLOWER ELECTRIC ($/YR)	=	2961.	
FIN-WATER PUMP POWER ($/YR)	=	1123.	
MAINTENANCE MATERIAL ($/YR)	=	217.	
PTA O&M LABOR ($/YR)	=	4280.	
SUM PTA O&M COST ($/YR)	=	10951.	(10.7 CENTS/1000 GAL)
TOTAL PTA SYSTEM COST ($/YR)	=	25713.	(25.1 CENTS/1000 GAL)

NEW STRIPPER DESIGN FOLLOWS:

THE COMPOUND IS TRICHLOROETHYLENE
HENRY"S COEF., CU.M WATER/CU.M AIR = 0.11600

TOTAL DESIGN FLOW, GPM	=	234.00	(0.01476 CU.M/SEC)
TOTAL AVG FLOW, GPM	=	195.00	(0.01230 CU.M/SEC)
INFLUENT CONC., ug/L	=	2078.000	
EFFLUENT CONC., ug/L	=	6.750	
EQUILIBRIUM CONC., ug/L	=	357.112	
WATER TEMPERATURE, deg-K	=	285.0	
ATMOSPHERIC PRESSURE, ATM	=	1.00	
TYPE OF PACKING MEDIA:	=	2 INCH-SADDLES	
PRESS DROP: MEDIA, N/SQ.M/M	=	66.3	
AIR-TO-WATER RATIO	=	50.0	
MINIMUM A/W RATIO	=	8.59	
DESIGN AIRFLOW RATE, CFM	=	1564.17	(0.74 CU.M/SEC)
STRIPPING FACTOR	=	5.80	
KLa MASS-TRANS COEFF, 1/SEC	=	0.009071	
LIQUID LOADING, GPM/SQ.FT	=	24.34	
TOWER DIAMETER, FT	=	3.50	(1.07 M)
TOTAL TOWER X-SECT AREA, SQ.FT	=	9.6	(0.9 SQ.M)
PACKING HEIGHT, FT	=	40.03	(12.20 M)
TOTAL PACKING VOLUME, CU.FT	=	384.9	(10.9 CU.M)
NUMBER OF TOWERS	=	1.0	
REMOVAL EFFICIENCY, %	=	99.68	
DESIGN POWER FOR BLOWERS, KW/HOUR	=	3.94	
DESIGN POWER FOR PUMPS, KW/HOUR	=	3.89	

PRELIMINARY COST ESTIMATES FOR SYSTEM:

EQUILIBRIUM CONC., ug/L	=	357.112	
WATER TEMPERATURE, deg-K	=	285.0	
ATMOSPHERIC PRESSURE, ATM	=	1.00	
TYPE OF PACKING MEDIA:	=	2 INCH-SADDLES	
PRESS DROP: MEDIA, N/SQ.M/M	=	66.3	
AIR-TO-WATER RATIO	=	50.0	
MINIMUM A/W RATIO	=	8.59	
DESIGN AIRFLOW RATE, CFM	=	1564.17	(0.74 CU.M/SEC).
STRIPPING FACTOR	=	5.80	
KLa MASS-TRANS COEFF, 1/SEC	=	0.009071	
LIQUID LOADING, GPM/SQ.FT	=	24.34	
TOWER DIAMETER, FT	=	3.50	(1.07 M)
TOTAL TOWER X-SECT AREA, SQ.FT	=	9.6	(0.9 SQ.M)
PACKING HEIGHT, FT	=	40.03	(12.20 M)
TOTAL PACKING VOLUME, CU.FT	=	384.9	(10.9 CU.M)
NUMBER OF TOWERS	=	1.0	
REMOVAL EFFICIENCY, %	=	99.68	
DESIGN POWER FOR BLOWERS, KW/HOUR	=	3.94	
DESIGN POWER FOR PUMPS, KW/HOUR	=	3.89	

PRELIMINARY COST ESTIMATES FOR SYSTEM:

PTA CONSTRUCTION COST ($)	=	99441.	
INDIRECT CONSTRUCTION ($)	=	23866.	
TOTAL PTA CONSTRUCTION ($)	=	123307.	
PTA AMORTIZED CAPITAL ($/YR)	=	14484.	(14.1 CENTS/1000 GAL)
TOWER PUMPING POWER ($/YR)	=	2272.	
BLOWER ELECTRIC ($/YR)	=	2761.	
FIN-WATER PUMP POWER ($/YR)	=	1123.	
MAINTENANCE MATERIAL ($/YR)	=	215.	
PTA O&M LABOR ($/YR)	=	4260.	
SUM PTA O&M COST ($/YR)	=	10631.	(10.4 CENTS/1000 GAL)
TOTAL PTA SYSTEM COST ($/YR)	=	25114.	(24.5 CENTS/1000 GAL)

DESIGN AND COSTS FOR TOWER OFF-GAS CONTROL BY GAC:

GAC BED DEPTH, FT	=	6.00	
GAS VELOCITY, FT/MIN	=	50.0	
GAC EBCT FOR GAS-PHASE, SEC	=	7.20	
TOTAL GAC X-SECT AREA, SQ.FT	=	31.28	
TOTAL EFFECTIVE GAC VOLUME, CU.FT	=	187.70	
TOTAL GAC REQD FOR ADSORBERS, LBS	=	6194.1	
GAS-PHASE CONCENTRATION, ug/L-AIR	=	41.43	
PART PRESS/VAPOR PRESS RATIO	=	0.00020	
GAC GAS-PHASE CAPACITY, ug/g-GAC	=	263062.5	
GAC USE RATE-GAS ADSRP, mg/L-WATER	=	7.8736	
GAC USE RATE, LBS/1000 GAL-WATER	=	0.0657	
GAC USE RATE, mg-GAC/L-AIR	=	0.1575	
SPENT GAC QUANTITY, LBS/YEAR	=	6734.6	
GAC BED LIFE, DAYS	=	335.7	
OFF-GAS BLOWER, KW per HOUR	=	3.3	
OFF-GAS HEATER, KW per HOUR	=	15.6	
GAC CONSTRUCTION COST ($)	=	110504.	
INDIRECT CONSTR COST ($)	=	26521.	
TOTAL GAC CONSTR COST ($)	=	137025.	
GAC AMORTIZED CAPITAL ($/YR)	=	16095.	(15.7 CENTS/1000 GAL)
OFF-GAS BLOWER POWER ($/YR)	=	1904.	
OFF-GAS HEATER POWER ($/YR)	=	9135.	
MAINT MATERIAL ($/YR)	=	932.	
O&M LABOR ($/YR)	=	6344.	
ON-SITE STEAM REGEN ($/YR)	=	2035.	
GAC REPLACE ($/YR)	=	2769.	
SUM GAC O&M COST ($/YR)	=	23119.	(22.6 CENTS/1000 GAL)
TOTAL GAC GAS-ADSORP ($/YR)	=	39214.	(38.3 CENTS/1000 GAL)

OVERALL SYSTEM COSTS:

TOTAL SYSTEM CONSTR COST ($)	=	260332.	
TOTAL SYSTEM CAPITAL ($/YR)	=	30579.	(29.8 CENTS/1000 GAL)
TOTAL SYSTEM O&M COST ($/YR)	=	33749.	(32.9 CENTS/1000 GAL)
OVERALL SYSTEM COST ($/YR)	=	64328.	(62.8 CENTS/1000 GAL)

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philadelphia mixers

January 5, 1993

Mr. Larry Kiener
Donahue and Associates
4839 North 40 Street
Sheboygan, Wisconsin 53082-1067

Dear Larry:

Subject: Philadelphia Mixers Quote No. M-93-7024
Reference: Philadelphia Mixers for Claremont Poly Chemical, Long Island, New York

Thank you for the opportunity of providing pricing and specifications on a group of mixers for your application in Long Island, New York.

Per our discussion, our proposal includes the following information:

1. All mixer wetted parts are 316 stainless steel per your requirements. If 304 stainless steel is acceptable, please advise us and we will indicate the appropriate deducts.

2. In all three tanks, we are mixing water with a specific gravity of 1.0 and a viscosity of 1. The level of agitation is mild to moderate and is designed to maintain a uniform fluid suspension.

3. Minimum liquid level on all tanks is to be no lower than 40% of total tank volume.

4. The large mixer in the 60K gallon tank is designed for open-tank service. If a stuffing box or mechanical seal is required, please advise and we will be happy to include it in our proposal.

5. Two large tanks, tank one and tank two, utilize spiral bevel, right-angle helical gearing manufactured to AGMA Quality 10 rating. All selections have a minimum gearbox service factor of 2.0 or better.

6. All 3800 Series drives have 100,000-hour bearing life.

Please find our formal proposal as follows:

60,000-GALLON STORAGE TANK

One only... Philadelphia Mixer Model 3803-PTO Process Mixer, manufactured complete with the following features:

- Unit designed for 60,000-gallon tank that would be approximately 22 feet tall and 22 feet in diameter
- 3-H.P., TEFC, 230/460-volt, 1200-RPM motor
- Gearbox output speed to be 30 RPM
- 3" diameter by 210" long 316 stainless steel mixer shaft
- 70" diameter hydrofoil, high-efficiency, 3-bladed impeller in 316 stainless steel construction
- In-tank shaft coupling

NET PRICE EACH PER ABOVE SPECIFICATIONS $10,109.00

TANK NO. 2

One only... Philadelphia Mixer Model 3801-PTO, Industrial-duty Mixer, manufactured complete with the following features:

- Mixer designed for a 7,500-gallon tank, which would be 10 foot 4 inches in diameter by 12 foot 6 inches tall
- 1-H.P., TEFC, 3-phase, 60-cycle, 460-volt, 1750-RPM motor
- 2" diameter by 112" long 316 stainless steel mixer shaft
- Gearbox operating output speed to be 45 RPM
- 37" diameter, 3-bladed, high-efficiency, 316 stainless hydrofoil impeller

NET PRICE EACH PER ABOVE SPECIFICATIONS $ 6,044.00

TANK NO. 3

One only... Philadelphia Mixer Model PG-12, Clamp-mount Portable Mixer, manufactured complete with the following features:

- Mixer designed for a 2,000-gallon tank that has a 90" diameter and an overall height of 78"
- 1/2-H.P., TEFC, 230/460-volt motor
- Gearbox final output RPM to be 350
- 1-1/4" diameter by 70" long 316 stainless steel shaft
- 10.5" diameter, 316 stainless steel, 1.5-pitch marine-style propeller
- Heavy-duty aluminum clamp assembly

NET PRICE EACH PER ABOVE SPECIFICATIONS $ 1,533.00

Estimated delivery for 3800 Series mixers is six to eight weeks. Delivery for portable mixer is two to three weeks.

For your review, I have enclosed representative drawings and illustrations of both the portable series and the 3800 Series Philadelphia mixer.

I will look forward to discussing this application with you in further detail. If you should have any questions and/or comments regarding this information, please feel free to contact me in my office in Minneapolis at 612-377-7480.

Very truly yours,

PHILADELPHIA MIXERS
Represented by the Mellema Company

Pat Lipinski

Patrick G. Lipinski

PGL:ln
Enclosures

cc: Robart, Inc.
624 North Maple Avenue
Hohokus, New Jersey 07423

Mr. Dave Gibson, Philadelphia Mixers

philadelphia mixers corp.

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CUSTOMER INFORMATION REQUIRED

SALES AGENT MELLOMA CO DATE 1/4/92

CUSTOMER NAME DONOHUE AND ASSOCIATES

LOCATION, CITY / STATE SHEBOYGAN WI 53082-1067

INQUIRY / PROJECT REF CLAREMONT POLY CHEM LONG ISLAND NY

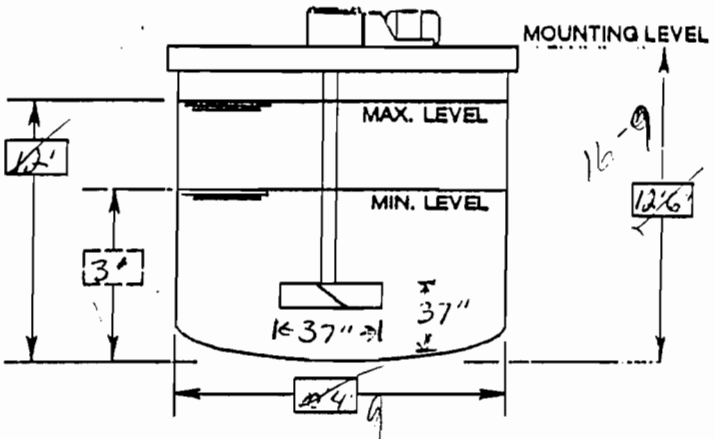
CONTACT LARRY KIENER TELEPHONE 414-458

FLUID PROPERTIES

MAXIMUM MIXTURE SPECIFIC GRAVITY	1
MAXIMUM VISCOSITY	1 CP
WEIGHT PERCENT SOLIDS	%
GAS RATE	SCFM

OPERATING CONDITIONS

MAXIMUM TEMPERATURE	AMB °F
MAXIMUM PRESSURE	ATMOS PSIG



- All levels measured to bottom of tank, not "weld line" or "tangent line".
- Mounting level is position where mixer is to be mounted, on beams or nozzle, frequently much higher than "tank height".

PROCESS REQUIREMENTS

CUSTOMER'S WORDS: *"WHAT IS MIXER EXPECTED TO DO?"* 7500 GAL
37" HYDRO FOIL
30" OFF BOTTOM
45 RPM

BLEND, BATCH OR RESIDENCE TIME

DEGREE OF AGITATION MILD (MILD / MODERATE / VIGOROUS / VIOLENT)

MECHANICAL REQUIREMENTS

SERVICE FACTOR 1.25 - 2.0 (1.25 IS STANDARD FOR NON-SHOCK)

MOTOR SPECS TEFC (TEFC, EXPLOSION PROOF, OTHER)

WETTED MATERIALS 316 SS (C/S, 304SS, 316 SS, OTHER)

TYPE OF SEAL (OPEN TANK, STUFFING BOX, MECH. SEAL)

OTHER

philadelphia mixers corp.

SECTION	T1
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REVISION	3 MAR 88

CUSTOMER INFORMATION REQUIRED

SALES AGENT MELLEMA CO DATE 1/4/92

CUSTOMER NAME DONOHUE AND ASSOCIATES

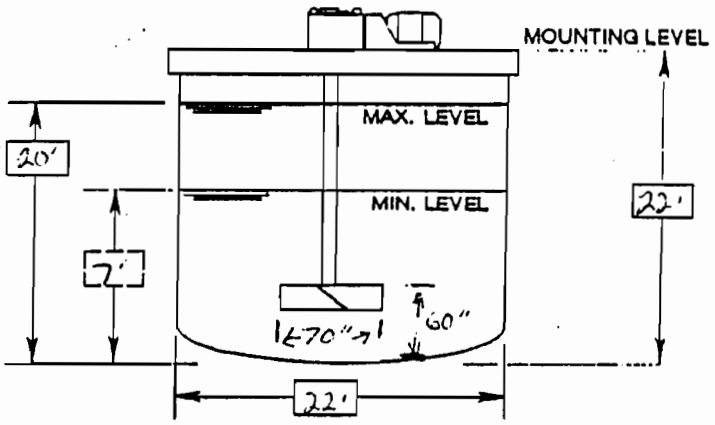
LOCATION, CITY / STATE SHEBOYGAN WI 53082-1067

INQUIRY / PROJECT REF CLAREMONT POLY CHEM LONG ISLAND NY

CONTACT [illegible] TELEPHONE 414-458

FLUID PROPERTIES

MAXIMUM MIXTURE SPECIFIC GRAVITY	1
MAXIMUM VISCOSITY	1 CP
WEIGHT PERCENT SOLIDS	%
GAS RATE	SCFM



- All levels measured to bottom of tank, not "weld line" or "tangent line".
- Mounting level is position where mixer is to be mounted, on beams or nozzle, frequently much higher than "tank height".

OPERATING CONDITIONS

MAXIMUM TEMPERATURE	AGE °F
MAXIMUM PRESSURE	ATMOS PSIG

PROCESS REQUIREMENTS

CUSTOMER'S WORDS: *"WHAT IS MIXER EXPECTED TO DO?"*

MILD AGITATION 60,000 GAL TONIC

30 RPM

70" 3 BLADE HYDROFOIL

60" OFF BOTTOM

BLEND, BATCH OR RESIDENCE TIME

DEGREE OF AGITATION MILD (MILD / MODERATE / VIGOROUS / VIOLENT)

MECHANICAL REQUIREMENTS

SERVICE FACTOR 1.25 - 2.0 (1.25 IS STANDARD FOR NON-SHOCK)

MOTOR SPECS TEFC (TEFC, EXPLOSION PROOF, OTHER)

WETTED MATERIALS 316 SS (C/S, 304SS, 316 SS, OTHER)

TYPE OF SEAL (OPEN TANK, STUFFING BOX, MECH. SEAL)

OTHER

M365

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MELLEMA CO.
Manufacturer's Representatives

5001 CEDAR LAKE ROAD • MINNEAPOLIS, MINNESOTA 55416 • PHONE 612-377-7480 • FAX 612-377-7485

DATE: 1/25/93

Number of pages sent ____
(including cover sheet)

TO: DONAHUE AND ASSOC

ATTENTION: LARRY KIENER

FROM: PAT LIPINSKI

SUBJECT: PHILLY MIXERS

LARRY: ATTACHED IS THE DATA YOU REQUIRE ON THE LARGE TANK

STATIC WT = 1150-LBS

BENDING MOMENT = 14,400 INCH LBS

DYNAMIC TORQUE = 8400 INCH LBS

PLEASE CALL IF I CAN BE OF FURTHER SERVICE

Best Regards
Pat Lipinski

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philadelphia mixers

February 4, 1993

Mr. Larry Kiener
Donahue and Associates
4839 North 40th Street
Sheboygan, WI 53082-1067

Subject: Philadelphia Mixer's Quote M-93-7024
Reference: Philadelphia Mixers for Claremont Poly Chemical, Long Island, New York

Dear Larry:

In follow up to our recent conversations, we are pleased to provide additional information regarding our selections.

On the large 60-gallon storage tank the maximum shaft run out under normal operational conditions for this mixer is approximately 1/4".

In addition, you requested that we select a new mixer based on tank #2 becoming 168" tall and 114" in diameter. This tank would still contain 7500 gallons of waterlike material.

Please find our formal revision as follows:

108" 201" (old) Quote 2/4/93

TANK #2

One only... Philadelphia Mixer Model 3801-PTO Industrial duty mixer, manufactured complete with the following features:

- Mixer would be designed for a 7500 gallon tank which would be 114" in diameter x 168" tall.
- 1 HP, TEFC, 3-phase, 60-cycle, 460 volt, 1750 RPM motor.
- 2" diameter x 123" long 316 stainless steel mixer shaft.
- Gearbox operating output speed to be 45 RPM.
- 50" diameter, 3 blade, high efficiency, 316 stainless steel hydrofoil impeller.

NET PRICE EACH PER ABOVE SPECIFICATIONS $6,792

23 & 45

Please review this information and advise me if we can be of any further assistance to you on this project.

Very truly yours,

PHILADELPHIA MIXERS
Represented by the Mellema Company

Pat Lipinski

Patrick G. Lipinski

PGL:kba
Encl.

cc: Mr. Steve Roselle - Philadelphia Mixers

24 of 45

philadelphia mixers

February 8, 1993

Mr. Larry Kiener
Donahue and Associates
4839 North 40th Street
Sheboygan, WI 53082-1067

Subject: Philadelphia Mixer Quote M-93-7024
Reference: Philadelphia Mixers for Claremont, Poly-Chemical, Long Island, NY

Dear Larry:

In follow up to our recent conversations regarding the mixer support on this tank we are pleased to offer the following data.

As you know, the actual calculation of the appropriate size steel is solely in the hands of the tank manufacturer. We have previously provided the static weight, bending moment and dynamic torque of this mixer. From this information the tank manufacturer should be able to properly calculate the required tank thickness and dome support.

However, as a base reference, we can advise you of the approximate support beam dimensions if this was to be mounted on an open all concrete tank. This data may give you a benchmark for evaluating your tank suppliers offering. The typical beams that we would expect to see on a tank of this size with this mixer would be W10 x 39 in carbon steel construction.

Even if a dome tank is used, the tank manufacturer may want to consider supporting the mixer independently from the domed structure. You would then have to anchor the cross beams into the tank sidewall for proper support. Please advise if we can be of any further assistance to you on this project.

Very truly yours,

PHILADELPHIA MIXERS
Represented by the Mellema Company

Patrick G. Lipinski

PGL:kba
Incl.

cc: Mr. Steve Roselle - Philadelphia Mixers

Specifications A*

SERIES	A14,A74		A34		A35		A15,A75		A16,A76		A17,A77		A18,A78		L11		L12	
Output Capacity	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
Gallons per hour	0.006	0.58	0.002	0.58	0.002	0.42	0.01	1.0	0.02	2.0	0.006	0.42	0.011	0.75	3.5	35	7.0	70.0
Liters per hour	0.023	2.19	0.008	2.19	0.008	1.57	0.038	3.79	0.076	7.57	0.023	1.57	0.043	2.84	13.25	132.5	26.5	265.0
ML or CC per min	0.40	38.0	0.13	38.0	0.13	26.3	0.63	63.0	1.26	126.0	0.40	26.3	0.72	47.3	221	2208	442	4416
Output per stroke ML or CC	0.08	.38	.08	.38	.07	.26	0.13	0.63	0.26	1.26	.07	.26	.14	.47	—	—	—	—
Strokes per minute (Adjustable)	5	100	1.7	100	1.7	100	5	100	5	100	5	100	5	100	—	—	—	—
Stroke Length (0-100% adjustable) Recommended min	20%		20%		30%		20%		20%		30%		30%		10%		10%	
Maximum Injection Pressure	250 psi (17.3 bar)		250 psi (17.3 bar)		140 psi (9.7 bar)		110 psi (7.6 bar)		50 psi (3.5 bar)		140 psi (9.7 bar)		80 psi (5.5 bar)		125 psi (8.6 bar)		125 psi (8.6 bar)	
Peak Input Power	110 watts		110 watts		75 watts		150 watts		150 watts		75 watts		75 watts		¼ H.P.		½ H.P.	
Average Input Power @ maximum speed	22 watts		22 watts		11 watts		22 watts		22 watts		11 watts		11 watts		N/A		N/A	
Height; max.	8" (203 mm)		8" (203 mm)		8" (203 mm)		8" (203 mm)		8" (203 mm)		8" (203 mm)		8" (203 mm)		24"** (610 mm)		24"** (610 mm)	
Length; max.	9.25" (235 mm)		9.25" (235 mm)		9.25" (235 mm)		9.25" (235 mm)		9.25" (235 mm)		9.25" (235 mm)		9.25" (235 mm)		19" (483 mm)		19" (483 mm)	
Width; max. (Facing head)	4.05" (103 mm)		4.05" (103 mm)		4.05" (103 mm)		4.05" (103 mm)		4.05" (103 mm)		4.05" (103 mm)		4.05" (103 mm)		12" (305 mm)		12" (305 mm)	
Shipping weight	10 lbs. (4.55 kg)		10 lbs. (4.55 kg)		10 lbs. (4.55 kg)		10 lbs. (4.55 kg)		10 lbs. (4.55 kg)		10 lbs. (4.55 kg)		10 lbs. (4.55 kg)		85 lbs. (38.6 kg)		85 lbs. (38.6 kg)	

Voltage: 115 Volts AC 50/60 Hz, single phase.
200-240 Volts AC 50/60 Hz, single phase available.

**14.25" (362 mm) without optional motor.
† 62 lbs. (28.2 kg) without optional motor.

Specifications B & D*

SERIES	B11 B71		B12 B72		B13 B73		D10 D70		D11 D71		D12 D72		D13 D73		D14 D74	
Output Capacity	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
Gallons per hour	0.008	1.6	0.012	2.5	0.022	4.5	0.006	1.3	0.012	2.5	0.02	4.0	.04	8.0	0.1	20.0
Liters per hour	0.03	6.0	0.05	9.5	0.085	17.0	0.024	4.9	0.047	9.5	.076	15.2	.15	30.3	0.3785	76.0
ML or CC per min	0.5	100	0.79	158	1.42	284.0	0.41	81.75	0.79	157.5	1.28	252	2.51	504.75	6.30	1260
Output per stroke ML or CC	0.10	1.0	0.16	1.58	0.28	2.84	0.11	1.09	0.21	2.10	0.34	3.36	0.67	6.73	1.68	16.8
Strokes per minute (Adjustable)	5	100	5	100	5	100	3.75	75	3.75	75	3.75	75	3.75	75	3.75	75
Stroke Length (0-100% adjustable) Recommended min	15%		10%		10%		10%		10%		10%		10%		10%	
Maximum Injection Pressure	150 psi (10.3 bar)		100 psi (6.9 bar)		50 psi (3.5 bar)		300 psi (20.7 bar)		150 psi (10.3 bar)		100 psi (6.9 bar)		60 psi (4.1 bar)		20 psi (1.4 bar)	
Peak Input Power	248 watts		248 watts		248 watts		381 watts		381 watts		381 watts		381 watts		381 watts	
Average Input Power @ maximum speed	29 watts		29 watts		29 watts		33 watts		33 watts		33 watts		33 watts		33 watts	
Height; max.	8" (203 mm)		8" (203 mm)		8" (203 mm)		9.25" (235 mm)		9.25" (235 mm)		9.25" (235 mm)		9.25" (235 mm)		9.25" (235 mm)	
Length; max.	10.75" (273 mm)		10.75" (273 mm)		10.75" (273 mm)		10.75" (273 mm)		10.75" (273 mm)		10.75" (273 mm)		11.00" (280 mm)		11.70" (298 mm)	
Width; max. (Facing head)	5.72" (146 mm)		5.72" (146 mm)		5.72" (146 mm)		5.72" (146 mm)		5.72" (146 mm)		5.72" (146 mm)		5.72" (146 mm)		5.72" (146 mm)	
Shipping weight	15 lbs. (6.9 kg)		15 lbs. (6.9 kg)		15 lbs. (6.9 kg)		19 lbs. (8.7 kg)		19 lbs. (8.7 kg)		19 lbs. (8.7 kg)		19 lbs. (8.7 kg)		19 lbs. (8.7 kg)	

Voltage: 115 Volts AC, 50/60 Hz, single phase. 200-240 Volts AC, 50/60 Hz, single phase available.

***For complete ordering information refer to individual product information and specification sheets or Bulletin 9.0.1000 General Price List.**

LIQUID METRONICS INCORPORATED
19 Craig Road, Acton, MA 01720-5495 U.S.A.
Telephone: (617) 263-9800
Telex: 95-1781
FAX: 617-264-9172

Printed in U.S.A. 30M 12.86 SGM WEA

WARRANTY

Liquid Metronics Incorporated warrants equipment of its manufacture and bearing its identification to be free from defects in workmanship and material. LMI's liability under this warranty extends for a period of one year from the date of delivery from our factory or authorized distributor. It is limited to repairing or replacing any device or part which is returned, transportation prepaid, to the factory within one year of delivery to the original purchaser, and which is proven defective upon examination.

LMI disclaims all liability for damage during transportation, for consequential damage of whatever nature, for damage due to handling, installation or improper operation, and for determining suitability for the use intended by the purchaser. Replaceable elastomeric parts are expendable and are not covered by any warranty either express or implied.

LMI makes no warranties either express or implied other than those stated above. No representative has authority to change or modify this warranty in any respect.

Specifications subject to change without notice.

ADLAM EQUIPMENT CO., INC.
2300 North Mayfair Road, Suite 740
Milwaukee, Wisconsin 53226
Phone: (414) 774-4050 *Fax:* 414-774-0484

FAX -- FAX -- FAX -- FAX

Number of Pages (Including cover sheet) 3

TO: MR. GARRY KIENER DATE: 1-29-93
SEC DONOHUE

FROM: DAN TIGHE

SUBJECT: JWI FILTER PRESS DRAWINGS
FOR 6" SUPERFUND PROJECT - LONG ISLAND N.Y."
ADLAM file # B-93-0030

FOR 6 CUFT OF CAPACITY, WE WOULD
RECOMMEND OUR MODEL 630G32-20-6DA

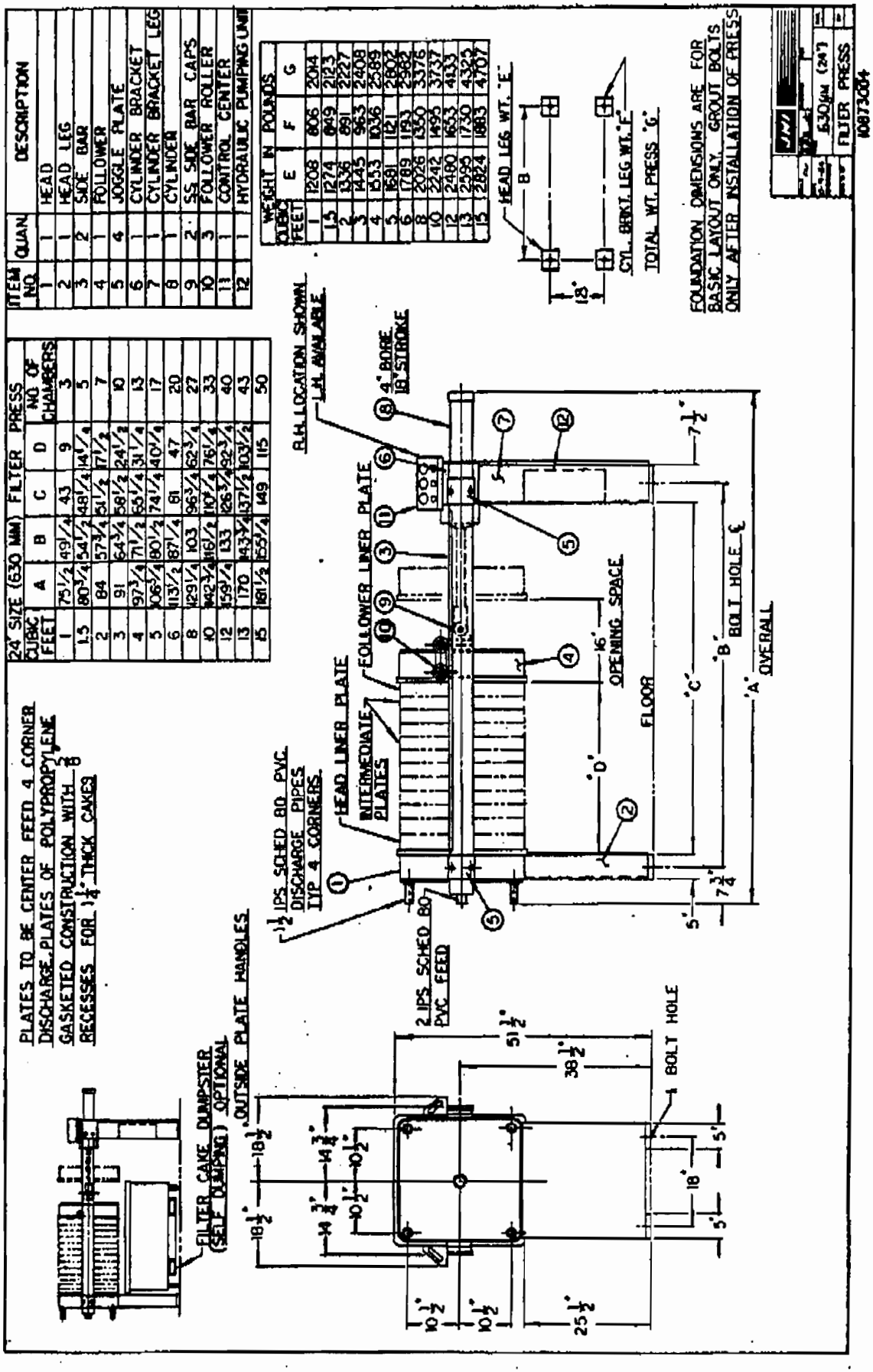
BUDGET PRICE $22,000
SHIPMENT 6-8 WKS

ATTACHED ARE DIMENSIONAL DRAWINGS
FOR YOUR USE.

LET US KNOW IF YOU NEED ANY OTHER
INFORMATION.

SINCERELY

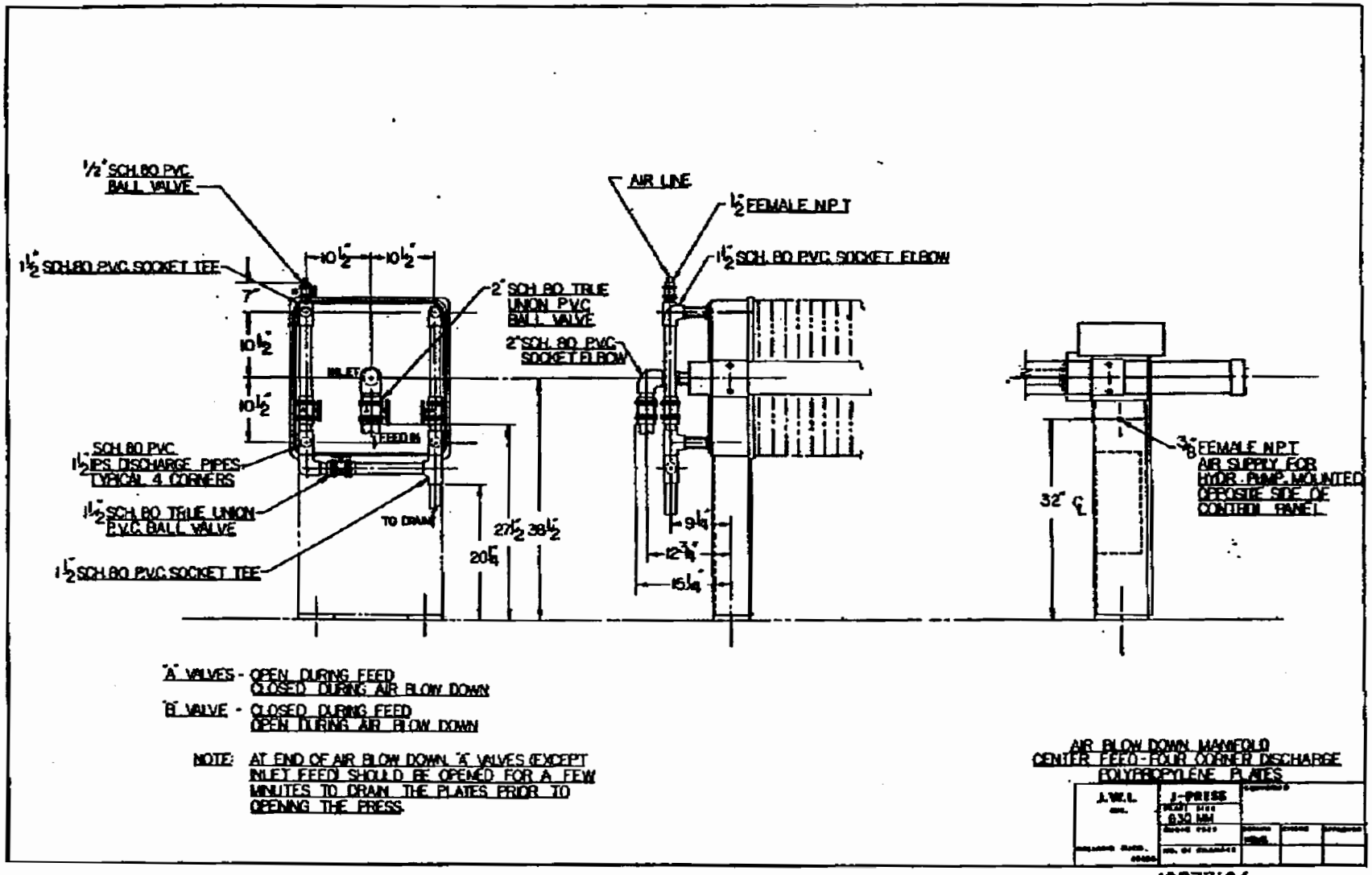
DAN TIGHE



ITEM NO.	QUAN.	DESCRIPTION
1	1	HEAD
2	1	HEAD LEG
3	2	SIDE BAR
4	1	FOLLOWER
5	4	JOGGLE PLATE
6	1	CYLINDER BRACKET
7	1	CYLINDER BRACKET LEG
8	1	CYLINDER
9	2	SS SIDE BAR CAPS
10	3	FOLLOWER ROLLER
11	1	CONTROL CENTER
12	1	HYDRAULIC PUMPING UNIT

24" SIZE (630 MM) FILTER PRESS						
CUBIC FEET	A	B	C	D	NO OF CHAMBERS
1	75½	49¼	43	9	3
1.5	80¾	54½	48¼	14¼	5
2	84	57¾	51½	17½	7
3	91	64¾	58½	24½	10
4	97¾	71½	65¼	31¼	13
5	106¼	80½	74¼	40¼	17
6	113½	87¼	81	47	20
8	129¼	103	96¾	62¾	27
10	142¾	116½	110¼	76¼	33
12	159¼	133	126¾	92¾	40
13	170	143¾	137½	103½	43
15	181½	155¼	149	115	50

WEIGHT IN POUNDS				
CUBIC FEET	E	F	G
1	1208	806	2014
1.5	1274	849	2123
2	1336	891	2227
3	1445	963	2408
4	1553	1036	2589
5	1681	1121	2802
6	1789	1193	2982
8	2028	1350	3378
10	2242	1495	3737
12	2480	1653	4133
13	2599	1730	4329
15	2824	1883	4707



"A" VALVES - OPEN DURING FEED
CLOSED DURING AIR BLOW DOWN

"B" VALVE - CLOSED DURING FEED
OPEN DURING AIR BLOW DOWN

NOTE: AT END OF AIR BLOW DOWN "A" VALVES (EXCEPT INLET FEED) SHOULD BE OPENED FOR A FEW MINUTES TO DRAIN THE PLATES PRIOR TO OPENING THE PRESS.

AIR BLOW DOWN MANIFOLD
CENTER FEED - FOUR CORNER DISCHARGE
POLYPROPYLENE PLATES

J.W.I. | J-PRESS | 630 MM

10873104

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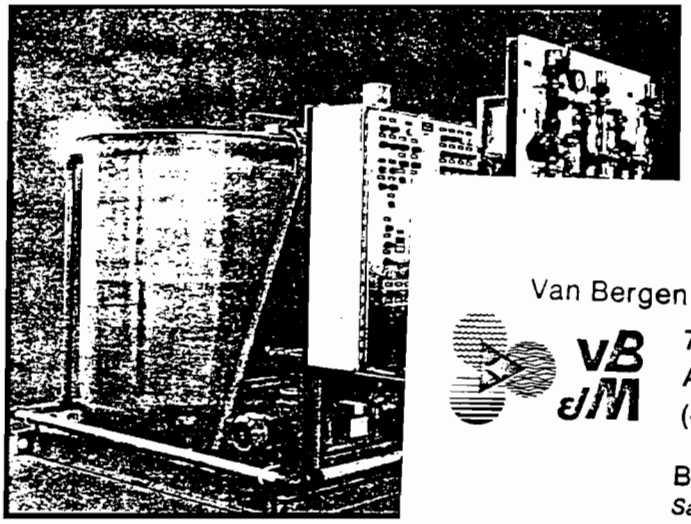
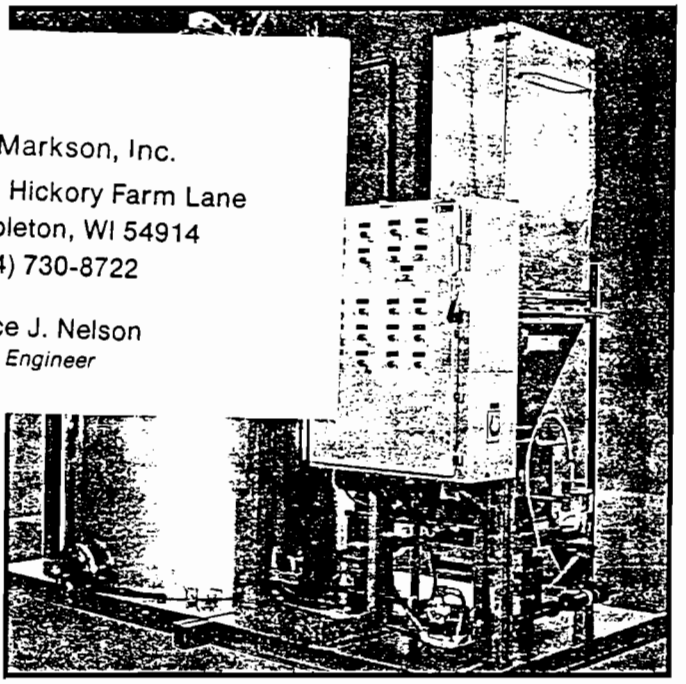
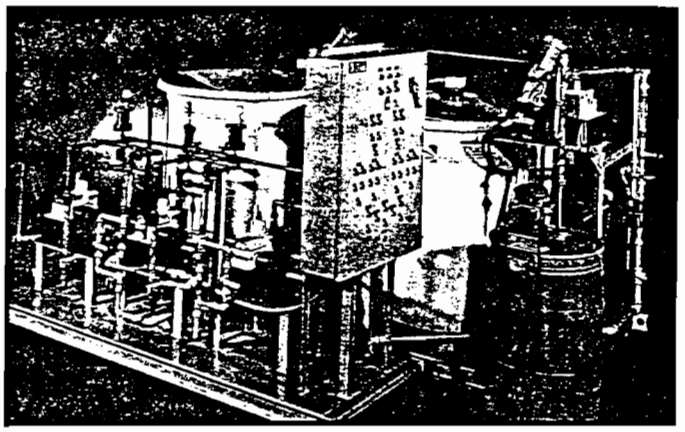


Left - skid containing the feed tank, control panel and downstream (of dilute pumps) dilution panel of a large hydraulic transfer System 3000H.

Van Bergen & Markson, Inc.
703 Hickory Farm Lane
Appleton, WI 54914
(414) 730-8722

Bruce J. Nelson
Sales Engineer





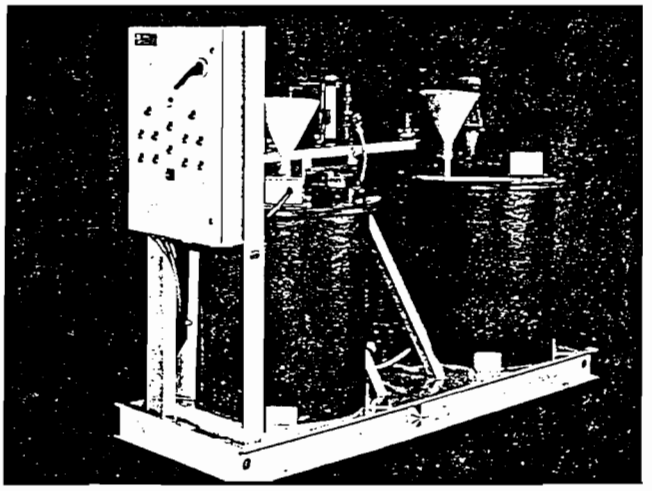
Left - this flip-flop automated system uses only liquid concentrate; mix/age tanks maximize activation. Note the skid mounted diaphragm pumps.

Above - over-under arrangement with gravity tank transfer via motor operated ball valve.

Manual Flip-Flop Package

A flip-flop system can also be supplied for manual operation at very low cost. The automatic helix feeder, the Spraymaster wetting cone, and transfer eductor are replaced with a manual funnel eductor. Manual flip-flop ball valves replace automatic 2-way valves. This cost effective manual system operates as follows:

Diluted polymer is metered from one tank while the operator manually prepares a new batch. Upon low level in the feed tank and after manually switching feed valves at the bottom of each tank, water is turned on and flows into the empty tank through a funnel eductor. The operator energizes the mixer in the empty tank when the lower impeller is covered. The operator gradually pours polymer concentrate into the funnel eductor, as the tank fills. Water is turned off on high level and the mixer times-out after 30 to 45 minutes mix time. A fresh batch stands ready until the other tank empties, whereupon the operator manually flip-flops valves (switching feed tanks) and prepares a new batch. Low tank level alarms, mixer timer and high level shut-off of water solenoid valve may be added at nominal cost.



Furey Filter and Pump, Inc.

12300 W. Carmen Avenue
Milwaukee, WI 53225
Phone: (414) 358-5555
FAX: (414) 358-5544

30 of 45

January 4, 1993

Sec Donohue
4738 N. 40th
Sheboygan, WI 53083

Attention: Larry Kiener

Subject: Polymer Pumps

Gentlemen:

In accordance with our recent conversation we are pleased to quote to following;

12 GPH MAX @ 20 PSI POLYMER

3 - Milton Roy Model FR-131P-117 mRoy P simplex controlled volume metering pump constructed of 316 stainless steel liquid end. The pump will be driven by a 1/4 H.P., D.C., 1750 RPM, 90V Armature motor. To include a Leeson D.C. Controller.

PRICE: $1,729.00 NET EACH

Due to the Viscosity of the Polymer, please forward information to run NPSH test prior to order. Information required S.G. operating, Temp and viscosity.

Thank you for the opportunity to provide you with this proposal. If you have any questions or if I can be of further assistance, please do not hesitate to call.

Regards,

Dave A. DeCono

DADC/sv

0193SECD.041

MAGNIFLOC® 845A FLOCCULANT

Potable Grade

31 of 45

Type: Dry, anionic

MAGNIFLOC 845A flocculant is a high molecular weight, anionic flocculant which works effectively as a coagulant aid or sludge conditioning agent in liquids-solids separation processes. MAGNIFLOC 845A flocculant is highly anionic.

TYPICAL PROPERTIES

Appearance	Off-white, granular powder
Degree of anionic charge	High
Bulk density	48-55 lb/ft³ (770-880 kg/m³)
pH of 0.5% solution at 25°C (77°F)	7.5-9.5
Residual monomer	< 0.05%

Viscosity,* cps:

% solution	25°C
0.1	150
0.25	400
0.5	850

*Brookfield

Environmental Properties*

BOD	~100 mg/L
COD	~9000 mg/L

*Based on a 1% solution

ADVANTAGES

- Approved by the EPA for use in potable water treatment.
- Economical to use – effective at very low dosage levels.
- Works over a wide pH range and does not alter the system pH.
- Larger, faster-settling flocs are formed in gravity settling operations.
- Increased filtration rates and drier cakes are produced in filtration processes. Sludges contain less ash when incinerated.
- Higher solids capture, increased clarity, and greater throughput are attained in centrifugation.

PRINCIPAL USES

MAGNIFLOC 845A flocculant is recommended for liquids-solids separation systems:

- Mechanical dewatering – treating alum muds and inorganic sludges for increased throughput, solids recovery, and effluent quality.
- Gravity settling – improves floc formation for faster settling rates, increased sludge compaction, and improved water quality.
- Coagulant aid – settling aid with inorganic and organic coagulants as in heavy metal precipitation and phosphorous removal.
- Water clarification – improves water effluent quality by reducing suspended solids and turbidity.

CYANAMID

American Cyanamid Company
Specialty Polymers Department
Paper Chemicals Department

Treatment Levels

• Flocculant	0.2-1.0 mg/L
• Coagulant aid	0.05-1.0 mg/L
• Filtration aid	0.002-0.01 mg/L

Application

MAGNIFLOC 845A flocculant should be dissolved in water using an eductor funnel to make a 0.1% to 0.5% solution. Dissolution should be complete after 30 minutes, but will be faster in warm water. However, avoid temperatures above 120°F (50°C). Stock solutions are stable for at least two weeks. For best results, further dilute (100:1) with clean water prior to feeding to process stream. Avoid turbulent mixing conditions in the process stream after adding MAGNIFLOC 845A flocculant.

EPA Status

MAGNIFLOC 845A flocculant is approved by the U.S. Environmental Protection Agency as a coagulant aid in the treatment of potable water at a maximum recommended concentration of 1.0 mg/L.

FDA Status

MAGNIFLOC 845A flocculant is approved under the U.S. Code of Federal Regulations for use:

As a clarification agent for water used to wash or to assist in the lye peeling of fruits and vegetables, not to exceed 10 mg/L in wash water (Food Additives Regulation 21 CFR 173.315).

In the clarification of beet sugar and cane sugar juices not to exceed 5 mg/l by weight of juice (Food Additives Regulation 21 CFR 173.5)

Health and Safety

MAGNIFLOC 845A flocculant is non-toxic by ingestion and non-irritating to the eyes and skin, based upon standard toxicity and irritation studies using laboratory animals.

Before handling this material, read the corresponding American Cyanamid Company Material Safety Data Sheet for safety, health and environmental data.

Handling and Storage

Solutions of MAGNIFLOC 845A flocculant are no more corrosive than water and recommended materials of construction for solution handling include mild steel, fiber glass, plastic and any other more resistant materials. Spilled polymer is very slippery—spills should be scooped and/or wiped up prior to flushing with water.

Shipping

MAGNIFLOC 845A flocculant is shipped in 55 1-lb (25-kg) moisture-resistant paper bags, F.O.B. Woodbridge, NJ.

Important Notice

The information and statements herein are believed to be reliable, but are not to be construed as a warranty or representation for which we assume legal responsibility. Users should undertake sufficient verification and testing to determine the suitability for their own particular purpose of any information or products referred to herein. NO WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE IS MADE. Nothing herein is to be taken as permission, inducement or recommendation to practice any patented invention without a license.

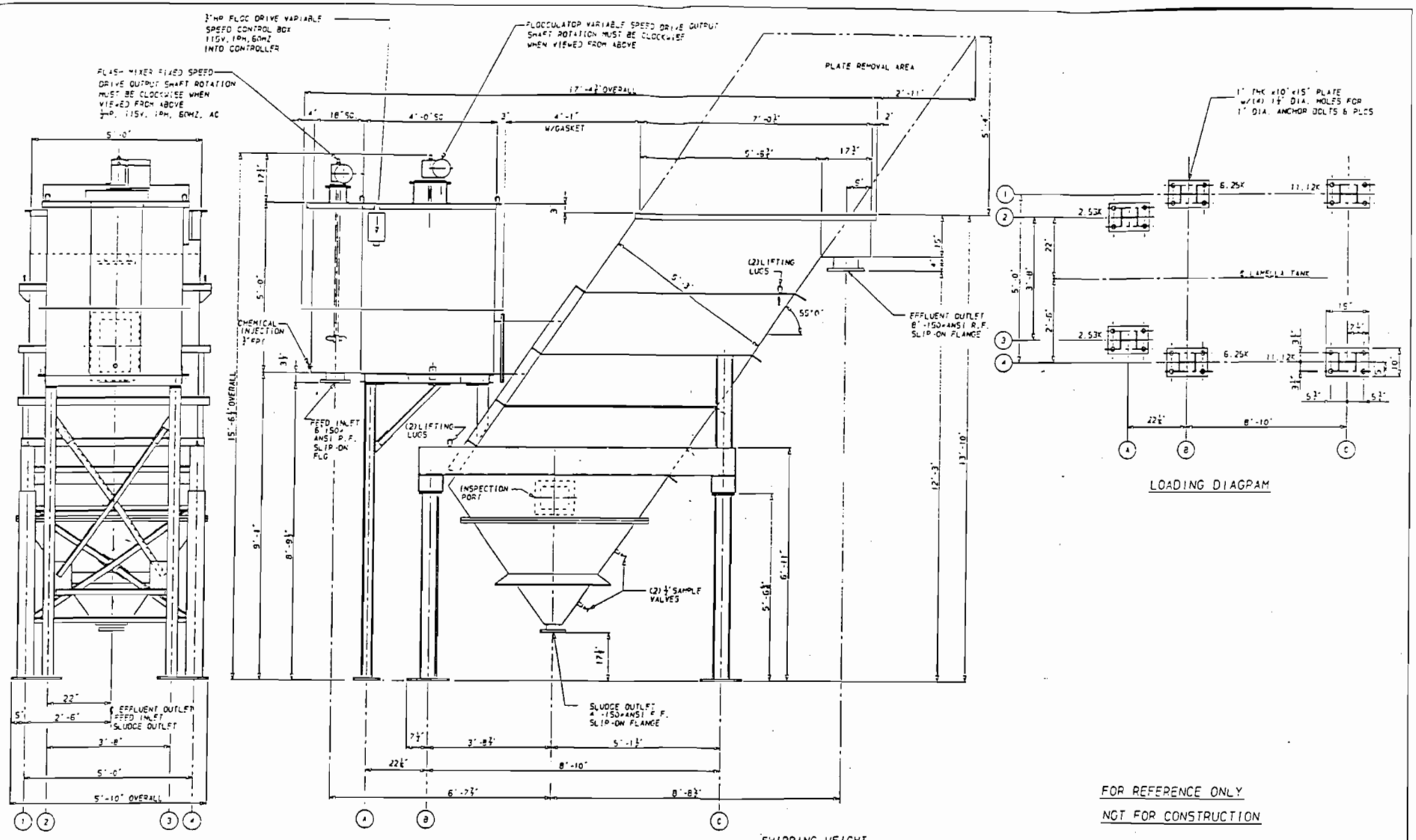
CYANAMID

American Cyanamid Company
Specialty Polymers Department
Paper Chemicals Department
Wayne, New Jersey 07470

86-1325 3k 10/88

81309-0979

LGSS570FC



SHIPPING WEIGHT
LAMELLA TANK: 9000 LB.
FLOC & MIX TANK 2100 LB.
TOTAL WT. 11,100 LB.

WEIGHT FULL OF LIQUID
LAMELLA TANK: 31,400 LB.
FLOC & MIX TANK 8400 LB.
TOTAL WT. 39,800 LB.

FOR REFERENCE ONLY

NOT FOR CONSTRUCTION

PARKSON
Lamella® GRAVITY SETTLER
GENERAL ARRANGEMENT
LGS-570/55
'C' FLOC MIX TANK
LGSS570FC

33 of 55

PARKSON CORPORATION

DS-304 C-1

DYNA SAND® FILTER

34 & 45

DATA SHEET - PACKAGED UNITS

	DSF-7	DSF-12	DSF-19	DSF-38	DSF-64	DSF-100
FILTER AREA (SQ.FT.)	7	12	19	38	64	100
INSIDE DIAMETER	3'-0"	4'-0"	5'-0"	7'-0"	9'-0"	10'-0" sq.
OVERALL DIMENSIONS (Ø x H)	4'-0" x 9'-0"	5'-4" x 11'-6"	6'-6" x 12'-4"	8'-0"x 14'-0"	10'-6"x 18'-6"	11'-1" x 11'-4"
SHIPPING WEIGHT (LBS.)	500	850	CS:2300	CS:4000 FRP:1800	CS:8000 FRP:8000	16,000
SAND REQUIRED (TONS)	2	4	6	11	20	24
OPERATING WEIGHT (LBS.)	6000	15,500	24,000	CS:50,000 FRP:48,000	CS:104,500 FRP:104,500	118,000
FEED RATE (GPM)	28-45	48-96	76-152	152-304	250-510	400-800
REJECT RATE (GPM)	1.5-4	2-8	2-10	3-15	5-25	8-35
AIR CONSUMPTION (SCFM @ 15-25 PSI)	0.5-1	0.5-1.5	1-2	1-3	1.5-4.0	4.0-8.0
SAND BED DEPTH	30"	40"	40"	40"	40"	40"
PRESSURE DROP	15"-20"	18"-24"	18"-24"	18"-24"	18"-24"	18"-24"
STANDARD TANK MATERIAL OF CONSTRUCTION	FRP	FRP	EPCS	EPCS or FRP	EPCS or FRP	EPCS

NOTES:

1. The DSF-19, -38 & -64 are available in FRP construction for a price adder.
2. All filters have their own air control system including the hook-up to the compressed air supply, an air filter, air regulator, flow indicator and a pressure gauge.
3. The surface loading rate is typically 4-8 GPM/ft^2, dependent on application.
4. The DynaSand® Filter can be gravity fed from any source which has a water level which is 2-3 ft. higher than the DynaSand Filter.
5. Feed solids range depends on application. The DSF can be designed to handle up to 200 ppm suspended solids.
6. Filtrate quality is generally the same as for conventional filters, i.e. 0-10 ppm depending on application.
7. Filter media is generally silica sand with an effective size of 0.85-1.2 mm and a uniformity coefficient of about 1.5 (99% silica is preferred).
8. The sand passes the washer 2-10 times per day depending on the application.

2727 N.W. 62nd Street
P.O. Box 408399
Fort Lauderdale, Florida 33340
Telephone: 305 974-6610

A subsidiary of
A. Johnson & Co., Inc.

DYNA SAND® FILTER

DS-399

35 of 45

THE PARKSON DYNASAND® FILTER

Introduction

The Parkson DynaSand® Filter is a unique filtration system since it continuously filters liquid suspensions to excellent effluent quality while it continuously cleans the filter media.

The DynaSand® Filter has been found to be a simple, yet powerful , efficient and cost effective method of filtration in the following applications:

Metal Finishing Wastewater
Steel Mill Scale Water
Municipal Tertiary Treatment
Oil Removal
Biologically Treated Wastes
Algae Removal
Surface Water
Various Steps In Chemical Processing

How It Works

The influent suspension is introduced into the bottom of the DynaSand® Filter unit and is filtered upward through the sand bed. The clean filtrate overflows the filtrate weir at the top of the tank and exits through the filtrate nozzle.

A small supply of air is continuously introduced into the airlift which is centrally located in the bottom of the tank. The filtered solids and sand are pulled into the airlift and conveyed to the top center of the unit. This allows continuous movement of the sand. The agitation and the turbulence within the airlift cleanses the sand of the filtered solids and these solids and sand are then separated as they fall through the sand washer assembly. A small amount of filtrate flows up through the sand washer assembly and acts as the reject water. The reject water traps all of the separated solids and this stream flows out of the filter through the reject nozzle. The clean sand, having fallen through the washer, is distributed evenly over the sand bed.

Advantages

Simplicity

Operational simplicity is realized with the DynaSand® Filter. The filter media is continuously backwashed with the rate controlled simply by the

2727 N.W. 62nd Street
P.O. Box 408399
Fort Lauderdale, Florida 33340
Telephone: 305 974-6610

A subsidiary of
A. Johnson & Co., Inc.

air supply to the airlift. This eliminates shutting the filters down to backwash the media at given intervals or when the filter begins to blind as on conventional filters. Operator attention is minimal since the DynaSand® Filter contains no moving parts and offers maintenance free operation.

Continuous

Continuous operation allows problem free performance. There is no need to stop operation and take the unit off line to backwash. Because the media is continuously cleaned, a small stream of reject water can easily be returned to its disposal point. This eliminates the need to use large equalizing backwash water holding tanks and pumps.

Performance

The DynaSand® Filter continuously filters with a clean bed of sand. This allows high rate filtration of suspensions containing very high concentrations of suspended solids while still continuously yielding excellent effluent quality.

Cost Savings

Internal, continuous media backwashing eliminates conventional backwash equipment such as piping, valving, storage tanks, pumps and intricate electrical systems. A small air supply is the only external piece of equipment which requires minimal power consumption.

Continuous clean media filtration also allows a constant low pressure drop (1-2 ft) across the filter media which, in many cases, eliminates pumping and allows gravity feed to the unit.

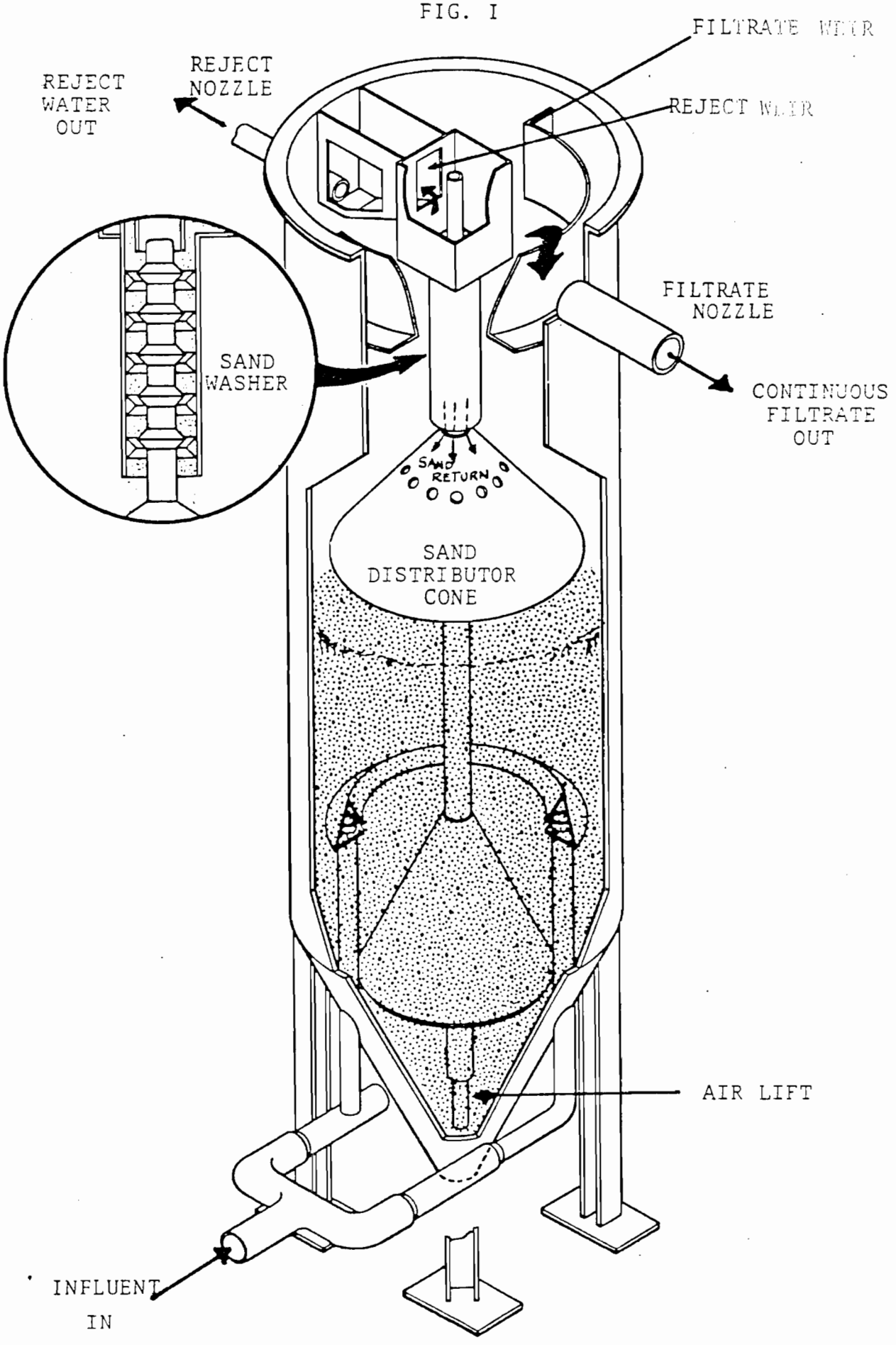
Installation and Flexibility

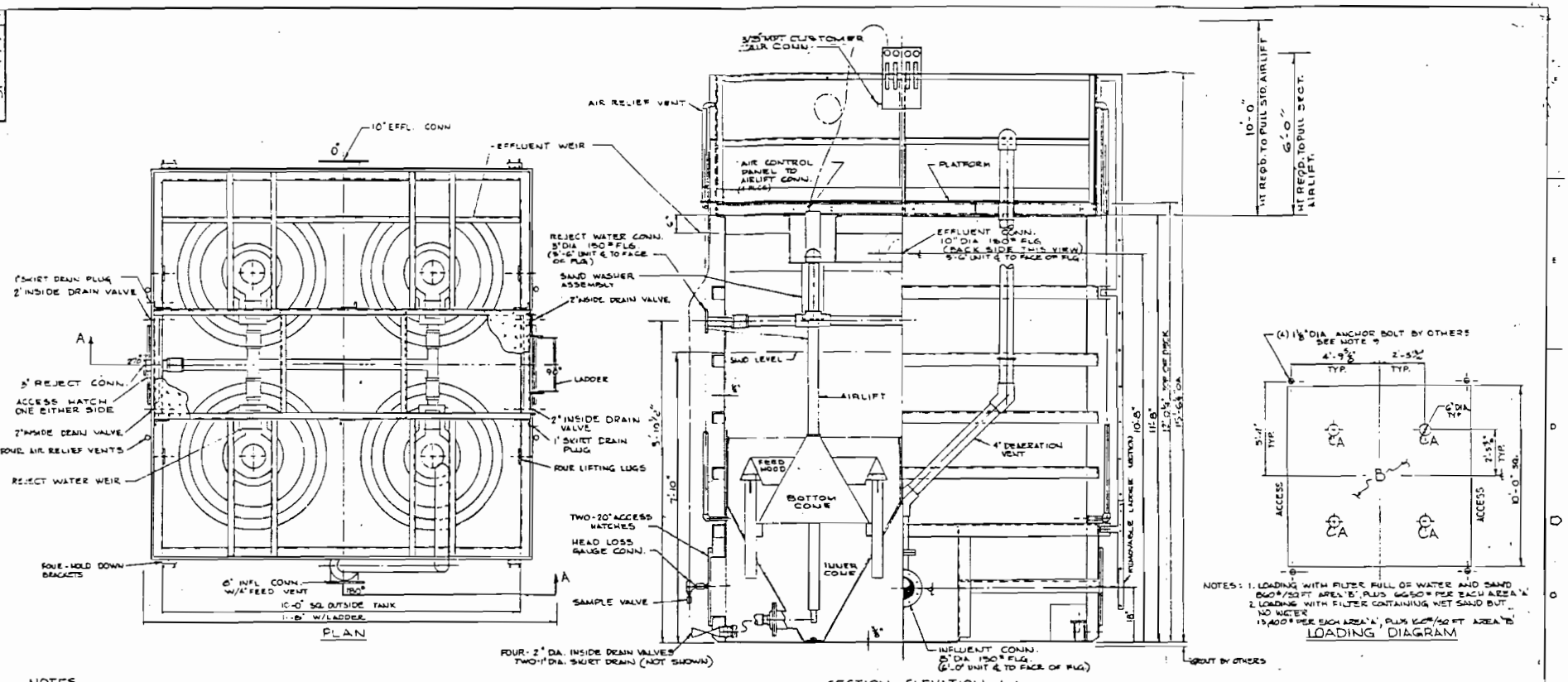
Completely preassembled units are easily compatible with existing or newly designed treatment systems. Installation requirements are merely pipeline and air line connections.

The DynaSand® Filter comes in various sizes to handle all ranges of flow rates and suspended solids concentrations.

THE PARKSON DYNASAND FILTER

FIG. I





NOTES: 1. LOADING WITH FILTER FULL OF WATER AND SAND 860#/SQ FT AREA 'B' PLUS 6650# PER EACH AREA 'A'
2. LOADING WITH FILTER CONTAINING WET SAND BUT NO WATER 13,400# PER EACH AREA 'A', PLUS 1600#/SQ FT AREA 'B'

NOTES

1. THIS DRAWING TO BE USED FOR GENERAL INFORMATION ONLY, NOT FOR CONSTRUCTION.
2. MATERIALS OF CONSTRUCTION
   - TANK — C.STL.
   - INTERNALS — F.R.P.
   - AIRLIFTS — S.STL.
3. WEIGHTS
   - SHIPPING WEIGHT — 16,000 LBS.
   - TANK & DRY SAND — 62,000 LBS.
   - TANK W/SAND & WATER 112,600 LBS.
4. A FLAT, HORIZONTAL FOUNDATION MUST BE PROVIDED FOR THE FILTER WITH THE BEARING AS ON THE LOADING DIAGRAM.
5. TANKS MUST BE GROUTED.
6. AIR CONTROL PANEL AND HEAD LOSS GAUGE ARE NOT SHOWN.
7. ALL CARBON STEEL SURFACES TO BE SANDBLASTED AND THEN COATED WITH PRIMER AND PARKSON BLUE EPOXY PAINT.
8. FILL SAND ONLY TO THE LEVEL INDICATED ON THE DRAWING FOLLOWING THE OPERATING INSTRUCTIONS.
9. CUSTOMER ANCHOR BOLT PROJECTION TO INCLUDE GROUT, BRACKET DIMENSION FROM BOTTOM OF THE TANK OF 7 3/8", WASHER AND NUT

PRELIMINARY
FOR INFORMATION ONLY
NOT FOR CONSTRUCTION

A REVISED 6-24-85

Parkson CORPORATION

DynaSand® filter
GENERAL ARRANGEMENT
100 SQ FT FILTER

3F-479 A

38 & 45

TABLE 2-12

PREDICTED INFLUENT QUALITY AND POTENTIAL EFFLUENT LIMITS
Preliminary Remedial Design Submittal
Operable Unit 1, Phase 1 Design
Claremont Polychemical Corporation Superfund Site
Old Bethpage, New York

Compound	Predicted Influent Quality (ug/l)	Potential Effluent Limit (ug/l)
PCE	465	5
TCE	111	5
1,2-Dichloroethene (total)	349	5
1,1,1-Trichloroethane	35	5
Benzene	3	5
Chlorobenzene	6	5
bis(2-ethylexyl)phthalate	20	50
Chloroform	1	7
Arsenic	2.5	50
Barium	101	1,000
Lead	8	50
Selenium	8.5	10
TDS	267,000	500,000
Chloride	56,800	250,000
Fluoride	150	1,500
Sulfate	28,700	250,000
Ammonia	650	2,000
Nitrate + Nitrite	2,320	10,000
Magnesium	6,200	35,000
Manganese	640	50
Iron	3,930	300

Note:

1. Concentrations that were reported at less than the detection limit were not used to develop this table.

2. Effluent limits were based on SDWA MCLs, 6 NYCRR Parts 700 to 705 and 10 NYCRR 5. The limits shown in this table are the most stringent of these three standards.

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AS 100 Packed Column Airstripper

The AS 100 Packed Column Airstripper by Carbonair offers the highest performance available in a high-flow airstripper. Skid-mounting of the AS 100 enables the unit to be wired and plumbed before shipment, requiring only electrical and influent/effluent connections for quick mobilization and installation. Carbonair's unique skid-mounted design together with the unit's exceptionally durable FRP and welded-steel construction make the AS 100 suitable for all emergency response remediations, pilot tests and full-scale treatment systems.

Carbonair packed column airstrippers are available with a variety of options according to purchaser's specifications.

OPTIONS

Optional materials of construction.

Guy wire kit.

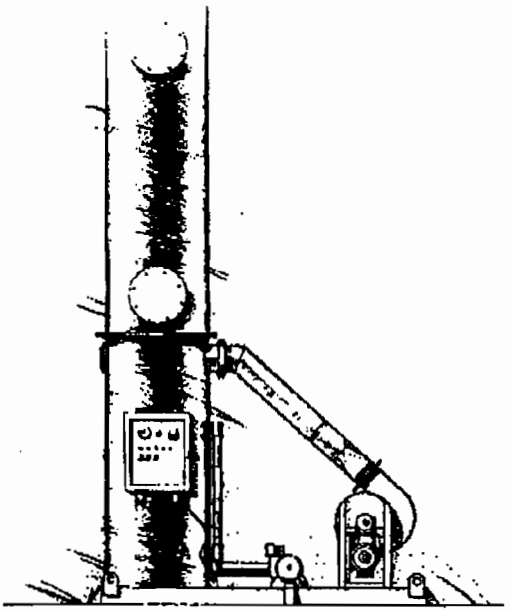
Additional 10-ft. packing sections.

Discharge pump, level controls, control panel.

Air-flow dampers.

Optional blowers.

Off-gas treatment ducting kit.



FEATURES

Skid-mounted design enables quick field mobilization and installation.

Epoxy-coated carbon steel sump and skid provide superior strength and high chemical resistance. Coating conforms to AWWA D 102 Inside System No. 1 and AWWA C 210-84 for immersion service, and has been tested and approved in accordance with FDA Regulations, Title 21, Section 175,300. It also meets U.S. EPA regulations for VOCs, as well as the abrasion resistance criteria established by ASTM D 4060.

Corrosion-resistant FRP and PVC internals provide exceptional durability.

10 horse-power blower ensures optimal air-to-water ratios at maximum liquid loadings.

Large access ports make packing exchanges and internal maintenance quick and easy.

2-inch polypropylene Jaeger Tri-pack tower packing ensures optimum performance.

SPECIFICATIONS

DIMENSIONS	3 ft. diameter x 23 ft. 5 in. overall height (0.9 m x 7.1 m)
LIQUID FLOW	10-425 gpm (38-1,615 L/min)
AIR FLOW	3,800 cfm maximum (114 m^3/min)
FITTINGS	See drawing #113213
BLOWER	10 h.p., 240/480v, 3-phase, ODP
PACKING VOLUME	71 $ft.^3$ 2-in. Jaeger Tri-pack per section (2.1 m^3)
EMPTY WEIGHT	3,120 lbs. (1,405 kg)
OPERATING WEIGHT	8,200 lbs. (3,690 kg)

CARBONAI
Water
Treatment

Airstripper
AS 100

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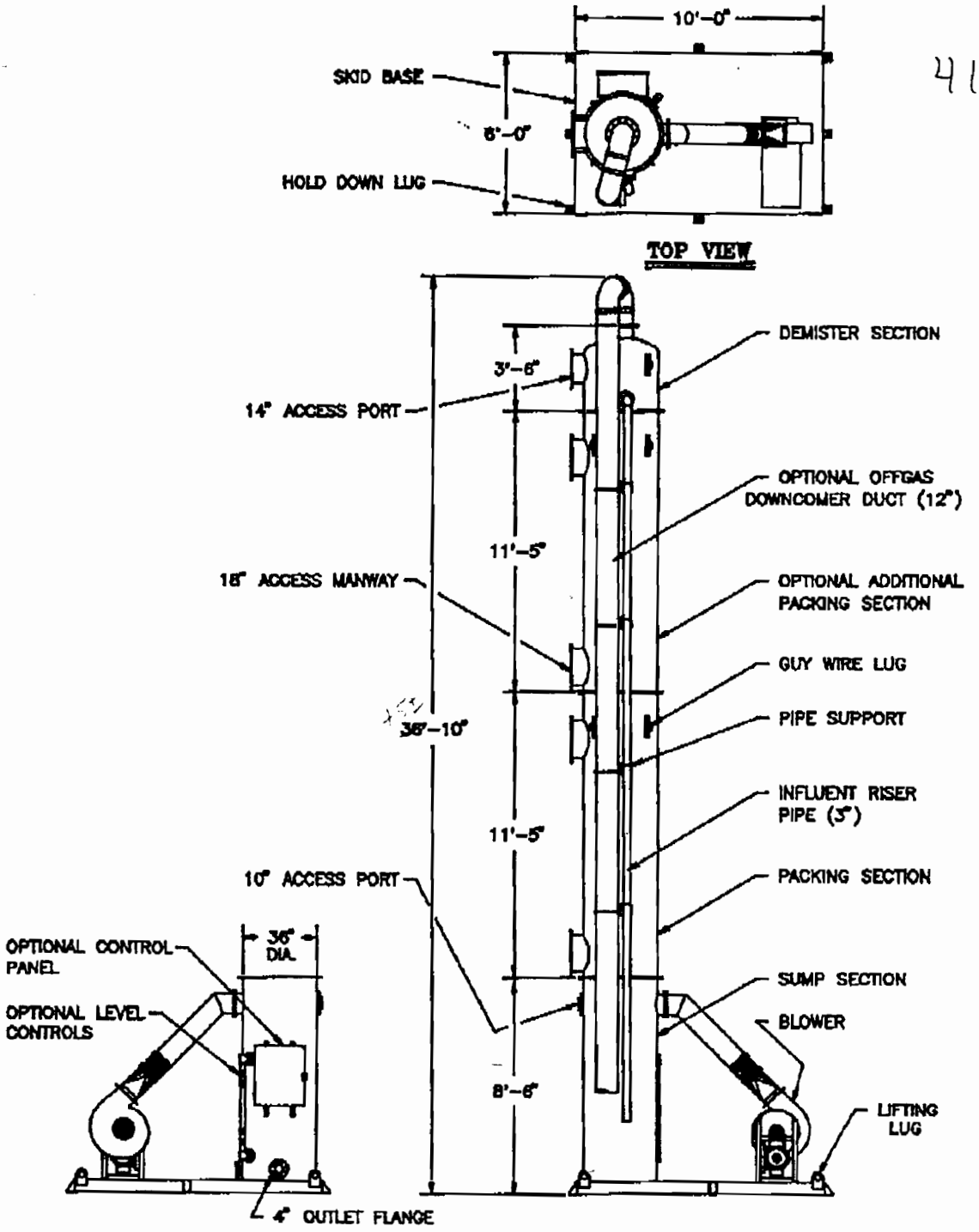

Sales Drawing #113213
91.11.26

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CARBONAIR Gas Treatment

GPC 48 Gas Phase Carbon Adsorber

The GPC 48 Gas Phase Carbon Adsorber by Carbonair is one of the most high performing gas phase carbon adsorbers of its size. Its welded-steel construction provides exceptional strength and durability, while the skid mounting and forklift compatibility of the unit make transportation and installation quick and trouble-free. The interior is double-coated with a corrosion-resistant epoxy polyamide ideal for the corrosive and abrasive conditions of gas phase service. The unit's superior design and remarkable portability make the GPC 48 suitable for any gas phase application, including airstripper and soil-venting off-gas treatment.

Carbonair adsorbers are available with a variety of options according to purchaser's specifications.

OPTIONS

Optional materials of construction.

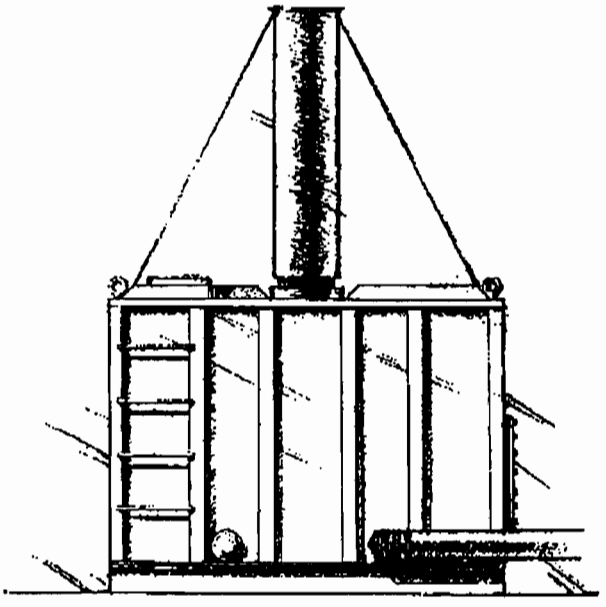
Blower(s) and controls.

Humidity control.

Influent/effluent ducting.

Additional sampling couplings and valves.

Discharge stacks.



FEATURES

Skid-mounted, welded-steel construction provides superior durability and convenience in transportation and handling.

Interior epoxy coating, stainless steel and FRP internals offer extraordinary chemical resistance. Coating conforms to AWWA D 102 Inside System No. 1 and AWWA C 210-84 for immersion service, and has been tested and approved in accordance with FDA Regulations, Title 21, Section 175,300. It also meets U.S. EPA regulations for VOCs, as well as the abrasion resistance criteria established by ASTM D 4060.

5,000-pound carbon capacity provides extended bed life.

8-inch inlet ports enable maximum carbon utilization.

16-inch discharge stacks promote optimum discharge of treated effluent.

Easy-access, stainless steel screen on FRP grate ensures full drainage of condensation.

Built-in sample couplings afford easy sampling of both the influent and effluent streams.

SPECIFICATIONS

DIMENSIONS	8 ft. 6 in. length x 6 ft. 6 in. width x 6 ft. 3¼ in. overall height (2.6 m x 2.0 m x 1.9 m)
BED AREA	48 ft.² (4.5 m²)
FLOW RANGE	480-4,800 cfm (14-140 m³/min)
CARBON CAPACITY	5,000 lbs. (2,250 kg)
FITTINGS	Four (4) 8-in. quick-connect air inlet ports One (1) 16-in. quick-disconnect off-gas stacks with weather shields One (1) ¾-in. condensation drain Two (2) ¾-in. full-coupling sample ports
EMPTY WEIGHT	3,000 lbs. (1,400 kg)
OPERATING WEIGHT	10,000 lbs. (4,500 kg)

Carbon Adsorber–Vapor Phase
GPC 48

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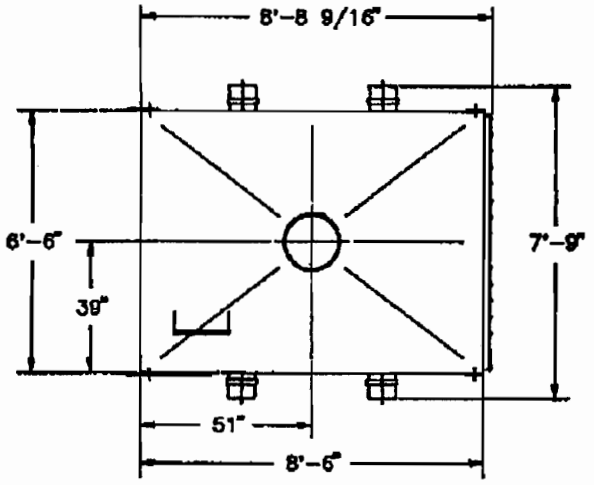
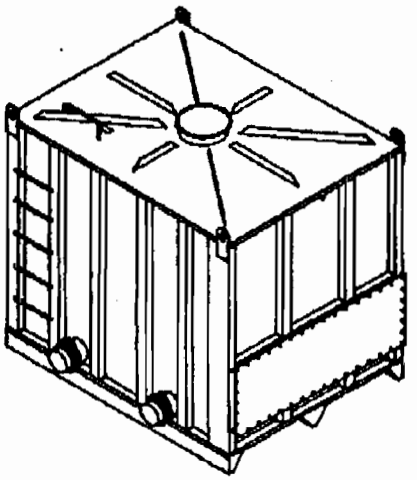
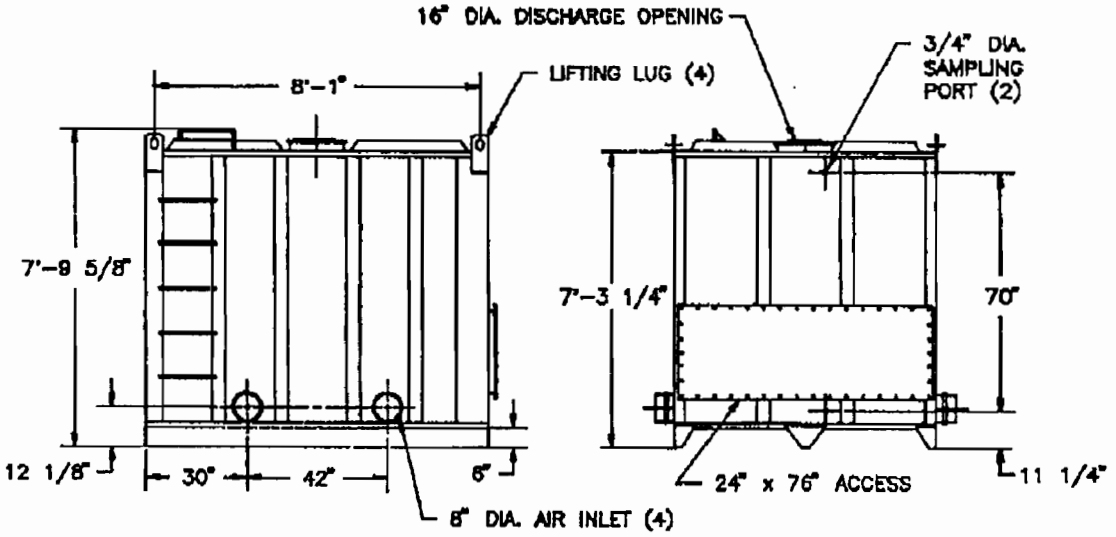
NOTE: VESSEL SHOWN WITH ALL CAPS AND COVERS INSTALLED.



TOP VIEW



ISO VIEW
(3/4 SCALE)



SIDE VIEW

FRONT END VIEW

Sales Drawing #105991
91.06.09

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CARBONAIR Water Treatment

PC 50 Liquid Phase Pressure Carbon Adsorber

The PC 50 Pressure Carbon Adsorber by Carbonair is an exceptionally durable and high-performing adsorber. Its welded-steel construction offers superior strength and reliability under all operating conditions. The conical-bottom collection system enables full use of the carbon bed, while the carbon-slurry piping provides for complete removal of spent carbon. The interior is double-coated with a corrosion-resistant epoxy tested and approved in accordance with AWWA, FDA and EPA regulations, making the PC 50 suitable for all industrial, municipal and potable applications.

Carbonair carbon adsorbers are designed and manufactured in accordance with the engineering standards set forth by the American Society of Mechanical Engineers. Carbonair adsorbers are available with a variety of options according to purchaser's specifications.

OPTIONS

Optional materials of construction.

Decon/3 piping package with quick connectors.

Influent-effluent quick connect kit.

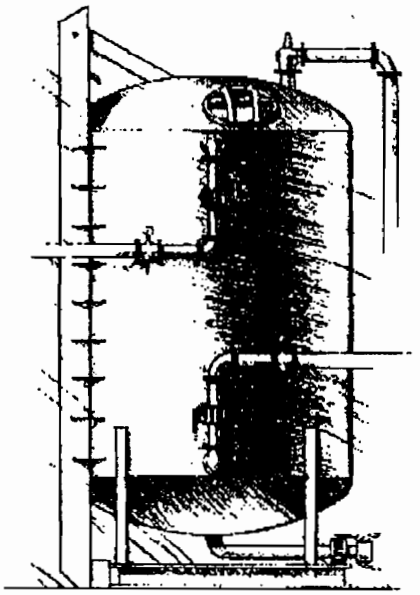
Influent-effluent sampling and pressure indicator kit.

Internal sampling kit.

Non-aerating sample ports.

Flow instrumentation, including meters, gauges and valves.

ASME certified.



FEATURES

Welded-steel, skid-mounted construction provides superior toughness and durability.

Interior epoxy coating and PVC or stainless steel internals offer high chemical resistance. Coating conforms to AWWA D 102 Inside System No. 1 and AWWA C 210-84 for immersion service and has been tested and approved in accordance with FDA Regulations, Title 21, Section 175,300. It also meets U.S. EPA regulations for VOCs, as well as the abrasion resistance criteria established by ASTM D 4060.

10,000-pound carbon capacity provides extended bed life at a full range of flow rates.

Conical-bottom collection system enables total carbon performance and greater overall operating efficiency.

Large carbon-slurry lines permit fast removal of spent carbon.

Four access ports afford easy inspection and enable trouble-free maintenance.

Roll-off truck capability provides greater flexibility in transport.

SPECIFICATIONS

DIMENSIONS	8 ft. diameter x 10 ft. straight height (2.4 m x 3.0 m) 17 ft. overall height (5.2 m)
BED AREA	50 ft.² (4.7 m²)
FLOW RANGE	25-360 gpm (95-1,500 L/min)
CARBON CAPACITY	10,000 lbs. (4,500 kg)
FITTINGS	Two (2) 4-in. influent-effluent flanges Four (4) 12-in. x 16-in. access ports One (1) 4-in. carbon slurry flange
DESIGN PRESSURE	66 psi
EMPTY WEIGHT	8,100 lbs. (3,700 kg)
OPERATING WEIGHT	36,500 lbs. (16,600 kg)

Carbon Adsorber--Liquid Phase
PC 50

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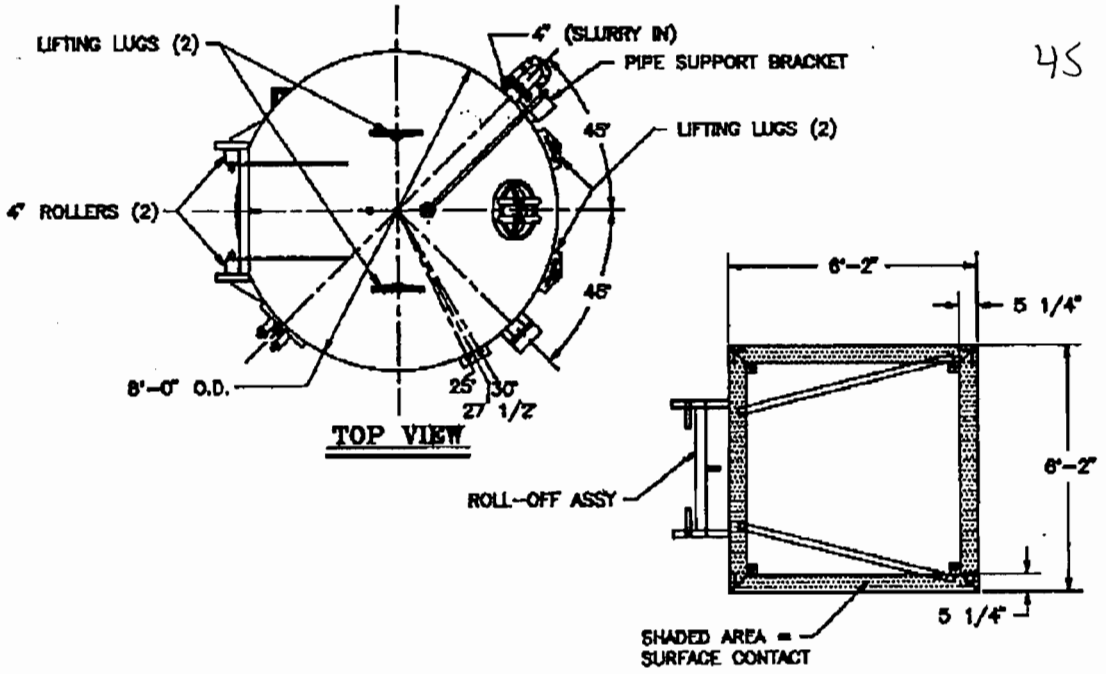

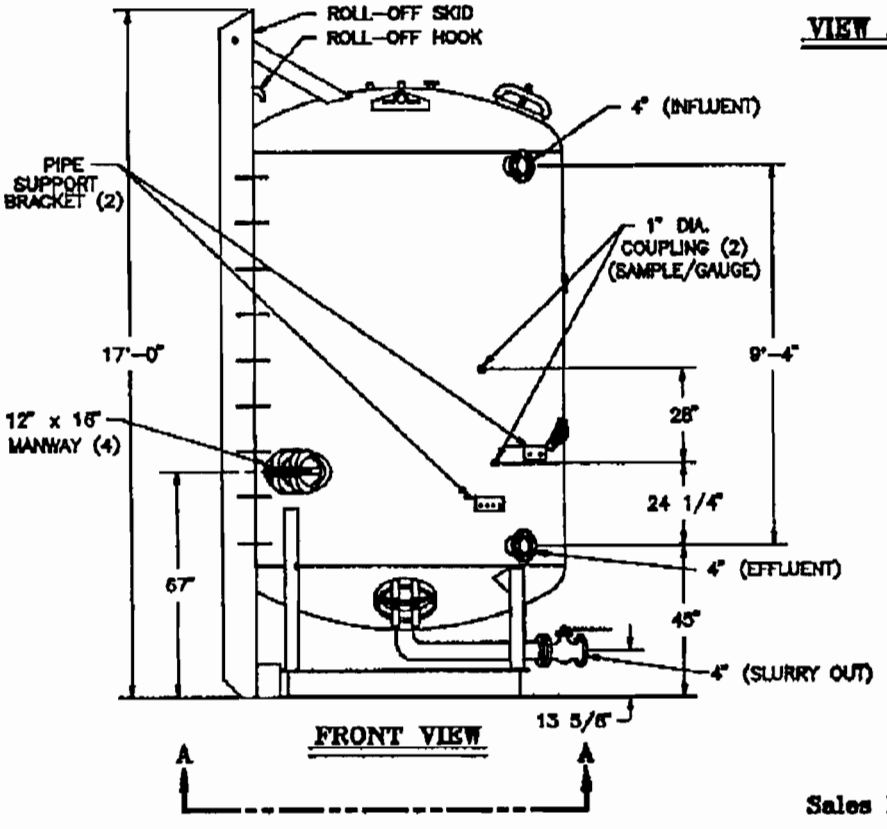

Sales Drawing #110070
91.06.20

9.0 INSTRUMENTATION AND CONTROL DESIGN ANALYSIS

9.1 GENERAL PARAMETERS

1. The design is based upon the concept of a facility with automatic and semi-automatic control of specific plant functions. With this in mind, the following Instrumentation and Control design parameters were developed:

   a. Installation of a central monitoring and control facility (Main Instrument Panel) to monitor critical alarms, failures, run status conditions, and control selected processes.

   b. Provision within the MIP for monitoring of critical events and dialing outside the facility.

   c. Use of Local Control Panels with appropriate controls and indication for individual packaged systems with above normal inter-system coordination requirements.

   d. Selection of automated control for facilities dramatically affected by plant flow variations, loading variations, or where operating efficiencies are paramount.

2. Instrumentation and Control design information shall be conveyed by means of Process and Instrumentation Diagrams (PID's) and Instrumentation and Control Riser Diagrams. A description of diagram functions follows.

   a. Process and Instrumentation Diagrams (PID's) are unscaled graphic designs that schematically depict the operation and control of a liquid, solid, or gas conveyance and treatment system. PID's show process flow streams through structures, equipment, valves, and miscellaneous piping components. In addition, PID's show the instrumentation, control panels, and signals (in standard symbology) necessary for the monitoring, operation, and control of the system. PID's are not drawn to scale and are not intended to show all existing facilities at the plant.

   b. Instrumentation and Control Riser Diagrams (Risers) are unscaled graphic designs that schematically depict the relational position of all instrumentation, control panels, and Instrumentation Terminal Cabinets (ITC's) requiring electrical control wiring. In addition, Risers show the quantities, types, and routing of control wiring between instrumentation, control panels, and ITC's. Risers are not drawn to scale and are not intended to show detailed point-to-point wiring connections.

3. The design has equipment specified under the following assumptions: (Note: Vendor names given as reference only, does not imply proprietary equipment).

   a. Instrumentation shall be controlled and monitored by a PLC-based Main Instrument Panel (MIP). The MIP shall be located in the electrical room. The MIP shall provide the following major functions:

      1) Control of process systems as described in Section 'B' below.
      2) Display of following status and alarm conditions:

         Equipment run indication
         Equipment fail indication
         Process alarms indication
         Facility alarms indication
         Manual/Automatic modes
         Equipment run-time monitoring

      3) Logging of alarms at MIP.
      4) The MIP shall include the following major components:

         PLC brainboard with memory and I/O modules - Allen Bradley or equiv.
         Operator Interface Unit (OIU) - Nematron or equiv.
         Limited conventional controls to facilitate operation during manual backup control mode.
         Automatic telephone dialer - Raco, Verbatim, or equiv.

      5) Alarms deemed "critical" shall activate automatic dialer.

   b. Panels shall conform to Nema 12 standards for interior installation and Nema 4X standards for exterior installation.
   c. Timers, time clocks, and cycle timers shall be electro-mechanical in nature.
   d. Status lights shall be of the Allen-Bradley/Square D Bullet Nose 6 vdc internal transformer type.
   e. Individual panel alarms, where used, shall be of the large Allen-Bradley/Square D Type, similar to status lights above.
   f. Output control relays shall be of the Allen-Bradley Series 700, Type N industrial class.
   g. Logic relays shall be of the Allen-Bradley Series 700, Type H general purpose class.

9.2 DESIGN OBJECTIVES AND PROVISIONS

1. Five specific unit processes are being used with one or more process systems in each. A description of the Instrumentation and Control as it relates to those systems follows:

1.1 Unit Process No. 1 - Groundwater Extraction and Metals Removal (09-N-2, 09-N-3)

Extraction well pumps shall be controlled by high and low levels in the equalization tank. Influent flows shall be monitored at MIP.

Equalization tank level shall be continuously controlled by throttling pneumatic operated level control valves. Feed pumps withdrawing from equalization tank shall be constant speed, running based on MIP requirements. Influent flow shall split into two identical process trains at this point.

Metals precipitation shall take place in reactors No. 1 and No. 2 where chemicals shall be added and mixed. Chemicals shall be injected by chemical feed pumps paced on flow and pH parameters. This is a continuous process with constant mixing.

Flocculation shall take place in flocculation tanks after flash mixing effluent from reactors with polymer in flash mix tanks. These are continuous processes.

Mixers shall cutout on no flow conditions or shutdown of process train.

Clarification and filtration are continuous, non-mechanical processes. Sludge withdrawal from the clarifier shall be timer-based. Filter backwash shall be a continuous air driven process with filter backwash waste water going to the plant recycle tank.

pH adjustment of filter effluent shall be in line acid injection and static mixing. Acid feed pump shall be pH-paced.

1.2 Unit Process No. 2 - Volatiles Removal (09-N-4, 09-N-5)

Filter effluent shall go to two air stripper wet wells. Wet wells shall be level controlled based on throttling the level control valves downstream of the wet wells.

Air stripper blowers and internal parameters shall be controlled by packaged, vendor supplied panel. Monitoring parameters shall be sent to MIP. MIP shall not have direct control of air stripping operation.

Air stripper off-gas shall pass through vapor-phase carbon adsorbers before being released to the atmosphere.

Air stripper effluent shall go to carbon adsorber feed tank. Feed tank level shall be controlled by carbon adsorber influent pump. Pump shall run based on high and low levels in the feed tank.

Liquid phase carbon adsorber is a continuous flow, non-mechanical process.

Carbon adsorber effluent shall be stored in treated water storage tanks with high level cutout of carbon adsorber influent pumps.

Injection well pumps shall operate based on high and low level in the treated water storage tank with high level cutout from injection wells.

1.3 Unit Process No. 3 - Sludge Handling and Plant Recycle (09-N-6)

Sludge from clarifiers shall be pumped to sludge holding tank. High level in tank shall cutout running sludge withdrawal pumps. Level shall be monitored at MIP.

Filter press, filter press feed pump and local control panel are packaged, vendor supplied system. Sludge is withdrawn and pressed based on PLC-based local panel. MIP shall monitor system parameters.

Recycle tank shall collect recycle from all process-related systems. Recycle pumps shall run based on levels in the recycle tank.

1.4 Unit Process No. 4 - Air System (09-N-7)

Air system shall be duplex compressor running on air receiver pressure. Output train shall consist of coolers, filters, and dryers to produce instrument quality air.

1.5 Unit Process No. 5 - Chemical Preparation and Feed Systems (09-N-8)

Chemical systems ($KMNO_4$, NaOH, Polymer, and HCL) will be batch processes that require operator input at local control panels. Chemical required alarms for all systems shall be sent to MIP. Operator initiates preparation at panel. Water fill based on tank level, mixer based on timer.

$KMNO_4$ and Polymer are flow paced. NaOH and HCL are pH paced.

9.3 GRAPHICS REPRESENTATION

1. Included in the completed drawing set are drawings identified as Process and Instrumentation Diagrams that schematically depict process flow, equipment, and related controls for each unit process system discussed above.